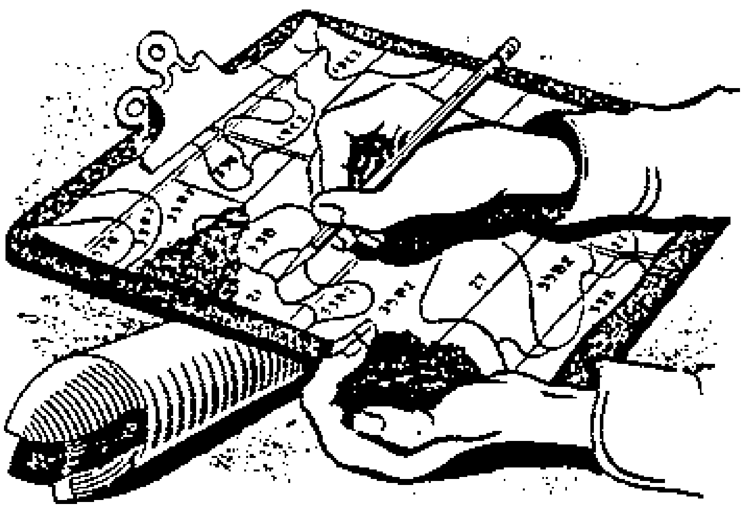
NATIONAL COOPERATIVE SOIL SURVEY

North Central Regional Conference Proceedings

Madison, Wisconsin
January 30-February 3, 1978

PROCEEDINGS
OF NORTH CENTRAL REGIONAL



NORTH CENTRAL REGIONAL TECHNICAL WORK-PLANNING CONFERENCE

of the

NATIONAL COOPERATIVE SOIL SURVEY

Madison, Wisconsin

January 30-February 3, 1978

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North Central Regional Work-Planning Conference
Of The National Cooperative Soil Survey
January 30-February 3, 1978
Madison, Wisconsin

Format

AGENDA

Monday, January 30

Horning

10:00 am Registration. Lobby.

Afternoon

1:30 pm Opening Remarks. Announcements

1:45 pm Welcome -
Jerome C. Hytry, Wisconsin State Conservationist
Soil Conservation Service

1:55 pm Welcome -
Glenn S. Pound, Director, Wisconsin Agricultural

2:10 pm

2:25 pm

2:45 pm

3:15 pm

3:45 pm

4:15 pm

5:00 pm

Tuesday, January 31

Morning

8:00 am	Meeting - Frank L. Anderson, Presiding Malcolm N. Dana, Chairman, Department of Horticulture, Soil and Crop Factors in Cranberry Production in Wisconsin
8:40 am	Break
9:10-11:45 am	Committee Meetings of Committees Numbered 1 Through 5
12:00 noon	Lunch

Afternoon

1:30-3:15 pm	Conclusion of the Meetings of the First 5 Committees
3:15 pm	Break
3:40-5:00 pm	Meetings of Committees Numbered 6 Through 9

Wednesday, February 1

Morning

6:45-8:00 am	Breakfast
8:00-11:45 am	Conclusion of Meetings of the Committees Numbered 6 Through 9
9:30 am	Break
12:00 noon	Lunch

Afternoon

1:00-4:30 pm	Tour of the U. S. Forest Products Laboratory and the University of Wisconsin Biotron. Departure Prom Lobby of University Bay Center at 1:00 pm

Thursday, February 2

Morning

8:00-11:45 am	Separate Meetings - Federal Agencies, NCR-3
9:30 am	Break
12:00 noon	Lunch

Afternoon

1:30 pm G. 3. Lee, Presiding.

1:50 pm Remarks by Richard R. Davis, Administrative Advisor to NCR-3

3:30 pm Break

4:30 pm Session Resumes

5:00 pm Adjourn

8:00 pm James G. Bockheim, Department of Soil Science
Soil Genesis in Antarctica

Friday, February 3

Morning - Francis D. Hole, Presiding

8:00 am Committee Reports to General. Session

10:00 am Break

10:15 em Business Meeting
1. Announcements
2. Necrology
3. Host for 1982 Selection
4: Instructions to Committee Chairman and Chairmen of the Separate Meetings (Federal Agencies, NCR-3) as to Submitting Reports, Camera-ready
5. List of Chairmen for the 1982 Committees

11:15 am Adjourn

PARTICIPANTS IN THE 1978
NORTH CENTRAL REGIONAL TECHNICAL WORK-PLANNING CONFERENCE

John D. Alexander
Frank L. Anderson
John I. Brubacher
Ferris P. Allgood
Wells F. Andrew
O. W. Bidwell
James A. Bowles
Edward L. Bruns
Donald P. Franzmeier
Raymond T. Diedrick
T. E. Fenton
Charles S. Fisher
Kenneth D. Fogt
George F. Hall
Milo Harpstead
Francis D. Hole
Phillip W. Harlan
Kenneth C. Hinkley
K. Keith Huffman
Ivan Jansen
Paul R. Johnson
A. J. Klingelhoets

Christian J. Johannsen
Gilbert R. Landtiser
James H. Lee
Charles W. McBee
Maurice J. Mausbach
Gerald A. Miller
Hollis W. Omodt
Burt W. Ray
Donald Rex Napes
Delbert L. Mokma
Wiley Scott
Neil E. Smeck
Robert Springer
Alexander Ritchie
Richard H. Rust
Stephen G. Shetron
Mike Stout
B. W. Thompson
L. A. Tornes
Earl E. Voss
E. P. Whiteside
DeWayne Williams

NORTH CENTRAL REGIONAL TECHNICAL WORK-PLANNING
CONFERENCE COMMITTEE ASSIGNMENTS

Committee 1 - Rooting characteristics in relation to paralithic horizons and other root restricting layers

Chairman - Sylvester C. Ekart
Vice-chairman - James H. Lee

Rex L. Carey
Keith Huffman
Maurice J. Mausbach
Steve Messenger
Hollis W. Omodt
H. Raymond Sinclair, Jr.
Bruce W. Thompson
Donald A. Yost
Larry D. Zavesky

Committee 2 - Improving soil survey techniques and modernizing soil surveys.

Chairman - Gilbert R. Landtiser
Burt W. Ray - Vice-Chairman

Louis L. Buller
Raymond T. Diedrick
Richard B. Jones
Ralph L. Meeker
Raymond L. Newbury
Mark S. Kusila
Miles W. Smalley
Robert F. Springer
E. P. Whiteside
Robert E. Wilson
John R. Worster

Committee 3 - Organic soils

Chairman - Kenneth C. Hinckley
Vice-Chairman - Neil W. Stroesenreuther

Don H. Boeltar
K. R. Everett
Harlan R. Finney
Charles S. Fisher
Rodney Harner
A. J. Klingelhoets
Gerhard B. Lee
Warren Lynn
Alexander Ritchie, Jr.
Frank W. Sanders

Committee 4 - Soil-water relations, including water movement in soil landscapes

Chairman - Richard H. Rust
Vice-Chairman - Erling E. Gamble

James A. Bowles
Edward L. Bruns
D. P. Franzmeier
Francis H. Hole
Dale Lockridge
R. F. Paetzold
C. L. Scrivner
Neil E. Smeck
Maurice Stout, Jr.
Thomas Thiel

'Committee 5 - Soil potential, including interaction between soils and fertilizer responses

Chairman - John I. Brubacher
Vice-Chairman - R. B. Grossman

Wells F. Andrews
James Bockheim
John R. Culver
Paul R. Johnson
Lloyd L. Joos
Donald 3. Patterson
Roy M. Smith
Lawrence A. Tornes

Committee 6 - Educational activities for soil resources and land use

Gerald A. Miller - Chairman
Henry D. Foth - Vice-Chairman

O. W. Bidwell
Leon B. Davis
Phillip W. Harlan
Milo Harpstead
Christian J. Johannsen
David Lewis
Delbert L. Mokma
R. A. Pope
Roger A. Swanson

Committee 7 - Soil correlation and classification (including forest soil classification)

John D. Alexander, Chairman
Marvin L. Dixon - Vice-Chairman

Steve R. Base
Eric A. Bourdo
Willard H. Carmean
T. E. Fenton
George W. Hudelson
D. Rex Mapes
DeVon Nelson
J. Wiley Scott
Robert I. Turner
F. C. Westin

Committee 8 - Using soil as a medium for treating wastes

George F. Hall - Chairman
Frank L. Anderson - Vice-Chairman

John D. Highland
Raymond L. Kunze
Gerald J. Post
William E. Roth
Edward A. Tompkins
E. Jerry Tyler
DeWayne Williams

Committee 9 - Classification, interpretation and modification of soils on mine spoils and disturbed soils

Earl E. Voss - Chairman
Stephen G. Shetron - Vice-Chairman

L. J. Bartelli
C. Reese Berdanier
Richard L. Christman
J.B. Fehrenbacher
A. R. Gilmore
Ivan Jansen
Charles W. McBee

MINUTES
of the
NORTH CENTRAL REGIONAL TECHNICAL WORK-PLANNING CONFERENCE
OF THE COOPERATIVE SOIL SURVEY
Madison, Wisconsin
January 30-February 3, 1978

The work-shop was called to order in the University Bay Center, University of Wisconsin at 1:30 pm, January 30th by Chairman Francis D. Hole, and closed at 11:15 am, February 3rd by H. Raymond Sinclair, incoming chairman of the 1980 Conference to be held at Indianapolis, Indiana probably some time in late spring of 1980. Attached is a list of participants with addresses, and a schedule (agenda) of the conference.

Each committee met for about five hours to review with its chairman the report and prepare comments. A copy of the nine committee reports is attached to these minutes.

Hollis W. Omodt, nominated by a committee consisting of James H. Lee, Earl E. Voss, Donald P. Franzmeier, and Hollis W. Omodt, was duly elected Secretary for the 1980 conference, to serve as chairman in 1982. The chairmen of the nine committees were asked to remain as chairmen of their respective committees at the close of the conference. It was discussed end agreed that chairmen probably need more than one term to add continuity to charge(s) of a committee.

Committee 1. Sylvester C. Ekart. Rooting Characteristics in Relation to Paralithic Horizons end Other Root Restricting Layers

Committee 2. Gilbert R. Landtiser. Improving Soil Survey Techniques and Modernizing Soil Surveys.

Committee 3. Kenneth C. Hinkley. Organic soils.

Committee 4. Richard H. Rust. Soil-Water Relations, Including Water Movement in Soil Landscapes.

Committee 5. John I. Brubacher. Soil Potentials, Including Interaction Between Soils and Fertilizer Responses.

Committee 6. Gerald A. Miller. Educational Activities for Soil Resources and Land Use.

Committee 7. John D. Alexander. Soil Correlation and Classification (Including Forest Soil Classification).

Committee 8. George F. Hall.. Using Soil as a Medium for Treating Wastes.

Committee 9. Earl E. Voss. Classification, Interpretation and Modification of Soils on Mine Spoils and Disturbed Soils.

A **replacement** for Dr. E. P. Whiteside on the regional snii taxonomy committee was needed. The person was selected in a separate meeting by NCR-3.

Following are the previous meeting places of the North Central Regional York-Planning Conferences:

Missouri 1955	Iowa 1966
Michigan 1956	Minnesota 1968
Illinois 1957	Illinois 1970
'Wisconsin 1958	South Dakota 1972
Kansas 1959	Missouri 1974
Indiana 1960	Michigan 1976
North Dakota 1961	Wisconsin 1978
Ohio 1962	Indiana 1980
Nebraska 1/ 1964	North Dakota 1982

1/ Chairman from Kansas

There are many people who have contributed their time and talents to this conference and earlier conferences. The following people are those recently retired or are retiring before the next North Central Regional Technical Work Planning Conference:

Donald L. Bannister, SCS, South Dakota
Nicholas Holowaychuk, Ohio State University
William E. McKinzie, SCS, Nebraska
Frank F. Riecken, Iowa State University
George M. Schafer, SCS, Ohio
Eugene P. Whiteside, Michigan State University
Alvin L. Zachary, Purdue University

This list is by no means complete. **Names *not* shown were not intentionally** omitted. Suggest each state prepare a list for the secretary at the 1980 meeting.

A motion was made and seconded that the bylaws be changed to include a representative of the Agricultural Research Service (now part of the Science and Educational Administration) on the steering committee. The motion was discussed and defeated.

Welcome and the significance and usefulness of soil survey were given by:

Jerome C. Hytry, State Conservationist
SCS, Madison, Wisconsin

Glenn S. Pound, Director
Wisconsin Agricultural Experiment Station

Meridith E. Ostrom, State Geologist and Director,
Geological and Natural History Survey, University
of Wisconsin - Extension

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Summaries of remarks made to the participants by the following people:

Walter Russell, Soil Group Leader, USDA, Forest Service. I'm looking forward to working with the people in the National Cooperative Soil Survey in this part of the

NORTH CENTRAL REGIONAL TECHNICAL WORK-PLANNING CONFERENCE
February 2, 1978
Madison, Wisconsin

Summary of Meeting with Federal Agencies

Participants included personnel of the Soil Conservation Service; other federal agencies; Don McCormack, Director, Soil Survey Interpretations Division. George F. Hall, Ohio State University, represented the NCR-3 membership. Paul R. Johnson and Maurice J. Mausbach of the MTSC sat in the NCR-3 meeting.

The following summaries of discussion were presented during this session:

1. Interim reports are printed if there is a need for them before the soil survey is published. They are to be technically correct which necessitates a thorough and accurate review.

2. The status of Automated Mapping System (AMS) is under review. The AMS is not producing map sheets as rapidly as planned.

3. Chapters of the Soil Survey Manual have been written and reviewed by people in the National Cooperative Soil Survey. It is hoped that the people in the states have an opportunity to test the manual before it is printed in final form.

4. CASPUSS is useful in managing soil survey when the dates are realistic. Updated CASPUSS dates need to be at TSC by the 15th of the month.

5. Soil surveys that are out of print (not available for distribution) can be reprinted. The state must pay for the reprinting.

6. Soil series in the old format need to be updated and circulated before a final correlation. A revised draft needs to be available at the time of the final correlation.

7. The state should consider the needs in SCS before purchasing word processing machines. South Dakota is working with the TSC to make their systems compatible. It is also working on developing a new procedure.

8. To make most efficient use of the soils staff time from the TSC, soil documentation needs to be available 30 days before their attendance at field reviews or final correlation.

9. The states need to suggest a date for the soil correlation conference. The TSC needs to reserve this date to assure that time is scheduled to do the correlation. Representatives from the state may or may not be in attendance during the date scheduled.

U. S. Forest Products Laboratory and the University of Wisconsin Biotron - Tour

The U. S. Forest Products Laboratory has excellent facilities to show the importance and uses of wood. The exhibits as one enters their beautiful building makes a person remember the role that wood played on this great country's heritage and continues to play today. The movie shown before the tour gave an overview of the activities at the laboratory. The equipment for use by the personnel demonstrates the unique properties and varied uses of wood. Trees are certainly one of America's renewable resources.

The University of Wisconsin Biotron conducts research under the most exacting controlled environment. The projects are so carefully regulated that change in temperature, humidity, length of light day, contamination, etc., jeopardize continuation of the experiment.

The tours were well organized. Our tour guides allowed sufficient time to ask questions at each stop. Our thanks to Dr. Hole for planning such an interesting tour.

REPORT OF COMMITTFE 1

CHARGE: Rooting characteristics in relation to paralithic horizons and other root restricting layers.

BRIEF BACKGROUND OF COMMITTEE 1: This committee gave its first report at the 1976 North Central Regional Work Planning Conference. The objective of this committee developed primarily as a result of:

1. Need to provide field soil scientists positive applicable guidelines on uniform identification of paralithic horizons.

2. Need to study the distribution and implication of roots in paralithic horizons and other restricting layers on root growth and distribution.

3. Need to study the definition of the Cr horizon and the field application of the criteria used to define this horizon.

A field study of soil having paralithic horizons was conducted in June 1977 jointly between the South Dakota, North Dakota and Montana Soil Survey Staffs and the Lincoln and Portland Soil Correlators' Offices.

A characterization of soils with paralithic horizons was conducted in Adams County,. North Dakota jointly with the North Dakota Agricultural Experiment Station and the National Soil Survey Laboratory. The samples are in the laboratory as of this date. The study concentrated on routine analysis, water movement and root distribution.

COMMITTEE MEMBERS: Chairman...............Sylvester C. Ekart
Vice-Chairman ....James H. Lee

Keith Huffman
Rex L. Carey
Maurice J. Mausbach
A. Steven Messenger
Gary B. Muokel
Hollis W. Omodt
Raymond H. Sinclair, Jr.
Bruce W. Thompson
Donald A. Yost
Larry D. Zavesky

SUMMARY - Committee 1 Recommendations

1. That NCR Committee 1 be discontinued.

2. Forward this topic to National Steering Committee for further appropriate action.

3. Additional study and characterization of paralithic and lithic soils and underlying materials for AWC and ability to deliver water to plants. Also encourage publication and/or sharing of all such data.

4. Recommend adopting "moderately deep" to be used as a family depth as stated in item 4 of Dr. McClelland's recommendation (attached).

5. Collection of yield data on soils having soft bedrock between 20 and 40 inches, to measure the influence of these layers on yields.

The following persons participated in the Madison, Wisconsin January 30-February 3, North Central Regional Soil Survey Work Planning Conference Committee 1 discussions:

Keith Huffman
Frank Anderson
Maurice Mausbach
Bruce Thompson
Maurice Stout, Jr.
Hollis Omodt
Wiley Scott
Kenneth D. Vogt
H. Raymond Sinclair, Jr.
George W. Hudelson
D. Rex Mapes
James H. Lee

Vice-Chairman, James H. Lee Presided

Lee called the meeting to order and read the committee charges. He opened the meeting for response to charges.

Stout discussed how interpretation8 are of some concern with respect to soft paralithic materials. Some soil scientists describe soft shale (paralithic) layers as soil. Stout **diagrammed** an example of a **shallow** soil underlain by soft shale (paralithic).

Mausbach discussed his views on the difficulty of determining whether a horizon is C or Cr. This determination influences our predictions about soil behavior. Several participated in this discussion and the following were addresaed:

1. Sampling (at what depth) for baae saturation for determining order level classification.

2. Different effects Of Climatic **factors** such a8 rainfall on **soils** with paralithic layers.

3. Why dense glacial tills could possibly constitute Cr horizon8 and be classed as paralithic.

4.

5.

6.

At this point the committee considered the specific recommendations made by Dr. McClelland's September 28, 1377 letter.

The committee agreed with the seven recommendations. (Regarding recommendation No. 5, the committee recommends that a 5 inch thick continuous horizon that begins within the control section be required for contrasting texture family end for recommendation 7 we suggest further testing for breakdown of fragments in water as tried in South Dakota and Montana before adopting for taxonomy.)

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE, P.O. Box 2890
Washington, D.C. 20013

SUBJECT: SOILS - Soil Taxonomy - Lithic and paralithic contacts

DATE: September ~~28~~, 1977

TO:
Klaus W. Flach, Assistant Administrator for Soil Survey
Victor G. Link, Director, Soil Survey Operations
Donald E. McCormack, Director, Soil Survey Interpretations
Raymond B. Daniels, Director, Soil Survey Investigations
Joe D. Nichols, Principal Soil Correlator, STSC
John D. Rourke, Principal Soil Correlator, NETSC
Maurice Stout, Jr., Principal Soil Correlator, MWTSC
J. Melvin Williams, Principal Soil Correlstor, WTSC
C. Steven Holshey, Head, Soil Survey Laboratory
Kermit Larson, Forest Service

Action Required By: December 31, 1977

There have been numerous field trips and discussions about the identification and significance of lithic and paralithic contacts and the material below these contacts. In particular bedrock fractured at horizontal spacing less than 10 cm appears to be relatively common. This communication will not review all of the committee reports on the subject. The report of Committee 1 of the North Central Regional Work-Planning Conference, pp. 34-90 of 1976 contains much of this information. You all have copies of this report. Attached is a report of the California Soil Survey Committee report of December 7, 1976, that you may not have. The following are my suggestions for your consideration. Please provide a response as soon as possible, not later than December 31, 1977.

A. Interpretation of Soil Taxonomy

1. Soil

In the opening paragraph in Chapter 1, soil is defined as including thin cemented soil horizons (including fragipans) but the lower limit is hard rock or'earthy materials virtually devoid of roots, animals, or marks of other biologic activity. A comparison with the definitions of lithic and paralithic contacts (pp. 48 and 49) indicates that the material below these contacts is excluded from the meaning of soil.

2. Lithic and Paralithic Contacts

In the development of Soil Taxonomy lithic and paralithic contacts were defined because at these contacts, there is a severe restriction to root penetration. Roots enter only along fracture planes. Pieces of bedrock below a lithic contact will not disperse when routine particle size determinations are made in our laboratories. On the other hand much of the material below a paralithic contact breaks to individual particles following the same procedure. When material below a paralithic contact is disturbed, appreciable quantities of fine earth are formed. Where material below a lithic contact is disturbed and mixed with the soil, normally only coarse fragments are added to the soil. The material underlying both lithic and paralithic contacts may be fractured with horizontal spacing averaging more than 10 cm providing there is not significant displacement. Lithic contacts within 50 cm of the surface have been recognized at the subgroup category. Except for a few paralithic subgroups, paralithic contacts within the same depth are recognized at the family level.

Where material similar to that below a lithic contact is fractured at closer spacing than 10 cm, the rock fragments are

3. Particle Size Classes

These are discussed on pages 43, 44, 383, and 364 in Soil Taxonomy. They are meant to be all inclusive although a problem does arise where bedrock is fractured at intervals closer than 10 cm and the bedrock is essentially displaced, cracks are not as wide as 1 mm, and frequently there is essentially no fine earth in the cracks. By definition this material is excluded from fragmental but there is essentially no fine earth fraction on which to base the textural class for skeletal material because the particle-size class modifier is based on the texture of the fine earth fraction.

B. Discussion

1. Material similar to that below a lithic contact, when fractured consists of rock fragments, and only that fraction smaller than 2 mm is assigned a textural class either by field examination or in the laboratory. Material similar to that below a paralithic contact, when fractured can be dispersed following our laboratory procedures, and much of it will be included in the fine earth fraction. However, roots do not penetrate the "paralithic" fragments although these may store and provide some moisture for growing plants. Should these "paralithic" fragments be considered to be rock fragments? The latter appears to be logical because, where unfractured, the material is not soil. Currently in the revision of the Soil Survey Manual, before determining the moist cementation class, the fragments are immersed in water for one hour. It has been suggested that this same procedure should be used in the field, the percentage of coarse fragments being determined after immersion for one hour and wet seiving. The water immersion will create some problems for Laboratory analyses. Where a high percentage of "paralithic" fragment9 are present, large bulk samples will be necessary.

2. Use of root penetration creates some problems in soils that have been cultivated a long time with annual crops. Roots may be scarce below the upper 2 feet or so. Root traces may be the only evidence available.

3. Saprolite is discussed on page 49 of the NCRWPC report of 1976. It may or may not contain a paralithic contact. Testing needs to be done to observe whether disintegration after immersion in water for 1 hour will make a reasonable separation. Saprolite within the root zone of plants should be tested both in the Presence and absence of roots within the matrix, not just along fracture planes or cracks.

4. Phase criteria for soil series should be based on soil properties. Massive bedrock and bedrock fractured at close intervals will have different interpretations for some uses. This is one objection to allowing more fractures in lithic contacts in particular.

C. Proposed Changes in Soil Taxonomy

1. Lithic contact - definition unchanged.

2. Paralithic contact - definition unchanged.

3. Particle-size classes - add another sentence at the end of the discussion on page 283:

   "Particle-size classes are not assigned to material below lithic and paralithic contacts although the class of the material below a paralithic contact, when crushed, is usually significant,"

4. Fragmental p.50 and p.383 - insert at the end of the last sentence:

   -- 1 mm ", or there is less than 5 percent fine earth by volume."

   This provision will place in the fragmental class bedrock below contacts that would be lithic or paralithic except fracture planes are too closely spaced. A companion change in all the skeletal classes will require a minimum of 5 percent fine earth fraction by volume.

5. Sandy, loamy, and clayey skeletal classes p.50 in each class insert after "Thirty-five", "to 95"; and on pages 383 and 384 make a similar change to the same classes by deleting "or more" and inserting "to 95" after "35", i.e. "Rock fragments make up 35 to 95 percent by volume; etc.

6. Depth of soil and paralithic subgroups.

Paralithic subgroups have a paralithic contact or altered rock that retains its rock structure within 50 cm and shallow families have a paralithic contact vithin 50 or 100 cm. There is some redundancy here and it is suggested that in the last sentence of Depth **of soil,** p.388, "Shallow" that "and paralithic" should be inserted after "lithic."

All of the paralithic subgroups are also vertic. There are 6 Parelithic Vertic subgroups in Eutiochrepts (p.252, approved after publication), Ustochrepts **(p.255),** Xerochrepts **(p.256),** Eutropepts **(p.260),** Ustropepts (p.262). and **Haplustolls (p.304).** Three series, Dupree **(SD), Fashing** (TX), and Watsonia **(AL)** are mapped, no two in one subgroup. Dupree is classified in a shallow family, the other two are **not.** The elimination of the provision for paralithic subgroups is my recommended solution rather than amend the shallow definition.

7. Test **for "paralithic"** material.

Immersion in water was tested on profiles in South Dakota and Montana to help identify paralithic material. If water does not penetrate these fragments within one hour and cause them to slake it is doubtful that there is enough porosity for fine roots to enter the fragments. Most fragments that slaked did so almost immediately and half a" hour or even less may be long enough. It would be a practical field test. Unfortunately I did not use this test on sites examined in **North** Carolina and Virginia. The test may not work as well on Saprolite.

The above **recommendations** do not simplify the mapping of soils with paralithic contacts. I believe that **many** soils that are considered to have paralithic contactsmay **have** lithic contacts. The basal glacial till probably will disintegrate in water and thus be C material. Most of the dense till occurs at depths below 50 cm. At one time **we** had soils with dense till separated from friable till but in the correlation process they were combined.

Your comments will be appreciated.

[redacted]
Soil Survey Classification
and Correlation

Attachment:

North Central Regional Work Planning
Conference of the National Cooperative Soil
Survey, 1978, Nadison, Wisconsin

REPORT OF COMMITTEE 2

Committee 2 - Improving soil survey techniques and modernizing soil surveys.

Charges and Responses:

1. Explore ways of improving soil mapping and legend design to increase efficiency and accuracy.

   Summary of Responses:

   A. Improve initial legend controls and design of mapping units.

   B. Better premapping preparation (collection of available publications, maps, and other pertinent data).

   C. Study of specific needs peculiar to each county.

   D. Outline of actual needs and items to be used such as minimum size of units, spot symbols, association of similar soils.

   E. Better training procedures are needed to develop taxonomic field guides to supplement mapping legends and increase individual mapping efficiency of party members.

   F. There is a necessity to provide more time for preparation and preliminary investigations before starting of the actual field mapping.

   G. Better use of progressive and decisive correlation during the mapping period is required. (Correlation by soil association.)

   H. Mapping of complicated areas early in the survey to outline correlation problems.

   I. Evaluation of the composition of map units and adequacy of the descriptive legend should be part of the ongoing mapping and correlation procedures.

2. Explore ways to update interpretations for published soil surveys that have adequate soils maps but are lacking in the full range of soil interpretations for modern or current uses.

   Summary of Responses:

   A. Establish a system to evaluate the need for updating (reclassification and new interpretations or changes).

B. If recorrelation and reclassification are needed, evaluate major mapping unit compositon, recorrelate names and update mapping unit descriptions, recompile and complete new map finishing and redrafting as needed; republish the soil interpretation sections to cover specific groups or all users of soils information in the survey area.

C. If recorrelation and reclassification are not needed, then a new set of soil interpretations and tables should be developed and special interpretations for local needs would be added.

3. Explore ways to revise and update older, but still useable, soil maps. This may include the revising of either the soil delineations by field work and map compilation or the recorrelation of mapping unit names, or both.

Summary of Responses:

A. Recorrelation processes require preparation of new mapping unit descriptions and steps similar to those discussed under Charge 2B.

B. Selection of well trained and open minded party leaders and the provision for supervision with the same qualities, are essential to making the best use of older soils information. Much time and useable information are lost because of inadequate background experience and conceptual prejudice on the part of individuals charged with the job of updating the older maps.

C. Map compilation and redrafting of the recorrelated soil mapping unit lines should be done using the most recent aerial photography available. This constitutes the need for republication of the updated maps along with new and wider range of soil interpretations.

4. Develop a method of preparing a more comprehensive, informative and functional soil survey work plan that will serve as an operational guide for all the participants of the cooperative survey effort.

Summary of Responses:

A. Present work plan is sufficient.

B. Use present work plan format but add a flow chart and schedule of important survey activities.

C. Rename the current work plan as a survey agreement and include a second part as a work plan covering all activities, flow chart, schedules, etc.

3--Report of Committee 2

The committee discussion of Charge 4 and its future as a valid charge for this committee led to the recommendation that Charge 4 as stated be dropped.

The committee members and conference participants recommended that Committee 2 with the area of concern as stated by the steering committee being "Improving soil survey techniques and modernizing soil surveys" be retained and the main charges be similar to the Charges 1 through 3 of this report.

Members of Committee 2:

Robert F. Springer
E. P. Whiteside
Raymond L. Newbury
Ralph L. Meeker
Richard B. Jones
Raymond T. Diedrick
Louis L. Buller
Robert E. Wilson
John R. Worster
Burt W. Ray, Vice Chairman
Miles W. Smalley
Mark S. Kuzila
Gilbert R. Landtiser, Chairman

Notes from Committee 2 Meeting - Madision *Wisconsin*

January 31, 1978, A.M.

Received five replies from committee members. Three were sent to all committee members, two were sent only to Chairman Landtiser.

These were combined and comments listed under specific charges for the report circulated at the workshop.

*There was major discussion concerning Charge 1. **Major** concern was expressed concerning the need for time for the party leader, plus whatever early help provided , to fully study and trial map in the survey area before the survey should actually begin. This time is necessary to develop an initial legend that is of good quality.

In **Minnesota,** time is allotted for this and is presently effectively aided by the fact that many surveys are just being started with first time party leaders and photography is available for the new survey areas. Observations are made and trial mapping is done in all townships.

In Indiana some preliminary work is usually done but production mapping has to be expected right away because of their accelerated program. Party leaders are encouraged to work in all geographical areas early. Legend is expected to be **complete** by time of comprehensive review. Need 200 acres mapped before mapping unit description is considered needed. All completed field sheets go through state office for a kind of quality control. They feel that they have all the directions they need: big problem is having time to get things done. With cost sharing money and set **completion dates,** some problems exist in sufficient production mapping to meet deadlines.

In South Dakota, cost sharing is 3-way as in many other states (federal, state, local). They try to hold the first year to investigations and legend development but the county is told not to expect production mapping the first year.

In some states, party leaders move to a new county and still have manuscript work or possibly even mapping to do in the county they left which is a problem.

Some counties indicate they will make money available if you start the current year. This would be a bad situation. Some people suggest **that ideally** county funds should perhaps not be put in until the second year of the survey. Mappers need to be paid and this type of handling funds could create problems.

Sometimes old mapping is not used or respected enough in setting up legends or studying areas in new surveys. Some old mapping is pretty poor and in some cases old mapping is claimed as areas mapped but still requires much checking and changing by field party. All information in a new survey area should be used and evaluated.

Z--Notes from Committee 2 Meeting - Madison, Wisconsin

In some counties (Minnesota) production mapping has been stopped if the legend is questioned or more documentation of mapping units is thought to be needed. General agreement by all that difficult areas should be mapped first. Try not to get crapped by county personnel into mapping a requested area first. May be difficult.if county funds are used.

In some states, university graduate students (Nebraska, Illinois) are available to some extent to work on some problems (field oriented or laboratory oriented) that are discovered early in the life of a survey. Special problem or thesis type studies.

*There was general agreement we need to make a strong statement as a committee to the effect that party leaders should be given the time needed to well understand their survey area before production mapping begins. Obtaining photography early has to be stressed. Administrators need to understand all this and the Soil Handbook should be followed more closely on photo availability and premapping time.

It is important to make decisions early and correlate as mapping proceeds. Essentially Item 1. G.

*There was unanimous agreement that the party leader needs to be a well trained, high caliber soil scientist who is a good manager and understands his responsibilities thoroughly.

Presently some states are having to use young, possibly inexperienced, first-time party leaders. Minnesota is following a program of bringing together young party leaders for some training and to impress upon them the importance of their job. Hopefully they will understand their responsible position and better understand what is expected of them. Some problems may exist with party leaders trying to do too much mapping and not enough managing of the survey. Major production mapping should be done by GS-7 or GS-9

Michigan has probably done more work on updating old reports than most states in region. Some of those are recent reports, none go back further than 1924. In some counties the old line soil maps have been superimposed on aerial photobase and correlation changes and interpretations are provided. Whenever this is done, the need for modern surveys is continually stressed.

Kansas has several old surveys that could be updated and made more useful. Chances of getting new surveys soon in some of these are slim:

In cases of updating old survey reports, the availability of map supplies is considered adequate. Reproductions of specific areas by photo copying, however, can usually be done quite easily.

Finding money and time for updating may not be easy. There was general agreement the county should be willing to pay for this or probably it could not be done.

If Land Use legislation is passed in states requiring that, the best available soil information is used, some updating of older surveys may be in order. With accelerated mapping programs, the need for updating interpretations in a few years may be much greater than for the present.

The question was raised, that perhaps interpretations for soils in a state (or county) should be published separately and periodically updated.

There are generally three categories of old maps or reports that seem worthy of updating:

1. Soil maps are adequate, recorrelation not necessary. In this case procure new or additional interpretive material as needed.

2. Soil maps are generally adequate but some reclassification and recorrelation are necessary. Napping unit descriptions need to be updated and new interpretations need to be published separately.

3. Soil maps need enough revision that some map compilation is necessary, possibly reprocution of line maps on most recent aerial photography. Reclassification, recorrelation, and revising mapping unit descriptions are necessary. Essentially an updated report is published along with needed interpretations.

Discussion on Charge 4.

Many think the so called work plan is more of an agreement than a work plan.

Present work plan may be sufficient, but the implimentation as suggested in the Soils Handbook can be handled better by use of a flow chart showing items to be done and when they should be done.

4--Notes from Committee 2 Meeting - Madison, Wisconsin

Several committee members stated that they hoped the work of this committee would be continued.

Chairman Landtiser requested that each member submit to him in writing their recommendations on need for continuation of the committee, what charges should be included, and what new approaches might be used.

Attendance at Committee 2 Meeting - Madison, Wisconsin, January 31, 1978

*DeWayne Williams - SCS, Indiana
Gene Whiteside - Michigan State University
*O. W. Bidwell - Kansas state university
Robert Springer - SCS, South Dakota
Ray Diedrick - SCS. Minnesota
Mark Kuzila - University of Nebraska
*Walter Russell - Forest Service (Milwaukee?)
Gil Landtiser, Chairman - SCS, Iowa
*+Milo Harpstead - University of Wisconsin, Stevens Point
Burt Ray - University of Illinois

* - Visitor, not official committee member
\+ - Attended P.M. only

North Central Regional Work Planning Conference
of the National Cooperative Soil Survey
Madison, Wisconsin

January M-February 3, 1978

Report of Committee 3 --- Organic Soils

Charge

1. List the unique properties of organic soils that are significant to each major use. Briefly summarize the affect of each property on each use. This would summarize present knowledge, be a useful guide for intern use, identify research needs, and provide the needed background for development of soil potential for organic soils.

2. Evaluate the rating guides for organic soils developed by the National Committee. What use has been made of it in the states having large amounts of organic soils?

3. Make a study on how fast organic soils are disappearing in each state.

Approach

Charges sent out by mail to all members. Comments received were summarized and put into preconference committee report. At the committee meeting during the conference the report and other items were discussed.

Findings

Charge 1

Properties of Organic Soils Significant to Agriculture and Their Effect On Use

1. Reaction - availability of nutrients; crop growth

2. Degrees of decomposition - permeability; initial and total subsidence; capillary rise of water

3. Thickness of organic material - rooting depth; total subsidence; time period between development longivity for use and complete wastage (productive life span). Available water holding capacity drainage pracitces.

4. Underlying material - rooting depth; permeability; ease of drainage; subsidence tolerance (suitability of underlying material for agriculture); available water capacity

5. Coarse fragments - planting, cultivation, harvesting; installation of tile drain and ditching

6. Availability of drainage outlets - practicability of drainage; water control

7. Size of area - practicability of clearing and drainage; susceptibility to blowing

8. Soil temperature - germination., plant growth, selection of crops

9. Growing degree days - crop maturity

10. Frost hazard - length of growing season

11. Rate of subsidence - drainage system; time period between development and complete wastage (productive life span); influx of salt water

12. Salinity - germination; plant growth

13. Slope - drainage; erosion

14. Mineral layers - drainage; permeability; tilth (when exposed at surface)

15. Limnic layers - drainage; permeability; 'tilth (when exposed at surface1

16. Sulfidic materials - development of acid sulfate (sulfuric horizons) with drainage

17. Sulfuric horizon - plant toxicity

18. Surface roughness - interfers with Land clearing

19. Water control - adequate drainage for crop growth; subsidence rate; wind erosion hazard; firs hazard

20. Surface texture - affects tilth soil blowing, seedbed preparation, management practices

Properties of Organic Soils	Significant to Forestry and Their Effect on Use
Reaction and salinity	Affects species and growth
Soil temperature	Affects species and growth
Thickness of organic material	Affects water control, rooting depth, water-holding capacity

Properties of Organic Soils Significant to Recreation and Their Effect on Use

Thickness of organic material	Affects water control, subsidence, rooting depths.
Reaction and salinity	Affects vegetative cover, management
Temperature	Affects vegetative cover.
Texture	Affects trafficability.
Flooding or ponding	Affects use.

Properties of Organic Soils Significant to Wildlife and Their Effect on Use

Reaction and Salinity	Affects vegetative cover.
Temperature	Affects vegetative cover.
Flooding or ponding	Affects type of wildlife use.
Thickness of organic material	Affects water control, subsidence.

Properties of Organic Soils Significant to Engineering and Their Effect on Use

Thickness of organic material	Affects water control, subsidence, depth to soft or firm underlying material.
Kind of material	Affects bearing capacity, trafficability.
Kind of underlying material	Affect8 bearing capacity
Coarse fragments	Affects construction costs.
Reaction and salinity	Affects corrosivity of metals and cement structures, landscaping vegetation.

More complete lists should be developed which would provide some of the needed background for development of soil potential for organic soils. However, discussion on soil potential of organic soils must include.other use8 not 80 much of organic soils per se but of areas of organic soils.

For example wetlands
source of energy
speciality uses
(iron rich bogs for removing phosphates from municipal wastes)

Wetlands are an important issue currently. Their relationship to organic soils is important. What is the quality of the areas for wetlands? Should they be identified by photo interpretation, vegetation, soil morphology? The Committee does not think that wetlands are generally destroyed, but the land use may be changed.

Charge 2

Responses - guides have been tested to some degree, but not really used in any of the states.

Some feel this would be a good first step in development soil potential.

Also would strengthen technical guides.
Some other comment follow:

penalty points - thickness 16-36 and 36-52 should be combined,
1 penalty factor for 16-52

growing degree days would be better to use than soil temperature

low reaction not penalized enough

suggested to develop a rating for each organic soil by specific crops

Charge 3

Many states have done some work on this.

Subsidence one half inch per year average when cropped-small percent of total organic area cropped. Minnesota feels generation of new peat exceeds losses.

Additional items discussed

1. The design of mapping units for organic soils. Organic soils are easy to locate through photo interpretations, but are often difficult to map for the following reasons:

   a. Difficulty of getting to the area.

   b. Difficulty of transferring the organic areas because of vegetation or standing water.

   C. Difficulty of examining the soil because of standing water or saturated soil.

   d. Need for special equipment to examine the soil.

Mapping of organic soils at the series level throughout a survey area can be a time consuming job and may not be as accurate as the series name implies, because of the difficulties mentioned. As is true with the design of all mapping units, careful consideration needs to be given at the start of the survey to the design of mapping units for organic soils in order to get the information needed. However, if excessive examination can be avoided, time could be saved. The following questions could be posed concerning organic soils.

a. How does land use affect the design of mapping units?

b. How does size of area affect design of mapping units?

c. How does pattern of occurence with other soils affect the design of mapping units?

d. Can level of classification vary throughout a survey area depending on land use, size of area, or associated soils?

e. What other factors affect the design of mapping units for organic soils?

2. How much are the test being used?
   sodium pyrophosphate test
   Some question on how good a correlation is being obtained.

   It has been suggested that
   water content or bulk density would be better test for
   Fibric Hemic or Sapric
   water % Fibric 800-1200%; Hemic 400-800%; Sapric 400%
   This should be tested further.

3. Mining of peat
   What will be the effects?

4. Potential of organic soils for energy--recent work in Minnesota.

5. Taxonomy
   Limnic subgroups

   Histic subgroups

Recommendations

Committee be continued
Areas for consideration
1. More on potentials

2. Continue on taxonomy

3. Behavior of underlying material

4. Land use - potential for uses
wetlands
agriculture
forestry
energy
speciality uses

Submitted by

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North Central Work Planning Conference

Committee 4 - Soil-Water Relations

The committee accepted the following charges, partly from the Steering Committee and partly from the National Committee.

1. Continue to develop inputs that soil survey can contribute to hydrologic modeling in small watersheds. This was the basis of much of our discussion at the last workshop at Traverse City.

2. a. Identify research needs and make recommendations for attaining information on water movement and moisture relationships in frozen soils.

   b. Identify research needs pertaining to the available water for crops, grasses, and trees in soils with fragipans.

3. Suggest (and test) ways of incorporation - into the Soil Survey program - methods forcharacterizing soil water movement and retention over the range in water content that normally occurs in soils.

   a. for hydraulic conductivities from saturation to conductivities of 0.01 cm/day.

   b. for expanded water retention measurements to include tensions of 100, 60, and 30 cm.

   c. for a standard infiltration measurement including difference between two standard surface conditions under cultivation.

   d. Consolidate data characterizing soil water movement and retention from ARS and Experiment Station sources, by named kinds of soils; initially for key soils of the region. This effort to be published in special reports.

4. Establish a procedure for including in the standard pedon description - information on observed surface conditions including cracks, crusts, aggregation and porosity.

In respect to committee consideration of the above, by correspondence and in committee session, the following suggestions and procedures are recommended for the Conference.

Item 1. There continues to be interest and concern in the matter of hydrologic modeling in small watersheds. There is considerable activity supported by EPA to derive regulations for non-point source pollution in the agricultural sector - under the aegis of the Water Quality Planning Act ("208"). An understanding of infiltration rates, runoff characteristics, the effort seem based in several disciplines - soils, crops, and agricultural engineering.

The Committee, at this point, reiterates the role of the soil survey in this effort, as suggested in the 1976 report. See also item 3.

There seems to be general agreement between the Committee 4 reports of the North Central Work Planning Conference (1976) and the National Work Planning Conference of 1977 in that more information on the geomorphic aspects of a watershed would be desirable. The report of the North Central Conference suggests the use of the hillslope slope model (Ruhe, 1969) as a means of describing landscape position. We believe that this approach might be worth further investigation, particularly in terms of the effects of converging, parallel and diverging slope lengths on water movement (See Ruhe, 1969, p. 132). For example, converging slope lengths tend to concentrate water and, in small watersheds, apparently have a direct effect on the expansion of saturated areas that produce streamflow during a rainstorm (Dunne, Moore, Taylor, 1975). Diverging slope lengths would appear to have an opposite effect, while parallel slopes are intermediate. Thus, it might be useful to try characterizing landscape in terms of the proportions of these kinds of slopes and their effects.

There are some recent studies that suggest that these slope types, in humid regions at least, might be approximated by the distribution and extent of soils mapped in the watershed (Dunne, Moore and Taylor, 1975; Henninger. Petersen, and Engman, 1976; Palkovics and Peterson, 1977). However, these studies did not attempt to relate to landforms other than to indicate that topography was important, especially in terms of the steepness of the slopes to the saturated (poorly drained soils) areas. If the distribution or shape of particular soil delineations can be shown to be an approximation of an association of diverging, parallel, and converging slope lengths, then there is a large amount of information already available for modeling input.

Recommendations:

A. Whereas hydrologic modeling continues to occupy the attention of soil scientists, agricultural engineers, and others and whereas the purpose of much of this modeling is intended to derive estimates of erosion and sedimentation as well as streamflow characteristics the Committee recommends that the field survey should attempt to delineate drainage nets as fully as possible on watershed or sub-watershed basis including character of intermittent streams, short drainageways, types of slopes and that this information be cartographically displayed perhaps on an overlay at the scale of the mapping units. Consideration should be given to printing this information on the Atlas sheets.

B. Since the Universal Soil Loss Equation does not integrate landscapes and since current soil maps do not offer much in this regard we recommend that geomorphic features or surfaces be described in the nature of soil landscape units and that this information be displayed at a scale consistent with the mapping units. In particular such features as drainage density, slope length and curvature of slopes, patterns of drainage be emphasized. We suggest that this information may be developed optionally as a supplement to selected survey reports. The selection may be based on a portion of a larger geomorphic region.

C. Whereas the Agricultural Research Service will soon establish a Soil Erosion Laboratory in Indiana with the expressed purpose of developing fundamental considerations for the Univeral Soil Loss Equation, we recommend that a soil scientist with field experience and with training in geo-morphology be assigned to this Laboratory.

Item 2a. Again, the need for research on the topic of water movement in frozen soils arises partly from the water quality considerations as well as conservation. If fertilizers -organic or inorganic - are applied to frozen soil, how much is lost to runoff? If snow falls on ground frozen to different depths, what is the loss in snowmelt? If there is no snow cover, what are the sublimation losses? what are the relative differences in water movement in the same frozen soil (or different series) if under sod, forest cover, or "clean" or mulch tillage?

There does not appear to have been much data collected on this matter in the course of, or closely related to, soil survey operations. Harris (1972) and Sartz (1973) have made infiltration studies on (frozen) Fayette soils in southwestern Wisconsin under forest plantation and bare field conditions. Depending on the nature of frost zone (kind and thickness) infiltration rates were rather variable.

The depth and pattern of soil freezing is not always well documented. The character of frost affects rate of infiltration. There is concern about significance of runoff from frozen surfaces and the impact on pollution and sedimentation. Recent ARS research at Morris, Minnesota suggested that nutrient losses from winter-applied manure may not be as great as anticipated due to mulching effect of manure. There is a need to understand conditions under which waste of various types could be applied to frozen (as well as unfrozen) surfaces. (Also a concern of Committee #8).

Except for the ARS research noted and some studies by forestry researchers, the Committee could not report significant findings and therefore can only recommend continued study and observation by concerned persons.

Item 2b. Soils with fragipans are of considerable extent in the North Central region, perhaps in the range of 4 million acres. While the morphologic properties are generally well described, the behavioral characteristics in terms of water movement and root penetration are not so well documented. The Committee offers the following for possible field and laboratory implementation:

a. Determine which soils with fragipans are worthy of study by virtue of extent and use.

b. Use crust test in the field to determine hydraulic conductivities at various depths in the soil pedons, at saturation and at various degrees of unsaturation.

c. Use the neutron probe in the field to determine moisture contents of the horizons throughout the year.

d. Use tensiometers planted at various depths to measure moisture tension regimes simultaneously with the neutron probe measurements.

e. On samples determine in the laboratory moisture retention curves for the various horizons.

f. In the laboratory determine 15-bar and 1/3 bar moisture contents and bulk density.

g. Excavate pedons under corn, oats or wheat, alfalfa-brome, trees to see where the roots are in the pedon. Examine under sides of storm-tipped trees to see the arrangement of roots and relate this to soil fabric.

h. Irrigate pedons with dyed water (at various intensities and over various periods of time to show where water goes).

i. Determine variability of profile characteristics along trenches of transects in the field.

Recommendations:

We recommend continued study of the hydrologic characteristics of soils having fragipans or dense underlying till. In particular a parameter to describe the depth and duration of a perched water zone should be developed. The estimation of plant available water capacityeeds to be modified in these soils to reflect the reduced rooting volume on the one hand and the probable existence of a near-saturated water zone above the fragipan or dense till for a significant time in the growing season. More field and laboratory characterization of the lower tension moisture limits should be conducted.

Item 3a,b. The field and laboratory characterization of soil water movement remains an operational, as well as technical problem of the soil survey. While much assistance has been given by the soil physicists, the persisting problem is one of characterizing the soil behavior in situ. And perhaps the most persistent present-day application is in septic field installations.

Soil scientists are asked to relate percolation rates to permeability rates. The relationship is tenuous, at best. If we define or measure permeability in terms of saturated hydraulic conductivity we are mostly describing a vertical water movement. Percolation rates, as measured by the usual method, are subject to lateral flow characteristics.

Bouma and co-workers have demonstrated (also to this group) possible field methods of measuring unsaturated hydraulic conductivities. However, the adoption of these techniques require, not only special training, but also a considerable time commitment. The question to be resolved is whether the necessity of providing better estimates of field soil conductivity will justify this effort.

The low tension measurements, in the range of 30, 60 or 100 cm, have been made with the intent of providing a basis for field capacity estimate, with the lower tensions associated with coarser textures. We have admitted, for some time, that laboratory estimates of field capacity are subject to caution. A principal reason is in the landscape itself. Aquolls and Aqualfs, for example, may have water tables at the "base" of the solum so that capillary rise characteristics of the solum may be more important than moisture release values. But perhaps the greatest difficulty is in integrating low tension moisture release values which are different for the respective horizons. Thus we find ourselves needing to make in situ measurements of field capacity.

Should these measurements - of field capacity, of unsaturated hydraulic conductivity, and of wilting point moisture content - be made a part of routine pedon characterization?

The committee suggests that the National Soil Survey Laboratory should consider developments of suitable field procedures for less than saturated soil water movement.

Item 3c. The effort to establish a standard infiltration measurement for soils of the North Central Region was undertaken some years ago by a regional committee. NC-40. The report of this committee is being prepared by a sub-committee headed by Ben Jones, University of Illinois and is scheduled for publication in 1978.

Equilibrium infiltration rates were made on (generally) 3 representative soils in each state under two standard conditions, corn and bromegrass sod, using a portable sprinkling infiltrometer.

The statistical design included duplicate runs and replicate plots.

The results illustrated variability. Infiltration rates ranged from about 0.1 inch/hour on fine textured soils to~1.0 inch/hour on medium textured andd3.0 inch/hour on coarse textured soils. Brome sod did not consistently have higher IR's.

Another approach to infiltration rates has been used by the Agricultural Research Service with the use of a "rainulator", essentially a larger area infiltrometer with somewhat lower raindrop energy. The ARS has recently held an Infiltration Workshop. The recommendations of the ARS group should be considered by this Committee.

Since infiltration of natural rainfall often occurs on less than saturated soils, antecedent moisture condition is a critical parameter.

The Committee has no recommendation on infiltration measurements at this time but suggests that the report of the NC-40 committee and the summary observations of the ARS Workshop (St. Louis, 1977) be studied by future committees concerned.

Item 3d. Efforts to characterize soil water movement have been made by soil physicists, agricultural engineers, as well as the soil survey personnel. The Agricultural Research Service, Soil Conservation Service, Forest Service and the Experiment Station personnel have been involved in single agency and in multiple agency investigations. Therefore it seems appropriate to consider a data consolidation effort, not only to see "what we've got" but also to guide future investigations particularly in respect to representative soils and landscapes.

We suggest a sub-committee of this Committee (or other) supervise the selection and collation of this data and place the data in a retrievable format, perhaps with the ISU Statistical Laboratory.

Calculation of soil water balance.

There is considerable interest in obtaining data for calculating soil water balance. This involves collecting records of temperature, precipitation, and pan evaporation at or very near the physiographic occurrence of a particular soil series. With this information a diagram could be constructed similar to those in each pedon in Appendix IV, begin page 487 of Soil Taxonomy.

It seems that this kind of study would be valuable in determining available water in a number of soils, especially if combined with on-site observations of moisture'status in the solum throughout the growing season.

Also. the soil water balance diagrams might give a better idea as to the proper drainage class for soils.

Recommendations:

The Committee believes that the climatic information prepared for most soil survey reports is helpful information on a macro-scale but is inadequate in respect to individual soils in the landscape. In order to translate the climatological data soil water balance information is needed on principal soils and, perhaps, by extrapolation to others. The calculation has 4 principal components: (1) estimate of plant available water capacity taking into account the effective rooting zone; (2) precipitation, both annual and growing season, expressed on a probability basis; (3) the estimate of run-off or run-on on various soils of the landscape including consideration of position of water table - natural or artificially controlled, and (4) estimate of evapotranspiration. The Committee suggests that the principal contribution of the soil scientist can be made in components (1) and (3).

The results of this calculation should be included as a part of the mapping units description.

Item 4. The work on infiltration done by NC-40 and by others clearly indicates the importance of surface condition, cracks, etc., on initial and on equilibrium infiltration. Moreover, these surface soil qualities are important in understanding detachment (i.e., erosive character) and water runoff.

Porosity and aggregation in the surface horizons are particularly correlated to fauna1 and floral influences (worms and roots, if you please).

While some effort has been made by those describing morphology, both macro and micro, a consistent pattern , or systematic method, does not seem to exist generally. For example, we have described soil surfaces as cloddy - meaning (probably) inability to recognize any structure. Nevertheless this characteristic needs elaboration, as may others. The work of Murphy et al. (4,5) offers a new technique.

The strength of soil structure is undoubtedly a seasonally changing parameter depending on the tillage operations, nature of crops and related root development, and other factors.

Recommendations:

A more detailed record be made of such properties as (1) organic matter content (scientists should be encouraged to estimate % organic matter); (2) crusting in respect to thickness and strength; (3) porosity; (4) nature of faunal and floral constituents; (5) past cropping practices. It is recognized that several properties are time-dependent, or transient, and that a seasonal record of observations may be necessary to establish the functional relationship of time or moisture dependent properties.

The Committee should be continued - for the actions proposed.

Committee report accepted by Conference.

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Committee 4 - NCSSWPC (78)

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Edward L. Bruns*
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Neil E. Smeck
Michael Stout, Jr.
Thomas Thiel

* present at Conference

Also in attendance:

Carl Glocker
Phil Harlan
George Hall
Ivan Jansen
C.J. Johannsen
Gerald Miller
Roger Swanson

NORTH CENTRAL REGIONAL WORK PLANNING CONFERENCE
OF THE NATIONAL COOPERATIVE SOIL SURVEY

January 30 - February 3, 1978

Lincoln, Nebraska

COMMITTEE #5 - Soil Potential, Including Interaction Between Soils and Fertilizer Responses.

Charge: For each major land use (cropland, woodland, rangeland, etc.) identify Me data needed and the source of that data for determining soil potential. This will assist in developing more accurate uniform ratings based on the best information available and to identify the needs for additional data.

Including interaction of fertilizer responses a suggested format was sent out:

Land Use	Data Needed	Data Source
Cropland	Erosion Hazard	K and T values in technical guides Research Bulletins

Committee Approach: The committee felt that we could not identify all data sources nor all the areas where more data was needed in the time allotted. Our basic approach then was to arrive at a system and/or format to use in a state or county to begin the task of documenting available data and the source of that data. The committee approached four land uses which were: septic tank absorption fields, dwelling sites, cropland and woodland. The above form was sent out to committee members for their input as to use of the form - either as it was or to alter and expand it.

The input from the committee members indicated that the form was workable but good ideas emerged for its alteration. Also Woodland dropped - Ord system. The chairman, after consultation with three committee members expanded the format to encompass member input. This form and pre-conference report was sent to the conference chairman Francis Hole for members of the committee and the conference.

Findings: The pre-conference report was present and thoroughly discussed at this conference. The form was designed to be used for mapping units. The committee approved the form but felt it should be altered slightly for use in gathering data by land use first. The revised form will be attached to this report.

In addition to taking the form back to the states for use the following procedure was also approved:

Recommendations; To begin a determination of what data is available, where is the data, and what additional data is needed we should use the following procedure:

A. Decide upon Land Uses (Not All)

I. Determine Interest Individuals/Groups

1. State Level

a. Data Sources

1. Multi State
2. Availability of Technology
3.
4.

II. Determine Interest Individuals/Groups

2. Local Level

a. Data Sources

1. Availability of Technology
2.
3.

3. Map unit

Conclusion: The committee felt work could start now

1. Determine land uses to work with: Suggest Dwellings, Septic Tank adsorption fields, cropland
2. Use Form for documentation
3. Evaluate and present progress at next conference

This overall procedure was recommended and approved by vote of members.

The committee also voted that the activities of this committee be continued to the next. conference.

I would move that this report be accepted by the Conference.

John I. Brubacher

John I. Brubacher
chairman, committee #5
Soil Potential

WORKSHEET FOR IDENTIFYING NEEDED DATA AND SOURCE OF EXISTING DATA FOR SOIL POTENTIAL RATINGS

Factors to Consider	Soil Facts	Rating	Data Source	Adverse Effects on Use	Data Source	Corrective Measures: Kind	Corrective Measures: Data Source	Corrective Measures: Relative Cost	Data Source	Proposed Index	Continuing Limitations	Data Source	Revised Index	Data Source List
Flooding	Common	Severe	2,3,4	Destroy System	5,6,8,9, 10,11,12	Protection	1,11	Construction and Maintenance Cost	1,8,9	90	Maintenance	1,8,9,11	90	1. SCS Technical Guide
	Rare	Moderate	-	-	-	-	-	-	-	-	-	-	-	2. SCS [illegible] Guide
	None Protected	Slight	-	None	1,8,9,11	-	-	-	-	-	-	-	-	3. SCS-SOILS-5 Form
Bedrock or Cemented Pan	< 40	Severe	2,3,4	Failure of System	5,6	Closed System Alternate Site	9,11	Cost of System Cost of New Area	9,11	100	Assume None Assume None	8,9,11	0	4. Published Soil Surveys
	40-72	Moderate	-	-	-	-	-	-	-	-	-	-	-	5. Field Observations
	> 72	Slight	-	None	5,6	-	-	-	-	-	-	-	-	6. Knowledge and Behavior
High Water Table	< 4'	Severe	2,3,4	Pollution Hazard	6,11	Drainage	1,9,11	Maintenance	1,8,9,11,12	90	Maintenance	1,8,9,11	90	7. ARS Research Reports
	4-6'	Moderate	-	-	-	-	-	-	-	-	-	-	-	8. Local Individuals
	> 6'	Slight	-	None	1,8,9,11	-	-	-	-	-	-	-	-	9. Local Contractors
Permeability (in/hr)	< 0.6	Severe	2,3,4	Failure of System	5,6,8,9,11	Closed System Enlarge Field	5,6,8,9,10, 11,12	Cost of System Cost of More Area	9,11	100	Assume None	8,9,11	0	10. Local Developers
						Gravel Pack	-	Cost of Materials	-	-	-	-	-	11. State Health Department
	0.6-2.0	Moderate	-	-	-	-	-	-	-	-	-	-	-	12. Research Needed
	> 2.0	Slight	-	None	1,8,9,11	-	-	-	-	-	-	-	-	13. No Reliable Data
Slope	> 15%	Severe	2,3,4	Failure of System	5,6,8,9,10	Levelling	1,8,9,10,11	Cost of Levelling	1,8,9	100	None	8,9,11	0	14. Other
	8-15%	Moderate	-	-	-	-	-	-	-	-	-	-	-	
	0-8%	Slight	-	None	1,8,9,11	-	-	-	-	-	-	-	-	
[illegible] > 3 Inches	> 50	Severe	2,3,4	Pollution Hazard	5,6	Alternate Site	-	Cost of New Area	8,9	-	Assume None	8,9,11	0	
	20-50	Moderate	-	-	-	-	-	-	-	-	-	-	-	
	< 20	Slight	-	None	1,8,9,11	-	-	-	-	-	-	-	-	
Total Subsidence	> 6	Severe	2,12	Failure of System	8,9,11,12	Alternate Site	-	Cost of New Area	8,9	-	Assume None	8,9,11	0	
	[illegible]	Moderate	-	-	-	-	-	-	-	-	-	-	-	
	< 6	Slight	-	None	5,6,12	-	-	-	-	-	-	-	-	

NORTH CENTRAL REGIONAL WORK PLANNING CONFERENCE
OF THE NATIONAL COOPERATIVE SOIL SURVEY

January 30 - February 3, 1978

Madison, Wisconsin

COMMITTEE 6 - Educational Activities for Soil Resources and Land Use

CHARGES:

1. Develop a model for soil survey educational programs to inform the public about soil surveys and use of soil surveys.

2.

FISDINGS:

1. Charge 1. Develop a model for soil survey educational programs.

a. A soil survey educational Program must be designed to meet the needs of the users -- present and potential. In order to develop an educational model for soil survey education objectives need to be identified and established. Major objectives identified for a soil survey educational program include:

(1) Establish the soil survey as the most valuable inventory of soil resources in the survey ares.

(2) Provide information and assistance in the interpretation and intelligent use of the soil survey.

(3) Establish the soil survey as a valuable resource to local programs in a broad sense, such as soil testing, herbicide management, crop productivity potentials, irrigation, drainage, soil and water conservation, equilization of taxes for agricultural land, land use planning and farmland preservation, road and highway construction, home sewage waste disposal and recreational development.

(4) Periodically inform the public about the need, status, availability, and usefulness of compiled data concerning soil resources.

A model consisting of three phases is proposed for soil survey education. Phase I is aimed at helping people see the benefits of and needs for a soil survey. During this phase the educational effort is designed to help people understand the benefits and realize the need for a soil survey. This phase occurs well ahead of the beginning of the field work. In those survey areas where financial resources are contributed by the local government phase I may include as an objective the procurement of financial support.

Phase II is initiated at the time the soil survey field work begins. During this phase educational and information activities are implemented that help answer questions about the soil survey activities. Activities during this phase continue until the field work is completed. Phase III is aimed at helping people use soil survey. During Phase III local people are provided assistance in understanding soil survey facts and provided suggestions for using soil survey information to solve Local problems involving soils and soil resources. Phase III is an open-ended continuing educational effort for the life of the soil survey report.

For such a model to be viable, leadership must be exercised by the county extension staff, working in a close cooperation with personnel of the soil conservation district and the Local SCS field office. A strong supporting role must, however, be assumed by personnel of SCS and the Experiment Station who have had or are taking a major responsibility for the conduct of the survey as well as appropriate area and state extension specialists. In addition, a realistic approach for accomplishing the major objectives requires an open-ended effort beginning well ahead of the commencement of field work. The inclusion of people from each cooperating agency is the key to the success of formulation and executing the educational model.

A more detailed explanation of how the model works is explained in a paper titled "A model for soil survey education: the Iowa Program" by Gerald A. Miller and Minoru Amemiya, to be published during April 1978 in the proceedings of the 32nd annual meeting of the Soil Conservation Society of America, pages 33-38.

b. Exchanged ideas, methods, and example materials for conducting educational programs within the framework of the three-phased model. Enclosure 1 to this report contains some of example materials offered by committee members.

c. Determined that procedures and agreements between agencies responsible for conducting soil survey educational activities is lacking in some states.

d. Determined that several states have developed standard procedures for securing, storing,, and distributing the congressional copies of the published soil survey report.

2. Charge 2. Address teaching effectiveness.

a. Determined that many different methods and techniques are being used by soil science educators. Also, determined that there is a need to formalize and share examples of teaching techniques in soil morphology and genesis. The committee was not aware of an existing laboratory manual for teaching soil morphology and genesis.

b. Teaching is most effective with small groups. One-on-one is generally the optimum teaching situation in soil morphology, genesis, and classification. Three to five individuals should be the maximum size of a group to receive instruction in field techniques.

3. Charge 3. Provide additional emphasis on interpretation of soil surveys.

a. Determined that at least 4 universities in the North Central Region have soil survey interpretation courses for nonagricultural students. In most instances the target student is a landscape architecture major in his freshman or sophomore year. Also, in most instances the soil survey interpretation course may be the only course in soils/soil science that the nonagricultural student may take during his undergraduate program.

b. In general, the universities with interpretation courses for nonagricultural students are unhappy with the depth of their courses. This is due to the lack of background in basic soils/soil science that the nonmajor is required for prerequisite.

c. Majority of the committee believes that the nonagricultural major has a better grasp of how to use a soil survey report than his agricultural major counterpart. However, the agriculture major possesses a greater understanding of the principles of soil morphology and genesis.

d. Determined that members of the teaching faculty in soils/soil science within the land grant universities are concerned with the time effect that the so-called "Early Quarter System" or "Early Semester System" has on the ending of the spring quarter or spring semester. The early quarter/semester system does not provide for adequate time in favorable weather to conduct field laboratory exercises in soil morphology, genesis, and classification. The teaching faculty is required to go to more and more classroom interpretative exercises.

4. Charge 4. Review SCS correspondence course "Soils-Soil Surveys and their Uses'!.

a. Determined that the SCS had made an excellent contribution to soil survey education in the establishment of the course. The formulation and compilation of the questions accompanying each of the 11 lessons are excellent.

b. A survey of several state SCS offices in the North Central Region indicated that enrollments varied considerably from none at all to as many as 45. The enrollees are mainly district soil conservationists and beginning non-SCS soil scientists, although employees of local conservation districts, soil conservationists. project coordinators, geologists, soil conservation technicians, engineers, soil scientists, range specialists, and an economist have been reported to be enrolled.

c. Determined that is some NC states the SCS has asked cooperating agencies, such as cooperative extension service, to provide leadership in administering the course. In most NC states, however, the state SCS office or the area SCS office administers the course.

d. Determined that a problem exists in the availability of a standard set of answers to questions. It was found that "the questions are the same but the answers change". This occurs due to some questions being vague. Also due to the lack of definitive guidance because of the nonavailability of an instructor's guide.

e. Determined that many of the references are difficult to locate in the students' locale. Some of the references are no longer available from the publisher and can be obtained only from an agricultural library or on microform.

5. Charge 5. Develop correspondence course on soil taxonomy.

a. Determined that no correspondence courses concerning soil taxonomy now exist in the NC region.

b. One hundred and six copies of a survey were distributed to individuals in all 12 states of the NC region. The 42 respondents included (1) Teachers. (2) Researchers, (3) Soil Scientists of the Soil Conservation Service, (4) Extension Specialists. (5) Graduate Students and (6) an Agricultural Experiment Station Director. The majority of the 42 respondents believe a correspondence course is needed.

c. Potential students include soil scientists in federal research (USDA), practicing soil scientist, college and university faculty members in related soil areas as well as SCS employees, area and local extension specialists in agronomy, planners, and others who work with soil survey information.

d. Determined that the cooperative extension service short-course and conference divisions in several states would be willing and pleased to have available for administering a correspondence course in soil taxonomy.

6. Charge 6. Develop correspondence course on soil interpretation.

a. Determined that lessons 8 and 9 of the SCS correspondence course "Soils-Soil Surveys and Their Uses" deal directly with soil interpretations.

b. Determined that no additional correspondence courses concerning soil interpretations now exist in the NC region.

c. A survey of state extension soil specialists and SCS state soil scientists Indicated that a correspondence course was needed for soil interpretation.

d. Potential students include SCS employees, SCD employees, area and local extension specialists, planners, public school teachers, vocational agriculture instructors and others who work with soils and natural resources.

e. Determined that the cooperative extension service short-course and conference divisions in several states would be willing and pleased to have available for administering a correspondence course in soil interpretation.

7. Charge 7. Regional travel course.

a. Determined that there has been in the past and still is of the published soil survey report are received into the inventory either at the state or local level.

4. That a committee be appointed or a" individual(s) volunteer to develop a laboratory manual for teaching field techniques and soil interpretation in soil morphology, genesis, and classification. The field techniques portion of the manual be developed for students at the advanced undergraduate level and the soils interpretation section be developed for the beginning student.

5. Each state review its training program for new/inexperienced soil scientist. Alternative methods for training new/inexperienced soil scientist could include a concentrated session for groups of 3 to 5 individuals or a one-on-one situation.

6. The Soil Conservation Service consider the following items concerning the correspondence course "Soils-Soil Surveys and their Uses".

a. An instructors guide be developed to include a standard set of answers.

b. That questions be reviewed and revised as needed to increase clarity.

c. That the reference lists be updated. Out-of-print and older publications be deleted. Recently published texts in soil morphology, genesis, and classification such as Soil Genesis and Classification, 1973, by Buol, Hole, and McCracken, and Pedology, Weathering, and Geomorphological Research, 1974, by P. W. Birkeland, could be used as standard reference texts. In addition, use local publications as references. Examples include Soils of Wisconsin; 1976, by F. D. Hole; Principal' Soils of Iowa. 1965, by W. R. Oschwald, F. F. Riecken, R. I. Dideriksen, W. H. Scholtes, and F. W. Schaller; and Soils of Nebraska, by J. D. Elder. Most of the states in the NC region have publications, similar to the examples listed above, which focus on the soil forming processes.

7. That a committee be appointed to develop a" undergraduate correspondence course in Soil Taxonomy. The course be for no more than 3 semester credit hours and one or more appropriate NC state cooperative extension service be selected to provide leadership in implementing the course. Prerequisites for the course should include undergraduate courses in basic soils and soil morphology, genesis and classification. Credit for the course would be at the undergraduate level.

8. That a committee be appointed to develop a" undergraduate correspondence course in soil interpretations. This committee could be the same group as recommended in item 7, or a separate committee. The title of the course, for identification purposes,

be "Soil Surveys: Interpretations and Uses". The prerequisites for the course be determined by the development committee.

9. Regional travel course. Committee 6 of NCRWPC of the NCSS or an Ad hoc committee continue efforts to develop a regional travel course.

a. Initially, the committee develop alternative course outlines, course descriptions, and range of costs for a regional travel course.

b. An effort be initiated to contact graduate students and graduate faculty in soil morphology. genesis, and classification to determine their reaction and interest in participating (students) and actively supporting (graduate faculty) a regional travel course.

c. The committee investigate the possibilities of outside funding assistance to reduce participants financial outlay.

d. The committee continue to coordinate its efforts with the teaching faculty at interested NC regional universities.

e. As the travel course is developed information concerning the travel course be provided to all colleges and universities in the NCR that teach senior level or higher soil morphology, genesis. and classification courses. and/or soil geography or soil geomorphology courses. Also. information should be provided each SCS-State Conservationist and State Soil Scientist as well as the SCS Midwest Technical Center.

10. Committee 6, "Educational Activities for Soil Resources and Land Use", be continued.

Submitted by:

Gerald A. Miller
Committee Chairman
March 20. 1978

Committee members:

*Orville W. Bidwell	**Mark Kuzila
Leon B. Davis	David T. Lewis
Henry D. Foth, Vice-Chairman	*Gerald A. Miller, Chairman
*Phillip W. Harlan, Recorder	*Delbert L. Mokma
*Milo Harpstead	*Robert A. Pope
*Lowell Hanson	**Burt W. Ray
*Christian J. Johannsen	*Roger W. Swanson

*Committee members in attendance at the NCRWPC, Madison.

**Other conference participants assisting with committee work at NCRWPC. Madison.

Enclosure

A guide for the distribution and education in the use of soil survey information.

Introduction

I. Objectives

5 listed

II. Program Responsibility

III. Program Stages

A. Pre-survey

1. Board meeting
2. Steering committee
3. Survey acceleration

B. Mapping/Pre-publication

1. Ceremonies

First Acre

Last Acre

2. Educational activities

Tours

Displays

Brochures & slide-tape

3. Publicity

C. Publication

1. Distribution meetings

First Copy

Community & Special Interest

2. Educational activities
3. Publicity
4. Distribution

IV. Program Evaluation

V. Appendix.

A. Suggested letter of invitation

B. Outside organizations to invite

C. First copy ceremony guide

D. Community & special interest meeting guide

E. Soil survey exercise example

F. Soil survey fact sheet for "Final Acre" ceremony

A Guide for the Distribtion and Education
in the Use of Soil Survey Information

A soil survey provides us with an inventory of the soil resources in a county. It is basic to achieving the goals of sound soil and water management, high agricultural production, and wise land

III. Program stages:

A soil survey information program can be divided into three distinct stages: pre-survey, mapping/pre-publication, and publication. Each stage has its own specific tasks and activities to perform.can

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3. Funds are sought to accelerate the completion of the survey. Attempts should be made to raise contributions from local government and private sources. These funds will go towards the purchasing of equipment and hiring of county or city personnel to assist with the completion of the survey. The board should also be advised about the potential for federal and state assistance on the soil survey, and on the application procedures and the requirements necessary to qualify

B. Mapping/Pre-Publication

This phase of a soil survey programs has three major facets: Ceremonies, educational activities, and publicity.

1. Ceremonies

First acre - The beginning of a survey should be highlighted by a public "ground breaking" or "first acre" ceremony. The main purpose of this program is the timely release of information on the survey. Thus coverage by the local media should be arranged.

The participants in the ceremony should include the administrators or their representatives from each of the agencies cooperating in the survey. Each representative should briefly explain the role his agency plays in the survey. Be sure to invite community leaders such as elected local and state officials to also participate in the program, The program is concluded with the mapping of the "first acre" by the party leader.

Last acre - At the completion of mapping for the survey, a "last acre" ceremony similar to the "first acre" ceremony is held. This provides another opportunity for release of soil survey information, and a chance for administrators or their representatives to discuss the survey with local community leaders. As part of the program, a tour of some of the important county soils can be planned, with soil scientists stationed at each site to explain the soil characteristics and uses.

2. Educational Activities

During the several years required to complete the field work in a county, many educational activities can be conducted to acquaint and educate the public about the up coming soil survey. It is anticipated that extension personnel will have a major role in the development of the educational activities. To assist with these activities, the expertise of the soil survey party should. be utilized. Their technical background and first hand knowledge of the local soils are an invaluable resource. Thus the survey party should be consulted with at the beginning of the survey for their assistance with educational activities, not at the conclusion of field work when they are preparing to leave the county.

The following are sane of the activities and projects that can be used to educate the public about the soil survey program:

Field tours. These provide participants with a chance to directly observe soil characteristics and discuss their implications for various land uses. The tour should be designed toaccommodate the special interests of the group involved.

Displays, These can be located in public facilities or local business establishments. Displays can consist of: maps depicting county soils, interpretations for different uses, and field mapping progress to date; soil monoliths, field

3.

A direct mailing to all rural households before mapping begins within a township is one method of contacting affected residents. This mailing consists of a cover letter from the district conservationist and the soil and water district board. A brief brochure explaining the soil survey program could also be enclosed.

Remember to publicize all soil survey ceremonies well in advance and to fully inform the public on educational activities relating to the survey.

C. Publication

This phase of a soil survey program is focused on the distribution and explanation of the newly published soil survey report. The areas of concern are distribution meetings, educational activities, publicity, and overall distribution success.

1. Distribution meetings.

"First copy". The purpose of this first public meeting is to introduce and distribute copies of the published soil survey to local leaders and other prominent citizens. The meeting should be held as soon as possible after the published survey is available.

Invitations to the ceremony should be sent to all interested parties by the steering committee or the chairman of the S & WCD. These should go to local leaders, representatives of government agencies, and organizations, both in and out of the county, which would benefit from the soil survey information. Personal invitations should also be considered for the members of the S & WCD and county court of adjoining counties that do not have a modern published soil survey.

A suggested letter of invitation (Appendix A) and a list of organizations (Appendix B) outside of the county which might be considered for invitation are contained in the appendix. The meeting should be well publicized in advance to encourage a large attendance by the general public. A sample program for the "first copy" distribution program is given in the appendix (Appendix C). If the opportunity permits, a dinner or a soils tour may be held in conjunction with the meeting.

Community & special interest. A sample program for these meetings is contained in the appendix (Appendix D). A community program should always have a practical exercise session in the use of the published soil survey, focusing on a well known local area or the user's farm or property. Special interest groups should be shown how to develop a soil interpretative map showing soil limitations for a particular land use. See the appendix (Appendix E) for an example exercise.

Community meetings should be organized for the general public at the township or city level in cooperation with local leaders. Special interest group meetings are particularly effective in those counties which have urban areas or are experiencing rapid urban expansion. Examples of some special interest groups are: contractors, real estate agents, landscape architects, sanitarians, assessors, highway engineers, county and city planners, agri-business dealers, farmer organizations, representatives of financial institutions, foresters, and recreation specialists. The program of a special interest meeting should be designed to emphasize that aspect of a soil survey report which is of most concern to a particular group.

2. Educational activities.

Many of the same activities described in the mapping and prepublication stage can be used to help explain the soil survey to potential users. Tours of county soils should include a practical exercise, designed specifically to meet the needs of participants, which involves the use of the published survey. Displays and brochures can be developed to demonstrate the steps involved in using the report. Slide-tape sets are of invaluable assistance in explaining the contents of a report, and demonstrating advantages gained in consulting a soil survey for interpretations on various land uses,

3. Publicity.

Through all stages of a soil survey program, publicity is a key factor in the achievement of the five major objectives. At the publication stage of a soil survey program the publicity effort should reach its peak. Extensive initial publicity is required for the "first copy" and following community and special interest group meetings. Educational activities also need to be adequately publicized to be effective. Maximum coverage of an event or activity is accomplished by utilizing as many different news outlets as possible. Some means to inform the public are: newspaper articles, noncommercial endorsement type of sponsored advertisements, television shows, taped radio programs, television and radio spot announcements and news releases, magazine stories, special brochures, displays and posters.

4. Distribution.

Every effort should be made to get the survey to those people who can make the best use of them. Avoid any distribution that does not provide an explanation of how to use the soil survey report.

The first major distribution should be made to those attending the “first copy” presentation ceremony. For those community leaders who are absent from this meeting, a special attempt should be made to see that they receive a copy. Where possible, the district conservationist should personally deliver a copy to these people with a short explanation as to its use and value.

The second major distribution is made at the series of community and special. interest group meetings or tours. The published surveys should be distributed primarily at these meetings, where the recipients will be trained in its use.

Early in the program, copies should be placed in all school libraries in the county for use by students. Public libraries will receive 8 copy from the SCS state office.

A generalized record of those who received the published soil survey should be kept for the first two year period to assist in a later program evaluation and follow up. This will also be used to determine how the survey is meeting the needs of various user groups. Often individual requests can be met by the use of single map sheets covering the area of interest, along with the applicable soil interpretation sheets.

IV. Program Evaluation:

The area conservationist is responsible for the evaluation of the program. Two formal evaluations of the soil survey program will occur. The first will be conducted after the field mapping has been completed. The area conservationist will make an analysis and evaluation of the activities performed in the pre-survey, and mapping/pre-publication stages of the survey. A review will also be made of the district conservationist's outlined future program in the following areas: distribution of survey information prior to publication of the report; conduction of educational activities explaining the soil survey; groundwork required to determine the number, location, and type of distribution meetings needed; and the schedule and types of publicity that will be used.

The second evaluation will be held two years after the publication date of the survey. The success of the program will be determined by its achievement of the five main objectives. The degree of completion of the proposed program, outlined and reviewed at the first evaluation, will be used as one of the criteria. A second criteria will be the overall survey distribution in conjunction with training that was achieved. Findings from this evaluation will be used to determine the program needs for the future. To assist in these evaluations, the district conservationist is responsible for keeping a record of all soil survey program activities. A list will be made of the different categories of users (include estimate of number) who receive the soil survey, and how they intend to use it, for a two year period following publication.

Program activities will also be reviewed periodically by the state soil scientist. Periodic meetings of the steering committee should be scheduled to consider needs, problems, results and opportunities of the program. Suggestions for improvement of the publication are to be sought.

Appendix A

Suggested Letter of Invitation[1/]

Date ______________

Mr. J. R. Doe

111 Main Street

Columbia, MO 65201

Dear Mr. Doe:

Tne presentation of the published soil survey of ___________ county, Missouri, will take place (day) (month) (date) (time) (location), Missouri. The __________ Soil and Water Conservation District extends a cordial invitation to you to be present at the ceremony.

The published soil survey of __________ County includes aerial photographs which show the outline and location of each kind of soil. It is an invaluable source of soil information for people in all walks of life and specifically for farmers, community planners, engineers, resource managers, government officials, and other leaders of the community.

Mr. ____________, State Conservationist, Soil Conservation Service, United States Department of Agriculture, will deliver the principal address of the evening. He will also present the first copy of the ____________ County published soil survey to ____________, Chairman, _________ county Board of Supervisors.

Refreshments will be served during a break period at which time you will have an opportunity to meet with leaders and people of your community. The Governor, Congressmen, and State Legislators are being invited.

Copies of the published soil survey, along with an explanation of its use, will be distributed to those attending and interested in receiving it.

We sincerely hope you will find it convenient to be our guest.

Very truly yours,

____

Chairman ________ District

1/ The use of Soil and Water Conservation District stationery enhances the letter of invitation

Appendix B

List of organizations and people to invite to "1st Copy" ceremony from outside the county:

I. Federal Agencies
   USDA
   ARS
   ASCS
   FHA
   SCS - state conservationist
         state soil scientist
         area conservationist
   USFS
   F&WS

II. State Agencies
   DNR
   Conservation Dept.
   Highway Dept.
   Agriculture Dept.
   State & regional planning Dept.

III. Education Institutions .
   UMC - Extension
         Agronomy
         Agri. Exp. Station
   local colleges and universities

IV. Political representatives
   Governor
   U.S. Senators and Representatives
   State Senators & Represntatives

V. Private organizations
   Bank & loan associations
   Media - newspapers, radio, TV
   Farm groups
   Utility Co.

Appendix C

Program Guide for Introducing the Published Soil Survey

PRESENTATION CEREMONY

Introducing the New Published Soil Survey of __________ County

MEETING CONVENES:

INTRODUCTORY REMARKS	Chairman, ____________________ ____________________, Missouri
PRESENTATION & REMARKS . . . .a.......	Presentation: First Copy of Published Soil Survey to ____________________, Chairman of the County Board of Supervisors, by ____________________
REMARKS	Official Guests
COMMENTS	______________, State Conservationist ______________, Director, Missouri Agricultural Experiment Station

REFRESHMENTS & DISTRIBUTION OF SURVEY BOOK

HOW IS A SOIL SURVEY MADE?	____________________, Soil Scientist, (Former Party Leader, if possible) USDA, Soil Conservation Service, ____________________, Missouri
HOW TO USE YOUR PUBLISHED SOIL SURVEY	______________, State Soil Scientist USDA, Soil Conservation Service, ______________, Missouri
USE OF THE SOIL SURVEY IN CROP AND SOIL SCIENCES	______________ Chairman, Agronomy Department, University of Missouri, Columbia. Missouri
USE OF A PUBLISHED SOIL SURVEY IN AGRICULTURE	______________, Area Extension Agronomist U. S. Cooperative Extension Service ______________, Missouri
THE USE OF A SOIL SURVEY . . . . COMMUNITY PLANNING AND DEVELOPMENT	____________________, Director ______________, County Metropolitan Planning Commission, ______________ Missouri
PLANS FOR FUTURE MEETINGS	______________, District Conservationist or Extension Specialist

ADJOURN

SAFE JOURNEY HOME

Appendix D

Community and Special Interest Meeting Program Guide

The following outline is suggested for community meetings, all or parts of which may be used, depending upon the location of the meeting, the soils, and the personnel available. It may also be adapted to special interest group meetings. Speakers should limit their discussion to a period of 10 or 15 minutes. Emphasis should be given to the practical exercise in the use of the published soil survey.

I. Introductory remarks.
Master of Ceremonies, S&WCD Director, Township Supervisor, Area Agronomist, or District Conservationist.

II. How a soil survey is made.
Soil Scientist. Use of color slides showing a soil scientist mapping and describing soil profiles is very effective.

III. Soils of __________ County.
Soil Scientist. Briefly cover some of the most important soils of the county, emphasizing such soil characteristics and properties as texture, color, drainage, available moisture, permeability, erodibility, and stability. The use of soil monoliths and soil texture samples is recommended.

IV. Uses of soil survey information.
Speakers should refer to the appropriate section of the published survey.

A. Agriculture - Extension Director

B. Conservation and land capability - District Conservationist

C. Urban and engineering - Staff Specialists

D. Woodland and recreation - Staff Specialists

V. Training in the use of the published soil survey.
Area Agronomist or District Conservationist, assisted by the Soil Scientist.

A. Explain the following steps: how to locate the proper map sheet, how to read the map, and how to use the soil symbols and the guide to soil mapping units to find various information. Limitations of the soil map due to scale and the nature and composition of the soil mapping unit should be explained.

B. Conduct several practical exercises to demonstrate the steps in A. Use areas familiar to the group. If time permits, have them make factor maps of soil limitations for various uses.

VI. Closing remarks.

If possible, announce a soils tour as a follow-up to the meeting.

APPENDIX E

GETTING ACQUAINTED WITH SOIL SURVEYS

Chris J. Johannsen
State Extension Agronomy Specialist, University of Missouri

This exercise is designed to help familiarize you with the soil information available from a modern Soil Survey Report. Copies of available Soil Survey Reports can be obtained through your local SCS office or Extension Center. Soil Surveys are available free to Missouri residents. Out-of-State requests are accepted for $3 per copy.

Procedure:

A. First locate the General Soils Map. This is the colored foldout map located near the center of your Soil Survey booklet.

Note that the General Soils Map shows the patterns of soil groups (called soil associations) across the county. It is not detailed for a small tract but is useful for obtaining an understanding of the soil patterns in your county.

B. Next fold out the Index to Map Sheets found immediately after the General Soils Map. (Another copy of the Index is found on the last page of your booklet.)

Locate the map number of the map sheet which contains the county seat. Note that there is a gray or green border around groups of sections. The large numbers refer to the map page containing the soil map of the area within a gray or green border.

What is the map number containing the county seat? ______________________________

This number can now be matched with the number on the fold-out soil map sheets found after the Index to Map Sheets. The number on the soil map sheets will be found in the upper left (even numbers) or right (odd numbers) corners with a circle around the number.

C. Turn to the soil map sheet which includes the county seat. Since each page contains over eleven square miles, 40 acres will be 1 square inch in size. 160 acres will be two inches x two inches.

Locate the numbers for each of the six sections on soil map sheets. Write them in the squares:

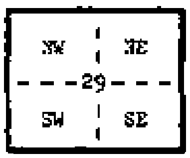
(The section number is the dark black number found in the center of each section.)

D. You will be determining the soils and the interpretations for a quarter section on the map sheet containing the county seat. The legal description of this quarter section is: ______________ ______________ ______________
(Section) (Township) (Range)

If you are familiar with legal descriptions - proceed to E and continue.

Legal Descriptions - A section (640 acres) is divided into four equal sized squares. Each square or quarter section (160 acres) is identified by a direction component from the center of the section.

For example:



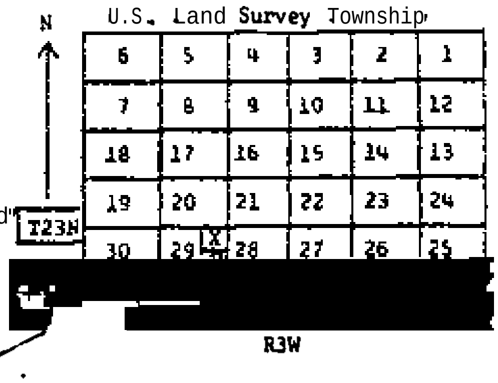
The upper right hand quarter is called the NE 1/4 of Section 29.

The upper half of the section is called the N 1/2 of Section 29.

Each quarter can be divided into smaller components such as the NE 1/4 NE 1/4 of Section 29 which is the northeast 40 acres of the northeast quarter of Section 29.

Here is a brief explanation of the system of defining legal locations and boundaries. A U.S. Land Survey Township is 6 miles square and contains 36 sections. Each section contains 640 acres except those on north and west sides of townships where all corrections are made as needed. These "corrected" sections may be larger or smaller than 640 acres; odd size 40's on outside tiers in these "corrected" sections are called lots.

Example of legal description of "X" quarter: NE 1/4 Sec. 29;



E. Surface Drainage

The predominate drainage of the selected quarter section is toward (direction) ____________ and runs into (name of stream) ____________

____

6. ____________

*Soil names are derived from a geographical location where the first true profile of a soil type was identified. Many soil names will be familiar to you as town names.

G. Other Special Symbols

There are other symbols and lines on a soil map <u>in addition</u> to the soil symbols. These special symbols help provide additional useful information such as man made features, drainage, boundaries, etc. List some of the special symbols found on your map sheet. The meaning for these symbols may be found on the back of the <u>Index to Map Sheets</u>.

<u>Special Symbols</u>	<u>Meaning</u>
1. ________	____________________
2. ________	____________________
3. ________	____________________
4. ________	____________________

H. Next turn to the <u>contents</u> page in the front of the Soil Report. Notice the general headings. Under the "Use and Management of the Soils" is a section called <u>Predicted Yields</u>. Turn to that page and complete the table for those soils on your farm where yield estimates are given. Use the yields listed under Column B. Yield Capacity = estimated acres x yield potential.

<u>Soil Name</u>	<u>Crop</u>	Yield <u>Potential</u>	Estimated <u>Acres*</u>	Yield <u>Capacity</u>	<u>Value</u>
An Example: Sharpsburg Silt Loam	Corn	110	10 ac.	1100 bu	
1. ________	________		________	________	________
2. ________	________		________	________	________
3. ________	________		________	________	________
4. ________	________		________	________	________
________	________		________	________	________
6. ________	________		________	________	________
7. ________	________		________	________	
8. ________	________		________		

* Estimate the acres of each soil in the home quarter section using the dot grid overlays provided

Total Acres = ________

Total Value = ________

Note: The total value is the expected receipts under current market prices. Costs of production need to be subtracted from this amount.

I. Interpretations for other uses.

An important use of the soil survey in rural and urban areas is the section on Engineering Interpretations of the Soils.

The ratings give an indication of the limitations which need to be overcome [redacted]

SOIL FEATURES AND LIMITATIONS

Soil Symbol	Source of Topsoil	Reservoir Area	Agricultural Drainage	Limitations for Septic Tank Filter Fields
An Example: SaB	Good	Mod. slow permeability generally no hazards	Medium Runoff	Moderate
1. ______				
2. ______				
3. ______				
4.				
5. ______				

APPENDIX F

GAM-JRN
10/77

SOIL SURVEY FACTS - MILLS COUNTY

I. Background

a. A Letter of Intent to enter into a cooperative soil survey for Mills County was signed by the County in August, 1971.

b. The County's investment was $45.000. This money covered approximately one-third of the cost of the field work. The State of Iowa and the Federal Government each contributed approximately one-third of the cost.

c. The field mapping started September of 1972 and will be completed in December. 1977.

d. Mills County consists of 285,760 acres of 12.40 townships. Rule of thumb--approximately three-quarters of a man-year is required to do the field work in one township.

e. Soil scientists making a significant contribution to the field mapping included:

-- John R. Nixon, Party Leader
-- Mary Ann Barger
-- Pat Pisarik
-- Willie Bragg

II. statistics

a. 52 soil types were identified in the county. Example: Marshall silty clay loam.

b. 105 soil mapping units were identified in the county. Example: Marshall silty clay loam, 5 to 9 percent slopes. moderately eroded.

Note: A soil type provides a soil name and texture of the surface layer. A soil mapping unit provides the soil type, slope class, and erosion class. All soil delineations on the soil map sheets are for soil mapping units.

c. 7 land capability classes were identified. Example: Class I, Class II, etc. Class I land has few or no physical limitations for crop production. Higher numbered classes have increasing number of physical limitations.

d. Approximately 90 detail soil profile descriptions were written by the field party.

a. During the course of the survey, soil samples were submitted to the Iowa Cooperative Soil Survey Laboratory for mechanical analyses and soil pH. In addition, organic carbon and available phosphorus were determined for some of these samples.

- more -

III. Publications

a. Approximately 70 copies of the field sheets will be made available to the county in the near future.

b. The Mills County published soil survey report should be available in 1980 or 1981.

IV. Soil Survey Status of Iowa Counties

a. 34 counties have completed modern soil surveys and have published reports available in the county.

b. 25 counties have the field work completed for a modern soil survey but the report is not published. #ills County is in this group of counties. 18 of these counties have advance reports.

c. 17 counties are presently being surveyed. Many field sheets are available for inspection at the Soil Conservation District or County Extension offices.

d. 21 counties have signed letters of intent for a soil survey. Starting dates for these counties range from 1977 to 1983.

e. 2 counties have no plans for a modern soil survey at this time.

NORTH CENTRAL REGIONAL WORK PLANNING CONFERENCE
of the
NATIONAL COOPERATIVE SOIL SURVEY
Madison, Wisconsin

January 30 - February 3, 1978

Report of Committee 7 on Soil Correlation and Classification

Committee 7 had five members in attendance at the discussion meeting at Madison plus about ten others of the conference, all of whom ably participated in the discussion.

Copies of the pre-conference report were submitted to the Chairman of the Madison conference for distribution to the entire membership before the conference date.

Following is a summary of the written committee comments plus those of the discussion at the conference committee meeting.

The members of this committee were asked before the conference to comment on the following three items:

1. Describe each of the "soil drainage classes" as they are used in your area and/or as you use them.

2. List briefly soil correlation problems that exist so that further improvement in the correlation process might take place.

3. List any problems that exist in Soil Taxonomy as it affects soil classification.

Comments on Item 1 above - Soil Drainage Classes.

1. Drainage classes may be more useful to the public than to pedologists.

2. Changes suggested for the revision of drainage classes in the "new" manual are: more specific parameters related to water table depth and where mottling is encountered in the soil profile.

3. The effect of water removal in and on the soil profile necessarily changes the drainage class?

4. Drainage classes seem to be used more where rainfall is sufficient to cause problems with soil use at some period during the year.

5. Might need to define zones of water saturation in terms of depth, duration and time of year saturation occurs.

6. Most respondents use depth of and degree of mottling as main criteria for drainage classes.

7. No respondents wanted to drop soil drainage classes.

8. Standard definitions are generally adequate.

9. Very poor and poor are frequently put together as are somewhat excessive and excessive.

10. Mottling between 18 and 40 inches seems to be accepted criteria for moderately well drained.

11. Indicator plants are often used - Sphagnum indicates poorly drained and sedges - somewhat poorly drained.

12. Definitions in revised manual seem adequate.

13. It is difficult to relate soil drainage to Soil Taxonomy.

14. It would be difficult to base soil drainage classes on the interaction of water table depth, duration, time of year, available water holding capacity, permeability, and runoff.

15. Ohio is testing water table depths relating to Soil Taxonomy

16. Thickness of sola can throw off interpretation of soil water table depths.

17. In relating drainage classes to "aquic" and "udic" moisture regimes appears to be a problem.

18. Natural drainage classes are usually reflected in soil morphology.

19. Relict mottling causes problems in assessing drainage classes.

20. Use mostly criteria in Handbook 18.

21. Is a major means of communication.

comments on Item 2 - Soil Correlation Problems.

1. We have too many series with overlapping properties.

2. Different capabilities may be assigned to the same soil in two states.

3. Difference between soil mapping units and soil taxonomic units is often confounded at early stages in a survey.

4. The soil correlation process is slowly becoming more efficient.

5. Differences between states as to what is a "high water table" causes correlation problems. High water table needs to be defined more clearly.

6. Correlation of "old" soil series into the New Classification System still remains a problem in most states.

7. Classification should be carried to the level which provides the best taxonomic basis for interpreting map units at the appropriate order of a soil survey.

8. Changing individual Soil Series concepts create problems for forest soil resource inventories.

9. Many series descriptions have a range in characteristics that is too long, many of which do not distinguish it from similar soils or are important in the series concept.

10. Too many taxadjuncts are used.

11. Tendency to expand the geographic extent of soil series.

12. Lack of consistency among survey areas within a state concerning erosion classes that are combined in correlation.

13. A de-emphasis on importance of erosion classes.

14. Correlation of similar soils situations in adjoining counties frequently is different in each county.

15. Slope combinations, especially in the steeper slopes above 9%, are questionable.

16. Depth to high water table causes problems in correlation.

Comments on Item 3 - Soil Taxonomy Problem

1. Lack in continuity between soil orders in properties that affect placement into suborders and great soil groups, e.g. aquic suborders.

2. Criteria for placement in categories of Soil Taxonomy, especially the subgroups, do not align with soil drainage classes.

3. Seem to need some "Fragic" subgroups for the "not-quite" fragipans.

4. Do B horizons extend into calcareous till?

5. Definition of the end of the solum may need more clarification.

6. Thin (< 10") mollisols pose correlation problems,

7. For aquic subgroups in Psamments, aquic Udipsamments alone exempt high chroma mottles.

8. A long term study might be to characterize the available phosphorus curves for Udolls and Udalfs.

9. Page 202 - first line at top of page in 2nd column. Perhaps "normally insoluble" should be changed to "nearly insoluble."

10. There should be Arenic subgroups of Argiborolls, Arguidolls, etc., like there are Arenic subgroups of Eutrochrepts, Eutroboralfs, etc. Compare the Krem series versus the Braham series.

11. Page 296 and 297 - Hapludolls. There is not a suitable placement for a soil with a mollic epipedon more than 24 inches thick that has a regular decrease in organic carbon with depth to a content of 0.3 percent or less within 50 inches of the surface. It appears this kind of soil should be Pachic rather than Cumulic like Ustolls and Borolls.

12. Many of the Glossic Natriborolls lack natric horizons as well as interfingering of albic material into the argillic horizon. However, there seems to be a need to set this group of soils aside from other Natriborolls and -the "normal soils."

13. Why not Vertisols with frigid temperature regimes?

14. Many Fragiaqualfs do not meet the criteria for fragipan.

15. Depth to mottling in Aquic Hapludalfs vs. Aquic Hapludults - why in upper 25 cm of argillic horizon in one order and 60 cm in the other?

16. Typic Ochraqualfs - we (Mapes-Ohio) feel that the requirement of a chroma of 2 to a depth of 75 cm is too great. Perhaps 60 cm would be more realistic.

17. Fluventic Eutrochrepts vs. Typic Udifluvents.

18. Criteria for paralithic contact (has and is being worked on).

19. Eroded Mollisols - Alfisols or Mollisols?

20. Too wide a gap in organic matter content between the criteria that defines a mollic epipedon and an ochric epipedon. Could be a serious problem in herbicide rate recommendation.

21. Identification of the argillic horizon in the field especially concerning clay film identification in the field andthelaboratory.

During the Committee 7 meeting at Madison, most of the time was spent on drainage classes.

Drainage classes, as such, are not a part of Soil Taxonomy but depth to water table is important in taxonomy. Some felt a need to better define what a water table is. Dick Johnson says that new national guide lines will be coming out. If drainage classes are imprecise and not used in Soil Taxonomy then the question was asked of the group - should we keep them? The concensus was yes; they are useful in communicating information about soils both to people inside and outside of Pedology.

All present agreed that color features in the soil profile were used as an indication of the degree of water saturation and ultimately a particular drainage class.

Dr. Tom Fenton reported on a water table-drainage class study in Iowa over a 4-year period with nearly 5000 observations, relating water table depth to an existing drainage class. Water table depth patterns for the poor, somewhat poor, and well drained classes followed closely with normal expectations for the drainage class.

After some discussion it was stated that if a more uniform application of the current definitions for drainage classes were used, especially the revised edition of the Soil Survey Manual, there would be less difference in use between regions and states than we now have.

After a long discussion it was concluded that redox potential was a measurement that could give us some numbers relating to water state in the soil. We should encourage more study of redox potentials and soil oxygen as it relates to moisture tension and soil morphology, expecially color, which we can more easily and directly interpret.

An attempt was made to rewrite the poorly drained soil drainage class of the to-be-published revised Soil Survey Manual. The changes suggested are shown in the revised definition as follows:

"2. Poorly drained - Water is removed so slowly in relation to supply that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for periods long enough during the growing season that most common mesophytic field crops cannot be grown unless artificially drained, yet the soil is not continuously saturated in layers immediately below plow depth at approximately 25 cm. Poor drainage is due to a high water table, to a slowly pervious layer within the profile, to seepage, to nearly continuous rain fall, a long wet season. or to some combination of these. In temperate forested regions, poorly drained soils may-be are dominantly gray from the surface downward, with or without mottling; some have dark surface horizons. Among the soils of the grasslands, poorly drained soils commonly have dark colored surface horizons thicker than these-meet the better drained soils common to the region or have less bright colored subsoils. Soils of this class ~~usually~~ have aquic soil moisture regimes."

Since the group present indicated a need for drainage classes then the question was asked - should there be fewer classes? After some discussion the present number appeared to be quite useful.

In discussion on the use of the term "water table" it was suggested that "zones of saturation" might be substituted for "water table."

Content of organic matter i.e., tons/acre was discussed as a possible indication of wetness. Exceptions were noted and the idea dropped.

This committee recommends:

1. That the field use of redox potentials be pursued to check any constant relationship to soil drainage classes.

2. That the "somewhat poorly drained" soil drainage class be concentrated on by the members of this committee for the next meeting of the workshop using all pertinent criteria and in relation to Soil Taxonomy.

3. That erosion classes be discussed and evaluated in a similar manner as soil drainage classes.

4. That a more accurate application of the definitions of soil drainage classes, especially as found in the to-be-revised Soil Survey Manual, should be encouraged as a means of getting more agreement on drainage classes among soil scientists'and pedologists.

5. That this committee be continued.

Committee 7

John D. Alexander, Chairman
Steve R. Base
Eric A. Bourdo
Willard H. Carmean
Marvin L. Dixon, Vice-Chairman
Tom E. Fenton
George W. Hudelson
D. Rex Mapes
DeVan Nelson
J. Wiley Scott
Robert I. Turner
Fred C. Westin

North Central Regional Work-Planning Conference
of the Cooperative Soil Survey

Madison, Wisconsin
Jan. 30-Feb. 3, 1979

Committee 8: Using Soil as a Medium for Treating Wastes

Charges:

1. Test degree of soil limitation ratings by application of criteria to mapping units in four survey areas distributed throughout the region so as to represent different soil and climate conditions.

2. For the same survey areas (for all mapping units) (a) develop soil potential ratings as 8 treatment medium for waste products, and (b) develop animal waste application rates and schedules for defined cropping systems.

3. Review and report on what Experiment Stations, Universities, ARS and other research groups in the region are doing in the area of use of soil as a treatment medium for waste products.

Committee Approach

Responses to the charges from the committee members indicated that we should proceed with the testing of soil limitation ratings across the region and develop some potential ratings for soils as a treatment medium for waste products. Most members of the committee had little or no experience in working with potential ratings so It was considered appropriate that we work on only a limited number of ratings. A review and report on regional research in the . area of soil as a treatment medium for waste products was considered to be important but there did not appear to be enough time to complete the task. Therefore most of the efforts of the committee were spent in testing the soil limitation and potential rating systems. Rather than attempt to cover a number of waste materials and systems at this time it was decided to limit cur testing to "Nontoxic Biodegradable Solids". The number of other wastes and systems is very large and includes such things as toxic solids, liquids, leach fields, sanitary land fills and many more. Principles developed from the testing of nontoxic biodegradable solids will apply to many of the other wastes and systems

Soil Limitation and Potential Ratings

Limitations and potentials for waste material are more difficult to determine than for crop production because it is a relatively new and untested ares. and because there are new techniques being developed. In crop production, technology has been developing for many years and the soil effects and corrective measures are reasonably well understood.

Surface application of waste material is in many cases dependent on the type of surface cover present (plowed fields, row crops, pasture, woods, etc). The ratings, particularly on sloping units. are therefore very dependent on the cover.

In order to test the limitation and potential fcr mapping units in widely separated areas around the region, various committee members were assigned to evaluate selected mapping units in counties in four states.

Osborne County, Kansas - Gerry Post
Palo Alto County, Iowa - John Highland
Wood County, Wisconsin - Frank Anderson
Jerry Tyler
Montgomery County, Ohio - George Hall

A portion of their work sheets are attached to this report. Most members of the committee have done little work in the area of soil potential. The exercise proved to be very informative. We consider soil potential as a valuable approach to an evaluation of soils to be used for waste utilization and testing should be continued. Some of the evaluations related to soil potential require major inputs from local users, engineers and contractors. This group should be able to develop the section on Effect of Use since the effects are primarily based on soil properties. General work can also be accomplished on Corrective Measures but will require inputs from local people.

During the workshop the committee evaluated the soil factors that were being used for rating soils for "Nontoxic Biodegradable Waste" As a result of these deliberations a number of additions and changes are suggested in the recommendations.

In our deliberations the importance of determining what toxicity meant became important. We do not know what the maximum amount of toxic material the soil can assimulate before it becomes detrimental to growth of crops raised on the soil or to livestock or humans eating crops raised. It was felt that by using CEC, pH and other soil characteristics we should attempt to determine the maximum amount of elements that can accumulate in a given soil before being considered toxic.

Recommendations

1. Testing the factors used in rating soils for utilization of non toxic biodegradable solids as a crop production resource should be continued in the region. The list of factors to be tested should be expanded to include:

   a. Permeability of the most restrictive layer above 60 in.
   b. Soil drainage class
   c. Depth to water table (zone of saturation)
   d. Percent slope (to replace runoff)
   e. Flooding
   f. Ponding
   g. Available water capacity
   h. CEC
   i. pH
   j. Surface texture
   k. Depth to fractured bedrock or sands and gravels
   l. Stoniness or rockiness
   m. Salinity
   n. Alkalinity

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
4601 Hammersley Road, Madison, WI 53711

January 13, 1978

Prof. G. F. Hall
The Ohio State University
Department of Agronomy
1885 Neil Avenue
Columbus, Ohio 43210

I am returning the assignment given me by Committee 8 of the NCR Work Planning Conference. I have worked with Jerry Tyler to rate 12 major acreage soils in Wood County, Wisconsin. I am sending the summary sheet and the worksheet for each soil. The Hiles, Kert, Vesper, and Veedum series form a drainage sequence as do the Plainfield. Friendship, Meehan, and Newson series. The Withee and Marshfield series are also drainage associates.

Neither Jerry nor I have had much time to spend on thls and I am sure further refinements in the potential ratings can be made.

Frank L. Anderson

Frank L. Anderson
Asst. State Soil Scientist

Attachments

cc:
Jerry Tyler, Dept. of Soil Science,
University of Wisconsin-Madison

Soil potential ratings and corrective treatment for spreading nontoxic biodegradable solids for nutrient removal by plants

Symbol and Soil Name	Potential	Corrective Treatments
HsB - Hiles silt loam, 2 to 6 percent slopes	High (92)	Stripcrops, terraces, or reduced application rates
Mt - Milladore silt loam	High (92)	Drainage or limit spreading to dry periods.
WeB - Withee silt loam, 2 to 6 percent slopes	High (92)	Drainage or limit spreading to dry periods.
PlA - Plainfield sand, 0 to 2 percent slopes	High (90)	Irrigate to increase plant growth
FrA - Friendship loamy sand, 1 to 3 percent slopes	High (90)	Irrigate to increase plant growth.
Mf - Marshfield silt loam	Medium (88)	Drainage or limit spreading to dry periods.
KeA - Kert silt loam, 0 to 3 percent	Medium (86)	Drainage or limit spreading to dry periods.
Mh - Meehan loamy sand	Medium (85)	Drainage or limit spreading to dry periods, with irrigation during dry periods
Vs - Vesper silt loam	Medium (84)	Drainage and limit spreading to dry periods
Vz - Veedum silt loam	Medium (84)	Drainage and limit spreading to dry periods.
Ne - Newson loamy sand	Medium (80)	Drainage with irrigation during dry periods.
Mc Markey mucky peat	Low (70)	Drainage, special spreading equipment and reduced loads.

83

WORKSHEET FOR DEVELOPING SOIL POTENTIAL RATINGS

Mapping Unit: | es silt loam, 2 to 6 percent slopes

Rating Factors	Soil Facts	Degree of Limitation	Effects On Use	Treatments: Kinds	Treatments: Index	C ... at: K	
Permeability of the most restricting layer above 60 inches	Slow 0.06 - 0.2	Severe	Plant growth restricted Limit the Use of deep rooted crops	Use shallow rooted crops	2	C ς	
Soil drainage class	Moderately well drained & well drained	Slight					
Runoff	Medium	Moderate	Surface seepage	Reduce runoff by strip cropping, terraces, or reduced application rate	3	F t	1
Flooding	None	Slight					
Available water capacity from 0 to 60 inches or to a limiting layer	9.6"	Slight					
				Total	5	7	3

100 - 5 3 = 92

WORKSHEE: FOR PREPARING SOIL POTENTIAL RATINGS (Nontoxic Biodegradable Solids) (for Nutrient Removal by Plants)

Soil Use: Area: Wood County, Wisconsin

Mapping unit: Newson loamy sand

Evaluation Factors	Soil and Site Conditions	Degree of Limitation	Effects On Use	Corrective Measures Kinds	Index	Continuing Limitatic Kind	Index
Permeability of the most restricting layer above 60 inche	Rapid 6.0 - 20	Moderate	Seepage	Reduce application rate	5	None	0
Soil drainage class	Poorly drained	Severe	Applicatior difficulty. Suitable plant spec limited.	Drainage	10	None	0
Runoff	Very slow	Slight					
Flooding	None	Slight					
Available water capacity from 0 to 60 in or to a limiting lag	4.7"	Moderate	Plant growth restricted	If drained, irrigation may be requirt during dry period.	5	None	0
				Total	20	Total	0

$$\frac{100}{\text{Performance Standard Index}} - \frac{20}{\text{Measure Cost Index}} - \frac{0}{\text{Continuing Limitation Cost Index}} = \frac{80}{\text{Soil Potential Index}}$$ 1/

1/ If performance exceeds the standard Increase SPI by that amount.

WORKSHEET FOR PREPARING SOIL POTENTIAL RATINGS (Nontoxic Biodegradable Solids) (for Nutrient Removal by Plants)

Soil Use: Area: Wood County, Wisconsin

Mapping Unit: Markey mucky peat

Evaluation Factors	Soil and Site Conditions	Degree of Limitation	Effects On Use	Corrective Measures Kinds	Corrective Measures Index	Continuing Limitations Kind	Continuing Limitations Index
Permeability of the most restricting layer above 60 in.	Moderatel, rapid 2.0-6.0	Slight					
Soil drainage class	Very poor drained	Severe	Application difficulty. Suitable plant species lim	Drainage, special equipment or reduc land size. Avoid wet seasons. ed.	25	Poor traffic-ability even afte drainage.	5
Runoff	Ponded	Slight					
Flooding	None	Slight					
Available water capacity from 0 to 60 in or to a limiting layer	14.8"	Slight					
				Total	25	Total	5

100	–	25	–	5	=	70
Performance Standard Index		Measure Cost Index		Continuing Limitation Cost Index		Soil Potential Index 1/

1/ If performance exceeds the standard Increase SPI by that amount.

UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

Agronomy Laboratory, Iowa State University, Ames, Iowa 50011

January 16, 1978

Dr. George F. Hall
Department of Agronomy
Ohio State University
Columbus, Ohio 43210

Dear George:

Due to budget cuts in SCS, I will not be able to attend the work conference in Madison.

George, I worked through some of the soils on "Soil Limitations for Accepting Nontoxic Biodegradable Solids for Nutrients Removal by Plants" in Palo Alto County, Iowa. I followed the guides as suggested in the National Soils Handbook rather closely. I have attached copies of the results.

You can see that soil drainage in Palo Alto County was the overriding factor. I would like to suggest the following changes in the guides:

1. CEC - Cation Exchange Capacity of the soil should be an item of concern. Soils like Webster have a CEC possibly as high as 35 to 40 ME/100 gr. and a soil like Estherville may be 10 to 15. I think this would be an important property.

2. pH - It seems to me a higher pH soil would be desirable also.

3. A soil that is adequately drained should not be rated as severe. This can be taken care of with soil potential, but I think limitation should be slight also.

Sincerely,

John D. Highland
Soil Scientist

Encl.

WORKSHEET FOR PREPARING SOIL POTENTIAL RATINGS

(Nontoxic Biodegradable Solids)

Soil Use: Area:

Mapping Unit: Clarion loam, 2 to 5 percent slopes

Evaluation Factors	Soil and Site Conditions	Degree of Limitation	Effects On use	Corrective Measures Kinds	Index	Continuing Limitation Kind	Index
Permeability	Moderate	Slight					
Soil drainage	Well	Slight					
Runoff	Slow	Slight					
Flooding	None	Slight					
Available water	77.8	Slight					
				Total	0	Total	0

100 (Performance Standard Index) - 0 (Measure Cost Index) - 0 (Continuing Limitation Cost Index) = 100 (Soil Potential Index 1/)

1/ If performance exceeds the standard increase SPI by that amount.

WORKSHEET FOR PREPARING SOIL POTENTIAL RATINGS

(Nontoxic Biodegradable Solids)

Soil Use: Area:

Mapping Unit: Nicollet loam, 1 to 3 percent slopes

Evaluation Factors	Soil and Site Conditions	Degree of Limitation	Effects On Use	Corrective Measures Kinds	Index	Continuing Limitations Kind	Index
Permeability	Moderate	Slight					
Soil drainage	SWP	Moderate	Lower yields Contamination of ground water	Tile drainage	5	None	
Runoff	Slow	Slight					
Flooding	None	Slight					
Available water	> 7.8	Slight					
				Total	5	Total	

100 Performance Standard index - 5 Measure Cost Index 0 Continuing Limitation Cost Index = 95 Soil Potential Index 1/

1/ If performance exceeds 'the standard Increase SPI by that amount.

WORKSHEET FOR PREPARING SOIL POTENTIAL RATINGS

(Nontoxic Biodegradable Solids)

Soil Use: Area:

Mapping Unit: Okoboji silty clay loam, 0 to 1 percent slopes

Evaluation Factors	Soil and Site Conditions	Degree of Limitation	Effects On use	Corrective Measures Kinds	Corrective Measures Index	Continuing Limitation Kind	Continuing Limitation Index
Permeability	Mod. slow	Moderate	Lower rates of application	None	5		5
Soil drainage	Very poor	Severe	Low yields Contamination of ground water	Surface intakes & tile drainage	10	None	
Runoff	None	Slight					
Flooding	(Ponds) Floods	Severe	Contamination of surface water	Surface intakes Land modification	10	Maintain drainage	5
Available water	>7.8	Slight					
				Total	25	Total	10

100 (Performance Standard Index) − 25 (Measure Cost Index) − 10 (Continuing Limitation Cost Index) = 65 (Soil Potential Index 1/)

1/ If performance exceeds the standard Increase SPI by that amount,

UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

Midwest TSC, FederalBldg.-U.S. Courthouse, km. 393, Lincoln, NE 68508

January 4, 1978

Dr. George F. Hall
Agronomy Department
Ohio State University
Columbus, OH 43210

Dear George:

Here is the information you requested for the upcoming Committee 8 report for the Madison meeting. As requested I have completed a table (attachment) showing the degree and kind of soil Limitations for accepting nontoxic biodegradable solids for nutrient removal by plants for all the mapping units in the Osborne County, Kansas soil survey. Also, I have prepared a potential statement for three of these mapping units which follows.

The Ma mapping unit has a very high potential for accepting nontoxic biodegradable solids for nutrient removal by plants. This soil is well suited to raising all the commonly grown crops in the county. It is well suited to irrigation, is easily cultivated over a range of moisture conditions, and its yield potential is very high. This soil is well drained and permeable thus allowing waste materials to be applied during much of the growing season.

The Hb mapping unit has a medium potential for accepting nontoxic biodegradable solids for nutrient removal by plants. This soil is suited to raising all the commonly grown crops in the county. It is extensive in the county and occurs in large areas commonly up to several hundred acres in size. It is suitable for irrigation and has a high yield potential. The permeability of this soil is restricted which somewhat Limits the times when waste materials can be applied. The more clayey texture and restricted permeability of this soil also limits the times when it cao be cultivated.

The Tm mapping unit has a very low potential for accepting nontoxic biodegradable solids for nutrient removal by plants. Because of a low available water capacity, steep slopes, and very poor workability characteristics cultivated crops are not suited to growing on this soil. The very slow permeability and very rapid surface runoff severely Limits when waste materials could be applied.

Gerald J. Post
Soil Scientist
Soils Staff

Mapping Unit	
Aa-	
Ab-	
Ar-	
As-	
Ax-	
Bo-	
Bw-	
Co-	
Cr-	
De-	
Ha-	
Hb-	
Hc-	
Hd-	
He-	
Hm-	
Hn-	
Hx-	
Hz-	
In-	
Ma-	
Mc-	
Nc-	
Nd-	
Nx-	
Ro-	
Rp-	
Rr-	
Tb-	

MONTGOMERY COUNTY, OHIO

Soil	Permeability (most restrictive layer, upper 60 i)	Soil Drainage Class	Runoff	Flooding	Available' Water	Rating & Limiting Property
Miamian	Moderate	Slight	Moderate	Slight	Slight	Moderate, Permeability & Runoff
Celinn	Moderate	Slight	Moderate	Slight	Slight	Moderate, Permeability & Runoff
Crosby	Moderate	Moderate	Slight	Slight	Slight	Moderate, Permeability & Soil Drainage
Brookston	Moderate	Severe	Slight	Severe	Slight	Severe, Soil Drainage & Ponding
Ross	Slight	Slight	Slight	Severe	Slight	Severe, Flooding
Russell	Moderate	Slight	Moderate	Slight	Slight	Moderate, Runoff
Fox	Slight	Slight	Slight	Slight	Moderate	Moderate, Available Water
Montgomery	Severe	Severe	Slight	Severe	Slight	Severe, Permeability, Soil Drainage & Ponding

Montgomery County, Ohio

Typic Hapludalfs, fine-loamy over sandy

Nontoxic Biodegradable Solids

WORKSHEET FOR DEVELOPING SOIL POTENTIAL RATINGS

Mapping Unit: Fox sandy loam, 0-2% slopes

Rating Factors	Soil Facts	Degree of Limitation	Effects On Use	Treatment: Yinds	Treatment: ndex	Continuing Limitations: Kind	Continuing Limitations: Index
Permeability of the most restrictive layer above 60 in.	0.63 - 2.0	Slight					
Soil drainage class	Well	Slight					
Runoff	Slow	Slight					
Flooding	None	Slight					
Available water capacity from 0 to 60 in. or to limiting layer	3.0 - 7.8 in.,	Moderate	Lower utiliza- tion	Lower applica- tion rates	10	None	
				Total	10	Total	

100	10	-	0	=	90
Performance Standard Index	Treatment Cost Index		Continuing Limitation Cost Index		Soil Potential Index

Montgomery County, Ohio

Typic Haplaquolls, fine | Nontoxic Biodegradable Solids

WORKSHEET FOR DEVELOPING SOIL POTENTIAL RATINGS

Mapping Unit: Montgomery silty clay loam, O-Z% slopes

Rating Factors	Soil Facts	Degree of Limitation	Effects On Use	Treatment: Kinds	Treatment: Index	Continuina Limitations: Kind	Continuina Limitations: Index
Permeability of the most restrictive layer above 60 in.	< 0.2 in.	Severe	Reduced movement into soil	Lower rates Limit time of application	20		
Soil drainage class	Very poor	Severe	Time of applica-tion Traffic-ability	Limit time of application Special equipment	10		
Runoff	Slow	Slight					
Flooding	Ponding	Severe	Time of applica-tion Reducing conditions	Limit time of application	20	Occasional reducing conditions	10
Available water capacity from 0 to 60 in. or to limiting layer	> 7.8 in.	Slight					
				Total	50	Total	10

100	-	50	-	10	=	4u
Performance Standard Index		Treatment Cost Index		Continuing Limitation Cost Index		Soil Potential Index

, Ohio

Cumulic Hapludolls, fine-loamy

Nontoxic Biodegradable Solid

WORKSHEET FOR DEVELOPING SOIL POTENTIAL RATINGS

Mapping Unit: Ross silt loam, 0-2% slopes

Rating Factors	Soil Facts	Degree of Limitation	Effects On Use	Treatments: Kinds	Treatments: Index	Continuing Limitations: Kind	Continuing Limitations: Index
Permeability of the most restrictive layer above 60 in.	0.63 - 2.0	Slight					
Soil drainage class	Well	Slight					
Runoff	Slow	Slight					
Flooding	Flooding	Severe	Stream Contamination	Limit time of application	30	Continuing tamination potential	20
Available water capacity from 0 to 60 in. or to limiting layer							
				Total	30	Total	20

100 (Performance Standard Index) - 0 (Treatment Cost Index) - 20 (Continuing Limitation Cost Index) = 50 (Soil Potential Index)

Committee 9 Report

CLASSIFICATION, INTERPRETATION, AND MODIFICATION OF SOILS ON MINE SPOILS AND DISTURBED SOILS

Charges for this committee were as follows:

1. A summary of work done or being conducted in classifying mine tailings, mine wastes, mine spoils, and disturbed areas.

2. A summary of work done in the modification of tailings, wastes, spoils, or disturbed materials that resulted in improving them as a better medium for growing plants.

Response from committee members shows that there has been an increased effort in the region during the past two years in inventorying and classifying mine spoils, tailings, wastes, and other disturbed materials. Also it appears there is an increased effort to conduct studies that will not only support classification but will document physical and chemical properties and behavior of the materials as a medium for growing plants.

It still appears that less work has been done on the modification of tailings, slurry, gob, and other wastes associated with mining than on mine spoils.

Missouri has correlated a soil series for surface mined areas in one county. In addition, they are proposing four new series for disturbed soils resulting from urbanization in the St. Louis area.

Ohio proposed five soil series in 1977 for mine spoils. The series and interpretations have been tested and are continuing to be tested in four counties.

Illinois and other states'have correlated old mine spoils and disturbed soils at categories higher in the classification system than soil series. Illinois initiated soil surveys in 1977 in two counties where extensive surface mining is taking place under current reclamation requirements. Field investigations are geared to determine whether the reclaimed materials can be placed in soil series.

Committee member Ivan Jansen began studies in 1977 in Illinois to characterize mine spoil materials. He will be attempting to relate observations to features of the premined land surface. to mining procedures, and to reclamation procedures. During the five year study he will be quantifying variability, both within mapping units and between mapping units. This should contribute to better classification of mine spoils.

Also committee member Stephen Shetron has studied and continues to study iron and copper mine tailings and wastes in northern Michigan. He has gathered physical and chemical data as well as information on the performance of various vegetative species.

Since the mid 1950's, the Cooperative Wildlife Research Laboratory at Southern Illinois University has conducted investigations of mine spoil and wastes. Two recent publications of their studies supported by the Illinois Institute for Environmental Quality include an inventory of Illinois Lands Surface Mined for Coal, 1975, and Illinois Lands Affected by Underground Mining for Coal, 1977. Both these documents give physical and chemical data of the upper six inches of the materials as well as chemical data for water and the vegetative cover.

The Argonne National Laboratory near Chicago is involved in land reclamation research. One demonstration project relates to modification of gob material from an abandoned underground mine. Investigations are underway to test and evaluate various plant species, soil amendments, and the thickness of surface cover material for revegetating refuse areas. The goals of the project are to (1) reduce or eliminate the quantity of pollutants entering the environment; (2) to improve the economic potential of the area; (3) to improve the aesthetics of the landscape; and (4) to develop and evaluate techniques that can be used to reclaim abandoned mine lands.

During the conference. Steve Shetron gave an hour long slide presentation showing many. kinds of spoil and mine waste materials. This not only depicted the wide range in kinds of materials but also the problems associated with them in classification and reclamation.

Subsequent discussion supported in general that most mine spoils and disturbed soils can be classified at different categorical levels of Soil Taxonomy. However, mine tailings, slurry, gob, or other mine wastes are more difficult to place in current slots of the classification system. Many of these materials have high levels of one or more elements significant to classification and reclamation. Irrespective of classification, this fact has been important in the modification or treatment of the materials in order to establish vegetation.

Further discussion reaffirmed that we really do not know very much about the behavior or performance of spoils, mine wastes, etc. for uses other than some vegetative ones. Because of this, the following recommendations were made by the conittee and concurred in by the conference:

1. Committee 9 be continued.

2. Summarize by states in the NCR the results of studies being conducted on mine spoils, tailings, wastes, and other disturbed materials.

3. Report on the performance of materials already classified to determine the validity of the interpretations.

4. Evaluate experiences resulting from implementation of Public Law 95-87, "Surface Mining Control and Reclamation Act of 1977."

<u>List of Members</u>

February 3. 1978

L. J. Bartelli
C. Reese Berdanier
Richard Christman
J. B. Fehrenbacher
A. R. Gilmore
Ivan Jansen - attended
Charles W. McBee - attended
Stephen G. Shetron, vice-chairman - attended
Kenneth Vogt - attended
Earl E. Voss, Chalrman - attended

NATIONAL COOPERATIVE SOIL SURVEY

North Central Regional Conference Proceedings

Traverse City, Michigan
May 3-7, 1976

PROCEEDINGS
OF NORTH CENTRAL REGIONAL
TECHNICAL WORK-PLANNING CONFERENCE
OF THE
NATIONAL COOPERATIVE SOIL SURVEY

Traverse City, Michigan

May ***3-7, 1976***

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

NORTH CENTRAL REGIONAL TECHNICAL WORK-PLANNING CONFERENCE

of the

NATIONAL COOPERATIVE SOIL SURVEY

Traverse City, Michigan

May 3-7, 1976

CONTENTS

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North Central Regional Work-Planning Conference
Of The National Cooperative Soil Survey
May 3-7, 1976
Traverse City, Michigan

AGENDA

Monday, May 3

Morning

10:00 am Registration

Afternoon - Rodney F. Harner, Presiding

1:30 pm Opening Remarks

2:00 pm Welcome -
James R. Callison, Area Conservationist
Soil Conservation Service

2:15 pm Welcome -
Sylvan H. Wittwer, Director
Michigan Agricultural Experiment Station

2:30 pm Welcome -
DeVon O. Nelson, Soil Group Leader
USDA, Forest Service

2:45 pm Use of the Soil Potential Concept in Soil Survey Interpretations -
Lindo J. Bartelli, Director
Soil Survey Interpretations Division
Washington, D.C.

3:30 pm Break

3:50 pm Waste Disposal on Land -
A. Earl Erickson, Professor
Department of Crop and Soil Sciences
Michigan State University

4:30 pm Business Meeting

5:00 pm Adjourn

Tuesday, May 4

Morning - Eugene P. Whiteside, Presiding

8:00 am The Tart Cherry Site Index
Guy Springer, District Conservationist (retired)
Soil Conservation Service

8:40 am Break

Tuesday, May 4 - continued

9:10 am	Discussion Group Meetings - 4 Groups
Afternoon	
4:30 pm	Adjourn

Wednesday, my 5

Morning	
8:00 am	Continuation of Discussion Groups
12:00 noon	Lunch
Afternoon	
1:00 pm	Field Tour

Water relations - separately

Thursday, May 6

Morning	
8:00 am	Separate Meetings - Federal Agencies, NCR-3
12:00 noon	Lunch
Afternoon	- Eugene P. Whiteside, Presiding
1:00 pm	Remarks by Richard R. Davis, Administrative Advisor to NCR-3
1:20 pm	Committee Reports to General Session
4:30 pm	Adjourn
6:30 pm	Social Hour
7:30 pm	Dinner

Friday, May 7

Morning	- Rodney F. Harner, Presiding
8:00 am	Committee Reports to General Session
10:00 am	Break
10:15 am	Business Meeting
11:00 am	Adjourn

PARTICIPANTS IN THE 1976
NORTH CENTRAL REGIONAL TECHNICAL WORK-PLANNING CONFERENCE

Ferris Allgood
Frank L. Anderson
Lindo Bartelli
Steve R. Base
James Bowles
John I. Brubacher
Louis Buller
Richard L. Christman
James R. Culver
Leon B. Davis
Richard R.Davis
Marvin L. Dixon
J. A. Elder
Earl Erickson
Kaye R. Everett
J. B. Fehrenbacher
T. E. Fenton
Richard W. Fenwick
H. R. Finney
Charles S. Fisher
Henry D. Foth
Don Franzmeier
Erling Gamble
Robert B. Grossman

Howard W. Hall
Phil Harlan
Rodney Harner
Kenneth C. Hinkley
Keith Hoffman
Francis D. Hole
N. Holowaychuk
Steve Holzhey
George W. Hudelson
Ivan Jansen
Christian J. Johannsen
Paul R. Johnson
Lloyd L. Joos
G. E. Kelley
A. J. Klingelhoets
Raymond J. Kunze
Gilbert R. Landtiser
Kermit E. Larson
Gerhard B. Lee
James H. Lee
Robert E. Lucas
Douglas Ma10
Steve Messenger
Gerald A. Miller

Delbert L. Mokma
DeVon Nelson
Jan Nemecek
Hollis W. Omodt
Donald D. Patterson
Ival O. Persinger
Gerald J. Post
Richard H. Rust
F. M. Scilley
Wiley Scott
C. L. Scrivner
H. Raymond Sinclair, Jr.
Miles W. Smalley
Neil E. Smeck
Roy M. Smith
Mike Stout
Neil W. Stroesenreuther
E. A. Tompkins
Robert I. Turner
Jerry Tyler
Earl E. Voss
E. P. Whiteside
Robert E. Wilson
Larry D. Zavesky

NORTH CENTRAL REGIONAL TECHNICAL WORK-PLANNING CONFERENCE COMMITTEE ASSIGNMENTS

Committee 1 - Rooting characteristics in relation to paralithic horizons and other root restricting layers

Chairman - James R. Culver
Vice-chairman - Sylvester C. Ekart

Steve R. Base
Rex. L. Carey
Marvin L. Dixon
J. B. Fehrenbacher
Henry D. Foth
Robert B. Grossman
Roger Lee Haberman
N. Holowaychuk
G. E. Kelley
William E. McKinzie
Steve Messenger
Ival O. Persinger
Stephen G. Shetron
H. Raymond Sinclair, Jr.
Donald A. Yost
Larry D. Zavesky

Committee 2 - Improving soil survey techniques

Chairman - Richard W. Fenwick
Vice-chairman - Gilbert R. Landtiser

Frank L. Anderson
Donald L. Bannister
Marvin T. Beatty
Eric A. Bourdo
John I. Brubacher
Rex L. Carey
Willard H. Carmean
Richard L. Christman
H. R. Finney
N. Holowaychuk
Christian J. Johannsen
Lloyd L. Joos
Gilbert R. Landtiser
Gerhard B. Lee
James H. Lee
Dave Lewis
Ralph L. Meeker
DeVon Nelson
Richard H. Rust
F. M. Scilley
Roy M. Smith
Edward A. Tompkins
Robert E. Wilson

Committee 3 - Organic soils

Chairman - Kaye R. Everett
Vice-chairman - Kenneth C. Hinkley

Don H. Boelter
Edward L. Bruns
Louis L. Buller
H. R. Finney
Kenneth C. Hinkley
A. J. Klingelhoets
Gerhard B. Lee
Robert Lucas
Warren Lynn
William E. McKinzie

Committee 4 - Water relations in soils

Chairman - C. L. Scrivner
Vice-chairman - Richard H. Rust

Louis L. Buller
Don Franzmeier
Robert B. Grossman
Francis D. Hole
G. E. Kelley
Raymond Kunze
Dave Lewis
J. L. Richardson
Richard H. Rust
Mike Stout

Committee 5 - Soil potential

Chairman - Paul R. Johnson
Vice-chairman -

John D. Alexander
Frank L. Anderson
Marvin T. Beatty
Eric A. Bourdo
John I. Brubacher
Edward L. Bruns
Sylvester C. Ekart
Richard W. Fenwick
Charles S. Fisher
Paul R. Johnson
Robert H. Jordan
James H. Lee
Ralph L. Meeker
Robert E. Radeke
Alexander Ritchie
F. M. Scilley
Stephen G. Shetron
Neil E. Smeck
Roy M. Smith
Edward A. Tompkins
Earl E. Voss
Eugene P. Whiteside
Donald A. Yost

Committee 6 - Improvement of teaching methods in soil science

Chairman - James Bowles
Vice-chairman - Don Franzmeier

H. F. Arneman
Henry D. Foth
Don Franzmeier
Francis D. Hole
Warren Lynn
Steve Messenger
Delbert L. Mokma
DeVon Nelson
H. Raymond Sinclair, Jr.

Committee 7 - Soil correlation and classification

Chairman - George W. Hudelson
Vice-chairman - John D. Alexander

John D. Alexander
Steve R. Base
Charles S. Fisher
Roger Lee Haberman
Kenneth C. Hinkley
George W. Hudelson
Richard B. Jones
Gilbert R. Landtiser
Frank Sanders
George M. Schafer
Neil W. Stroesenreuther
Robert I. Turner
Eugene I'. Whiteside
Larry D. Zavesky

Committee 8 - Using soil as a treatment medium for waste products.

Chairman: Delbert Mokma
Vice-Chairman: George Hall

Test the interim "Guide for Rating Limitations of Soils for Disposal of Waste" against benchmark soils.
Refine the guidelines for specific kinds of waste using state or local criteria, if such exists.

This is a new regional committee. There is a corresponding national committee.

Committee 9 - Classification, interpretation, and modification of soils on mine spoils, and disturbed soils.

Chairman: Gerald Post
Vice-Chairman: Earl Voss

Determine how to characterize and classify soils on mine spoils and disturbed soils.
Determine the kinds of interpretations needed for these soils.
Determine how these soils can be modified for various uses.
Corresponds to National committee 6, Classification of Soils Resulting From Mining Operations and the Interpretations.

This is a new regional committee. There is a corresponding national committee.

April 24, 1975

NORTH CENTRAL REGIONAL TECHNICAL WORK-PLANNING CONFERENCE COMMITTEE ASSIGNMENTS

Additions To Committees

Committee 1 - James R. Boyle
Miles Smalley

Committee 2 - Lacy Harmon
John R. Worster

Committee 3 - Leon Davis

Committee 4 - James A. Bowles
George Holmgren
D. D. Malo

Committee 5 - Leon Davis
Lacy Harmon
George Holmgren
C. L. Scrivner
F. C. Westin
John R. Worster

Committee 6 - James R. Boyle
F. C. Westin

Committee 7 - none

Committee 8 - D. D. Malo

Committee 9 - Miles Smalley

MINUTES
of the
NORTH CENTRAL REGIONAL TECHNICAL WORK-PLANNING CONFERENCE
OF THE COOPERATIVE SOIL SURVEY
Traverse City, Michigan
May 3-7, 1976

The work-shop was called to order in the Holiday Inn Motel at 1:30 p.m., May 3rd, by Chairman Rodney F. Harner, and was closed at 12:00 p.m., May 7th by Francis D. Hole, incoming chairman of the 1978 Conference to be held at Madison, Wisconsin, probably Monday, January 30 through Friday, February 3, 1978. Attached is a list of participants with addresses, and a schedule (agenda) of the conference. The conference welcomed Dr. Jan Nemeck, soil scientist from Czechoslovakia.

The conference discussion sessions were organized into (a) one continuing session for Committee 4, chaired by C. L. Scrivner, and (b) four discussion groups under the leadership of Chris Johannsen, James Lee, Earl Voss and K. Holowaychuk. Each of the four discussion groups had 70 minutes to review with respective chairmen each of the eight committee reports and to prepare comments. These comments are summarized in eight reports attached to these minutes.

Ray Sinclair, nominated by a committee consisting of Maynard Scilley, Gil Landtiser and Don Franzmeier, was duly elected Secretary for the 1978 conference, to serve as chairman in 1980. Vicechairmen of the eight committees were asked to take over chairmanships of their respective committees at the close of the conference, with the exception of D. P. Franzmeier, who will be replaced by Jerry Miller as Chairman of Committee 6. The new chairmen of the committees are as follows:

Committee 1. Sylvester C. Ekart. Rooting Characteristics in Relation to Paralithic Horizons and Other Root Restricting Layers.

Committee 2. Gilbert Landtiser. Improving Soil Survey Techniques.

Committee 3. Kenneth C. Hinkley. Organic Soils.

Committee 4. R. H. Rust. Water Relations in Soils.

Committee 5. John I. Brubacher. Soil Potential.

Committee 6. Gerald A. Miller. Improvement of Teaching Methods in Soil Science.

Committee 7. John D. Alexander. Soil Correlation and Classification.

Committee 8. George Hall. Using Soils as a Treatment Medium for Waste Products.

Committee 9. Earl E. Voss. Classification, Interpretation and Modification of Soils on Mine Spoils and Disturbed Soils.

The following were asked to continue serving on the regional soil taxonomy committee: R. Rust, for three years and E. P. Whiteside for one year, to be replaced in 1978.

In a distributed memo, entitled "Redirection of the NCRWPC," (attached) R. B. Grossman proposed that the steering committee of this conference be enlarged to include representatives from multi-state units, including the Agricultural Research Service and the Soil Survey Laboratory at Lincoln. The incoming chairman was asked to set up an ad hoc committee to study the proposal and bring a recommendation to the steering committee (R. Harner, F. Hole, R. Sinclair, M. Stout, F. Westin) by 1977.

D. P. Franzmeier made a statement concerning the professional contri-

The Forest Service is responsible for management of approximately 4 million acres of land on ten National Forests in States throughout the midwest. One of the essential inputs to the decisionmaking process on this land is soils information. To gather this information we have a staff of sixteen soil scientists assigned to the National Forests.

The Forest Service is a cooperator in the National Cooperative Soil Survey Program. Our need for soils information and the pattern of ownership for most National Forests makes our involvement in this program inevitable. We have certainly been beneficiaries of the National Cooperative Soil Survey Program. We have cooperative soil survey agreements with the Soil Conservation Service in most States having National Forest land. In Illinois, Ohio, and Indiana the Soil Conservation Service has provided most of the detailed soils information we have on the National Forest land in these states. It is interesting to note that the only National Forest in the United States having a complete, detailed soil survey is the Shawnee National Forest in southern Illinois. The SCS has mapped each county completely that is occupied by this National Forest. We are certainly appreciative of this accomplishment.

In addition to the soil survey work by the SCS that is benefiting the Forest Service, we also have close ties with SCS field offices. The soil scientists in these offices have been very generous in consulting with us on special problems. The Forest Service has also relied on the SCS for the training of our beginning soil scientists. This last year we had soil scientists working with the SCS in both Indiana and Michigan for the training this experience provides.

Just as cooperation between the Forest Service and other participants in the National Cooperative Soil Survey Program is inevitable, so also are certain differences between the Forest Service's approach to soil information collection and the methods of the National Cooperative Soil Survey. This is reasonable when we consider:

1. The land managed by the Forest Service is forested, rather hilly, and generally supports natural vegetation. This is marginal land as far as agriculture is concerned in most parts of the midwest. The economic value and contribution this land makes is generally less than the adjacent agricultural land.

2. The clientele for Forest Service soil inventories are professionally trained land managers. They are in direct contact with the soil scientists. This results in rapid feedback to the information provided by the soil scientist. The soil scientist is one member of a team of specialists providing information for land resource management decisions.

3. Management on National Forest land is considerably less intense than it is on most land surveyed in the National Cooperative Soil Survey Program. At the same time, there are many management

activities requiring immediate and precise input by the soil scientist. Planning is a major use of soils information. The Forest Service has been required to develop management plans faster than we can gather soils information by the traditional methods. O. C. Olson, when he was heading the soils program for the Forest Service, referred to this in his 1973 talk at the national conference of the Cooperative Soil Survey Program when he said, "Going back a few years, some of the top administrators in the Forest Service began depreciating our detailed soil surveys. Rightly or wrongly, they came to believe that our going soil survey program was not really responsive to Forest Service resource management. Among other things, they were negatively impressed with the prospect of 30 to more than 100 years to complete the detailed Soil survey in the various regions at the foreseeable rate of progress. Perhaps equally important, was that we seemed to be projecting an image of being unduly engrossed with classification for classification's sake."

We have tailored a soil program in the Forest Service that is responsive to the land, clientele, and management practices in the Forest Service. This has been at the expense of our full participation in the National Cooperative Soil Survey Program. The demand for soil consultation services for example requires that the typical soil scientist on a National Forest spend 40 to 60 percent of his time on project level soil investigations. We call our approach to soil survey Soil Resource Inventory to be in tune with the nomenclature used in the Forest Service for other kinds of resource inventories. Most of our soil resource inventories differ from the typical soil survey in the National Cooperative Soil Survey Program by being less detailed, having a less formal in-Service report, and by using interpretations unique to the National Forests covered by the inventory.

There is a trend toward greater participation on our part in the National Cooperative Soil Survey Program. Some of the positive signs that are facilitating this trend are:

1. Greater and more flexible use of the various orders of soil surveys. This permits us to map the soils at a detail suitable for local management needs.

2. The use of taxonomic units above the series level is being tried. The work plan for the Itasca soil survey in Minnesota permits the use of non-series taxonomic units. We hope that this approach receives the support it needs at the Regional and Washington levels to make it viable.

3. The emergence of the natural. land unit concept within the Soil Conservation Service. This concept, which seems to be fostered by Dr. Bartelli, parallels closely the Forest Service's land systems approach to natural resource inventory. We hope that this kind of perspective on land units will be accelerated in the National Cooperative Soil Survey Program.

We recognize that soil survey is a continuously evolving activity. We in the Forest Service hope that our experience with different soil inventory metnods and in the wide range of land types will enable us to make a positive contribution to this evolution.

Lindo J. Bartelli, Director, Soil Survey Interpretations Division, S.C.S., Washington, D.C., spoke (see attached document) of the challenge to us soil mappers to express the soil map in the user's language, not in our language. The soil potential concept is designed to assist the user to decide whether a soil body is suited to a particular use, or can be made suitable. Society will not be restricted by "soil limitations," as we are used to stating them. Given enough financial resources, a user can adapt a soil to many uses not previously considered seriously. "Soil potential" is a positive expression of the quality of a soil after improvement, allowing the user several alternatives and a knowledge of economic requirements and ecological consequences of various management procedures. There are four steps involved in definition of soil potential for a parcel of land. (1) Identify the soil properties that affect a particular use of soil landscape mapping unit. (2) Identify the practices necessary to overcome the limitations of the mapping unit for the use in question. (3) Evaluate the level of performance of the soil once improvements have been made. (4) Array the soils of a given area on a scale of 0 to 100 for each particular use. In short, soil potential rates soil map unit quality, but does not attempt to include considerations of distance to market, market demand, transportation facilities or skills of the developer. Note that a given kind of soil may have a different rating for a given use in a different area, because comparisons are being made within local soil populations.

A. Earl Erickson. Professor of Soil Science, Department of Crop and Soil Sciences, Michigan State University, discussed waste disposal on land. He pointed out that sewage sludge (30 tank RR cars of it leave Detroit daily) is a manure-like material. Heavy metals need not be in it, because they can be removed at the industrial source. Waste water is nutritious water. The soil may act as a filter, absorber and decomposing medium for pollutants in waste water. It is important to harvest crops from land irrigated with waste water to keep removing excess nitrogen and phosphorus. Waste waters of Michigan could be used to irrigate bean and beet land in southern counties.

Guy Springer, District Conservationist (retired), Soil Conservation Service, explained the importance of land reshaping of tart cherry orchard sites (a) to improve air drainage on windless days, so that frost does not destroy a potential crop at blossom time, arid (b) to reduce steep slopes to the less than 12% gradients necessary for the operation of shaking machines. Smoke flares were used to trace downslope movement of air. Cold air piles up behind barriers several times the height of the barriers. Plans for land shaping for air drainage must take into account the dumping site for the cold air?. This should not be in an adjoining orchard! Housing developments are encroaching on prime cherry orchard land. Homes and even raised roadbeds can dam up cold air and reduce cherry production. The red tart chewy inventory is a product of a cooperative effort by soil scientists, Charles Kesner, District Horticulture Agent, Extension Service, Traverse City, gave an illustrated talk, after the Thursday evening banquet, on research in cherry production. Among other practices illustrated was the pruning of trees and training of tree branches to maximize utilization of sunshine and to leave room for machinery moving between rows. Trickle irrigation was discussed.

Marion Strong, Director, Midwest Technical Service Center, Lincoln,

of ideas. Water quality is now a foremost concern for consideration of conferees.

Richard R. Davis, Administrative Advisor, North Central Research soil survey coordinating committee, Wooster, Ohio, spoke of the nature of the contribution to the cooperative soil survey program made by the Agricultural Experiment Stations. Coordination of research in this region is facilitated by three kinds of committees: (1) a coordinating one (NCR-3), (2) one that implements a funded research project (NC-109), and (3) an advisory committee consisting of department heads (NCA-1 for soils; NCA-9 for field crops). At the national level is a statutory committee, "Committee of Nine," with two representatives from each region and one from the research service. The NCR-3 committee has a representative from each of the 13 state experiment stations (Alaska, included), and from concerned agencies, including the S.C.S., U.S.F.S. and A.R.S.

Summaries of the separate half-day sessions of the NCR-3 Committee and the Federal Agencies are as follows.

NCR-3 Committee Meeting, J. B. Fehrenbacher, Chairman; D. D. Malo, Secretary, reports that Dr. Davis described the new NC-109 project as dealing essentially with the rating of soils for specific uses. A resolution was approved to be sent to Agric. Exp. Sta. directors pointing out the need for additional federal, state and local funds for the acceleration of soil survey programs in the region. K. K. Everett discussed soil survey work in Alaska which is concentrated on (1) patterned ground in the Arctic Coastal Plains, (2) watersheds in the Brooks Mountains (Eskimos are shifting life habits from dependence on marine food sources to caribou sources), and (3) impact of oil spills on landscapes. T. E. Fenton reported on progress on the Prime Agricultural Land Map of the N. C. Region. Establishment of a Forest Soils regional committee was discussed. Use of soil survey information in equalization of rural land tax assessments was considered. R. H. Rust reported that five experiment stations and the Lincoln Lab. are participating in laboratory analysis (1976-77) of samples from ten soils of the region. The final report will be prepared at The Ohio State University. N. Hollowaychuk was elected as new secretary. Fred Westin is in-coming chairman.

Minutes of NCR-3, 1976 Meeting
Traverse City, Holiday Inn - Traverse City, Michigan
May 6, 1976

The meeting was called to order at 8:15 a.m., May 6, 1976 by Chairman J.B. Fehrenbacher. Those in attendance were:

Alaska - No representative
Illinois - J.R. Fehrenbacher, I.J. Jansen
Indiana - D.P. Franzmeier
Iowa - T.E. Fenton, G.A. Miller
Kansas - No representative
Michigan - E.P. Whiteside, D.L. Mokma, Ray Kunze, Robert: Lucas
Minnesota - R.H. Rust
Missouri, - C.L. Scrivner
Nebraska - Phil Harlan, J.A. Elder
North Dakota - D.D. Patterson, H.W. Omodt
Ohio - N. Holowaychuk, R.L. Christman, K.R. Everett
South Dakota - D.D. Malo
Wisconsin - F.D. Hole, J.A. Bowles, E.J. Tyler
SCS - R.D. Turner,, C.S. Holzhey
Administrative Advisor - R.R. Davis
NCR-3 representative to the SCS meeting - N.E. Smeck

Minutes of the 1975 meeting were approved.

The following agenda for the present meeting was approved:
1. Remarks hy Dr. R.R. Davis
2. Reaction to our NCR-3 resolution for our November 18-19, 1975 meeting concerning increased funding support for soil surveys in state agricultural experimentations.
3. Polar Soils of Alaska by K.R. Everett
4. Report. on NCR prime agricultural land map by T.E. Fenton
5. Forest Soils Committee established and needed assignments for the National Work Planning Conference.
6. Use of soil survey information in equalization of rural 1 and tax assessment
7. Report on lab data project by R.H. Rust
8. Soil Taxonomy Committee report
9. Other matters
    a. Nominations Committee Report
    b. Houston SSSA Meetings in 1976
    c. 1978 International Soil Science Meetings in Canada
    d. NC-109 Meeting in 1976 at Bridgeton, Missouri
    e. National Work Planning Conference in 1977 at Orlando, Florida

1. Remarks by Dr. R.R. Davis

Dr. Davis reviewed the current status of funding for research and extension. The Senate has granted an increase of $13 million in Hatch and McIntire-Stennis funds for research. This represents a 10% increase over the budget of last year. The Senate failed to increase extension funds, The House of Representative5 has yet. to act on both requests.

Dr. Davis also discussed some of the problems and future courses of action with NC-109. This project as viewed by some observers was felt to be unmanageable and in need of critical review. Dr. Davis mentioned that many of the major problems appear to be associated with state agencies and not with the regional effort. It was urged that members of NC-109 convince their experiment station directors, department heads and representatives of the NCR as to the importance and advantages of the NC-109 project. On June 1, 1976 the directors will meet and a decision will be made as to the future of the NC-109 project. Dr. Davis mentioned a new direction for the NC-109 project which will deal with the rating of soils for specific uses.

2. NCR-3 Resolution

During the November, 1975 meeting of NCR-3 the following resolution was passed unanimously, "In view of the accelerated soil survey programs in the states of the North Central Region bc it resolved that our Administrative Advisor convey' to the North Central Experiment Station Directors Association the urgency of increased federal, state and/or local financial support for the state Agri. Exp. Stations as a contribution to the National Cooperative Soil Survey." Since the adoption of the resolution it has been brought to the attention of the experiment, station directors by our administrative advisor, however little action was taken. Dr. Davis urged us to talk to our department heads and ask that the department heads consider the resolution in their next meeting of NCA-9 and then pass the resolution on to the directors again for further consideration. This approach may receive a more favorable response from the directors. A committee composed of R.H. Rust, N. Holowaychuk, and H.W. Omodt will work on a statement or newsgram to send to the directors expressing the views of the. NCR-3 participants as to the resolution.

3. Polar Soils of Alaska (A report by Dr. K.R. Everett)

Since the discovery of oil in 1968 at Prudow Bay, Alaska scientists have been concerned with the environment and present land use. As the U.S. oil companies begin to develop these petroleum reserves there is concern as to the effect on the environment. Dr. K.R. Everett, a specialist in polar soils from Ohio, has ongoing research programs in the Artic Coastal Plains area of Alaska. This area from Point Barrow, Alaska to the Canadian border is a permafrost area with polygonal patterned topography and most soils have an 18 inch profile or less.

Soils in the area are classified as Histosols and Histic Cryaquepts. The polygons are formed primarily in basins of former lakes. These basins have a large amount. of silt and organic matter present. As the silts freeze they contract, cracks develop, and ice wedges begin to form in the cracks. The polygons which develop from this 'process average about 12 meters in diameter. Initially the soils in these lake basins have histic epipedons. The continuation of the contraction and ice wedge formation in the cracks cause the perimeter of these polygons to be thrust upward. These perimeter areas tend to have improved aeration which causes a discussion it was decided that the woodland suitability ratings for appropriate soil. association areas should be sent to Tom Fenton by May 24, 1976.

Each state will be given soil association areas to describe and it was encouraged that black and white photos be taken of these areas which depict the landscape and present day land use. The written narratives will in part speak to the current land use of these areas. Dr. Fenton will send out example narratives for our comment and as a guide.

5. Forest Soils Committee established and needed assignments for the National Work Planning Conference

Dr. R.R. Davis mentioned that the NCA-9 committee has recommended that a Forest Soils Committee be established and the Dr. J.V. Drew from Alaska was chosen as the administrative advisor. Each experiment station director will be naming a representative to this committee in the future.

Dr. E.P. Whiteside mentioned that the North Central Region does not have representatives on the following committees for the National. Work Planning Conference of the Cooperative Soil Survey:

Committee 3 - Waste treatment on named kinds of soils
Committee S - Soil survey in woodlands, rangelands and wildlands
Committee 6 - Interactions between soils and fertilizer response

It was urged that representatives from the North Central Region he selected to represent us at the national conference.

6. Use of soil survey information in equalization of rural land tax assessments

A brief discussion on the use of soil surveys for tax assessment purposes was led by J.B. Fehrenbacher. Representatives from Illinois, Iowa, Indiana, Minnesota, and Michigan described some of the problems and techniques they were using to meet this need. Detailed soil surveys were being used where available for tax assessment. Areas not yet covered by a detailed survey use general county soil maps as a basis for assessment. Land in Illinois is assessed at 33% of its market value.

Another concern expressed by Dr. Fenton was that symbols on soils maps have been altered or deleted in some cases thus causing communication problems between the assessor and a farmer. These symbols may be extremely important to an individual, farmer. When these symbols are deleted the farmer begins to question the validity of the entire survey. The state and local people who help fund the soil survey mapping want to have some input into the form of the final product to help meet their needs.

7. Report on Laboratory Data Project by R.H. Rust

Ten soil samples will be gathered and stored by five participating experiment stations. Each experiment station will serve as a depository for the 10 soils gathered for this project. These soils will be used as reference samples for chemical and physical determinations in the North Central Region. The five cooperating experiment stations (Illinois, Indiana, Michigan, North Dakota and Ohio) should have their soil samples gathered and to the various cooperators by July 1, 1976. The SCS lab at Lincoln was also interested in participating in this project. Each participant should run tests on the soils and be completed with these tests by July 1, 1977. After all data is gathered it should be forwarded to Ohio where the results will be compiled and a report written.

8. Soil Taxonomy Committee

There has been little activity with respect to this committee since the last meeting of NCR-3. Current

d. On October 28 and 29, 1976 the NC-109 Committee will meet at the Holiday Inn at Bridgeton, Missouri.
e. The two NCR-3 representatives to the National Work Planning Conference of the Cooperative Soil Survey are F.C. Westin and R.H. Rust. This conference will be held in Orlando, Flórida on January 30 thru February 4, 1977.

The meeting adjourned at 11:45 a.m. on May 6, 1976.

Respectfully submitted,
Doug Malo
Douglas D. Malo
Acting Secretary for F.C. Westin

NORTH CENTRAL REGIONAL TECHNICAL WORK-PLANNING CONFERENCE
May 3-7, 1976
Traverse City, Michigan

Thursday, May 6. 1976 -- Maurice Stout, Jr., Chairman

8:00 A. M.	SOIL INTERPRETATIONS Discussion Leader:	Johnson
	Frequency of S-5 update -- How handled and must series description be updated each time.	Johnson
	Coordination progress on K&T's, woodland and capability classes, cropland yields and prime land.	Johnson
	Procedure to follow in adjusting computer tables -- How much adjusting can be done.	Smith
	Computer rating program.	Johnson
	The SCS-SOILS-5 form and management of soil survey interpretations.	Grossman
9:00 A. M.	SOIL POTENTIAL Discussion Leader:	Stout
	Developing soil potential guidelines -- Maintaining consistency between survey areas and states.	Bartelli
9:30 A. M.	PROJECT SOIL SURVEYS Discussion Leader:	Buller
	When should the descriptive legend be submitted to Lincoln.	Buller
	Format of field correlation when submitted.	Turner
	Can mapping unit symbols in computer tables be in numerical order but out of Alpha sequence.	Smith
	Timely obtaining of aerial photos.	Wilson
	Financing of project soil surveys after FY 1978.	Bartelli
	Project soil surveys -- A stimulant to other disciplines.	Sinclair

'Thursday, May 6, 1976, Maurice Stout, Jr., Chairman

10:00 A. M.	Break	
10:30 A. M.	MAP COMPILATION AND FINISHING Discussion Leader:	Post
	Quality of recently finished maps.	Wilson
	Experiences doing compilation and finishing concurrently during the survey.	Culver
11:00 A. M.	CASPUSS Discussion Leader:	Smith
	Project vs. nonproject surveys -- How handled.	stout
	Does CASPUSS determine level of state funding.	Bartelli
	When and how updated.	Smith
11:30 A. M.	GENERAL Discussion Leader:	Hinkley
	Need for soil specialist two-week progressive correlation workshop.	Culver
	status of AMS.	Bartelli
	Can and should the Soil Survey Manual (5th draft) be field tested more.	Sinclair
	Can the development of the National Soils Handbook be accelerated.	Bartelli
	Procedure to follow in reporting accomplishments in July-October 1976 interim period.	

12:00 - Lunch

NORTH CENTRAL REGIONAL TECHNICAL WORK-PLANNING CONFERENCE
May 6, 1976
Traverse City, Michigan

Summary of Meeting with Federal Agencies

Participants included personnel of the Soil Conservation Service; other federal agencies; Lindo Bartelli, Director, Soil Survey Investigations; and Marion E. Strong, Director of the Midwest Technical Service Center and field representative of the Midwest states. Neil Smeck, Ohio State University, represented the NCR-3 membership. Robert Turner and Steven Holzhey of the MTSC sat in the NCR-3 meeting.

The following summaries of discussion were presented during this session:

1. Form SCS-Soils-5 may be updated whenever new data are developed or errors are noted. New data are promptly reviewed, approved, and inputted into the computer bank so that it is available for use. Corrections should be significant additions and not consist of values less than the error of observation. All phases of a series must be accounted for on the input form.

   It is impractical to revise soil descriptions each revision of the form SCS-Soils-5. Itisalso impractical to "print and distribute" these forms each revision. The Soil Correlation Unit is working on a scheme to inform all, states of dates and record numbers of new data inputs. Printouts of most recent data forms are available to all states from the Ames lab via the SCU for a small cost--a fixed price of $15 per order and $.50 per scs-Soils-5.

2. The coordination of K/T values for the Soil Loss Equation is still incomplete. Apparent problems stem from values obtained for some soils using the monograph and from rating all till similarly. Soils having sandy loam and coarser-textured tills having lower bulk densities should not be rated the same as soils having finer-textured tills with high bulk densities. It was pointed out that the rules for determining these values may change.

3. The first tables generated by computer techniques contained many errors, as evidenced by the great number of changes recommended after a review by the states. This great number of adjustments was caused, in part, by the incomplete and poorly prepared forms SCS-Soils-5 and because each reviewer requested adjustments which were relatively small and of low significance. Updates on the forms SCS-Soils-5 have upgraded the data they contained and, as a consequence, the tables need less adjustments of this sort. We still receive requests to change values a point or two higher or lower, as the case may be. Small value changes are being looked at quite closely and may not get approved if not class determining. Tables for these twelve states are improving and will become even better the more the interpretative data on the SCS-Soils-5 forms are tested and updated. The data on these forms need to

8. TSC Advisory SOILS-LI-12, Interpretations - Map Symbols and Series Names in the Stub of Tables, April 26, 1976, provides some relief when the alpha-numerical, sequence is violated by name changes. The name of the series and the alpha symbol need not be coordinated. Alpha symbols may be used in the same manner as numerical symbols. The arrangement of map symbols and soil series names in the tables has been resolved.

9. The relationship of CASPUSS (scheduling) to project soil surveys was discussed. The dates on the CASPUSS must be real dates that must be met if "project" soil survey philosophy is to be carried out. The deadlines for completion of mapping, manuscripts to TSC, and map-finished sheets to Carto must be met if the survey is to be published within a twelve-month schedule. Tentative deadline dates for manuscripts on the '78 and '79 schedules were announced.

MANUSCRIPT NOTES

1. The first paragraph of each mapping unit is to be formatted as follows:
   MmB2 Miami loam, 2 to 6 percent slopes, eroded. This gently sloping soil is on ...etc.

2. Interpretative groups shown at the end of each m.u. is not on a separate line, is not indented, and is not in parentheses. (See TSC LI-23 (Harris County, Texas) for a correct example.)

3. Use small "f" when writing fig. 10 in text.

4. Do not refer to other agencies in mapping unit descriptions.

5. Do not put slope in parentheses (for those units correlated without slope as part of the name). Be sure it is given (verbally) in the first paragraph of the m.u. description.

6. Lit. citations: submit only those pages of the "master list" that have a reference (marked in red) that was used in the manuscript.

7. Have state information specialist review authors photos ... especially the cover pictures.

8. Do not give ranges in characteristics in the mapping unit description. They are too easily confused with "similar soils" (the surface thickness range given for Miami loam, 2 to 6 percent slopes, in the MTSC pilot example, is a mistake).

9. Write only about those engineering uses that are relevant to the soil being described--and that are important in the survey area. In other words, authors should fit each soil description to the kind of soil being described (its present use, plus a very realistic appraisal of potential use and need).

10. Hyattsville does not plan to return tables to the state for review after they have been edited. This makes it extremely important that the tables are accurate <u>before</u> they are keyed into the Linolex.

11. When describing soil associations:
    (1) do not give locations of associations
    (2) minor soils should be located on the landscape (TSC LI-27 is a poor example for these two items).

12. Do not rate anything "good to poor".

S-5 Forms and Management of the Soil Survey

Background

1. The soil potential concept as developed by Dr. Bartelli includes greater local flexibility in ranking of soils:

   "The rating for a soil will not be standardized, county wide. The same soil may have a different rating within two separate soil survey areas. Its position in order of degree of suitability is determined by the ratings of other soils in the area...." (Nat. Soil Sur. Conf. 1975. p. 114)

2. Plant growth in our interpretation program is subordinate to non-farming interpretations. This situation must and will be rectified shortly.

3. The next 10 years will see the completion of the standard soil survey. In 5 years, senior SCS administrators will be very much concerned with the activities of the Service in the post mapping period. AES people are presently concerned because their teaching and research must of necessity be more future oriented than the activities of an action agency such as the Service.

4. The present series description is designed for the use of the small minority of the users involved in correlation and not for the much larger user group concerned with soil behavior prediction and potential evaluation: It should be modified in format to contain more information on the moisture and temperature regime of the series concept and a broader spectrum of laboratory measurements or estimates thereof.

5. The present S-5 forms do not contain several kinds of pedological laboratory data (organic matter, clay, bulk density, 15 bar retention, fertility P and K, extractable bases, cation exchange capacity) that are generally available and which are very pertinent to interpretations.

6. Maintenance of satisfactory quality of the S-5 forms nationally has been seriously hampered by the lack of national guidelines for the soil property data.

Suggestions

1. Separate the responsibility for quality control of the S-5 forms into two parts: technical quality and kinds of soil property data to be the responsibility of Soil Survey Investigations; all other aspects to be the responsibility of the Regional Correlation Offices.

2. Revise the present soil series description to be more useful for soil potential evaluation. A possibility is attached. Have a draft for discussion at the 1977 National Soil Survey Conference and begin testing in several MLRAS (one per administrative region?) in calender 1977.

R.B. Grossman
4-26-76

[illegible]
[illegible]
[illegible]

Marshall consists of dark-colored, well drained silty soils. They have formed in loess under prairie vegetation. [illegible] on upland ridges and sideslopes and to some extent on benches. Slopes are typically 2 to 14 pct. They are usually [illegible] and have [illegible] restricted free water in a [illegible] zone due to frost impedance February and March.

Setting: Marshall soils are on nearly level, moderately wide, upland ridges and benches of 0 to 3 percent gradient and narrow ridges and smooth convex side slopes of 3 to 20 percent gradient. They have developed from Wisconsin loess of very low sand content (usually less than 5 percent). The loess thickness is commonly over 240 inches. The upper part of the solum has developed from an oxidized and leached weathering zone but in some areas the lower part has developed from mottled oxidized and leached loess, however, solums with a deoxidized and leached weathering zone present at 40 inches and below are not excluded from the Marshall series. The climate is midcontinental type with hot summers and cold winters; mean annual temperature is 49 to 54°F, and mean annual precipitation ranges from 27 to 32 inches.

Distribution and Extent: Western Iowa, eastern Nebraska and northwestern Missouri. In Iowa Marshall soils are in a belt which extends north to south approximately 130 miles and west to east 48 miles. This is one of the major soils in 30 southwestern Iowa counties. Their acreage is extensive.

Climate

J F M A M J J A S O N D

Temp.

Precip.

Evapotrans. (Standard Pan if available)

Stress Days?

Heat Units?

Station (Select central to occurence of series)

We should have a paragraph here
that describes the internal water regime.
Presently to some extent this is given in the Setting and under Drainage and Permeability. This information would be retained but in a different guise. We would also pull from the present S-5 form the information on flooding , water table, Hydrologic Group, Potential Frost Action (note ice is solid water), etc.

Use and Vegetation: Most areas are cultivated. Used for corn, soybeans, small grain, clover, and alfalfa. To a limited extent nursery stock is grown. Native vegetation was tall prairie grasses.

Principal Associated Soils: These are Minden and Corley soils on moderately wide ridges and high benches. Corley soils have A2 horizons and gleyed B horizons. In their area of occurrence the Marshall soils approach the minimal range in clay content, structural development, and soil acidity as expressed in the range of characteristics on side slopes and near the Monona-Marshall soil association border. They express their maximal range in characteristics on nearly level ridges and near the boundary to the Sharpsburg soil association area. In west central Iowa the Marshall soils have solums that are in the minimal acidity range near the Galva soil association area. Near stream valleys these soils are associated with the Ladoga and Shelby soils. Shelby soils have loamy solums which contain some stones and pebbles. Marshall soils form a hydrosequence with the somewhat poorly drained Minden.

Competing Series and Their Differentiae: Marshall soils differ from the somewhat poorly drained Minden and Muscatine soils by having thinner A horizons and B horizons with chromas of 3 or higher. Minden and Muscatine soils are mottled immediately below the A horizon. They have a lower clay content, a more friable consistence, and lower B/A clay ratio than Otley or Sharpsburg soils. Galva soils have finer textured A horizons, a thinner clay maximum layer, a neutral to slightly acid B2 horizon, and are shallower to carbonates. Marshall soils have finer textured B horizons, are typically more acid, and commonly have lower value and chroma in the upper B horizon than Monona soils. They are less acid, have a higher base saturation, and have a higher level of extractable potassium in the B horizon than Tama soils. Marshall soils have thicker A1 horizons, lack A2 horizons, distinct silt and clay coats in the B horizon, and have low B/A clay ratios as compared to Ladoga and Knox soils. Moody is shallower to carbonates and has yellower hue in lower B and C. Nora is shallower to carbonates and lower in clay content throughout the control section. Fort Byron is lower in clay content throughout the control section. Sac soils contain a higher content of sand and some pebbles in the lower part of the 40 inch control section.

Range in Characteristics: Solum thickness is greater than 40 inches in most places. They are typically free of carbonates to 120 inches or more. Marshall soils have A horizons that are very dark brown (10YR 2/2) to black (10YR 2/1) grading to very dark grayish brown (10YR 3/2) in the lower portion. The A horizon is usually 10 to 20 inches thick unless eroded. Texture of the A horizon centers on light silty clay loam but ranges from 25 to 35 percent in clay. The B2 horizon is 12 to 20 inches thick and is dark brown (10YR 3/3) and dark brown to brown (10YR 4/3) in the upper part and dark brown to brown (10YR 4/3) and yellowish brown (10YR 5/4) in the lower part. Some Marshall soils have B1 horizons that are dark brown (10YR 3/3) in color and 2 to 6 inches thick. Colors of 3 value and 2 chroma are present as coats on ped exteriors to depths of 24 inches in places. Clay content of the B2 horizon is about 32 to 34 percent but may range down to about 27 percent. Depth to clay maximum decreases with increasing slope gradient. No mottles are present in a 8 to 14 inch layer immediately below the A. In some areas a very few fine relict grayish brown mottles are in the lower B2 horizon. These mottles as well as yellowish brown, strong brown, and dark brown to brown mottles are in the B3 and C horizons and increase in size and abundance with depth. Structure of the B horizon is moderate in grade. Some very thin discontinuous clay films are evident on vertical ped faces in the B3 horizon but the B/A clay ratio is less than 1.2. Color of the B3 and C horizons range from values of 4 to 5 with chromas of 4 to 6 and relict mottles are evident. Soil reaction ranges from medium to slightly acid.

Ida–Monona? Pedon [illegible]

Cass County, Iowa 825 feet south of road center and 500 feet east of the northwest corner of NW¼, SE¼, Sec. 34, T77N, R37W (about 5 miles NW of Atlantic, Iowa) Pedon is located on a NE-SW trending interfluve with slope gradient of 5 percent toward the west, under clover vegetation, and is ______ eroded.

(All colors are for moist conditions unless otherwise stated.)

Ap -- 0-7" -- Black (10YR 2/1) to very dark brown (10YR 2/2) light silty clay loam, dark gray (10YR 4/1) to grayish brown (10YR 5/2) when dry, weak medium subangular blocky breaking to weak fine granular structure; friable; common fine and medium root channels; very dark brown (10YR 2/2 when kneaded, few very dark grayish brown (10YR 3/2) worm casts; medium acid; clear smooth boundary. (6 to 8 inches thick)

A12 -- 7-13" -- Very dark brown (10YR 2/2) light silty clay loam, grayish brown (10YR 5/2) when dry, weak fine granular with some weak fine subangular blocky structure; friable; common fine and medium root channels; very dark brown (10YR 2/2) to very dark grayish brown (10YR 3/2) when kneaded; few worm casts as above; medium acid; gradual smooth boundary. (0 to 6 inches thick)

A3 -- 13-18" -- Very dark grayish brown (10YR 3/2) medium silty clay loam, grayish brown (10YR 5/2) with some pale brown (10YR 6/3) peds when dry; weak fine subangular blocky structure; friable; common fine inped tubular pores and some medium root channels; pore fills and worm casts of dark brown to brown (10YR 4/3); medium acid; clear wavy boundary (4 to 6 inches thick)

B21 -- 18-26" -- Dark brown to brown (10YR 4/3) medium silty clay loam, pale brown (10YR 6/3) when dry; weak to moderate fine subangular blocky structure; friable; pores as above; some oriented thin discontinuous very dark grayish brown (10YR 3/2) skins on a few peds; few black (10YR 2/1) fills in fine vertical channels; very few very fine soft dark brown concretions of an oxide, medium to slightly acid; gradual smooth boundary. (6 to 10 inches thick)

B22t -- 26-36" -- Dark brown to brown (10YR 4/3) light to medium silty clay loam; weak medium prismatic breaking to moderate fine subangular blocky structure; very few/fine/grayish brown (2.5Y 5/2) mottles in lower part; friable; many fine inped tubular pores; thin discontinuous clay films on some peds; kneaded color the same; few fine soft dark brown and yellowish brown concretions of an oxide; medium to slightly acid; clear smooth boundary (6 to 10 inches thick)

B31t -- 36-47" -- Yellowish brown (10YR 5/4) and dark brown to brown (10YR 4/3) light silty clay loam; weak medium prismatic breaking to moderate to weak medium subangular blocky structure; common fine/grayish brown (2.5Y 5/2) and common fine yellowish brown (10YR 5/6) grading to dark brown to brown (7.5YR 4/4) mottles; friable;

[illegible]

tubular pores, few thin discontinuous films on some vertical faces (may be clay); slight increase in grayish brown color in ped interiors; pores as above; very few very fine soft black concretions of an oxide; slightly acid; gradual smooth boundary. (4 to 8 inches thick)

B33 -- 47-58" -- Color same as above except the grayish brown colors grade to olive gray (5Y 5/2); light silty clay loam to heavy silt loam; weak medium to coarse prismatic breaking to weak medium subangular blocky structure; mottles as above; friable; oxides and pores as above; very few indistinct grainy silt coats on a few vertical faces; slightly acid to neutral; diffuse smooth boundary. (0 to 12 inches thick)

C -- 58-66" -- Mottled yellowish brown (10YR 5/4 to 5/6) and olive gray (5Y 5/2) silt loam; massive with some vertical cleavage; friable; many fine and very fine tubular pores; few indistinct grainy silt coats on vertical faces; few fine soft dark brown to black concretions of an oxide; mottled oxidized and leached weathering zone; neutral; clear smooth boundary.

Morphology Summary

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
No.	Depth to Horizon Base (in)			HORIZON(S)	MORPHOLOGY			
	Soil bbbb	Soil bbbb	Typ. Pedon		WATER STATE	STRUCTURE	PORES	CONSISTENCE
1	a.	a.	7	A1p	Very moist	Weak medium subangular	Common root channels	Friable
2			18	A12, A3	Very moist	Weak fine subangular	Common inped tubular	Friable
3			34	B2	Very moist	Weak fine subangular; prismatic	Common fine inped tubular	Friable
4			58	B3	Slightly moist	Weak medium prismatic; coarse	Many fine inped tubular	Friable
5			76	C	Very moist	Massive	Many fine inped tubular	Friable

a. Select from among a set of soils: Phase bbbbb
Thickest solum
Thinnest solum
Thinnest B
Lack horizon l..... 6
Etc.

(1) No. Depth in.	(2) 2-0.5	(3) 0.5-0.25	(4) 0.25-0.1	(5) 0.1-0.05	(6) 0.05-0.002	(7) LT 0.002	(8) ORGN CARB	(9) EXTRACTABLE Ca	(10) Mg	(11) Na	(12) K	(13) CEC	(14) BAR	(15) SO_4 meq/l	(16) P SORP	(17) FERTILITY P	(18) K	(19) CONDUCTIVITY mmhos/cm	(20) pH Water
	<----	PCT	---->					<----	meq/100g	---->									
1																			5.6 [illegible]
2																			6.9 [illegible]
3																			[illegible] 6.5
4																			6.1 6.5
5																			6.1 [illegible]
6																			

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(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(19)	(20)
0-7	tr	tr	tr	2	66	31	2.1	13.0	4.8	.1	.7	22	.2	6.1
7-18	tr	tr	tr	2	64	33	1.6	14.4	6.2	.1	.6	23	.2	6.0
18-34	tr	tr	tr	3	66	30	0.6	14.9	7.6	.1	.6	23	.3	6.1
34-58	tr	tr	tr	4	68	28	0.2	14.9	7.6	.2	.6	22	.3	6.2
58-76	tr	tr	tr	3	69	28	0.1						.4	6.4

(21) NO. Depth in.	(22) GT 3 IN PCT.	(23) PASS SIEVE 4	(24) 10	(25) 40	(26) 200	(27) LL	(28) PI	(29) UNIFIED	(30) AASHO	(31) VOL. COARSE FRAG. PCT.	(32) BULK DENSITY g/cc	(33) 15-BAR PCT	(34) COLE	(35) WRD in/in	(36) PERMEABILITY in/hr
1	0	100	100	100	95 100			ML-CL CL		0			.03 .06	.21 .23	.6 2
2	0	100	100	100	95 100			CL CH		0			.03 .06	.18 .20	.6 2
3	0	100	100	100	95 100			CL CH		0			.03 .06	.18 .20	.6 2
4	0	100	100	100	95 100			ML-CL CL		0			.03 .06	.18 .20	.6 2
5	0	100	100	100	95 100			ML-CL CL		0			.03 .06	.20 .22	.6 2
6															

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(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)	(33)	(34)	(35)	(36)
0-7	0	100	100	100	98					0	1.42	13.0	.024	.15	
7-18	0	100	100	100	98					0	1.22	14.4	.032	.16	.8a/
18-34	0	100	100	100	97					0	1.35	14.9	.034	.14	.6a/
34-58	0	100	100	100	97					0	1.40	14.9	.03	.15	.5a/
58-76	0	100	100	100	97					0	1.45		.03	.15	.5

a/ From 74IA-129-1.

We would have a table here in which would be given series ranges for various numbers and class placements that are derivative from other information in the description, involve judgment and are integrative in source from a number of kinds of observations and/or measurements, and which instead of being assessed for all the horizons delimited in the present table of Estimated Soil Properties would be more usefully applied to a set of depths that are standard:

Depth in	AWC[a]	Corrosivity Steel	Corrosivity Concrete	Erosion K	Erosion T	RLC[b]	LEI[c]
0 - 10							
10 - 20							
20 - 40							
40 - 60							
60 - 80							
40 - 80 (Optional in place of two twenty inch zones.)							

a. Adjust WRD for interaction among horizons and root ramification; also possibly whether saturated and oxygen deficient.

b. Physical root limiting contact.

c. Linear extensibility field capacity to 15bar.

On this page would have soil potential norms. Presently these are on the lower part of page 3 and on page 4. This information can be arranged in a more spatially economical format. I would visualize little change in substance from current information.

Prepared for MWRWPC, 4/28/76
R. B. Grossman

Old Mission Peninsula Field Tow

On Wednesday afternoon, May 5, the group boarded buses for a trip of about 25 miles, with four stops all on the Old Mission Peninsula, which projects 15 miles N.N.E., separating the two Grand Traverse Bays. Stop one was at the 200-acre cherry orchard of Bill and Judy Harmon on south- and east-facing slopes. Air drainage, trickle irrigation, pruning of branches below 4 feet, picking by mechanical shaking (two weeks after a chemical treatment of the fruit to loosen it) were discussed. The tart cherry crop is harvested in a two-week period. By double planting of trees (12 ft. x 20 ft.), 15 tons of cherries may be produced per acre. A tree pays for itself from age 10 to 25. Mechanical shaking shortens the life of a tree by about 10 years. Orchards are planted in sod and in as straight rows (for harvesting convenience) as approximate contouring allows. Sweet cherries bloom before tart cherries and sell for more. Other fruits grown in the area are grapes, pears, apricots and apples. Because of the pressure for residential development on the Peninsula, land prices and taxes are high on agricultural holdings.

Another stop was at a tart cherry specialty plant (Kroupa's, Inc.) which handles 30 million tons of tart cherries per year. The harvested cherries are placed in scattered vats of $CaCO_3$ and SO_2 brine where they can be left two to 24 months. The brine changes the color from red to blonde. These cherries are brought to the processing plant throughout the year for sorting by size and quality. They are sold to specialty companies that color them for use as chocolate candy centers or as marishino red cherries.

A third stop was at a new vineyard and at the associated wine-making plant and imported wine wholesale warehouse. German equipment and methods are being used at this Chateau Grand Traverse grape culture enterprise.

The fourth stop was at a profile of the Emmet sandy loam, a coarse-loamy, mixed, frigid Alfic Haplorthod. The spoaic horizon seemed to have faded considerably at the exposure. (Later in the conference a Typic Haplaquod profile slab was brought in from a wetland near Traverse City.)

Each participant in the tour was furnished with an excellent guide book.

REPORT OF COMMITTEE I

Rooting Characteristics in Relation to
Paralithic Horizons and other Root Restricting Layers

TABLE OF CONTENTS

REPORT OF COMMITTEE I

Rooting characteristics in relation to paralithic horizons and other root restricting layers.

Charge: Study the effect of paralithic horizons and other restricting layers on root growth and distribution.

Brief Background of Committee I: This is a new regional committee. It does not correspond to a national committee. The objectives of this committee developed primarily as a result of:

1. Need to provide field soil scientists positive applicable guidelines on uniform identification of paralithic horizons.

2. Need to study the distribution and implication of roots in paralithic horizons and other restricting layers on root growth and distribution.

3. Need to study the definition of the Cr horizon and the field application of the criteria used to define this horizon.

A field study of soils having paralithic horizons was conducted in November of 1975 jointly between the Nebraska Soil Survey Staff, the South Dakota Soil Survey Staff, and the Lincoln Principal Soil Correlator's Office. A similar kind of field study was also made this past year by the South Region in North Carolina and Virginia. Reports of these two field studies on paralithic horizons are included as a portion of Committee I report.

Committee Members: Chairman - James R. Culver
Vice-Chairman - Sylvester Ekart

Steve R. Base	William E. McKinzie
James R. Boyle	Steve Messenger
Rex L. Carey	Ival O. Persinger
Marvin L. Dixon	Sam J. Ross
J. B. Fehrenbacher	Stephen G. Shetron
Henry D. Foth	H. Raymond Sinclair, Jr.
Robert B. Grossman	Miles Smalley
Roger Lee Haberman	Maurice Stout, Jr.
N. Holowaychuk	Donald A. Yost
G. E. Kelley	Larry D. Zavesky

Recommendations:

1. Recommend bulk density of soil series be added to SCS-SOILS-5 forms by layers.

2. Recommend that the statement concerning roots in the definition of paralithic contact and Cr horizon be amended to permit roots in filled cracks spaced at 10 cm. or greater. The 10 cm. rule be modified to include such bedrocks as fissile shales as meeting the requirements for Cr horizons.

3. Recommend partially weathered, fractured, altered materials such as shales, siltstone, and sandstone with cracks less than 10 cm. apart and having more than 10 percent volume for rooting, not be included as Cr horizon.

4. Recommend information on distribution and amounts of roots be encouraged in pedon

5.

Committee Discussion: The comments and remarks included in this report are the summation of correspondence and/or telephone discussions with committee members. A letter from the Chairman, and Vice-chairman was sent to all committee members for their response. A copy of this letter is provided as Attachment No. 1. We have attempted to summarize comments from each state and included them as part of the report proper. Copies of response letters make up Attachment No. 2. The Chairman and Vice-Chairman wish to express their appreciation for the positive, cooperative assistance provided by committee members.

1. Kinds of rooting limitations noted by members of committee

   A. Bedrock - lithic vs. paralithic

      (1) Shallow or moderately deep to shale, limestone, sandstone, siltstone

      (2) Shallow or moderately deep loess or glacial till over shale or other kinds of bedrock.

   B. Shallow or moderatley deep soils over sand and/or gravel.

   C. Dense till

   D. Claypans

   E. Fragipans

   F. High sodium content - natric horizons

   G. Fine sandy loam, silt loam and loamy fine sands horizons over loamy sand toloam tills.

2. Definition of mechanically root-limiting zones and comments on soil consistence

   Dr. Grossman has suggested the following guidelines for defining mechanically root-limiting zones and remarks on soil consistence:

   A. Definition of mechanically root-limiting zones -

   "We very much need more attention to root-limiting contacts defined as that independent of horizon genesis, taxonomic diagnostic horizons, or nature of material deposition. These contacts should be defined on properties of the soil alone. I have worked on a definition of mechanically root-limiting zones:

   (1) Structural expression exceeding weak is restricted to units with a repeat distance greater than 10 cm., and either the bulk density of the moist fine earth is equal to or greater than 1.8 or the micro-penetration resistance when wet is equal to or greater than 5kg.;

(2) A fragmental zone if it underlies a non-fragmental zone:

(3) A zone with less than 10 percent passing 0.1 mm. on a less than 2 mm. basis if it underlies soil material that is non-fragmental and not sandy or sandy-skeletal.

Micro-penetration resistance in this proposal is based on insertion of 1/4-inch diameter rod, 1/4 Inch. The criterion of 5 kg. is based on the work of Campbell _et al_ (1974)."

B. Soil consistence -

Consistence description has undergone major change in the current draft (5th) of the Soil Survey Manual from the previous draft. Classes of micro-penetration resistance and the test for strength of platy fragments have been dropped. Incorporating of soil-water state in the morphological description has been made vague. These matters are very pertinent to prediction of root distribution and to the description of peralithic material. Micro-penetration resistance is particularly pertinent, since penetration resistance is the most common measurement employed to obtain a measure of soil strength for relating to root growth.

COMMENTS FROM COMMITTEE MEMBERS BY STATES

KANSAS:

1. There have not been studies on the effect of paralithic horizons on root growth and distribution in Kansas. Some studies on root distribution of native grasses have been made.

2. There is a problem with determining depth to paralithic contact in certain parent materials. Specifically these are the calcareous shales and/or chalk of the Greenhorn limestone and Niobrara formation of Cretaceous age and the silty shales, siltstones, and very fine feldspathic sandstone mainly of the Whitehorse sandstone, Cedar Hills sandstone, and the Salt Plain formation of Permian age. Moisture conditions effect the root penetration in these materials, for instance when dry they are hard to penetrate sometimes even with a spade; however. when moist they are easily penetrated. Under cultivation, fragments of these materials which are sometimes brought to the surface break down in a short time through normal weathering processes.

NORTH DAKOTA:

Worksheet was sent to field soil scientists and the information recorded reflects their individual observations.

OHIO:

1. Studies on rooting characteristics have been limited.

2. In Ohio, fragipans and soft bedrock are the primary root restricting layers. Most glacial till is also sufficiently dense to cause some root restriction.

3. Worksheet for Ohio lists only the major acreages of soils having either a fragipan or soft bedrock layer. No soils formed over hard bedrock or glacial till are included.

ILLINOIS:

1. We have a continuing severs problem of oak mortality on Morley silt loam when the natural forest understory is replaced by grass as in parks, pastures, etc., and especially when residential development encroaches. The problem seems to be physiological since in virtually all cases no disease such as oak wilt can be blamed. As a consequence of the magnitude of this problem, The Morton Arboretum has for several years supported research on ecosystems involving Morley silt loam. Dr. Virgil How, Western Illinois University, has directed research on root distribution, soil microflora, and mycorrhizae.

2. Dr. Steve Messenger has been monitoring foliar chemical elements, soil moisture and available nitrogen forms, and has considerable stable soil property data as well. Evidence indicates two selective plant root barriers, one in the upper B and one in the C.

MICHIGAN:

1. Work in the general area being conducted at Ford Forestry Center, A National Park Service study on Isle Royale being made to correlate soil and forest types on burned-over areas (soil No. 4 on worksheet No.2).

2. The first three soils listed on the worksheet #2 contain a fragipan with varying degrees of hardness within and between.

3. Suggested the following:

   A. Regional compilation of soil series which contains paralithic or root restricting horizons - occurance i.e. climate or vegetation.

   B. Minimum criteria for a root restricting horizon. i.e. fragipan morphology of horizons with respect to regional occurance.

ILLINOIS:

1. Some excellent recent research work in this area has been conducted at the University of Illinois by Drs. Fehrenbacher, Ray and Alexander, Selected sections of a few of their publications are attached to this report for reference.

2. The general groups of soils that limit root penetration for Illinois are as follows:

   A. Thin loess or drift on shale - paralithic contacts

   B. Fragipans

   C. Claypans - improved fertility overcomes quite a bit of the root restriction.

   D. Dense till

   E. Shallow to gravel

   F. Shallow to bedrock - limestone and sandstone.

3. Except for the claypans, Illinois has had very limited success in providing remedies to modify the effects of these limiting horizons or layers on root distribution.

MISSOURI:

1. "Nearly 75% of the soils in Missouri (33,000,000 acres) fall in one of the categories mentioned in your letter on root restriction. Enclosed is a copy of the MLRA's for Missouri. M112 and M113 areas are dominated by fragipans at 20-30 inches. N116 has cherty soils and rock outcrop or bedrock at 20-40 inches. M109 has high bulk density glacial till. 0131 has sodium soils along with all the other problems."

2. Root restricting layers have been considered in a system of evaluating soil for crop production entitled "Productivity of Missouri Soils". Different subtracting quantitative values have been assigned by (1) depth of root penetration; (2) layers partially restricting roots; (3) layers completely excluding roots.

OUTH DAKOTA: Department of Interior, Bureau of Indian Affairs

Suggest consideration should be given to soils having natric horizons as they do restrict root growth and distribution when they occur in the upper portion of the rooting zone.

MISSOURI:

Please refer to the attached correspondence from Dr. Grossman. Bob's comments relate to some of the work done in Missouri and provides some good thoughts on identifying and characterizing root characteristics.

NEBRASKA: J. E. Weaver, Professor of Plant Ecology, University of Nebraska, has done extensive work on study of rooting patterns of native grasses.

Ascertaining the depth to a paralithic contact based on current definitions in soil taxonomy is often difficult. Soft sandstones of the Ogallala formation and soft siltstone in western Nebraska are extensive. Extensive land leveling for irrigation often exposes small outcrops of siltstone or sandstone. These materials are readily rippable and after a few years of deep plowing, additions of fertilizers and irrigation, the nature of these exposed areas is drastically changed and productive crop yields are attained.

SOILS - Field Study Trip - Paralithic Contacts and Underlying Materials in Nebraska and South Dakota

To Participants

Summary :

Soft bedrock materials are often mistakenly designated as soil when they are soft, have textures similar to overlying soil, or consistence that makes recognition difficult when "digging" a pedon overlying such material. Despite similarities to unconsolidated soil mater ial, plants growing in soils having these materials within 25 to 100 cm. differ in kind and amount from soils deeper to bedrock. Root numbers are not always reliable indicators of presence or absence of paralithic contacts because many are relic and may be of several previous seasons growth. Engineering properties of these material also differ from soil. They are harder to estimate in that they are generally more subject to change by pretreatments prior to analysis . Plants, however, do strongly reflect even the barely detectable physical differences from soil. Observed native species react to the soft materials much as they do to lithic contacts. Both composition and vigor reflect root zone restrictions in materials having penetrometer readings that do not reflect strong contrasts in in-place strength. Roots do penetrate through disruptions in the original rock structure, and along horizontally cracked bedding planes. This implies that:

(1) Very soft bedrock does limit the rooting zone,

(2) Soil strength is not adequate to resist root penetration if the roots were attempting to grow into the soft material,

(3) Observed native species can root to depths below the contacts when favored by root environment,

(4) Only cracks in these soft materials are conducive to such root penetration.

Non-uniform identification of paralithic contact arises largely from non-uniform emphasis on key points in the definition. Emphasis on strength excludes from the definition, materials that restrict roots. Emphasis on root zone includes materials that are easy to dig. In the soils observed, the most useful distinction is based upon the root zone. Applied in this way, the definition of paralithic contacts needs little adjusting except to include bedrock such as fissile shales having many partings and cracks and qualify amounts of roots permitted. Rules of application must permit some increase of roots in cracks of the underlying material; particularly in the more fractured upper few inches. In addition, soft bedrock such as fissle shales must be accepted and the 10 cm. requirement waived. Soils having paralithic contacts and soft underlying bedrock must be evaluated undisturbed and in place. Additional study and data is needed to support or disprove these observations and tentative plans have been made.

Recommendations:

(1) That either the definition of paralithic contacts be amended or that rules of application be devised to adjust the application of the definition.

(2) That the statement concerning roots in the definition of paralithic contact and Cr horizon be amended to permit roots in filled cracks, and

(3) Allow a subdivision of the underlying material (Crl and Cr2). Both Crl and Cr2 would qualify as underlying material and the paralithic contact would be the top of the Crl providing this horizon was two-thirds or more soft rock mass with less than one-third qualifying as soil fines. Also a few to common roots in the Cr1 along with increased fracture of material and less than 10 cm spacing. Roots would be in cracks only and would diminish to few or none in the less altered portion. Permit only few to none rooting in the Cr2 with cracks spaced 10 cm. or greater.

(4) Recognize that these materials yield less moisture in-place than similar-textured soil fines. Apparently, roots fail to penetrate the softer materials for reasons other than strength. This points to available water as influenced by porosity, and pore size distributions and as partially reflected by bulk density and water retention difference. To support this.

(5) Existing data is being researched for values to further qualify this statement. Plans are tentatively made to collect additional samples for testing the water holding capacity, available moisture, and bulk density. These data would assist in evaluating the effects of these soil qualities already observed in kind and amount of vegetation supported by series Kadoka, Keota, and Epping or Morton and Farland which have soft bedrock at different depths.

(6) The 10 cm rule be modified to include such bedrocks as fissile shales as well as the more fractured and weathered materials cited in the Crl horizon discussion. Pierre, Collier, Graneros and similar shales having thin elongated platy parting that are closely packed in place would qualify as materials underlying paralithic contacts. The density and available moisture is even more contrasting in these materials than more loamy shale. Generally these will be clay textured when ground.

(7) That some soils having dense and compact tills with a high bulk density be included as having paralithic contacts and qualifying underlying materials when occuring within 100 cms of the surface. The effect of dense compact tills is often greater on AWC and plant growth than were qualified paralithic contacts. These tills would also be designated to Cr horizons. The English Soil Survey Field Handbook, 1974 uses Cr designations for "some exceptionally hard and dense glacial tills". It infers that they would also recognize a paralithic contact in soils having these tills at depth less than 100 cm. The designation Cr could be used at any depth.

This field study was held because of the (1) lack of uniform recognition of paralithic contacts and characteristics underlying material and (2) because of the resulting variation in classification and interpretation of similar soils which seemingly have paralithic contacts and similar underlying materials. The area of study was the grassland areas of western and central Nebraska and South Dakota. Observed were the rooting characteristics of natural herbaceous plants growing in soils thought to have paralithic contacts and continuous coherent underlying materials. Kinds of plant communities were compared with depth to paralithic contacts, density of roots and rooting characteristics, and character of the contact and underlying materials. The field investigation considered the effect of soft bedrock on the performance of soil for growing plants and for engineering purposes. The conclusions gained from the study are to be used in developing (1) better understanding of paralithic contacts and the underlying materials, (2) better rules of application of the definition of paralithic contacts and characteristic underlying materials (Cr),(3) and more uniform classification and interpretation of soils having similar boundaries over soft underlying bedrock.

The following definition of a paralithic contact is taken from the Prel. iminary, Abridged Text Soil Taxonomy, October 1973:

> "A paralithic (lithic-like) contact is a boundary between soil and continuous coherent underlying material. It differs from a lithic contact in that the underlying material, if a single mineral, has a hardness by Moh's scale of <3. If the underlying material is not a single mineral, chunks of gravel-size than can be broken out dispersed more or less completely during 15 hours of end-over-end shaking in water or in sodium hexametaphosphate solution and, when moist, the material can be dug with difficulty with a spade. The material underlying a paralithic contact is normally a partly consolidated sedimentary rock such as sandstone, siltstone, marl, or shale, and its bulk density or consolidation is such that roots cannot enter. There may be cracks in the rock, but the horizonal spacing between cracks should be 10 cm or more."

In addition, Chapter 1, Page 4, of same Abridged Taxonomy, first paragraph deals with the soil we classify. In describing the lower boundary of soil the following is quoted, "In a few places where it contains thin cemented horizons that are impermeable to roots, soil is as deep as the deepest horizon. More commonly, soil grades at its lower margin to hardrock or to earthy material virtually devoid of roots, animals, or marks of other biological activity. The lower limit of the soil, there fore, is normally the lower limit of the biologic activity which generally coincides with the common rooting depth of native perennial plants."

Advisory-Soils-15 from William M. Johnson. Deputy Administrator for Soil Survey dated June 13, 1975 on the Use of Cr to Designate Subdivision of the C Horizon states that the definition of a Cr horizon is:

"Cr- mineral horizons or layers of weathered bedrock and sapralite such as granite or partly consolidated soft bedrock such as sandstone, siltstone or shale with bulk density or consolidation such that roots cannot enter. The material can be dug with difficulty with a spade and chunks of gravel-size will disperse more or less completely in overnight shaking with water or sodium hexametathosphate soluion. This horizon layer is equivalent to the material underlying the Paralithic contact of Soil Taxonomy underlying Soil Taxonomy."

From these three authorities, it is apparent that the presence of a paralithic contact is depended upon the character and definition of the underlying material. A paralithic contact is a boundary between soil and the continuous coherent underlying material which is usually of geologic origin. Much of the difficulty experienced in classification and interpretation of soils having underlying materials such as these is caused as much as from differing rules of application than from omissions in or failure of the definition. The definition used in Soil Taxonomy describes the underlying material as follows: (1) continuous, (2) coherent, (3)<3 Mohs scale for hardness, (4) disperses with shaking, (5) can be dug, (6) is of partly consolidated rock, (7) bulk density and/or consolidation does not permit roots to enter but, (8) there may be cracks with horizontal spacing between cracks 10 cm or more. The observations of this field study will be discussed in terms of these parts of the definition in addition to other features which we feel will determine whether a soil has a paralithic contact or not.

The following general observations were made:

(1) Observers more readily designated the underlying material as rock than acknowledged a paralithic contact. This was mostly because of the softness of the underlying material and because rooting was observed in the material of the zone called "rock". Close observation indicated that these bedrocks are consolidated even though relatively soft and easily dug. The penetration of roots within these layers is restricted to cracks, even in cases where material had strengths less than 0.5 kg/Cm2 by penetrometer reading.

(2) The number of roots observed was often times misleading because in many instances, a high proportion of roots were dead and relic from previous growth periods. The abundance of roots is often misleading and represents the line roots of the current season plus the dead relicts of several seasons.

(3) The shape and kind of roots observed ranged from those having a even round cross-section to very flatten ones with irregular cross-sections. Both primary and fine hair-like roots were observed ; both in desireable rooting medium and generally mis-shapen primary roots having fewer root hairs in snug cracks. Where cracks enlarged and contained soil masses, roots rounded out and, in general, increased in number of root hairs.

(4) Observations of the kind and amount of vegetation indicated differences are caused by the character of the underlying

material. The variation depends on the closeness of the soft rock to the surface and/or the density of the material. Vegetation of soils having soft bedrock relative close to the surface differ greatly in kinds and amounts from those having none. This is thought to be due to combinations of differences in water holding capacity, available water, and the density or packing (consolidation) of the bedrock materials even though they are soft and are easily textured when disturbed. Underlying materials had considerably less strength than indicated by Moh's 3 scale. Most observers concluded that the real differences of these materials from soil were in the available moisture and related amounts and size distributions of pores in place and undisturbed. The general conclusion was that the soft rock did not hold or yield water in the same manner as pedegenic soil material nor would roots penetrate as readily.

(5) The precise boundary of the paralithic contact was vague in many pedons observed. The soft bedrock materials have thin zones of weathering. Bedrock is apparent in cross-section. The upper zone is fractured more than the lower. The fractures are generally closer together than 10 cm. and this zone contains increased number of primary roots and root hairs in cracks, but considerably less than in the overlying soil horizon. Plant roots decrease considerably in the lower zone and are mostly primary with few to none fine root hairs. The roots in both zones are concentrated along cracks and fractures and do not penetrate the soft rock mass. Cracks were mostly less than 10 cm apart in the upper part and greater than 10 cm. in the lower part. Observers concluded that Cr designation should be used for both zones and subdivision designations should be as Crl and Cr2.

(6) The fact that these bedrocks are soft has already been cited. When dug, the soft materials fracture and crush as any similar unconsolidated material of the texture. From the surface downward, these soft rocks dig and textures like soil. The true character of these underlying materials is hinted at by kind and amount of the native vegetation, and growth of tame crops, but the rock character is evident in a cross-sectional view or a cut. The soft bedrock is easily dug by equipment but less so than unconsolidated soil material. The statement, "dug with difficulty" is relative and misleading. These soft rocks dig with less difficulty than material having hardness greater than Moh's 3 but with more difficulty than unconsolidated soil materials of pedogenic origin.

(7) These materials are coherent in place but become less so with increased handling. The mass to be more or less massive in place - except for cracks - and breaks to both angular and subangular blocky fragments that a seemingly the same color crushed. They lack definite ped faces and surfaces are not colored except at times along vertical cracks filled with soil fines.

(8) These underlying materials are continuous and broken only by fractures and cracks of the rock. Shales such as the Pierre formation or the Graneros are excluded from the definition of paralithic contacts by not having continuous underlying materials

with cracks not closer than 10 cm. apart. These are fissile shales with thin platy partings 1 to 10 mm. or more in thickness and much longer and wider than thick; but considerably closer spaced than the 10 cm. Hoot penetrate between partings of the upper few centimeters but are pinched off by the close-spaced arrangement of the overlapping plates as effectively as materials both massive and of high bulk density. These bedrock should also be included as underlying material to paralithic contents.

(9) These materials will shake and disperse.

Maurice Stout, Jr. Principal Soil Correlator
Midwest Hegion

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Attachments

UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

P. O. Box 6567, Fort Worth, Texas 76115

'SOILS - Saprolite and Paralithic Contact Study - North Carolina and Virginia - September 2-5,1975

DATE October 2, 1975

This joint study trip was initiated to study the nature and character of saprolite and its relationship to paralithic contact as defined in Soil Taxonomy. Uniform recognition of a parelithic contact by all soil scientists is paramount in soil classification. It determines not only soil depth and series control section, but also controls the depth at which base saturation is measured in differentiating Ultisols from Alfisols. This is of particular importance in the Piedmont Plateau where most of the soils have formed in varying thicknesses of materials weathered from acidic and basic rocks.

A total of nine profiles were studied. The first six sites were in North Carolina and the last four in Virginia. All observations were in deep pits that had been excavated prior to the study.

Soils examined were selected to illustrate variability of thickness, degree of weathering of parent rock, and different kind of parent materials characteristic of the Piedmont area. Profile descriptions were available at all sites, however for illustrative purposes, only three descriptions are attached to this report. The three descriptions were modified slightly to suggest a format for describing saprolite in soil descriptions. Soils studied and depth of observations were as follows:

Soil Series	Location	Depth of Observations
White Store	Durham County, NC	72"
Madison	Wake County, NC	72"
Helena	Vance County, NC	63"
Iredell*	Vance County, NC	62"
Wilkes	'fence County, NC	54"
Vance	Vance County, NC	74"
Pacolet*	Lunenburg County, VA	60"
Ashlar*	Lunenburg County, VA	38"
Poindexter Variant	Lunenburg County, VA	47"
Goldston	Lunenburg County, VA	38"

*Pedon descriptions attached

Personnel Participating

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*part time

Comments and Conclusions

Soil Taxonomy includes horizontal, upper, and lower limits in the definition of soil. It recognizes that the lower limit to the not-soil beneath is perhaps the most difficult to define (Soil Taxonomy, Chapter 1). This lower limit is readily recognizable when the soil rests on hard bedrock (Lithic contact). It is much less evident when it rests upon less hard materials such as saprolite or partially consolidated siltstone or shale.

The paralithic contact as defined in Soil Taxonomy is a boundary between soil and continuous coherent underlying material. The material underlying a paralithic contact has a bulk density or consolidation such that roots cannot enter. It may have cracks in which roots enter, but the horizontal spacing between cracks is 10 cm (4 inches) or more.

In applying the definitions to the pedons observed in this study, we arrived at the following observations and conclusions.

1. Webster's dictionary defines saprolite as "disintegrated somewhat decomposed rock that lies in its original place." The following more restrictive definition is found in the "Glossary of Geology" which was edited by Margaret Gary, Robert McAfee, Jr., and Carol L. Wolf, and published by the American Geological Institute, Washington, D. C., 1972. "Saprolite. A soft, earthy, clay-rich, thoroughly decomposed rock formed in place by chemical weathering of igneous and metamorphic rocks. . . . . .the color is commonly some shade of red or brown." To equate the upper boundary of saprolite with a paralithic contact is an error. A paralithic contact is found only in some saprolite.

2. Rooting pattern, along with bulk density and consolidation, are the important clues in distinguishing between saprolite that contains a paralithic contact and that which does not. The point where the saprolite is such that it essentially stops root penetration or expansion of root diameter with root growth in pores or cracks is considered a paralithic contact. Roots may penetrate cracks, but the horizontal, spacing between cracks is 10 cm (4 inches) or more. In the absence of roots or at depths greater than normal rooting depth, it is necessary to make a detailed evaluation of the kinds and amount of pore space. Continuity of tubular pores indicate continuous passages are available for liquid, gases, and life in the soil. Their absence is indicative of the material below a paralithic contact.

3. Saprolite that does not contain a paralithic contact should be treated as soil. It should be designated as a C or B3 horizon and appropriate interpretations entered on the Form SCS-SOILS-5.

4. Saprolite below a paralithic contact should be treated as not-soil. It should be designated as a Cr horizon and treated as weathered bedrock (WB) in completing the Form SCS-SOILS-5.

Participants

5. In soils having a paralithic contact, base saturation should be determined immediately above the paralithic contact if the contact is shallower than 1.25 m (50 inches) below the upper boundary of the argillic horizon, or 1.8 m (72 inches) below the soil. surface.

6. The term "saprolite" should be added to the glossary for published soil surveys.

7. A number of Hapludults in the Piedmont Plateau are currently differentiated on the basis of solum thickness. Because of the lack of uniform application among soil scientists in identification and designation of transitional B horizons. (B3), it appears that ranges in thickness, or depth to the bottom, of the

Principal Soil Correlator

Attachments

cc: (w/attachments)
J. B. Rourke
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TOTAL Loess or drift over shale (paralithic contacts)		165,000 (include other soils in addition to 4 above)	
Fragipans, i.e. Hosmer	Fine-silty, mixed, mesic Typic Fragiudalfs	1,300,000 (Total, not just Hosmer)	Ridgetops & sideslopes, loess
Dense till, i.e. Clarence	Very fine, illitic, mesic Aquic Argiudolls	2,250,000	Gentle slopes on Wisc. till plain
Elliott	Fine, illitic, mesic Aquic Argiudolls	(Total - all soils)	
Claypans, i.e. Cisne	Fine, montmorillonitic, mesic Mollic Albaqualfs	3,500,000 (Total)	Thin loess on gentle sloping Illinoi[s]
Shallow to gravel, i.e. Warsaw	Fine-loamy over sandy or sandy skeletal mixed mesic Typic Argiudolls	205,000 (Total)	Thin loamy sediments on gently slopin[g] outwash plains

Worksheet 9/75

EXTENT OF SOILS WHICH L.. ROOT DISTRIBUTION

state Illinois

	Soil Series	Classification	Approximate Acreage	Landscape Position Parent Material
1.	Shallow to limestone, i.e. Dubuque	Fine-silty, mixed, mesic, Typic Hapludalfs	450,000 (Total)	Thin loess on sideslopes over LS
2.	Shallow to sands one, i.e. Wellston	Fine-silty, mixed, mesic Ultic Hapludalfs	305,000 (Total)	Thin loess on sideslopas over SS
5.				
6.				
7.				
8.				
9.				
10.				

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	Hardness of Parent Material (Rippable or Hard)	Depth to Paralithic Horizon (0-20". 20-40" or 40-60")	Observed Root Distribution in Paralithic Horizon	Maximum Depth to Which Roots Have Been Observed	Dominent Kind of Vegetation
1.	See reprint attached				
6.					
7.					
8.					
9.					
10.	. .				

Worksheet 9/75

EXTENT

state Illinois

Soil Series			
1. Morley			
2.			
3.			
4.			
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7.			
a.			
9.			
10.			

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Hardness of Parent Material (Rippable or Hard)				
			~~Others: 1 ft.~~	~~red oak in some areas~~; sugar maple in others.

EXTENT OF SOILS WHICH L[illegible] ROOT DISTRIBUTION

state Kansas

	Soil Series	Classification	Approximate Acreage	Landscape Position Parent Material
1.	Bates	fine-loamy, siliceous T Typic Argiudoll	45,000	sandstone/thin strata of silty shal
2.	Benfield	fine, mixed M Udic Argiustoll	60,000	clayey shales - mainly Permian age
3.	Bogue	very fine, montmor. M Udorthentic Pellusterts	60,000	clay shale
4.	Bolivar	fine-loamy, mixed T Ultic Hapludalfs	2,000	sandstone/thin beds of clayey and sandy shales
5.	Clime	fine, mixed M Udic Haplustoll	190,000	calcareous clayey shale
6.	Corinth	fine, mixed M Typic Ustorchrepts	30,000	calcareous clayey shale
7.	Darnell	loamy, siliceous T Udic Ustochrepts	15,000	sandstone
8.	Edalgo	fine, mixed M Udic Argiustoll	15,000	clay shale
9.	Eram	fine, mixed T Aquic Argiudoll	95,000	clay shale
10.	Gosport	fine illitic M Typic Dystrochrepts	35,000	clay shale

	Hardness of Parent Material (Rippable or Hard)	Depth to Paralithic Horizon (0-20", 20-40" or 40-60")	Observed Root Distribution in Paralithic Horizon	Maximum Depth to Which Roots Have Been Observed	Dominent Kind of Vegetation
1.	Rippable	20-40"	few in upper few inches		mid & tall grasses
2.		20-40"			mid & tall grasses
3.		20-40"			mid grasses
4.		20-40"			hardwood trees
5.		20-40"			mid & tall grasses
6.		20-40"			mid & tall grasses
7.		10-20"			mid & tall grasses - oaks
8.		20-40"			mid & tall grasses
9.		20-40"			tall grasses
10.					mixed grass & trees

FXTENT OF SOILS WHICH LI : ROOT DISTRIBUTION

State Kansas

	Soil series	Classification	Approximate Acreage	Landscape Position Parent Material
11.	Kingfisher	fine-silty, nixed T Udic Argiustoll	15,000	silty and/or clayey shale
12.	Kipson	loamy mixed T Udorthentic Haplustolls	80,000	calcareous silty shales
13.	Lancaster	fine-loamy, mixed M Udic Argiustoll	20.000	sandstone & sandy shale
14.	Lucien	loamy, mixed T Typic Haplustolls	3,000	sandstone, siltstone or sandy shale
15.	Minnequa	fine-silty, mixed (calc) M Ustic Torriorthents	25,000	caalk, marl, limestone
16.	Nashville	fine-silty, mixed T Udic Haplustolls	40,000	siltstone
17.	Nibson	loamy, carbonatic M Entic Haplustolls	15,000	Interbedded shales & soft limestone
IS.	Niotaee	fine, montmorillonitic T Aquic Paleustalfs	25.000	shales, interbedded/limestone
19.	Owens	clayey, mixed T Typic Ustochrept	15,000	clay shale
20.	Quinlan	loamy, mixed T Typic Ustochrepts	75,000	weakly consolidates sandstone

	Hardness of Parent Material (Rippable or Hard)	Depth to Paralithic Horizon (0-20", 20-40" or 40-60")	Observed Root Distribution in Paralithic Horizon	Maximum Depth to Which Roots Have Been Observed	Dominent Kind of Vegetation
1.	Rippable	20-40"	few in upper few inches		tall grasses
2.		10-20"			mid, short, tall grasses
3.		20-40"			mid & tall grasses
4.		10-20"			mid & tall grasses
5.		20-40"			short grasses
6.		20-40"			mid & tall grasses
7.		10-20"			mid grasses
8.		20-40"			trees & tall grasses
9.		10-20"			short & mid grasses
IO.	↓	10-20"	↓		mid & tall grasses

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EXTENT OF SOILS WHICH LI : ROOT DISTRIBUTION

State Kansas

	Soil Series	Classification	Approximate Acreage	Landscape Position Parent Material
21.	Ringo	fine, mixed T Typic Hapludolls	20,000	Calc. clay shales
22.	Rosehill	fine, mont. T. Udertic Haplustolls	60,000	clay shale
23.	Siblevville	fine-loamy, mixed M Typic [illegible]		
				chalky limestone & shale

Typic Ustochrepts

	(Rippable or Hard)	Horizon (0-20", 20-40" or 40-60")			of
.	Rippable	20-40"	few in upper few inches		tall grass
.		20-40"			tall grass
.		20-40"			tall grass
.		20-40"			mid, tall grasses
.		20-40"			mid, tall grasses & t
.		10-20"			tall grasses
.		10-20"			mid & tall grasses
.		20-40"			mid & short grasses
9.		10-20"			Mid & tall grasses &
10.		20-40"			mid & tall grasses

Worksheet 9/75

EXTENT OF SOILS WHICH LIMIT ROOT DISTRIBUTION

state Michigan

	Soil Series	Classification	Approximate Acreage	Landscape Position Parent Material
1.	Kinde	Typic Hapludalfs fi-lo mixed mesic (well drained)		Compact loam till
2.	Grindstone	Glossaquic Hapludalfs fi-lo mixed mesic (mod. well drained)		" " "
3.	Shebeon	Aeric Ochraqualfs fl-lo mixed mesic (somewhat poorly)		" " "
4.	Aubarque	Aeric Haplaquepts fi-lo mixed (calc) mesic (somewhat poorly)		" " "
5.	Aubarque gray sub oil	" " " " " "	" (poorly drained)	" " "
6.	Munksing	Alfic Fragiorthods co-lo mixed frig d	West. U.P.	Fragipan inhibits roots
7.	Skanee	Alfic Fragiaquods co-lo mixed frigid	West. U.P.	" " "
8.	Iron River	Alfic Fragiorthods	" " " " "	" " "
9.	Baraga	Alfic Fragiorthods " " "	" "	" " "
10.	Wakefield	Alfic Fragiorthods fi-lo	" " " "	" " "

	Hardness of Parent Material (Rippable or Hard)	Depth to Paralithic Horizon (0-20", 20-40" or 40-60")	Observed Root Distribution in Paralithic Horizon	Maximum Depth to Which Roots Have Been Observed	Dominent Kin of Vegetation
1.	Rippable	12-24"	Only along fractures	in C horizon	Cultivated
2		24-40"	" " "	" " "	"
3.		24-40"	" " "	" " "	"
4.		U-24"	" " "	" " "	"
5.		11-20"	" " "	" " "	"
7.					
8.					
9.					
10.					

EXTENT OF SOILS WHICH LIMIT ROOT DISTRIBUTION

state Michigan

	Soil Series	Classification	Approximate Acreage	Landscape Position Parent Material
1.	Baraga		Several thousand	Morainic
2	Iron River		Several thousand	Morainic
3.	Champion		Several thousand	Morainic
4.	Unknown		unknown	Lake Tewace
5.				
6.				
7.				
8.				
9.				

Hardness of Parent Material (Rippable or Hard)	Depth to Paralithic Horizon (0-20"	Observed Root Distribution in	Maximum Depth to Which Roots Have	Dominent Kind of

EXTENT OF SOILS WHICH LI. ROOT DISTRIBUTION

state Missouri

	Soil Series	Classification	Approximate Acreage	Landscape Position Parent Material
1.	Bado	Typic Fragiaqualfs fine mixed		Upland depression-weathered dolomite
2.	Barco	Mollic Hapludolfs fine loamy		Rolling upland - acid sandstone
3.	Bolivar	Vetic Hapludolfs fine loamy		Rolling upland - acid sandstone
4.	Captina	Typic Fregiudults fine silty		Upland - cherty limestone
5.	Coweta	Typic Hapludolls loamy		Upland - soft sandstone
6.	Creldon	Mollic Fragiudolfs fine		Upland - weathered limestone
7.	Hatton	Typic Fragipans fine		Ridgetops - silty pedisediments
a.	Lebanon	Typic Fragiudolfs fine		Upland - cherty limestone
9.	Loring	Typic Fragiudolfs fine silty		Upland - loess
10.	Nixa	Glossic Fregiudults loamy-skeletal		Upland - cherty limestone

	Hardness of Parent Material (Rippable or Hard)	Depth to Paralithic Horizon (0-20", 20-40" or 40-60")	Observed Root Distribution in Paralithic Horizon	Maximum Depth to Which Roots Have Been Observed	Dominent Kind of Vegetation
1.	Rippable	Fragipan at 27-50			
2.		20-40"			50% grassland; 50% culti-d crop
3.		20-40"			pasture & hay
4.		40-60"			pasture and hay
5.		10-20"			rangeland
6.		20-40"			pasture and hay
7.		20-40"			Forest and pasture
a.		20-30"			Corn, hay & pasture
9.		22-35"			Crops
10.		12-24"			Forest and pasture

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EXTENT OF SOILS WHICH LI ROOT DISTRIBUTION

state Missouri

	Soil Series	Classification	Approximate Acreage	Landscape Position Parent Material
1.	Norris	Typic Udorthents loamy		Steep side slopes - acid shale
2.	Roseland	Umbric Dystrochrepts loamy skeletal		Ridgetops - acid shale
3.				
7.				
8.				
9.				

10.

Worksheet 9/75

EXTENT OF SOILS WHICH LI : ROOT DISTRIBUTION

state Missouri

	Soil Series	Classification	Approximate Acreage	Landscape Position Parent Material
1.	Some claypan soi s are:			
2.	Auxvasse			
3.	Chariton			
4.	Mexico			
5.	Parsons			
6.	Putnam			
7.	Some Sodium soils are:			
a.	Carytown			
9.	Foley			
10.	Lope			

	Hardness of Parent Material (Rippable or Hard)	Depth to Paralithic Horizon (0-20". 20-40" or 40-60")	Observed Root Distribution in Paralithic Horizon	Maximum Depth to Which Roots Have Been Observed	Dominent Kind of Vegetation
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					

EXTENT OF SOILS WHICH LI. ' ROOT DISTRIBUTION

stare Nebraska

OVER SHALE OR LIMESTONE

		Soil Series	Classification	Approximate Acreage	Landscape Position Parent Material
Shallow	1.	Orella	Clayey, mixed (calcareous) mesic, hallow - Ustic Torriorthents	30,000	Uplands - weathered shale
	2.	Samsil	Clayey, mont. (calcareous) mesic. shallow - Ustic Torriorthents	140,000	Uplands - weathered shale
	3.	Sansarc	Clayey, mont. (calcareous) mesic, shallow - Typic Ustorthents	40,000	Uplands - weathered shale
	4.	Penrose	Loamy, mixed (calcareous) mesic Lithic, Ustic Torriorthents		Uplands - weathered limestones
	5.	Kipson	Loamy, mixed, mesic, shallow Ud orthentic Haplustolls	36,000	Uplands - weathered shale
Mod. deep	6.	Pierre	very fine, mont., mesic Ustertic Camborthids	40,000	Uplands - weathered shale
	7.	~~Boyd~~	Fine, mont., mesic Vertic Haplustolls	~~50,000~~	~~Uplands - weathered shale~~
	8.	Minnequa	Fine-silty, mixed (calcareous), mesic - Ustic Torriorthents	12,000	Uplands - weathered soft limestones
	9.	Lakoma		150,000	
	10.				

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	Hardness of Parent Material (Rippable or Hard)	Depth to Paralithic Horizon (0-20", 20-40" or 40-60")	Observed Root Distribution in Paralithic Horizon	Maximum Depth to Which Roots Have Been Observed	Dominent Kind of Vegetation
1.	Rippable	0-20"	Few in upper inches		Shallow Limy
2.	↓	0-20"	↓		Shallow Clay
3.		0-20"			Shallow Clay
4.		0-20"			Shallow Limy
5.		0-20"			Shallow Limy
6.		20-40"			Clayey
7.		20-40"			Clayey
8.		20-40"			Limy Upland
9.		20'40"			Clayey
10.					

EXTENT OF SOILS WHICH, IT ROOT DISTRIBUTION

state Nebraska

OVER SILTSTONE AND SEDIMENTARY BEDROCK

	Soil Series	Classification	Approximate Acreage	Landscape Position Parent Material
Shallow 1.	Epping	Loamy, mixed, (calcareous) mesic, shallow - Ustic Torriorthents	12,000	Uplands - weathered siltstone
2.	Gavins	Loamy, carbonatic, (calcareous) mesic, shallow-Ustic Torriorthents	--	Uplands - weathered siltstone
3.	Shingle	Loamy, mixed, (calcareous) mesic, shallow - Ustic Torriorthents	50,000	Uplands - weathered sedimentary bedrock
Mod. Deep 4.	Keota	Coarse-silty, mixed, (calcareous) mesic - Ustic Torriorthents	35,000	Uplands - weathered siltstone
5.	Kadoka	Fine-silty, mixed, mesic - Aridic Argiustolls	115,000	Uplands - weathered siltstone
6.	Norrest	Fine-mixed, mesic - Ustollic Haplargids	30,000	Uplands - westhered siltstone
7.				
8.				
9.				
10.				

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	Hardness of Parent Material (Rippable or Hard)	Depth to Paralithic Horizon (0-20", 20-40" or 40-60")	Observed Root Distribution in Paralithic Horizon	Maximum Depth to Which Roots Have Been Observed	Dominent Kind of Vegetation
1.	Rippable	0-20"	Few in upper few inches		Shallow Limy
2.	↓	0-20"	↓		Shallow Limy
3.	↓	- "	↓		Shallow Limy
4.	↓	20-40"	↓		Limy Uplands
5.	↓	20-40"	↓		Silty
6.	↓	- "	↓		Silty
7.					
8.					
9.					
10.					

Worksheet 9/75

EXTENT OF SOILS WHICH LIMIT ROOT DISTRIBUTION

state Nebraska

OVER MIXED SAND AND GRAVEL

		Soil Series	Classification	Approximate Acreage	Landscape Position Parent Material
Mod.	1.	Cheyenne	Fine-loamy over sandy or sandy skeletal - Aridic Haplustolls	50,000	Foot slopes and bottoms alluvium--colluvium
deep	2.	O'Neill	Coarse-loamy, mixed, mesic Typic Haplustolls	100,000	Stream terraces - alluvium
	3.	Chappell	Coarse-loamy, mixed, mesic Aridic Haplustolls	40,000	Foot slopes - alluvium-colluvium
	4.	Jansen	Fine-loamy over sandy or sandy-skeletal Aridic Argiustolls	120,000	Uplands - loess
	5.	Altvan	Fine-loamy over sandy or sandy skeletal Aridic Argiustolls	220,000	Uplands - loess
Shallow	6.	Schamber	Sandy-skeletal, mixed, mesic Ustic Torriorthents	10,000	Old stream terraces
↓	7.	Gothenburg	Mixed mesic Typic Psammaquents	100,000	Bottomlands - alluvium
	8.				
99					
64	10.				

	Hardness of Parent Material (Rippable or Hard)	Depth to Paralithic Horizon (0-20", 20-40" or 40-60")	Observed Root Distribution in Paralithic Horizon	Maximum Depth to Which Roots Have Been Observed	Dominent Kind of Vegetation
1.				40"	Silty
2.				40" to maximum	Sandy
3.				40" depth of the	Sandy
4.				40" fine-earth	Silty
5.				40" material.	Silty
6.					shallow to Gravel
7.					Subirrigated
a.					
9.					
10.					

Worksheet 9/75

EXTENT OF SOILS WHICH LIMIT ROOT DISTRIBUTION

state Nebraska

OVERMIXED SAND AND GRAVEL

		Soil Series	Classification	Approximate Acreage	Landscape Position Parent Material
Sh	1.	Dix	Sandy-skeletal, mixed mesic Torriorthentic Haplustolls	105,900	Uplands 6 stream terrace - outwash & alluvium
	2.	Meadin	Sandy skeletal, mixed, mesic Udorthentic Haplustolls	240.000	Uplands & stream terraces - outwash & alluvium
	3.	Plette	Sandy, mixed, mesic Mollic Fluvaquents	91,700	Bottomland - alluvium
	4.	Barney	Sandy, mixed mesic Mollic Fluvaquents	20.000	Bottomland - alluvium
	5.	Eckley	Fine-loamy over sandy or sandy skeletal - Aridic Argiustolls	10.000	Uplands - alluvium
Mod.	6.	Alda	Coarse-loamy, mixed, mesic Fluvaquentic Haplustolls	30,000	Bottomland - alluvium
deep	7.	McGrew	Coarse-loamy, mixedd (calcareous) mesic - Ustic Torrif uvluvents	10.000	" "
	8.	Lex	Fine-loamy over sandy or sandy skeletal - Fluvaquentic Haplaquolls	30.000	" "
	9.	Gering	Fine-loamy over sandy or sandy skeletal - Ustic Torrifluvents	12.000	" "
	10.	Darr	Coarse-lomy, mixed, mesic Fluventic Haplustolls	10,000	" "

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	Hardness of Parent Material (Rippable or Hard)	Depth to Paralithic Horizon (0-20". 20-40" or 40-60")	Observed Root Distribution in Paralithic Horizon	Maximum Depth to Which Roots Have Been Observed	Dominent Kind of Vegetation
1.					Shallow to Gravel
2.					Shallow to Gravel
3.					Subirrigated
4.					Wetland
5.					
6.					Subirrigated
7.					Subirrigated
8.					Subirrigated
9.					Subirrigated
10.					Sandy Lowland

EXTENT OF SOILS WHICH LIMIT ROOT DISTRIBUTION

state Nebraska

OVER SANDSTONE OR CALICHE

		Soil Series	Classification	Approximate Acreage	Landscape Position Parent Material
Sh	1.	Tassel	Loamy, mixed (calcareous) mesic shallow Ustic Torriorthents	80,000	Uplands - weathered sandstone
	2.	Trelona	Loamy, mixed, mesic, shallow Torriorthentic Haplustolls	10,000	Uplands - weathered sandstone
M.Deep	3.	Duda	Mixed, mesic Typic Ustipsamments	10,000	Uplands - eolian sands
	4.	Holt	Coarse-loamy, mixed, mesic Typic Argiustolls	500,000	Uplands - weathered sandstone
	5.	Ronson	Coarse-loamy, mixed, mesic Entic Haplustolls	10,000	Uplands - weathered sandstone
Shallow	6.	Canyon	Loamy, mixed (calcareous) mesic, shallow - Ustic Torriorthents	630,000	Uplands - weathered sandstone caliche
M.deep	7.	Campus	Fine-loamy, mixed, mesic Typic Calciustolls	15,000	Uplands - weathered caliche or old alluvium
	8.	Rosebud	Fine-loamy, mixed, mesic Typic Argiustolls	1,590,000	Uplands - weathered caliche or sandstone
	9.				
	10.				

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	Hardness of Parent Material (Rippable or Hard)	Depth to Paralithic Horizon (0-20", 20-40" or 40-60")	Observed Root Distribution in Paralithic Horizon	Maximum Depth to Which Roots Have Been Observed	Dominant Kind of Vegetation
1.	Rippable	0-20"	Not much		Shallow limy
2.		0-20"	" "		
3.		20-40"	-		
4.		20-40"	-		
5.		20-40"	-		
6.		0-20"	Not much		Shallow limy
7.		20-40"	" "		
8.		20-40"	" "		Silty
9.			Only to a short distance in fractures.		
10.					

NORTH DAKOTA

SOIL SERIES ~~Hardn~~ ~~ss of Parent~~ ~~aterial~~	Depth to Paralithic Horizon	Obse--ed Root Distr ution in	Maximum Depth to Which	Dominant Kind of Vegetation
1. AMOR	20-40			
2. BOXWELL	20-40			[illegible]
3. CABBA	0-20		9	Sedge, needle and thread
4. CARMART	0-20			
5. COHAGEN	0-20	very few	Vfew to 36"	threadleaf sedge, blue grama, needle and thread
6. FLASHER	0-20			
7. FLEAK	0-20			
8. LEFOR	20-40			
9. LISAM	0-20	very few very few	numerous to 5", few below very few at 16"	wheatgrass, needlegrass.
10. MARMATH	20-40			
11. MORTON	20-40			

1. MOREAU	20-40	many to 28", few below		
2. REEDER	20-40			
3. REGENT	20-40			
4. RHAME	20-40			
5. SEN	20-40			
6. TUSLER	20-40			
7. VEBAR	20-40			needleand thread, green needle, blue grama
8. WAYDEN	0-20			
9. WERNER	0-20			
10. YAWDIM	0-20			

	SOIL SERIES	Depth to Paralithic Horizon (0-20", 20-40" or 40-60")	Observed Root Distribution in Paralithic Horizon	Maximum Depth to Which Roots Have Been Observed	Doninent Kind of Vegetatic
1.	AMOR	20-40		60"	
2.	BOXWELL	20-40		17	
3.	CABBA	0-20	56	26	
4.	CABHART	0-20		40	
5.	COHAGEN	0-20			
6.	FLASHER	0-20		60	
7.	FLEAK	0-20		16	
8.	LEFOR	20-40			
9.	LISAM	0-20			
10.	MARMATH	20-40			
11.	MORTON	20-40		31	
1.	MOREAU	20-40			
2.	REEDER	20-40		27	
3.	REGENT	20-40		64	
4.	RHAME	20-40		35	
5.	SEN	20-40		29	
6.	TUSLER	20-40			
7.	VEBAR	20-40		36	
8.	WAYDEN	0-20	48	17	
9.	WERNER	0-20			
10.	YAWDIM	0-20			

Soil Series ~~Hardness of Parent material (Rippable or Hard)~~	Depth to Paralithic Horizon (0-20", 20-40" or 40-60")	Observed Root Distribution in Paralithic Horizon	Maximum Depth to Which Roots Have Been Observed	Dominant Kind of Vegetation
1. AMOR	20-40 common to few	penetrate beds in upper part	45 inches	western wheatgrass Needleandthread
2. BOXWELL	20-40	—	—	—
3. CABBA	0-20 many to few	mostly along bed planes Some penetrate beds	30 inches	Little bluestem
4. CABBART	0-20	—	—	—
5. COHAGEN	0-20 many to few	mostly along bed planes some penetrate beds	20 inches	Little bluestem
6. FLASHER	0-20	"	30 inches	Prairie sandreed Little bluestem
7. FLEAK	0-20	—	—	—
8. LEFOR	20-40 common to few	penetrate beds in upper part	41 inches	Prairie sandreed Needle and thread
9. LISAM	0-20	—	—	—
10. MARMATH	20-40	—	—	—
11. MORTON	20-40 common to few	penetrate beds in upper part	43 inches	
1. MOREAU	20-40 few	Some penetrate and most along bed planes	40 inches	upland sedges western wheatgrass
2. PEEDER	20-40 common to few	penetrate beds in upper part	45 inches	western wheatgrass
3. REGENT	20-40 few	penetrate beds in upper part		upland sedges western wheatgrass
4. RHAME	20-40	—	—	—
5. SEN	20-40 common to few	penetrate beds in upper part	45 inches	western wheatgrass [illegible]
6. TUSLER	20-40	—	—	—
7. VEBAR	20-40 common to few	mostly along bed planes	42 inches	Needleandthread Prairie sandreed

[redacted]

Soil Series ~~Hardness of Parent~~ ~~(Rip, able or Hard)~~	Depth to Paralithic Horizon (0-20", 20-40" or 40-60")	Observed Root Distribution in Paralithic Horizon	Maximum Depth to Which Roots Have Been Observed	Dominent Kind of Vegetation
1. AMOR	20-40 @ 34 @ 26"	few fine few fine roots	48" 46"	cropland Western Wheatgrass.
2. BOXWELL	20-40	few fine	34"	crop
3. CABBA	0-20 @ 15" @ 16"	few very fine few fine	29" 42"	Buffalo grass, Blue Grama
4. CARMART	0-20 @ 10"	few in cracks	25"	Little Bluestem
5. COHAGEN	0-20 @ 15"	few below 15"	715"	native grass
6. FLASHER	0-20 @ 14" @ 11"	few few	20" 11" (18")	little bluestem native grasses
7. FLEAK	0-20 @ 17"	few	to 25"	Native grass
8. LEFOR	20-40 @			
9. LISAM	0-20 @ 15"	few very fine	15"	Native grass
10. MARMATH	20-40	few fine	35"	Crop
11. MORTON	20-40 @ 39" @ 38"	Numerous Many	31" 38"	Blue grama Small grain
1. MOREAU	20-40 @ 19" @ 26"	Many few	19" 40"	Bluegrama (Wayden)? Blue grama
2. PEEDER	20-40	few fine	36"	Crop
3. REGENT	20-40 @ @ 34"	Many to 34" few to 54"	54" 54"	Alfalfa Alfalfa
4. RHAME	20-40	Common very fine	34"	Native grass
5. SEN	20-40 @ 26"	few fine roots	46"	Western wheatgrass
6. TUSLER	20-40	few	27"	Native grass
7. VEBAR	20-40 [illegible]	[illegible]	[illegible]	[illegible]
8. WAYDEN	0-20 @ 16"	few	40"	June grass
9. WERNER	0-20			
10. YAWDIM	0-20	few in porous plates	20"	Native

EXTENT OF SOILS WHICH LIMIT ROOT DISTRIBUTION

state Ohio

	Soil Series	Classification		Approximate Acreage	Landscape Position Parent Material
1.	Colyer	Lithic Dystrochrept	c., sk.	83,000	Sideslopes - shale
2.	Coshocton	Aquallic Hapludalf	f.l.	60,000	Sideslopes - shale
3.	Eden	Typic Hapludalf	f.	130,000	Ridge, sideslopes - shale
4.	Edenton	" "	"	95,000	" " "
5.	Gilpin	Typic Hapludult	f.l.	700,000	" " shale, siltstone
6.	Latham	Aquic Hapludult	c.	170,000	" " shale
7.	Rarden	" "	"	46.000	" " "
8.	Westmoreland	Ultic Hapludalf	f.l.	500,000	" " shale, limestone
9.	Wynn	Typic Hapludalf	f.l.	53,000	" " " "
10.	Others			300,000	

	Hardness of Parent Material (Rippable or Hard)	Depth to Paralithic Horizon (0-20", 20-40" or 40-60")	Observed Root Distribution in Paralithic Horizon	Maximum Depth to Which Roots Have Been Observed *	Dominent Kind of Vegetation
1.	Rippable	8-20"	few extend	20-40"	(Mixed cropland-
2.		40-60"	down fractures	50-60"	
3.		20-40"		30-50"	
4.		"		"	
5.	Mostly rippable	"		"	
6.	Rippable	"		30-40"	
7.	"	"		"	
8.	Mostly rippable	40-60"		50-60"	
9.	Rippable	20-40"		30-50"	
10.					

* Roots from deep rooted plants have occasionally been observed extending down rock fractures 5-10 feet.

EXTENT OF SOILS WHICH MIT ROOT DISTRIBUTION

state Ohio

Soil Series	Classification	Approximate	Landscape Position
9.			
10.			

Literature Review:

We have listed a number of publications which provide, directly or indirectly, background data and some current studies relative to the assignment of this committee. We have selected various portions of a few of these publications to highlight some significant points.

Yearbook ofculture - 1957

A study et University of Iowa on roots of a single winter rye plant illustrates a high proportionof the linear growth of a plant takes place beneath the ground surface. The plant was grown for four months in one cubic foot of loam soil. It was determined that this one plant has approximately the following:

1. 13,800,000 roots
2. Total length of roots was 385 miles
   surface area of roots was 2,550 square feet
2: 14 billion root hairs
5. total length of root hairs was 6,600 miles
6. surface area of root hairs was 4,320 square feet.

Root penetration is seriously inhibited by the presence of compacted layers in soils. Roots cannot penetrate ledges or hard layers except through cracks. Roots are hydrotropic--they grow in a direction toward increasing available moisture if they are not impeded by a very dry layer. Roots of most plants will not enter wet, saturated soils.

Monolith Method of Root-Sampling in Studies on Succession and Degeneration-- J. E. Weaver and John W. Voigt

A study of roots of Agropyron smithii (wheat grass) on Crete soils (Pachic Argiustolls - fine) with high clay content Argillic horizon illustrates three distinct enfironments underground -

A horizon - normal development of roots
B2t horizon - roots were very few; branching poor, roots penetrated the soil with difficulty
C horizon - root branching greatly increased, occurred In all planes, and total weight of roots was a third greater in this horizon.

Decomposition of Roots and Rhyzomes - Weaver

"Underground plant materials in the surface four inches regularly amount to 2.5 to 4 tons per acre in the prairies of western Iowa and eastern Nebraska." Rate of decomposition of underground pack of 12 range grasses was ascertained at Lincoln, Nebraska. The most resistant to decay was blue grama but side-oats grams and buffalo grass were similar. Here much undecayed material remained and some roots of each species retained moderate tensile strength after 3 years.

Root Systems of Grassland Forbs - Weaver

Root systems of several plants of each of 80 species of forbs were examined and classified. The root systems were of four types.

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Attachment No. 1

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
Federal Bldg.-U.S. Courthouse, Rm.345
Lincoln, Nebraska 68508

September 10, 1975

To: Members of Committee 1,
Rooting Characteristics in Relation to Paralithic Horizons and Other Root Restricting Layers,
1976 North Central Regional Work-Planning Conference of the National Cooperative Soil Survey

Steve R. Base	William E. McKinzie
James R. Boyle	Steve Messenger
Rex L. Carey	Ival O. Persinger
Marvin L. Dixon	Sam J. Ross
J. B. Fehrenbacher	Stephen G. Shetron
Henry D. Foth	H. Raymond Sinclair, Jr.
Robert B. Grossman	Miles Smalley
Roger Lee Haberman	Donald A. Yost
N. Holowaychuk	Larry D. Zavesky
G. E. Kelley	

From: Jim Culver, Chairman, and
Sylvester Ekart, Vice-Chairman

Jim Culver
Sylvester Ekart

Welcome to Committee 1. This committee is unique. It is a new regional committee and does not correspond to a national committee. A worthy contribution of this committee to the conference will require ingenuity and input from each of us.

The prime objective of this committee is to study the effect of paralithic horizons and other restricting layers on root growth and distribution.

Tentative arrangements have been made to have a field trip in November of this year to observe soils with paralithic horizons and the distribution of roots in these kinds of soils. In order to get some preliminary information on the nature and extent of the paralithic horizons, I would like your comments on the following remarks,

1. What kinds of prior studies similar to this may have been made by other researchers in your state or area of responsibility; ie., graduate studies, field studies, ARS research, etc.

2. The kinds of soils, parent materials, etc., in your state which give rise to paralithic horizons. (Please see attached worksheet.)

3. Other kinds of restricting layers on root growth and distribution needing attention; ie., high density glacial till, fragipans.

4. Any other experiences or thoughts which you feel need consideration by our committee at this stage.

I will keep you advised of the pans for the field trip this fall. I shall appreciate each committee member prividing me with your comments to the above remarks at your earliest convenience.

I shall summarize all comments and, perhaps, we can proceed from there.

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE MTSC, National Soil Survey laboratory
Federal Bldg.-U.S. Courthouse, Room 345, Lincoln, Nebraska 68508

February 18, 1976

Mr. James R. Culver
state Soil Scientist, scs
Federal Bldg., Room 345
Lincoln, Nebraska 68508

Dear Jim:

This is a belated response to your request of September 10 for thoughts about the work of the Rooting Characteristics Committee of the 1976 NCRWPC.

1. You asked for information on rooting studies. I have had a cursory look at some of the work in Missouri. The information supplied is limited to one soil, Menfro (Typic Hapludalf, fine-silty). There are two sources of information. One is direct studies on root distribution. The other is inferential from the water-state over an appreciable depth during periods when the soil is relatively dry for the pattern of soil-water states that the soil exhibits if not irrigated. My interest at this stage is how to organize information. Pedon descriptions accompanying root dnta should give the six observations shown in the example if available. From field moisture data we need to extract an index number that is descriptive of the depth above which most of the water extracted comes from. To do this we need a cutoff to exclude zones where the deficit is small enough to be largely a consequence of drainage. Also, we need an index for the dryness of the soil, since the pattern of extraction changes as the soil dries. That is as far as I've gotten in thinking about the matter.

2. I pass on this.

3. We very much need more attention to root-limiting contacts defined explicitly as that, independent of horizon genesis, taxonomic diagnostic horizons, or nature of material deposition. These contacts should be defined on properties of the soil alone. I have worked on a definition of mechanically root-limiting zones:

   A root-limiting contact would be assumed, unless there is evidence to the contrary, at the upper boundary of any zone or horizon which meets one of these three conditions:

   (1) structural expression exceeding weak is restricted to units with a repeat distance greater than 10 cm, and either the bulk density of the moist fine earth is equal to or greater than 1.8 or the micro-penetration resistance when wet is equal to or greater than 5 kg;

(2) A fragmental zone

Analysis of Field Water Content Data As Index of Pattern of Rooting

Use of field water content to evaluate the root distribution. Calculate the integrated depletion to the depth at which the depletion is either less than the volume fraction 0.03 or lsss than 20 percent of the difference between the maximum field state water content and the 15-bar retention. Determine the depth at which the integrated depletion is two thirds of that to either of the criteria given above. This depth is the index of depth of water extraction. Calculate relative dryness by computing the deficit to 60 inches as a percentage of the total amount of water in excess of 15-bar to 60 inches.

Soil	Depth of Extraction Index inches	Relative Dryness Index Pct.	Vegetation	Reference
Menfro, Boone Co., MO.	52	60	Mixed Hardwoods	Horn (1971)
Same pedon	44	49	Same	Same
Same pedon	12	41	Same	Same
Menfro, Boone Co., MO.	31	26	Mature corn	Bohnert (1967)

Sample of a format for morphological observations to accompany root distribution data.

SERIES : Monfro

CLASSIFICATION : Typic Hapludalf

LOCATION : Booné Co., Missouri

NO. (1)	DEPTH (cm) (2)	HORIZON(S) (2)	WATER STATE (3)	STRUCTURE (4)			MORPHOLOGY PORES (5)	CONSISTENCE (6)	VOL. CHANGE (7)	BULK DENSITY g/cc (8)
1	0-13	Ap		1	VF	SBK	2 F&VF	FR	O	
2	13-25	B1		1	VF	SBK	2 F&VF	FR	O	
3	25-38	B21		2	F	SBK	2 F&VF	FI	O	
4	38-56	B22t		2	F	SBK	2 F&VF		O	
5	56-74	B23t		2	F	SBK	1 VF	FI	O	
6	74-112	B3		1	F	SBK	1 F&VF	FI	O	
	112-178	C				M		FI	O	

Heatherly, 1975

Table 5. Relation of plant age to the fraction of grain sorghum roots present in each of seven soil depths in 1973 and 1974.

Days after planting	Depth, cm								
	0-7.5	7.5-15	15-22.5	22.5-33	30-45	45-60	60-90	Partial profile 0-30	Partial profile 30-90
					1973				
64	.608	.124	.088	.046	.065	.032	.038	.866	.134
78'	.539	.210	.076	.068	.060	.023	.026	.892	.108
92*	.604	.075	.064	.079	.075	.055	.047	.823	.177
					1974				
24	.735	.174	.044	.030	.016	†	†	.983	.017
38	.440	.330	.100	.030	.054	.026	.020	,900	.100
52	.414	.264	[illegible]	.039	.091	.039	.046	.824	.176
66*	.422	.096	.100	.093	.130	.068	.090	.712	.288
80	.606	.101	.070	.046	.063	.044	.072	.822	.178
94*	.546	.147	.050	.041	.083	.054	.078	.784	.216

*Only one sample. Remaining data values are average of two samples.

†No roots present.

Heatherly, 1975.

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
Box 600, Salina, Kansas 67401

SUBJECT: SOILS - committee 1 - NCR Work-Planning Conference 1976 **DATE:** November 3, 1975

To:

James R. Culver
State Soil Scientist
Soil Conservation Service
Federal Bldg. --U. S. Courthouse
Room 345
Lincoln, Nebraska 68508

Following are comments relative to your remarks in the letter dated September 10, 1975:

1. There have not been any studies on the effect of paralithic horizons on root growth and distribution in Kansas.

2. See attached work sheet.

3. None of importance in Kansas.

4. There is a problem with determining depth to paralithic contact in certain parent materials. Specifically these are the calcareous shales and/or chalk of the Greenhorn limestone and Niobrara formation of Cretaceous age and the silty shales, siltstones, and very fine feldspathic sandstone mainly of the Whitehorse sandstone, Cedar Hills sandstone, and the Salt Plain formation of Permian age. Moisture conditions effect the root penetration in these materials, for instance when dry they are hard to penetrate sometimes even with a spade; however when moist they are easily penetrated. Under cultivation, fragments of these materials which are sometimes brought to the surface break down in a short time through normal weathering processes.

Roger L. Haberman
by [illegible]

Roger L. Haberman
Soil Correlator

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
P.O. Box 459, Columbia, Missouri 65201

January 26, 1976

To: Jim Culver, Chairman, Committee 1
Rooting Characteristics in Relation to Paralithic
Horizons and Other Root Restricting Layers,
1976 North Central Regional Work-Planning
Conference of the National Cooperative Soil Survey

I have been pondering your letter dated September 10, 1975, for months. I started filling out the worksheet back in September and then realized the massive job. It has been very difficult this fall to put any time and effort into this project. Sorry for the delay.

Nearly 75% of the soils in Missouri (33,000,000 acres) fall in one of the categories mentioned in your letter on root restriction. Enclosed is a copy of the MLRA's for

Ival O Persinger

michigan technological university
houghton, michigan 49931

school of forestry and wood products
ford forestry center 906/524-7236
l'anse, michigan 49946

Sept. 24, 1975

Mr. Jim Culver
c/o Soil Conservation Service
Federal Bldg. U.S. Courthouse, Rm. 345
Lincoln, Nebraska 68508

Dear Mr. Culver:

Enclosed please find a worksheet for your information. The first three soils contain a fragipan with varying degrees of hardness within and between. I've indicated the probable range in the area I am most familiar with. (West half of the U.P. of Michigan) The fourth is a" unknown soil found on Isle Royale, Michigan. My comments on your remarks are as follows and pertain to work at the Ford Forestry Center:

1. Sugar maple nutritional study on Baraga- N.S. thesis- chemical, physical properties as well as foliar data. National Park Service study on Isle Royale to correlate soil and forest types on burned-over areas. (soil no. 4 on worksheet)

2. Soil materials which give rise to fragipans, and No. 4, aeolian (L.P.S. + F.S.L. + Silt Loam) caps over loamy sand to loam tills.

3. Fragipans

4. A. Regional compilation of soil series which contain paralithic or root restricting horizons - occurance e.g. climate • r vegetation.

   B. Minimum criteria for a root restricting horizon, e.g. fragipan morphology of horizons with respect to regional occurance.

Lots of luck and let me know if your have any questions concerning my comments.

Sincerely,

Stephen G. Shetron
Prof. of Forestry Research

SGS/dm
enc.

University of Illinois at Urbana-Champaign

COLLEGE OF AGRICULTURE · DEPARTMENT OF AGRONOMY · URBANA, ILLINOIS 61801

January 27, 1976

Mr. James Culver
USDA, Soil Conservation Service
Federal Bldg. - U.S. Courthouse, Rm. 345
Lincoln, NB 68508

Dear Jim:

Even though late, I am enclosing a copy of a filled in worksheet on the extent of soils in Illinois which limit root distribution, which you sent out last September 10th for consideration of committee 1 of the 1976 NCR Workshop.

Several reprints on some of our root work are also enclosed. The general groups of soils that limit root penetration for us, as you will note from the worksheet are:

Thin loess or drift on Shale - paralithic contacts
Fragipans
Claypans - Improved fertility overcomes quite a bit of the root restriction
Dense till
Shallow to gravel
Shallow to bedrock, limestone and sandstone

I believe the above will give an idea of the extent and kind of root restriction layers in soils of the region. Except for the claypans, we haven't been able to come up with many remedies.

Sincerely,

Joe

J. B. Fehrenbacher
Professor of Pedology

JBF:lr

Encl.

THE MORTON ARBORETUM LISLE, ILLINOIS 60532 Phone: 312/968-0074

Founded by Joy Morton, 1922

September 26, 1975

Mr. Jim Culver
USDA -SCS
Federal Building - U. S. Courthouse
Room 345
Lincoln, Nebraska 68508

Dear Jim:

We have a continuing severe problem of oak mortality on Morley silt loam when the natural forest understory is replaced by grass as in parks, pastures, etc., and especially when residential development encroaches. The problem seems to be physiological since in virtually all cases no disease such as oak wilt can be blamed. As a consequence of the magnitude of this problem, The Morton Arboretum has for several years supported research on ecosystems involving Morley silt loam. Dr. Virgil Howe, Western Illinois University, has directed research on root distribution, soil microflora, and mycorrhizae. and I have been monitoring foliar chemical elements, soil moisture and available nitrogen forms, and have considerable stable soil property data as well.

We have evidence to indicate two selective plant root barriers. one in the upper B and one in the C.

Sincerely,

A. Steven Messenger
Assistant Professor,
Northern Illinois University
Research Associate,
The Morton Arboretum

UNITED STATES DEPARTMENT **OF AGRICULTURE**

SOIL CONSERVATION SERVICE

P. 0. Box 1458, Bismarck, North Dakota 58501

SUBJECT: **SOILS - Root Distribution & Paralithic Layers** DATE: **October 2, 1975**

TO: **'Jim Culver**
State Soil Scientist
Soil Conservation Service
Federal Bldg., U.S. Courthouse, Rm. 345
Lincoln, Nebraska 68508

We are sending the information your requested on rooting depths. The information being sent Is from our field soil scientists. We didn't attempt to summarize the data. Hope the individual thoughts are more helpful than a summary.

Sy Ekart /kk

Sylvester C. Ekart
State Soil Scientist

Attachments

THE OHIO STATE UNIVERSITY

April 19, 1976

Mr. Jim Culver
Soil Conservation Service
134 South 12th Street
Lincoln, Nebraska 68508

Re: NCRTWPC Committee 1

Dear Mr. Culver:

This is a very belated response to the charge given to NCRTWPC Committee 1 but I am sending a few comments for possible consideration during the discussion at Traverse City. I am limiting my comments to substrate rock as a possible restriction to roots.

1. Substrate rock, especially sandstone and the carbonate rocks, are seldom massive for extended horizontal distances. Jointing is common so roots (and water) can extend or penetrate into the substrate rock. Some vertical partings are also common in shales. The question then is the size, characteristics and frequency of these joints or partings in an area comparable to that of a pedon. Thus it seems that a lithic or a paralithic horizon should not be considered as an extensively continuous barrier but rather as one that markedly restricts the rooting volume below a certain depth. As a working criterium I would suggest 10 percent or less possible rooting volume. This would mean that jointed or fractured rock, with the fragments or blocks still in place or at least not disturbed or displaced, would constitute 90 percent or more of the volume. Also depending on the extent of fines in the joints, could this horizon be characterized as being skeletal or fragmental in nature?

2. Presence or absence of roots.

Presence of roots as an indicator of rooting depth may not be applicable in all cases. The rooting habits of the vegetation when a pedon is examined should be considered. Extent of rooting under trees would be a more reliable indicator than would be grass or annual crops ordinarily. Thus if forested or woodland areas are available nearby, this property of a soil could be better evaluated at such sites.

3. Description of a lithic or paralithic horizon.

The descriptions of this horizon in soils that appear in print are in most cases rather cryptic. Usually this consists of such statements as "sandstone", "fractured sandstone", "weathered shale", etc. An attempt should be made to describe more fully, the characteristics of the material over an area of a pedon. Not only the lithology of this material should be indicated but also the state of weathering and also the extent of fracturing, parting or jointing and the nature of abundance of fines.

Agronomy Department / 1885 Neil Avenue / 105 Townshend Hall / Columbus, Ohio 43210 Phone (614) 422-2001

N. Holowaychuk

N. Holowaychuk
Professor

NH/gmn

North Central Regional Work-Planning Conference
of the Cooperative Soil Survey

Traverse City, Michigan
May 3-7, 1976

Committee #2 - Improving Soil Survey Techniques

CHARGES

A. Assemble and evaluate information on remote sensing as related to soil survey mapping and interpretation.

B. Examine ways of increasing the efficiency and accuracy of field mapping operations.

C. Determine what the needs of users of soil survey reports are, and how to best meet these needs.

Introduction

This is a new committee for the North Central Regional Work-Planning Conference. It corresponds to a national committee. In addition, Committee #1 of the National Soil Survey Conference--Modernizing Soil Survey Publications, does not have a comparable committee in NCR Work-Planning Conference. Part of the subject matter of this committee fits well into Committee #2 as the modernizing and improvement of soil survey reports is certainly an important part of the overall goals of improving soil survey techniques.

A preliminary report was prepared by the chairman from material submitted by members of the committee for Improving Soil Survey Techniques. This preliminary report was presented to the participants at the North Central Regional Work-Planning Conference. The recommendations that follow resulted from discussions, suggestions, and agreements reached by the four discussion groups and the conference as a whole after considering the committee's report.

Recommendations

A. Assemble and Evaluate Information on Remote Sensing for Use in Improving and Accelerating Soil Surveys.

1. Remote sensing should not be considered merely as a tool to substitute for field mapping, but rather as a supplement for it, and the primary goal should be improved quality of the soil survey with increased quantity as a natural product. This would not preclude the study of techniques for low-intensity use where such is desired.

2. False Color Infra Red (CIR) imagery is being used in some survey areas. The Soil Conservation Service and other agencies involved in these trial efforts should make their evaluations available to other agencies which have indicated definite needs for evaluating applications of remote sensing techniques to soil surveys. Minnesota will issue a report when they complete their studies.

3. Small pilot studies should be set up with specific objectives such as, can remote sensing techniques (1) increase production of soil surveys; (2) improve the accuracy of either detailed type surveys or low-intensity type surveys?

4. Since remote sensing includes conventional panchromatic photography, some newer types of imagery should continue to be evaluated. We should continue to study and evaluate the kind of photography now being furnished to most field parties. Specifications could be less stringent when ordering photos for base maps for publishing only rather than when used as a base map for field mapping. Timely ordering of photography is of utmost importance.

B. Increasing the Efficiency and Accuracy of Field Mapping Operations.

1. The recommendations listed under part A would also apply here.

2. Information on less commonly used techniques or new equipment having application in soil survey activities should be collected, summarized, and made available through some means of communication. This information would include a description of the equipment or technique, its uses, advantages and disadvantages, approximate cost and benefits, and if commercially available, its source.

3. Recommend the use of specialized equipment such as all terrain vehicles and the use of vans for field trips.

4. Develop legends early in the survey that will require a minimum of change throughout the course of field mapping, and also design symbols to facilitate concurrent mapping, correlation, and cartographic operations.

C. Soil Survey Publications.

1. Update and keep current the definitions of all “soil science terminology” in the glossary for use in soil survey manuscripts.

2. Study the use of the technical series descriptions in the soil survey reports. Can they be modified? Could they be issued as a supplement to the report for use by those interested, or should the soil survey report be a technical document and supplementary reports supply the necessary interpretative data?

3. Committee #2 of the NCRWPC should be continued and be expanded to include both Committees #1 and #2 of the NTWPC.

Some other comments of the committee are as follows:

1. Remote sensing imagery can be used most effectively if soils are clearly perceived as landscape units. New research to identify soil landscape units and emphasis on soils as landscape units in teaching might encourage more effective utilization of imagery.

2. One problem that must be overcome is having the photography available when it is needed. At present, the time lapse is quite large between the ordering and receiving of aerial photography.

3. LANDSTAT imagery can be utilized beneficially in conjunction with available soils data to construct state general soil maps and county soil association maps. In many instances this information has already proven its worth in helping to delineate broad landforms, soil association areas, and land resource areas. A recent publication of South Dakota State University, "Soilscapes Interpreted from LANDSTAT Imagery" describes some of the methods used.

4. The use of thermal IR and near IR techniques has been tried in several instances. It has been used successfully to identify soil and vegetative patterns, thermal pollution of streams, and location of failing septic tanks.

5. The use of All Terrain Vehicles has been estimated to increase production by 20 to 25 percent in one survey area. Production increase will vary according to terrain, crop production, etc.

6. We should use the computer to generate more options in the interpretation of the soil map and data. Not necessarily more options, but options fitted to the needs of the particular survey area. We are continually asking ourselves if the description of the soils and the interpretations should be under the same cover. Today's users are increasing in their sophistication and specific requirements. They want to be able to exercise options in managing their soils.

7. The present format of soil survey reports attempts to satisfy the needs of many types of users--from the scientist to the flower gardener. It is most difficult for any one publication to satisfy all levels of readers.

8. We must be careful to define all the classes used in a soil survey report. Many reports do not define slope groups or depth classes. Many earlier reports do not define permeability classes in the glossary, but the terms were used throughout the report.

Respectfully submitted,

Richard W. Fenwick
Chairman, Committee #2

Committee #2 Members:

Chairman - Richard W. Fenwick
Frank L. Anderson
Donald L. Bannister
Marvin T. Beatty
Eric A. Bourdo
John I. Brubacher
Rex L. Carey
Willard H. Carmean
Richard L. Christman
H. R. Finney
N. Holowaychuk
Ivan J. Jansen
Christian J. Johannsen
Lloyd L. Joos
Gilbert R. Landtiser
Gerhard B. Lee
James H. Lee
Dave Lewis
Ralph L. Meeker
DeVon Nelson
Richard H. Rust
F. M. Scilley
Roy M. Smith
Edward A. Tompkins
Robert E. Wilson

National Cooperative Soil Survey North Central
Regional Technical Work Planning Conference

3-7 May 1976

Report of committee 3 --- Organic Soils

The primary charge of Committee 3 was to seek and compile evaluations of the Interpretative Guides for Organic soils which were issued on 7 February 1975.

The following narrative attempts to summarize the principal areas of interest generated in the four discussion groups and in the general session.

A. The evaluation of the Interpretative Guides was a bit premature at this time (1976) for at least two r&sons: 1. there was insufficient time from the date of issue of the Guides for through testing in areas where they were used. 2. Some states with areas of organic soils had no surveys operating in those areas.

It was recommended that at least another year or two be allowed to elapse and that the Guides then be reevaluated.

B. Although the Interpretative Guides were generally well received some difference of opinion was voiced as to whether they were more suitably applied in site specific situations or were equally applicable at the series level. Lt appears at this time their greatest use may be in site specific situations.

C. Because all factors in a rating system, be it positive or negative, do not operate equally under all situations it was suggested that some weighing system be applied along with the points.

D. In line with the philosophy that a soil's potential uses should be evaluated a positive, cumulative and open ended numerical rating system was considered preferable to the negative or penalty system as it now exists. However, in the process of this conversion, sight should not be lost of factors that do limit a soil for different uses.

E. Many of the criteria used in the rating scheme need more complete explanations and/or quantification.

F. In order for the Guides to become a rating system truly reflecting an organic soils potential uses (not only its agricultural use) additional factors should be rated, for example, aesthetic value of the area, water storage potential, wildlife and recreational potential and potential for disposal of industrial or residential wastes. The point was also made that a wider range of crops (beyond the corn belt staples) be rated which would increase the regional applicability of the Guides.

G. Portions of the Guides dealing with factors which are of an engineering or forestry nature should reflect a stronger and more detailed imput from representatives of these areas. It was suggested that possibly this could be accomplished in the form of two subcommittees of Committee 3.

H. Concern was expressed that the Interpretative Guides were not compatible either philosophically or in terminology with other systems of wet land classification adopted and in use by other agencies.

I. Committee 3 should take the initiative in developing a suitable definition of wetlands even if this means expanding its commission beyond organic soils per say. It was also suggested that committee 3 invoke itself or at least some of its membership in developing an inventory of the Region's wetlands and along with the inventory a suitable wetland terminology. At the least Committee 3 should have an imput in such documents as revised Bull. 39.

I. It was recommended that Committee 3 be continued with at least one of its charges to be a further evaluation of the Interpretative Guides.

The annotated solicited comments on the Interpretative Guides which appeared in the Pre-Conference Report follow. These have bee" supplemented or amended as a result of discussion group comments.

Soil tempera-and growing degree days:

1. A 30 (penalty) point spread between mesic and frigid soil temperature is too great. It should be reduced to 20 to 25 points.

2. Soil temperature groupings should be expanded because a penalty of 30 points for all parts of the frigid area is too great. This appears particularly in areas in which a mesic - frigid zone transition occurs. Specifically, in Minnesota, the southern part of the frigid zone should be penalized only 15 points and the northern part of the mesic zone 5 points.

3. With reference to the above, the number of growing degree days should be increased from 3 to 6 classes as follows:

Growing degree days	Penalty
> 3000	0
2750-3000	5
2500-2750	10
2250-2500	20
1800-2250	30
< 1800	45

4. It might be beneficial to explore the use of a temperature base other than 50°F for developing the growing degree day classes.

5. The heavy penalty of a Cryic temperature regime will cause any sloping or moderately deep well-drained soil to have a very low rating for agriculture.

6. There is no provision for ratings within the Pergelic temperature regime.

Thickness of Organic Material :

1. There are too many classes for thickness of organic soil materials. One

of the assumptions in the preparation of the guide was that it was to be used for general planning purposes and not for site specific or special investigations. Therefore the number of thickness classes in the guide should be similar to the series limits.

2. At present, organic soils are defined to be shallow, 16 to 50 inches thick, and deep, greater than 50 inches thick. The guidelines suggest breaks at 16 to 36 inches, and greater than 52". Since mapping units are set up to accommodate the series definition, and most organic soils as mapped have this range, actual detailed on-site investigation would be necessary to comply with thickness breaks suggested by the guidelines. Perhaps guidelines could be changed to reflect 16 to 52 inches with a penalty rating of perhaps 25.

3. In using the guide to evaluate peat bogs mapped in detail, the only alternative seems to be to average the penalty points of (16-36") and (36-52") depths.

4. To develop the full potential of organic soils it would be valuable to have them rated for their entire depth, this would be particularly useful in engineering and mining evaluations.

5. The decomposition status of the different organic horizons should be rated throughout the depth of the deposit.

6. See 2 under Soil Reaction.

Rooting depth:

1. Should factors affecting rooting depths in the explanation of soil features also include high water table since this will also affect the depth plant roots can penetrate?

2. Mineral soils have a 5 point penalty for rooting depths of 20 to 40 inches for cool and short season crops. A very small percentage of rooting of the crops listed is deeper than 12". Thus the penalty may be too high for these crops.

3. The definition of rooting depth for mineral soils might include the depth to fragipan or other soil features that can restrict root development.

Slope:

1. In terms of drainage a question arises as to why a penalty of 10 points is placed on a 2% slope phase in mineral soils, while on organic soils the slope is allowed to reach 6% before a penalty is added. Both surface and subsurface drainage is easier to achieve on both wet mineral and organic soils that have some grade than it is on level soils.

2. Organic soils especially cultivated ones with sapric materials at the surface are subject to severe water erosion even when nearly level. They are also subject to severe wind erosion.

3. For mineral soils, should the slope break (0, 1 and 2) be combined to better the reflect mapping units? On steeper slope groups why not use the break set-up on the SCS soils 5, i.e., 3 to 8 (rather than 3 to 6) and 8-15 (rather than 6-14) etc.?

4. For mineral soils, shouldn't slopes < 6 percent be shown since crops can be grown on these slopes without strip cropping, terracing or other forms of slope manipulation?

Surface texture of material:

1. The first group of surface texture classes should be split and Sl, FSl and Cl should be removed from the 0 penalty group and assigned 10 points.

2. See comment 2 under Slope.

P.E. (no residual wetness):

1. No units are given - one assumes this is in inches - P.E. should be spelled out and explained somewhere.

Available water holding capacity:

1. No values are given for mineral soils more poorly drained than somewhat poorly drained. In determining available water capacity for series definition or single sheet interpretations even poorly and very poorly drained soils are figured to depths of 60 inches. (This comment would also apply if used for rating series).

water Control:

1. Should penalty points be levied for no water control?

Residual Wetness:

1. The classes of residual wetness in mineral soils need a more quantitative definition, similar to the class definitions of water control for organic soils. Also four classes are too many. The penalty points are too high. Perhaps two classes, defined and with penalty points somewhat similar to those of water control, would suffice. As it is now, the deck is clearly stacked in favor of organic soils.

2. Residual wetness should be more exactly defined. What criteria are used to define, for example, moderate residual wetness?

Flooding during growing season:

1. Why the lack of penalty points for soils with less than 4 mo. of flooding?

2. There is a need to more precisely define the groupings. How, for example, is ponding on very poorly drained soils to be rated, i.e., time and duration of flooding - perhaps similar to that used in the southern states, (factor 7 page 19 Appendix A of the guide).

3. Does flooding (during growing season) also include ponding as it is defined in Advisory SOILS 9, 1973?

Reaction:

1. Should not reactions above 7.8 to 8.4 be penalized 10 points, because nutrients may be tied-up in the soil at these pH ranges and are unavailable to plants?

2. There is probably no need for pH breaks at 5.0-6.0 and 6.0 to 7.0. At pH's greater than 7.0 some plant deficiencies may occur and difficulty may be encountered with decreased herbicide effectiveness, for example on shallow organic soil - when marl is turned up in ploughing.

Additional comments with respect to physical features:

1. Annual and growing season precipitation should be a factor in rating soils. The difference between 10 and 20 inches of rainfall during the growing season has a large affect on crops that can be grown.

2. Another set of factors is needed to evaluate the landform the peat land occupies. This feature (the landform) will have an impact in determining whether the organic soil can be utilized for other than its present natural condition.

Example:

Factor		Penalty Factors
Landform or Landscape Position		
Adjacent to lake or stream		80
Ice block to depressions (deep)	(> 20 ft.)	40
Ice block depressions (shallow)	(< 20 ft.)	20
Level plain		0

Development Difficulty Rating:

1. At present this would appear to require an on-site investigation. TOO many characteristics of the area are not shown on series descriptions or scs-5's. There is a need to be more precise (quantify) as to what actual

conditions are in a particular bog, i.e., cover types, water outlets, surface roughness, what constitutes a large tree or a small tree?

2. If development difficulty ratings are designed for use for specific areas then they will work well. If, however, they are designed for use for series, a problem arises with vegetative cover since some series may range through all three categories listed.

Forest Production:

1. More needs to be known about the water tables in soils (forest) in the undrained state, during the growing season. This information is not provided in the series descriptions or in the SCS 5's.

2. In wooded land on organic soils there appears to be a poor correlation between site index and the criteria used in assessing penalty points. (Perhaps there should be more concern for water table slope and hydraulic conductivity).

3. There is also a question as to the soundness of applying no penalty for rooting depths greater than only 16 inches.

Floating light loads:

1. This seems to be an on-site evaluation because the real percent of logs and stumps and surface densification will be different from site to site in an area where a series is mapped. It cannot be generalized to a series or a mapping unit at this point in time.

2. Some penalty should be applied to organic soils when their contemplated use is for livestock pasture as the sod on organic soils is subject to severe hoof cutting.

3. Interpretative guides for planning purposes will suit specific sites very well. Only question here is if they are used to rate a series, problems arise with the "logs or stumps" factor when some organics may have both marsh grass (less than 0.1 percent logs or stumps) and woody (0.1 to greater than 3 percent

logs or stumps) vegetation.

Excavation and Removal:

1. Where and how are liminic materials taken into consideration in this system. They are highly liquid and tend to flow into the hole being excavated and flow through a dragline bucket.

2. The decomposition status of the different organic horizons should be rated throughout the depth of the deposit.

Submitted 7 June, 1976

K. R. Everett
Chairman
Kenneth C. Hinkley
Vice Chairman

Committee Members:

Don H. Boelter
Edward L. Bruns
Louis L. Buller
H. R. Finney
Kenneth C. Hinkley
A. J. Klingelhoets
William E. McKinzie
Alexander Ritchie
George M. Schafer
Neil W. Stroesenreuther
Warren Lynn
Robert E. Lucas
Gerhard B. Lee

NORTH CENTRAL REGIONAL
TECHNICAL WORK-PLANNING CONFERENCE
OF THE COOPERATIVE SOIL SURVEY

Traverse City, Michigan
May 3-7, 1976

REPORT OF COMMITTEE 4 - WATER RELATIONS IN SOILS

Committee Charge:

Consider the question, "How can the soil survey contribute to, and benefit by, hydrologic modelling?"

It was recommended by Committee 4 of the 1975 National Soil Survey Conference that regional conferences give major emphasis to the application of hydrologic models. (See Page 207 of the Proceedings)

Committee Approach:

It appeared to the Committee that the future quality of the understanding and the interpretation of soils might be determined by how well the soil survey foresees the kinds of soils information that will be required for accurate hydrologic models. The need appeared to be that members of Committee 4 become more familiar with hydrologic models and with soils inputs. With that need in mind, a seminar type approach was arranged for the Traverse City meeting. The outline for the seminar was as follows:

Part I. Quantitative Input Needs for Hydrologic Modelling.

Keith Saxton, Research Hydraulic Engineer,
A.R.S. Columbia, Missouri

Part II. A Review of the USDAHL-74 Model of Watershed Hydrology.

This review was accomplished in four parts, each centered around kinds of input parameters and each having a discussion leader.*

Each discussion leader led discussion of 5 general questions:

(1) What parameters are in the model?
(2) What soils information is required?
(3) How does one obtain the needed soils information using current procedures?
(4) If information is not available, how can procedures be modified?
(5) Do other models require different input data?

A. Watershed Parameters - D.D. Malo - South Dakota State Univ.

Part II - (Continued)

B. Soil Parameters - R.B. Grossman - University of Missouri

C. Crop Parameters - Don Franzmeier - Purdue University

D. Hydrographs and Coefficients of Routing - Keith Saxton

Part III. Suggested Courses of Action - Dick Rust - University of Minnesota.

The report which follows does not contain the entirety of discussions and presentations. It focuses upon those points that appeared to be most pertinent to the committee charge.

Part I. Quantitative Input Needs for Hydrologic Modelling.

The question "Why model?" was asked. Two important reasons are: (1) soil survey has new needs for determining where agricultural water is going and what is in the water; and (2) the rapid development of computer technology has released the new capabilities for modelling which permits the integration of a large number of processes. The soil survey should use modelling in order to take advantage of the wealth of information that has accumulated.

Keith Saxton differentiated between hydraulic models and hydrologic models. Hydraulic models are concerned with the flow of water after it reaches streams. Hydrologic models are concerned with the manner in which water interacts with the soil-plant system in order to generate stream flow, or, in some cases, to result in no flow. Hydrology is the main focus and interest of the soil survey. The ARS program is focused upon hydrology.

Part IIA - Watershed Parameters.

In order to subdivide a watershed into some landscape units that groups soils, the USDAHL model identifies hydrologic response zones. The zones are essentially land capability units. This approach is questionable and it appears that the soil survey should explore the extent to which soil mapping units would be a better way to subdivide a watershed. It was thought that in some instances this approach would be fruitful. In other cases this would not be so because current mapping units were designed with a different objective in mind.

In order to improve our descriptions of watersheds or of mapping units, the soil survey should explore the possibility of identifying geomorphic surfaces or perhaps the hillslope model of Ruhe could be used to describe landscape position.

Part IIB - Soil Parameters.

Infiltration is the primary process that must be quantitatively described for soils for the USDAHL model or any other hydrologic model.

Soil layers in two positions appear to merit special consideration by the soil survey; First, the description of the immediate surface and its expected effect upon infiltration is needed. Crusting is an example. Plant cover affects this part of the soil. The "a" value of the USDAHL model is an initial step. The soil survey should be able to provide the modeller with improved "a" values or substitutes for it. The second kind of positional layer meriting attention is below the solum in landscapes where the particular layer restricts water movement to a greater degree than do overly BT 8i 16 4 /BPC 1 /C6 /4> /C ~• €`•ð x ð ð and stratigraphy of materials to estimate for the hydrologist the relative magnitudes of overland flow, interflow and base flow.

Keith Saxton presented his view, as a hydrologist of the soils information that would be needed for modelling of agricultural hydrology:

<u>Desired Soil Information for Agricultural Hydrology</u>

(1) Mapped soil units (soil map)
(2) Profile descriptions
(3) Water char. for major horizons

W.P.; F.C. Sat. vol. of water
Pressure vs. vol. of water
Conductivity vs. vol. of water

(4) Performance characteristics

crusting, cracking, drainage
root penetration, lateral seepage

(5) Geomorphic setting

surficial geology

(6) Erosion characteristics
(7) Chemical characteristics

The list suggested by Keith Saxton provided the basis for final discussion and for suggested courses of action. The terms, wilting point (W.P.), field capacity (F.C.) and available water were recognized as needing description in terms of water contents at stated water pressures.

Part III. <u>Suggested Courses of Action</u>.

As a result of Committee 4's discussions, several courses of action were suggested. The list of suggestions that follow is not arrayed in an order of importance. The list is divided into two categories; (1) those suggestions for actions that can be taken rather quickly from our base of knowledge and (2) those courses of action that will require some additional effort in the direction of improved or changed procedures. This second category will be those areas in which the soil survey must move from qualitative to quantitative descriptions.

Courses of Action That Can Be Taken Rather Quickly.

(1) The soil survey can provide the hydrologist with map unit descriptions that will be useful in the delineation of hydrologic response zones.

(2) The soil survey can provide the hydrologist with profile descriptions that will enable him to decide upon a minimal number of soil horizons or depth increments that will be required for a reasonable analysis of infiltration.

(3) The soil survey can provide the hydrologist with estimated values of soil water characteristics

(a) available water by water retention difference
(b) a set of curves relating (1) water pressure and water volume:
(2) water conductivity and water volume:

with a first guess as to which curve is characteristic for any horizon.

(4) Bulk density estimates can be made so that the modeller can convert other estimates to volumes. The modeller can also use such estimates of bulk density to improve predictions of root penetration.

Courses of Action Requiring Additional Effort Toward Quantification.

(1) Performance characteristics of the soil, particularly the surface soil need to be described according to their changes with time, seasons, or particular use.

(2) Seasonal moisture conditions or states need to be quantitatively described by soil horizons.

(3) Root penetration needs to be related to morphological variability.

(4) Soils and geomorphology descriptions are needed on the 50 small watersheds that have the instrumentation required by hydrologists.

(5) The soil survey should encourage persons to try the USDAHL model to see if it works for them and to attempt our suggested modifications.

In discussion of the report to the conference, N. Holowaychuk made the statement that follows:

> "The mathematical description of water regimes is closely related to behavioral characteristics of soils. This committee has looked at water only. The real value will be realized when the dynamics of water flow in a landscape are combined with the interactions between soil and water. Predictions of soil stability, or failure, will be made possible."

Chairman Scrivner admitted that the committee had deliberately considered water only. The rationale was that the quantitative description of water in soil systems was a prerequisite to all interpretations.

Committee 4 Members:

C. L. Scrivner, Chairman
R. H. Rust, Vice-Chairman
Keith Saxton
Louis Duller
Don Franzmeier
Robert B. Grossman
Francis D. Hole
C. S. Holzhey
G. E. Kelley
Sam J. Ross, Jr.
R. J. Kunze
Dave Lewis
J. L. Richardson
Mike Stout
D. D. Malo
Howard W. Hall

COMMITTEE 5 REPORT
SOIL POTENTIAL

Soil potentials have been incorporated in soil survey reports and will be an important part of all mapping unit descriptions in soil survey reports. In addition to giving limitation ratings of slight, moderate, and severe and listing the restrictive soil feature, soils need to be evaluated taking into consideration the technology available to overcome these limitations. The use of soil potential will not lessen the need for making soil limitation rating since soil limitations are the factors to be considered in arriving at the soil potential,.

Soil potentials need to be developed for all interpretations pertinent to a soil survey area: cropland, woodland, pastureland, rangeland, wildlife, recreation, sanitary facilities, and construction sites. The evaluation of the potential must be based on supporting data. This supporting data must be assembled by those making these evaluations. Soil potential ratings should be developed first on the state-wide level and arranged on a local basis (county, soil survey area, RC and D project area, or whatever level desired). These ratings may be useful in determining prime agricultural land and other inventories in addition to their use in soil survey reports.

This committee addressed itself to the following charges:

1. Degrees of Soil Potential. For most interpretations three degrees of soil potential will be adequate. However, the number of degrees to be considered can be tailored to the interpretation and the area. To determine the degrees of soil potential, numerical ranking will need to be developed by assigning positive points to those soil

properties that affect a particular use, multiplying this by a weighting factor, and summing the products. Soil Potentials and Limitations, a Supplement to the Soil Survey, Seminole County, Florida, and Red Tart Cherry Site Inventory for Grand Traverse County, Michigan, have examples of how these numerical ranking systems have been used.

2. Determining Potential for Cropland or Specific Crops. Yield potentials should be the primary consideration when determining the potential for cropland or specific crops. Practices needed to maintain the productive level of the soil and meet the environmental quality standards are additional factors to be considered. Cropland or crop potentials should be determined on a mapping unit basis.

3. Determining Potential for Woodland. The ordination system is a starting point in rating soils for woodland potential. In addition to the soil characteristics used in the ordination system, the introduction of more productive species, management systems, such as drainage, fertilization, harvesting times based on growth curves, etc., should be considered and weighted. Potential for certain high value species should be considered where applicable.

4. Determining Potential for Rangeland and/or Pastureland. The productivity of the soil should be the primary consideration in rating soil potential for rangeland or pastureland. Introduced as well as native species should be considered.

5. Methods of Overcoming Limitations for Engineering Uses. Data on tested and proven techniques of overcoming limitations for engineering uses need to be compiled. This is one area in which the practices and

specifications are not presently a part of technical guides. The placement of these techniques in technical guides should be considered. The tested techniques should be brought to the attention of local regulatory agencies for their testing and approval.

Committee Recommendations. This committee recommends:

1. Committee 5 be continued.

2. Each state form "Soil Potential Rating" committees to develop rating systems for all soil-s and interpretations pertinent to the state.

List of Committee Members:

Chairman--Paul R. Johnson
Vice-Chairman--John I. Brubacher
Members:

John D. Alexander
Frank L. Anderson
Marvin T. Beatty
Eric A. Bourdo
Edward L. Bruns
Sylvester C. Ekart
Richard W. Fenwick
Charles S. Fisher
Howard Hall
Robert H. Jordan
James H. Lee
Ralph L. Meeker
Robert E. Radeke
Alexander Ritchie
Francis M. Scilley
Stephen G. Shetron
Neil E. Smeck
Roy M. Smith
Edward A. Tompkins
Earl E. Voss
Eugene P. Whiteside
Donald A. Yost

North Central Regional Work Planning Conference
of the
National Cooperative Soil Survey

Traverse City, Michigan
May 2-6, 1976

Summary report of the discussion group comments concerning Committee 6 - for Improvement of Teaching Methods in Soil Science.

The four discussion groups used the committee's suggested topics in discussion topics and the following is a summary of the main comments and suggestions offered.

Regional travel course: A travel course studying soil classification and the related land use and management considerations is a very effective teaching device and should be offered. Therefore a course such as planned by John Schafer (Iowa State University) should be offered on a regular basis or as often as possible.

The following suggestions were made to increase the number of possible enrollees:

1. Offer the course on both a credit or non credit basis.

2. Shorten the length to either two weeks or 8 days (part of two weekends plus one work week).

3. Schedule at a time when conflicts with prime mapping season; academic semesters, quarters or summer sessions; and summer jobs or research would be minimized. A difficult task! - but mid-August may have least conflicts.

4. Publicize to following:

   a. State Conservationists (SCS)
   b. State Departments of Soil Survey
   c. Regional Forester(s)
   d. University Departments and Colleges (Soils, Agronomy, Geography, Natural Resources and Forestry)
   e. Colleges and Universities not having soils majors or minors i.e. Kent State and Toledo University in Ohio. (Usually Geography, Geology or Natural Resources disciplines)
   f. Employment and training Branch (RTSC) of the Soil Conservation Service and ask that they encourage State Conservationists to support this course officially.

5. Notify Federal agencies at least 6 months in advance of trip.

6. Encourage foreign students to enroll and solicit funds from AID for their expenses.

7. Send out travel route and course objective list along with application forms.

ADDENDUM TO COMMITTEE 6

In the past five years Cooperative Extension Service Administrators have recognized the need for sound soil survey and land use programs. The result has been an increased emphasis for programming extension activities in this area as well as the establishment of a full-time extension position for this purpose in several states.

During the NCRWPC seven university based representatives from six states met as an Ad hoc committee. These representatives discussed mutual interests and shared ideas for educational techniques in soil survey. Following these sessions a representative from the Ad hoc committee met with the chairman and vice-chairman of NCRWPC committee 6. This meeting resulted in the following proposals.

a. Committee 6 - "For improvement of teaching methods in soil science" be designated "Educational activities for soil resources and land use".

b. University teaching - Cooperative Extension Service and agricultural experiment station persons who have responsibilities for conducting educational programs in soil survey and land use activities be identified.

1. A mailing list be established and distributed to these individuals.
2. These individuals be encouraged to affiliate with NCRWPC Committee 6 and attend the 1978 and future NCRWPC's.
3. Each representative be encouraged to share "in-house" training materials and publications relating to soil survey and land use activities.

c. The committee consider innovative techniques for packaging soil resource information. Example subject areas include:

1. Supplemental reports to existing standard soil survey publications.
2. Storage and retrieval of soil data on microform with NTIS (National Technical Information Service - Dept. of Commerce).

d. The committee be concerned with activities which are important and timely and of particular interest to soil classifiers in public service.

Respectfully submitted,

Chris J. Johannsen
University of Missouri
Co-chairman - Ad hoc
Committee

Gerald A. Miller
Iowa State University
Co-chairman - Ad hoc
Committee

NORTH CENTRAL REGIONAL PLANNING CONFERENCE
of the
NATIONAL COOPERATIVE SOIL SURVEY

Traverse City, Michigan

May 3-7, 1976

Report of Committee No. 6 - For Improvement of Teaching Methods in Soil Science

The committee had the main assignment of consideration and establishment of a travel course(s) to study soils and the factors influencing soil development. John Schafer, Iowa State University, with advice from Dave Lewis, organized a travel course to serve the area as a whole and solicited enrollees from Universities and agencies in the region. Information concerning this trip is included as Attachment 1 to this report. Due to lack of enrollment the course is not being offered as planned this spring.

Other travel courses serving the region and known to the committee include three that originated in Wisconsin. They are coordinated by Francis Hole, UW-Madison, Jim Bockheim, UW-Madison, and Jim Bowles, VW-Stevens Point. Information concerning these courses are provided in Attachments 2, 3, and 4 respectively. The courses conducted by Hole and Bockheim cover only Wisconsin and the course coordinated by Stevens Point has stops in Wisconsin, Minnesota, South Dakota, Wyoming, Nebraska, and Iowa.

Another travel course is coordinated by Steve Messenger at Northern Illinois University and consists of a 3400-mile field trip of 8 days duration which covers all the major soil variations in the NCR, extending from upper Michigan west to eastern North Dakota, south to south-central Kansas, east via southern Missouri to southern Illinois and then back to northern Illinois.

The committee members were asked to submit ideas for this committee to work on in preparation for the 1978 meeting and for discussion groups this year in Michigan. Those topics submitted are included in the following list of discussion topics suggested for consideration by the discussion sessions on Tuesday, Wednesday, and Thursday.

1. Discussion of the makeup of the travel course developed by John Schafer and what action is needed to have this course offered on a regular schedule.

2. Discussion of the other travel courses as to; (1) the value of each to students and employees in the region, and (2) need to publicize and offer to the region as a whole.

3. Topics concerning the classification and mapping systems for which more complete information is needed in order to improve the teaching of Classification, Morphology, and Genesis courses.

   a. Functional status of diagnostic soil horizons and whole pedons as to moisture storage and transmission, virgin vs cultivated soils, etc.

b. Methods of teaching concepts in the new classification system to students.
c. The exclusion of the cambic horizon from certain coarse textured soils and how this influences the mapping of Typic Udipsamments, Spodic Udipsamments, and Entic Haptorthods.
d. The absence of diagnostic horizons for the Vertisols.
e. Others to be presented by committee members at the discussion groups.

4. The need, mechanism, and host location of mini training courses for soil scientist in the field. (An assignment to the committee for this meeting.)

5. Should "measurable behavioral objectives lists" for soils courses pertaining to the soil survey be developed and used in Universities in the region?

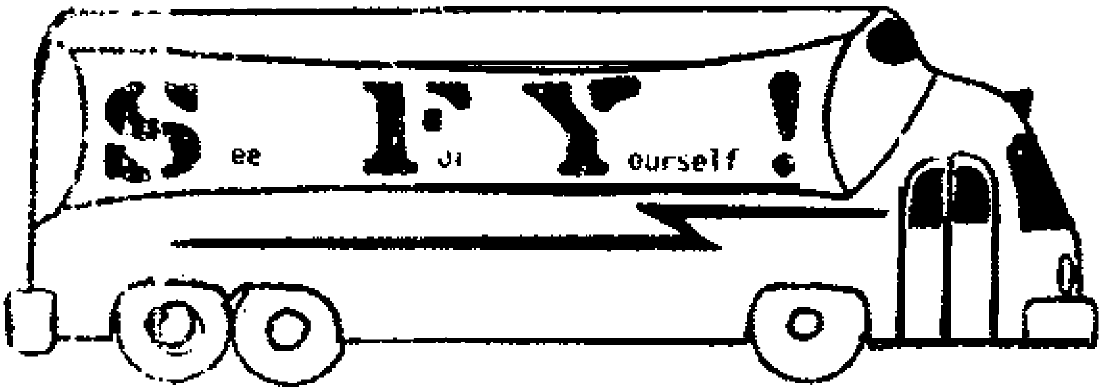
Respectfully submitted:

James A. Bowles, Chairman
Committee 6

JAB:ms

Attachments: 4

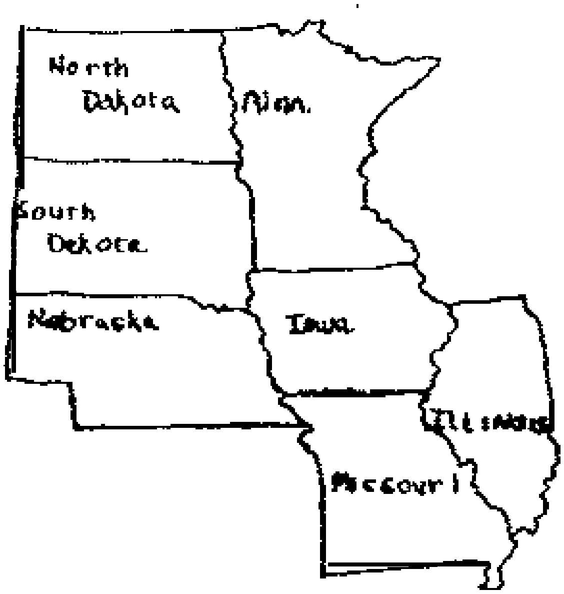
... are the soils of the North Central Region like?



June 14 - July 2, 1976

Students from all over the United States can join this three week tour by enrolling in an appropriate course at their home universities

Outstanding soil scientists in each state visited will describe local landscape evolution, soil development and utilization. There will be opportunities to examine many soil profiles. We will visit several farms, an urban expansion area and a stripmine reclamation project [illegible] tations



For further information visit with:

Or write to the tour coordinator

John Schafer
127 Agronomy
Iowa State University
Ames, Iowa 50011

Iowa State University *of Science and Technology* Ames, Iowa 50011

Department of Agronomy
Telephone 515 294 1360

December 5, 1975

Dear Colleague:

In October I sent you a letter about a proposed travel course in morphology, genesis and classification. Since that last letter I have found cooperators in each state we will visit. They include:

Iowa	Tom Fenton
Minnesota	Richard Rust
North Dakota	Hollis [illegible]
South Dakota	Fred Westin
Nebraska	David Lewis
Missouri	R. B. Grossman
Illinois	Burt Ray

I have tried to get a firmer estimate on the costs. It would appear that we can reduce the cost $25 to $75 below the original estimate. However, until we know how many are going we will have difficulty estimating the actual costs. Thus, I would estimate that for accommodations [illegible] 4 persons to a room the cost could go as low as $245, compared to an earlier estimate of $300. A double room, as low as $300 compared to $375 And private rooms as low as $425 compared to our original estimate of $475.

The problem now is getting an adequate number of participants. We need at least 20 more in order to make it go. And, unfortunately, I can't give you a more detailed itinerary at this time because I am not willing to ask the state cooper ators to develop a detailed plan unless I am reasonably sure the trip will actually take place

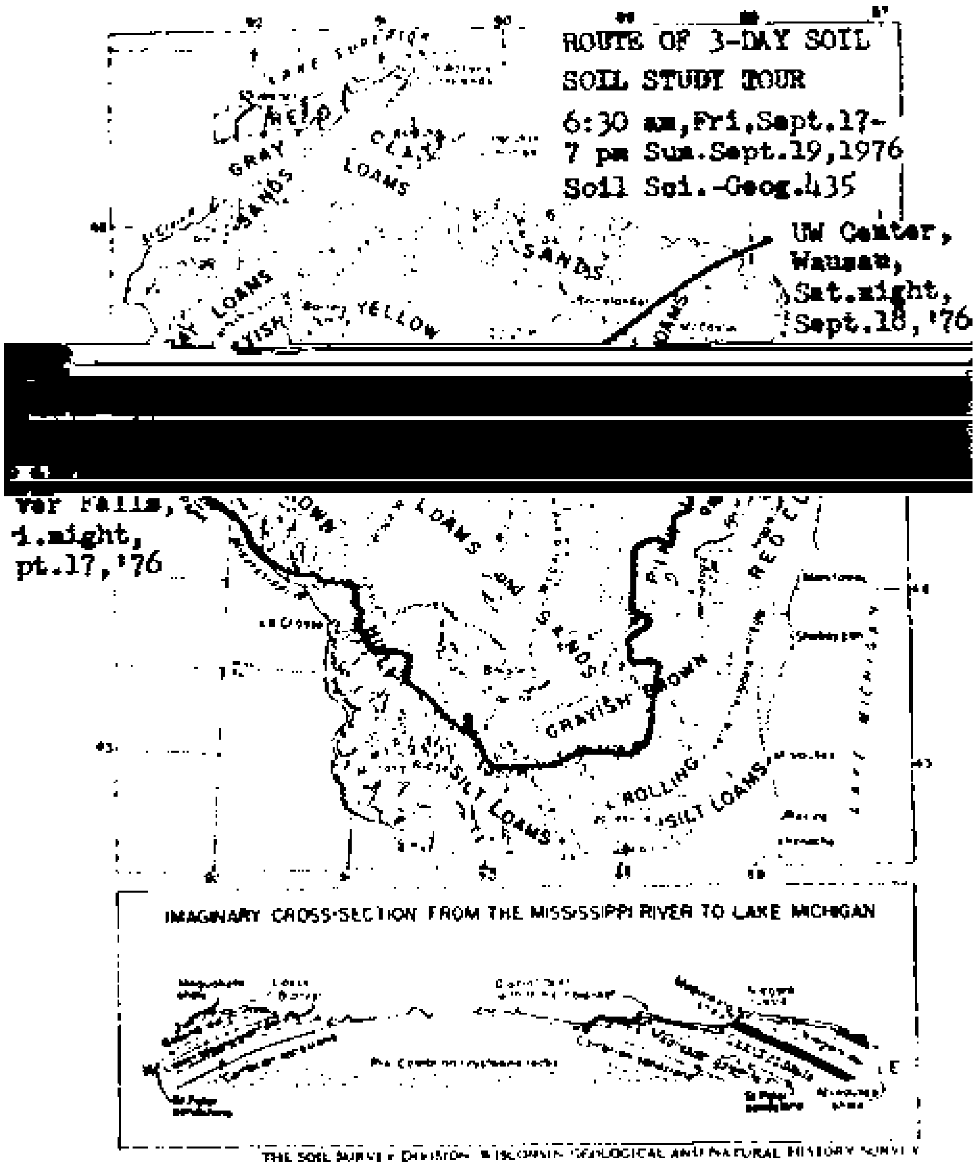
The idea of a regional field trip has been kicked around for a long time. The enthusiasm among NCR cooperators is high. But the idea will die without enough [redacted]

Sincerely

John Schafer
Associate Professor [illegible]

[illegible]

FALL 1976



Soil Science - 435
Geography - 435 2 cr

Prereq. Soil Sci. 325, 431, Geog. 431 or cons. instructor.

Enrolment limited to 30 students of Jr. standing or higher.

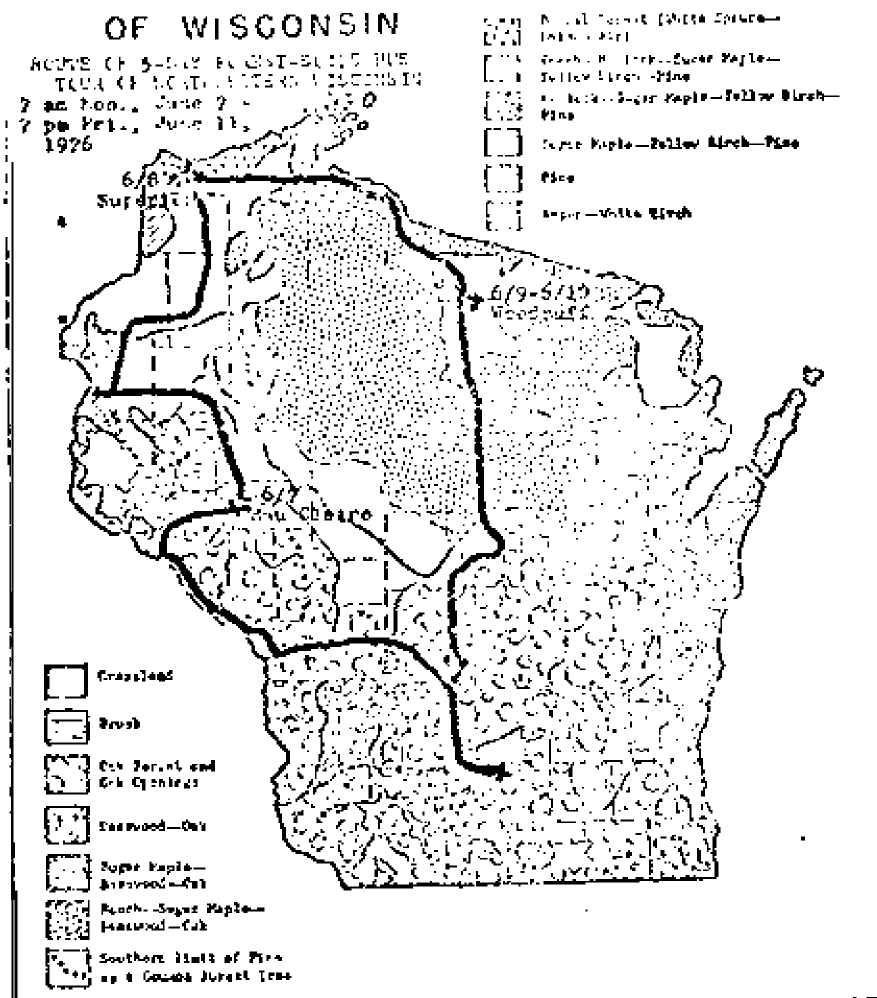
There is also room for 15 paying faculty and resource persons.

COSTS

Bus fare $35.00
(850 miles)

ATTACHMENT 5

ORIGINAL VEGETATION COVER OF WISCONSIN



INTERSESSION

Soils 601 -- FOREST-SOIL RELATIONSHIPS IN NORTHWESTERN WISCONSIN (special topics; incorrectly listed in intersession brochure as Soils 355, Forest Soils)

Description: Effect of regional climate and bedrock and surficial geology on distribution of forest cover types and soils in northwestern Wisconsin. Tree growth-forest soil interactions. Forest land uses.

Date: June 1 - 18, 1976

Prerequisites: Enrollment limited to 12 advanced students. Soils 101 and Bot. 101 required and consent of instructor.

For further information:

Dr. Jim Bockheim
Dept. of Soil Science
University of Wisconsin
Madison, WI 53706
(608) 262-6416

Five-day field trip (June 7 - 11) will consider:

-- All major forest community types in Wisconsin
-- All major soil regions in western and northern Wisconsin
-- All physiographic provinces (except Eastern Ridges and Lowlands)
-- Selected geologic features: periglacial frost phenomena, glacial erosion and deposition
-- Forest land use: forest nursery practice, aspen clear-cutting, intensive management of hybrid poplar, selected forest plantations, disposal of mill waste on soils
-- scenic features

Lectures:

Four discussion sessions, 8-10 AM, 357 Soils Bldg.
2 pre-trip sessions - June 1,3
2 post-trip sessions - June 15,17

Grading:

Each student will submit a two-part report discussing a) the trip in general, b) some aspect of the trip of special interest. Due June 18.

costs: $20 housing
5 guidebook (approx. 100 pp)
12 mini-bus (1300 miles)

$37 TOT. (payment due in adv. to JGB)

REGISTRATION FORM:

Name: ____________________

Address: ____________________

____

Phone: ____________________

Affiliation or classification:

____

Chief interests: ____________________

____

____

(Please give this form to J. G. Bockheim, 108 King Hall)

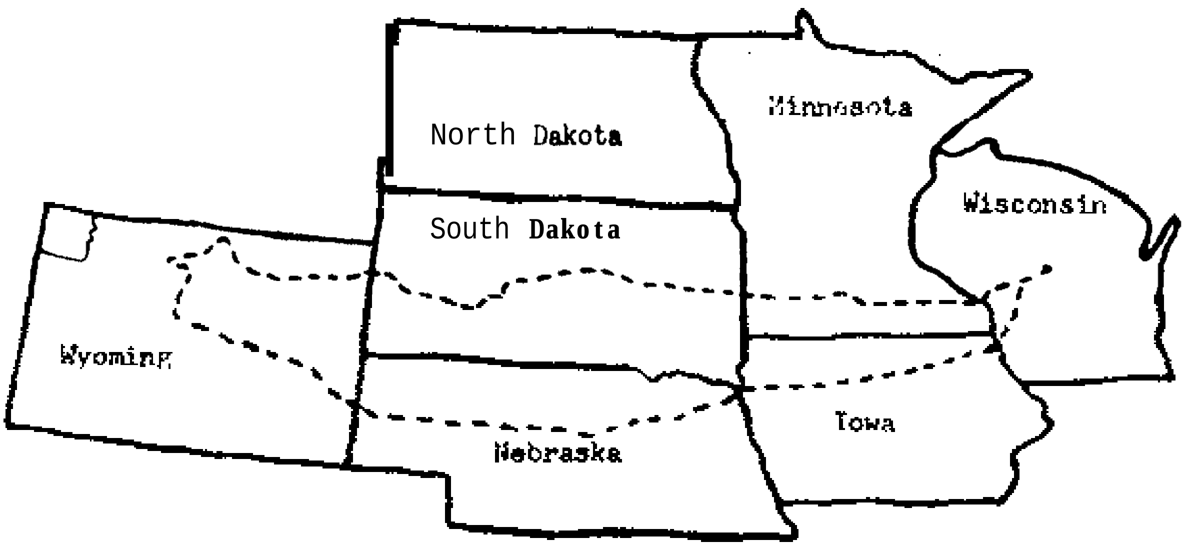
ATTACHMENT 4

SOILS FIELD SEMINAR 493/693 - University of Wisconsin-
Stevens Point

Objective:

To study soil classification and factors governing soil development in the northern tall and short grass plains, Nebraska Sand Hills, and desertic intermountain basins. Soils are related to land use and conservation practice needs.

Travel Route:



Credits and Requirements:

Two credits. Participants are required to develop a report on soils and soil forming factor information for a certain portion of the route for use in a travel book.

Duration:

Nine days. Transportation, lodging and food costs - approximately - $70.00-$85.00.

NORTH CENTRAL REGIONAL WORK PLANNING CONFERENCE
of the
NATIONAL COOPERATIVE SOIL SURVEY
Traverse City, Michigan

May 3-7, 1976

Report of Committee 7 on Soil Correlation and Classification.

Committee 7 for the 1976 conference was a combination of committees 2, 4, and 7 of the 1974 NCRWPC. The 1976 committee, consequently, inherited some charges from the combined committees, as well as developed some of its own.

A pre-conference report of Committee 7 was submitted to each member of the NCRWPC and discussed at the conference in small groups with the committee chairman present. The following is a summary of committee comments and those of the discussion groups to the charges, as well as recommendations which were formulated as the result of this procedure.

A. Reconsider the definition of the series control section, especially those soils with lithic and paralithic contacts and soils which developed to depths greater than 40 inches.

<u>Summary:</u>
The committee was divided on the need for redefining the series control section. More thought it adequate than thought a change needed. Two of the discussion groups passed over this charge, but the other two groups expressed some concern because of the great number of substratum phases that are creeping into series where the definition does not include the substratum material. It is a question of redefining these series to allow each new substratum phase as it comes along or redefining the series control section to stem the influx of so many substratum phases. Extending the series control section to some depth greater than 40 inches would eliminate many of these phases but also create more series.

One discussion group felt that the control section should be "opened up" for allowances of lithic and paralithic contacts between a depth of 40 and 60 inches that affect use and management as well as soil potential. It was brought out by several committee members and some members of the discussion groups that a change was proposed in the 1972 conference, which adequately redefined the control section. This proposal, however, was rejected. Strong support for changing the definition was expressed by some members of one discussion group; however, those desiring a redefinition are not in the majority. The committee and discussion groups could not agree.

B. Study the feasibility of standardizing phase criteria for soil series as far upward as possible in the categories for soil classification.

Summary:
The committee agreed that there was little need to standardize phase criteria. Discussion groups did bring up the problem of slope phase differences between States. Users of soil surveys are somewhat confused by different slope phases between survey areas. It was also recognized that breaks in different interpretative ratings fall between slope phase separations. One group discussed the desirability of using slope letters on the SCS-SOILS-5 rather than slope phase in percent. The majority of committee response was that there was no need for standardization. The discussion groups had little input to the charge.

C. Explore the feasibility of standardizing the use of soil drainage classes assigned to series in certain subgroups, e.g., Aquic Hapludalfs or Aeric Ochraqualfs.

Summary:
Discussion groups brought out the fact that soil drainage classes are observed values or interpretations for a particular region or survey area. Since Soil Taxonomy is more precise and the drainage classes are observed values, there is not necessarily a correlation. It was brought out, however, that there is considerable variation in the use of these terms and we should try to reduce these differences when possible.

Some interpretations on the SCS-SOILS-5 use soil drainage classes to arrive at certain intepretative ratings. Soil drainage classes are a means of communication to the layman and perhaps two sets of terms are needed -- a precise one for soil scientists and a communicative one for the public -- the present drainage class terminology.

Recommendations:
A subcommittee of the Soil Classification and Correlation committee be set up to study the use and standardization of soil drainage classes and what is needed to get better agreement.

D. Encourage initiation of additional studies that will supply more quantitative data as basis for interpretation.

Summary:
Committee members mentioned in their response what was occurring in their States in the way of studies. Many stressed need for more water table data. Discussion groups stressed better dispersing of data among States which have soils in common.

Recommendations:
It is recommended that as quantitative data becomes available for soils, which are common to several States, that this data be circulated to these states.

E. Develop means to better integrate the soil landscape in our classification, correlation, and interpretative work.

Summary:
Committee members and discussion groups stressed that this was needed. Some stressed that block diagrams were one of the best means to relate soil landscape relationship to the layman. Others suggested that the word picture for

H. Should this committee be continued?

Recommendation:
It is recommended that this committee be continued.

committee 7

George W. Hudelson, Chairman
John D. Alexander, Vice chairman

Steve R. Base
Charles S. Fisher
Roger Lee Haberman
Kenneth C. Hinkley
Richard B. Jones
Gilbert R. Landtiser
Frank Sanders
George M. Schafer
Neil W. Stroesenreuther
Robert I. Turner
Eugene P. Whiteside
Larry D. Zavesky
Thomas E. Fenton

North Central Regional Work Planning Conference
of the
National Cooperative Soil Survey

Traverse City, Michigan

May 3-7, 1976

Summary of major comments concerning Using Soil as a Treatment Medium for Waste Products - Committee 8.

More precise definitions of many of the terms used in the interim "Guide for Rating Limitations of Soils for Disposal of Waste" are needed. Infiltration rate is not constant with time and, consequently, should be defined more explicitly.

In rating areas for waste disposal factors other than soils most be considered. The crop to be grown, the size of the area, and the amount of waste to be disposed of are very important.

Ratings should be based on soil potential rather than limitations. Most people objected to rating soils in the mesic and frigid zones no better than moderate. Using potential this objection is corrected because storage facilities must be utilized. Many small communities and agricultural operations in these areas are successfully using land treatment for disposal of their waste.

The higher available water capacity for a temporary installation and much less for permanent installation if plants and soils are to remove nutrients should be explained. Suggest available water capacity be changed to <3",

Del Mokma

TO: NCRTWPC Members

RE: Pre-conference report of committee 8, Using Soil as a Treatment Medium for Waste Products

Committee 8 for the 1976 NCRTWPC is a new committee which corresponds with a national committee. The main objective of the committee was to evaluate the interim "Guide for Rating Limitations of Soils for Disposal of Waste." Several questions were raised concerning the information included in Tables 1 and 2 of the report, these tables arc included in this report.

The following questions were raised concerning disposal of liquid waste (Table 1). The responses of the committee are included in parenthesis.

	YES	NO
1. Should soils in the mesic and frigid zones be no better than moderate limitations?	(1)	(7)
2. Should available water capacity for temporary installation be less than 7.8 inches for slight limitations (for permanent installation it is more than 3 inches)?	(4)	(4)
2a. If yes, would breaks at less than 3 inches, 3 to 6 inches, and greater than 6 inches be acceptable?	(5)	(3)
3. Should breaks for available water capacity for permanent installation be less than 3 inches, 3 to 6 inches, and greater than 6 inches?	(7)	(1)
4. Should slope rather than runoff be used as criteria (slope is more easily understood by lay persons)?	(8)	(0)
4a. If yes, would breaks at 0 to 6%, 6 to 12% and greater than 12% be acceptable?	(7)	(1)
5. Should soils flooded only during non-growing season be rated moderate?	(4)	(4)
5a. Or severe?	(4)	(4)

The following comments were also made:

Why the need to downgrade soils in the mesic and frigid zones to moderate at best? Isn't this a management problem rather than soil limitation since holding ponds, etc., can be used in conjunction with waste disposal.

We are not concerned about rating soils in the mesic and frigid zones lower than soils in other climatic zones, since applications would be based on crop nutrient needs and would be made only when crops were expected to utilize the nutrients when the ground would not be frozen.

Under field conditions where the disposal area is of adequate size, winter temperatures do not restrict operations during winter months. Therefore, soils in the mesic zone should not be penalized on the basis of temperature.

Mesic soils should be allowed to have slight limitations.

The Mesic zone should be permitted a slight limitation, frigid possibly should be no better than moderate.

Depth to bedrock - suggest slight (more than 72 inches), moderate (48-72 inches), and severe (O-48 inches). This item is very important in Missouri, especially in areas where underground water contamination is on the increase.

Slope - suggest slight (O-5 percent), moderate (5-10 percent), severe (< 10 percent) Slope is certainly related to runoff but is a more direct measurement. Slope is a part of the mapping unit name and we feel it should he included in the table.

Hydrologic group - suggest slight (B), moderate (C), and severe (A and D).

Shrink-swell - suggest slight (low), moderate (moderate), and severe (high).

Before disposal of waste is made on floodplains, a careful study of the history of flooding (frequency) should be made.

A severe rating is warranted if flooding is frequent and longer than two weeks.

Perhaps <3%·3-6%,6-12% and over 12% slope breaks-would be more appropriate for liquid waste disposal.

While runoff can be defined, there is still a lot of room for bias between different individuals. Slope on the other hand is more tangible and can be applied more easily by laymen to mapping units.

I

YES	NO
(1)	(7)
(4)	(4)
(7)	(1)
(8)	(0)
(8)	(0)
(8)	(0)

The following comment was made·

Slope breaks could also be 0-8%, 8-15%, > 154. Then they would be more consistant with other guide sheets in current use.

Delbert L. Mokma
Chairman

Committee Members:

Willard H. Carmean
Richard L. Christman
Marvin L. Dixon
A.R. Gilmore
George F.

Table 1

Soil Limitations for Accepting Nontoxic Biodegradable Liquid-Waste for Nutrient Removal by Plants 1/

Item Affecting Use		Degree of Soil Limitation: Slight	Moderate	Severe
Permeability of the most restricting layer between 60 inches and the Ap or similar surface horizon		Moderately rapid and moderate 0.6-6.0 in./hr.	Rapid and moderately slow 2/ 6-20 and 0.2-0.6	Very rapid, slow, and very slow > 20 and < 0.2 in./hr.
Infiltration Rate		Very rapid, rapid, moderately rapid, and moderate > 0.6 in./hr.	Moderately slow 0.2-0.6 in./hr.	Slow and very slow < 0.2 in./hr.
Soil Drainage 3/ Class		Well drained and moderately well drained	Somewhat excessively drained and somewhat poorly drained	Excessively drained, poorly drained, and very poorly drained
Runoff 4/		None, very slow, and slow	Medium	Rapid and very rapid
Flooding		None	Soils flooded only during non-growing season	Soils flooded during growing season
Available Water Capacity from 0 to 60 inches or a limiting layer 6/	Temporary Installation	> 7.8 inches	3-7.8 inches	< 3 inches
	Permanent Installation 5/	> 3 inches		< 3 inches

1/ For regional interpretive groupings assign no better than moderate limitation to mesic and frigid soils; assign severe limitation to cryic, pergelic, and isofrigid soils.

2/ Assign severe limitation to moderately slowly permeable soils in which any horizon has an electrical conductivity of 8 millimhos or greater.

3/ For class definition see Soil Survey Manual, pp. 169-172.

4/ For class definition see Soil Survey Manual, pp. 166-167 (amended to use "None" for "Ponded").

5/ Permanent installations should have ground water monitoring systems.

6/ A limiting layer is a lithic or paralithic contact, duripan, fragipan, petrocalcic horizon, or other horizons of low permeability.

Table 7

Soil Limitations for Accepting Nontoxic Biodegradable Solids for Nutrient Removal by Plants 1/

Item Affecting Use	Degree of Soil Limitations		
	Slight	Moderate	Severe
Permeability of the most restricting layer above 60 inches	Moderately rapid and moderate 0.6-6.0 in./hr.	Rapid and moderately slow 2/ 6-20 and 0.2-0.6 in./hr.	
Soil Drainage Class 3/	Well drained and moderately well drained	Somewhat excessively drained and somewhat poorly drained	
Runoff 4/	None, very slow, and slow	Medium	[illegible] rapid
Flooding	None		

Committee 9 Report

CLASSIFICATION, INTERPRETATION, AND MODIFICATION OF SOILS ON MINE SPOILS AND DISTURBED SOILS

Charges for this committee were as follows:

1. Determine how to characterize and classify soils on mine spoils and disturbed soils.

2. Determine the kinds of interpretations needed for these soils.

3. Determine how these soils can be modified for various uses.

The Committee 6 report in the 1975 Proceedings of the National Soil Survey Conference dealt with this subject. This committee decided to thoroughly review the national report and respond to all the recommendations and if possible, expand on the matter of interpretation of these disturbed soils.

National Committee 6 Recommendations

A. Classification of Soils on Mine Spoils

1. The definitions and criteria for the proposed suborder of Spolents should be studied further and revised before further consideration is given to incorporating the suborder into the soil classification system.

NCR Committee 9 Response - The committee agrees that study should continue. However most members are of the opinion that these mine spoils and disturbed soils can be adequately handled within the present classification system.
NCR Conference Response - Agree with Committee response.

2. For the present, soils on mine spoils and other areas affected by mining operations should be classified at appropriate levels of the current classification system.

NCR Committee 9 Response - Agree.
NCR Conference Response - Agree.

3. The feasibility of setting a limit between Orthents (or Spolents) and Arents at 20 percent by volume of fragments of diagnostic horizons in the 10 to 40 inch section should be tested.

NCR Committee 9 Response - To date this has not been a problem in the region. The diagnostic horizons have been dispersed to a point where they are not recognizable. However several members did think that if mined land is to be reclaimed under the new laws that require stockpiling and replacement of the upper soil material, then the use of Arents may be necessary. They did agree that the 20 percent by volume criteria would likely be adequate
NCR Conference Response - Agree with Committee response.

4. The criteria for Fluvents and Fluventic subgroups should be amended to exclude soils in mine spoils that have an irregular distribution of organic carbon with depth.

NCR Committee 9 Response - The committee strongly agrees that these subgroups should exclude mine spoils. However the committee has no firm idea on how to do this.
NCR Conference Response - Agree with Committee response except in those instances where the disturbed soils have been deposited by flowing water. An example are areas where waste soil material is pumped to disposal areas and thick deposits are formed. These soils would be extremely difficult to classify in any suborder other than Fluvents and the Conference indicated that this classification for these soils is satisfactory.

5. The possibility of making the lower limit in degree of expression of the cambic horizon slightly more restrictive, by requiring peds distinct enough that crushing them results in a perceptible change of color, should be tested.

NCR Committee 9 Response - The committee agrees that the definition of cambic horizon needs to be somewhat more restrictive. However the committee would not like to see any of the current soils, described as having cambic horizons, be eliminated by this new definition.
NCR Conference Response - Agree with Committee response. However, a number of participants did not believe the perceptible change of color would work because some soils with relatively strong structural peds do not exhibit this color change.

B. Identification and Naming of Mapping Units

1. The categorical level at which soils on mine spoils are named and identified could depend on the objectives of the survey and on the resources available to make the survey.

NCR Committee 9 Response - Again the committee agrees that this is important and must be done. The categorical level within a survey might be different for different situations. This would especially be true in survey areas where there are significant areas of both old pre-law unreclaimed mined land and land currently being reclaimed under new and more restrictive laws. It is likely that land being reclaimed under current new laws could possibly be classified in a lower category than unreclaimed mine spoils.
NCR Conference Response - Agree with Committee response.

2. Where identification of soils as phases of great groups will meet the objectives of the survey, current conventions for naming mapping units at that level should be followed. The inclusion of a short term in the name to indicate that the soil has been altered seems feasible.

NCR Committee 9 Response - The committee agrees and would strongly endorse a short term in the name to indicate that the soil has been altered.
NCR Conference Response - Agree with Committee response.

3. Where identification of the soils as phases of families is required for the objectives of the survey, the short (common) names for soil families should be used in the names of mapping units.

NCR Committee 9 Response - Many of the families that would be used currently do not have any series within them and consequently, no family names. We believe the current family names even though somewhat cumbersome might serve the purpose just as well as setting up special names for a family, especially if phases of families can be named using a short term in the name to indicate that the soil has been altered.
NCR Conference Response - Agree with Committee response.

4. We should be conservative in using soil series to name soils on mine spoils. It is proper to test the idea of mapping and classifying such soils at the series level. In those instances, however, the soils should be examined more systematically than would be necessary for natural soils in order to establish the validity of the series classification.

NCR Committee 9 Response - The committee agrees that series should be tried. However if the series range and concepts are to be kept as narrow as we currently use them, the likelihood that series could be used in mapping mine spoils is not very great. Thus it seems more logical to map at the phase of families level rather than at a series level.
NCR Conference Response - All levels of the classification system should be used to properly classify the soil. Soil series should be used where feasible. Most participants felt that reclaimed strip mined areas especially those with surface material replaced as well as large disturbed areas such as large subdivisions should be classified into soil series. Unreclaimed strip mine areas will likely continue to be classified at a level higher than the series.

C. Interpretations

1. Guides for rating soil materials for use as final cover for mined land should be prepared.

NCR Committee 9 Response - The committee pretty well agrees that the current guidelines for rating topsoil is adequate, even rating topsoil for mined land. However it is not likely that there will be enough topsoil to do the job of reclaiming the stripped areas and thus it will be necessary to use more of the soil. This being true, we should also rate the top several feet of the soil and for this we will need a new rating guide.
NCR Conference Response - Agree with Committee response.

2. Predictions of behavior of soils on mine spoils should be conservative until more data on the behavior of classified soils have been accumulated.

NCR Committee 9 Response - We agree that predictions must be conservative for a time. However, we also realize that we must make predictions even though some of our backup material is less than we would like to have.
NCR Conference Response - Agree with Committee response.

3. Results of investigations of special problems encountered in soils on mine spoils should be assembled for guidance in making interpretations. Among the special, problems that should be included are extreme acidity arising from sulfide minerals, potential acidity, field clues to the presence or absence of sulfide minerals, and high clay and high absorbed sodium content.

NCR Committee 9 Response - We agree that many more kinds of special studies need to be made. Some thoughts on the kinds of studies needed in addition to those listed are:

a. Predictions of permeability, water intake rate, and available water capacity of mine spoils. This will be needed when a plan for revegetating these areas is proposed. Our current guides are not adequate in predicting these values for disturbed soils.

b. Predictions of landslide hazards in these areas will be important. Information that will be needed to help in these predictions is, what is the internal friction and cohesions for shear strength of these materials.

c. Kinds of heavy metals in the mine waste material.

NCR Conference Response - Agree with Committee response.

A major concern expressed by several committee members as well as some of the conference participants is that we are not spending enough time classifying mine waste material. This provides a somewhat different situation than classifying strip mine land. In these situations it might be important to document in the classification of these materials the kind of mine from which the waste material originated.

Committee Recommendations - Concurred in by Conference

1. Committee 9 be continued.

2. More regional effort be put into the classification of mine tailings and wastes in addition to the effort going into the classification of spoils and disturbed areas.

3. More regional effort into the matter of how these materials can be modified to make them a better medium for growing plants.

THE USE OF SOIL POTENTIAL - IN SOIL SURVEY INTERPRETATIONS

LINDO J. BARTELLI[1/]

THE NATIONAL COOPERATIVE SOIL SURVEY FACES AN INCREASINGLY URGENT CHALLENGE TO PROVIDE FOR THE FULLEST POSSIBLE USE OF SOIL DATA. IN ORDER TO MEET THE FOOD AND FIBER DEMAND OF OUR SOCIETY AND MAINTAIN A SATISFACTORY QUALITY IN THE SOIL RESOURCE BASE AND STILL PROVIDE ATTRACTIVE, CONVENIENT, AND SATISFYING PLACES TO LIVE, WORK, AND PLAY, SOIL SURVEYS MUST BE EXPANDED TO INCLUDE SOIL BEHAVIOR PREDICTIONS ON SOILS WITH INHERENT LIMITATIONS. THE FULL RANGE OF PRACTICES THAT MAY BE USED TO OVERCOME SOIL LIMITATIONS MUST BE CONSIDERED. WITH OUR LIMITED SOIL RESOURCE BASE IT WILL NOT BE POSSIBLE TO MEET THE NEEDS OF SOCIETY USING ONLY THOSE SOILS WITH NO NATURAL LIMITATIONS. THE SOIL POTENTIAL CONCEPT IS PROPOSED AS A SYSTEM OF SOIL INTERPRETATION TO HELP THE DECISION MAKER EVALUATE WHETHER OR NOT A SOIL WITH LIMITATIONS HAS POTENTIAL FOR A PARTICULAR USE.

BACKGROUND - DEVELOPMENT OF SOIL SURVEY INTERPRETATIONS:

SOIL SURVEY INTERPRETATION INVOLVES THE PREDICTION OF SOIL BEHAVIOR UNDER PRESCRIBED SYSTEMS OF MANAGEMENT. SOME KIND OF SOIL INTERPRETATION HAS BEEN A PART OF SOIL SURVEYS SINCE THE FIRST ONE WAS PUBLISHED AT THE TURN OF THE CENTURY. SOIL SURVEYS WERE ORIGINALLY DESIGNED TO HELP FARMERS SELECT THE MOST SUITABLE FARMING AREAS,

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[1/] PRESENTED AT THE NORTH CENTRAL REGIONAL SOIL SURVEY WORK PLANNING CONFERENCE, TRAVERSE CITY, MICHIGAN, MAY 3-7, 1976.

SOIL INTERPRETATIONS WERE EXPANDED FROM THE EAKLY GENERAL STATEMENTS OF LAND USE SUITABILITY TO SELECTION OF SUITABLE CROPS, YIELD PREDICTIONS AND MANAGEMENT PRACTICES NEEDED TO IMPROVE THE PRODUCTIVITY OF DIFFERENT KINDS OF SOIL, WITH THE INTRODUCTION OF THE CONCEPT OF FARMING ACCORDING TO THE CAPABILITY OF THE SOIL AND TREATING THE SOIL ACCORDING TO ITS NEEDS SOIL SURVEY INTERPRETATIONS MUSHROOMED INTO SYSTEMS FOR IDENTIFYING HAZARDS OR LIMITATIONS FOR CROPPING, MORE COMPLETE YIELD PREDICTION, IDENTIFICATION OF PRACTICES NEEDED TC OVERCOME SOIL LIMITATIONS AND REQUIREMENTS OF IRRIGATION AND DRAINAGE IMPROVEMENTS BY NAMED KINDS OF SOIL. AS THE NEED FOR SOIL INFORMATION BECOME MORE COMPLEX THE SOIL CLASSIFICATION SYSTEM WAS REVISED TO ALLOW MORE COMPLETE SOIL INTERPRETATIONS, MAP SCALES WERE INTRODUCED TO MEET THE SPECIFIC NEEDS OF THE SOIL SURVEY AREA AND SOPHISTICATED AUTOMATED DATA STORING AND RECALL TECHNIQUES FOR A MORE EFFICIENT AND EFFECTIVE SOIL INFORMATION DISTRIBUTION SYSTEM WERE DEVELOPED, THE INCREASE USE OF SOIL SURVEYS IN COMMUNITY PLANNING AND DEVELOPMENT CAUSED ME FORMULATION OF A SYSTEM OF RATING SOILS BY DEGREE OF LIMITATIONS IN WE NON-FARM SOIL INTERPRETATIONS. HIGHLY SUITABLE SOILS WERE DEFINED AS HAVING NO SIGNIFICANT

MODIFICATIONS OF SOIL WILL BE NECESSARY AND EVEN DESIRABLE. LIMITATION RATINGS HAVE SERVED A USEFUL PURPOSE, BUT DO NOT MEET THE NEEDS OF TODAY, LIMITATIONS DO NOT EQUATE TO SUITABILITY. MODERN TECHNOLOGY, COUPLED WITH SUFFICIENT CAPITAL ENABLES MAN TO USE LAND IN ANY MANNER DESIRED, THE CONCEPT OF SOIL POTENTIALS WILL PROVIDE A BASIS FOR LAND USE DECISIONS WITH THE SELECTION OF PROPER DEVELOPMENT PRACTICES AND SOIL USE SYSTEMS. THE DECISION MAKER WILL BE ABLE TO OPTIMIZE ME SOIL RESOURCE BASE AND STILL MAINTAIN THE DESIRED QUALITY IN THE ENVIRONMENT.

THE SYSTEM OF SOIL POTENTIAL IS DESIGNW TO FOCUS ON A POSITIVE EXPRESSION OF THE QUALITY OF A SOIL AFTER IMPROVEMENTS RELATIVE TO OTHER SOILS THAT MAY BE AVAILABLE, THIS SYSTEM OF RATING SOIL SUITABILITY WILL PROVIDE THE USER WITH ALTERNATIVE SOIL USES AND MANAGEMENT SYSTEMS, AND THE ECOLOGICAL CONSEQUENCE OF EACH DECISION. UNDER MIS SYSTEM SOILS NATURALLY UNSUITED FOR A SPECIFIC USE MAY BECOME EMINENTLY SUITABLE WHEN THEIR LIMITING SOIL PROPERTIES ARE OVERCOME, THE DEGREE OF INTENSITY OF REQUIRED PRECAUTIONS ARE STRESSED IN ADDITION TO THE DEGREE OF LIMITATIONS THE SOIL PRESENTS.

DEFINITION OF SOIL POTENTIAL:

THE SOIL POTENTIAL CONCEPT IS A SYSTEM FOR EVALUATING THE NATURAL UNIT OF SOIL, AS MAPPED IN THE SOIL SURVEY PROGRAM. SOIL POTENTIAL IS DEFINED AS THE ABILITY OF THE SOIL, USING LATEST FEASIBLE TECHNOLOGY, TO PRODUCE, YIELD, OR SUPPORT A GIVEN STRUCTURE OR ACTIVITY AT A COST EXPRESSED IF! ECONOMIC, SOCIAL, OR ENVIRONMENTAL UNITS OF VALUE, THE

SYSTEM INVOLVES FOUR BASIC STEPS: (1) IDENTIFY FOR EACH SOIL USE THOSE SOIL PROPERTIES THAT AFFECT THE SELECTION OF CROPS, YIELDS OF PLANTS AND PERFORMANCE OF ACTIVITY: (2) IDENTIFY AND EVALUATE THE KINDS OF PRACTICES THAT MAY EE USED TO OVERCOME THE SOIL LIMITATIONS TO ACHIM THE PERFORMANCE THAT MAINTAINS QUALITY IN THE NATURAL RESOURCE EASE IN THE ENVIRONMENT AND IN THE STANDARD OF LIVING; (3) EVALUATE THE LEVEL OF PERFORMANCE OR YIELD AFTER INSTALLATION OF FEASIBLE PRACTICES AND THE EFFECT OF PERFORMANCE ON THE ENVIRONMENT; (4) ARRAY THE SOILS WITHIN A STUDY AREA IN ORDER FROM THE BEST TO THOSE WITH THE WORST PERFORMANCE.

THE SYSTEM OF SOIL POTENTIAL IS A RATING OF THE QUALITY OF THE SOIL ITSELF. IT DOES NOT TAKE INTO ACCOUNT THE EFFECT OF THE LOCATION OF THE LAND, DISTANCE TO MARKET, MARKET DEMANDS, TRANSPORTATION FACILITIES, THE SKILLS OF THE CULTIVATOR OR DEVELOPER, OR THE ECONOMIC OR SOCIAL CONSIDERATIONS NECESSARY TO DETERMINE "LAND SUITABILITY." HOWEVER, SOIL POTENTIAL RATINGS ARE CONSIDERED AN ESSENTIAL FIRST STEP IN THE DETERMINATION OF LAND SUITABILITY.

SOIL POTENTIAL RATINGS PRESENT A COMPARISON OF SOIL USE ALTERNATIVES IN SIMPLE TERMS. THE RATING PROCEDURE REQUIRES THE ASSISTANCE OF MANY DISCIPLINES. IT PROVIDES A BASIS FOR DECIDING HOW LAND WILL BE USED, CONSIDERING ITS PERFORMANCE AFTER MODERN TECHNOLOGIES ARE APPLIED TO OVERCOME THE SOIL LIMITATIONS.

THE FOLLOWING MODEL IS PRESENTED TO CLARIFY THE DEFINITION OF SOIL POTENTIAL:

$$SPI = \sum_{i} W_I I_I + \sum_{j} W_J J_J$$

SPI = SOIL POTENTIAL INDEX

I = FACTORS INHERENT IN SOIL TAXONOMIC UNIT

W_I = INDEX WEIGHT FOR FACTOR I

I_I = VALUE OF INDEX FOR FACTOR I

J = FACTORS REPRESENTING ASSOCIATED FEATURES IN SOIL MAPPING UNIT

W_J = INDEX WEIGHT FOR FACTOR J

J_J = VALUE OF INDEX FOR FACTOR J

ADVANTAGES OF THE SOIL POTENTIAL SYSTEM:

THE SOIL POTENTIAL RATING SYSTEC: PROVIDES A VALID EASE FOR A POSITIVE APPROACH TO MAKING LAND USE DECISIONS. THE SYSTEM INSURES ME PRUDENT USE OF EXISTING INFORMATION REGARDING SOIL BEHAVIOR, AND THE DEVELOPMENT OF SOIL POTENTIAL RATINGS. A DISTINCT CHANGE IN PHILOSOPHY IS IDENTIFIED.

THE SOIL POTENTIAL RATING IS DEVELOPED WITHIN THE CONTEXT OF THE SOIL MAPPING UNIT, IN ADDITION TO SOIL CHARACTERISTICS INHERENT IN THE SOIL TAXONOMIC UNIT, THE SYSTEM INCLUDES THE ASSOCIATED LANDSCAPE FEATURES IN THE MAP UNIT, THE RATING SYSTEM ALLOWS FOR FLEXIBILITY AMONG SOIL SURVEY

AREAS, ALTHOUGH RATINGS WILL BE DEVELOPED FOLLOWING STANDARDIZED PROCEDURES, THE FINAL RATING FOR A SOIL MAPPING UNIT IS PRESENTED SO THAT THE QUALITY OF ME SOIL RELATIVE TO OTHER SOILS IN THE AREA UNDER STUDY IS APPARENT, FOR EXAMPLE, ALL SOILS IN ONE SURVEY AREA MAY HAVE A SEVERE LIMITATION FOR THE USE IN QUESTION, HOWEVER, THE SOIL POTENTIAL SYSTEM ARRAYS THE SOILS IN ORDER OF DEGREE OF SUITABILITY DEPENDING ON THE EFFORTS REQUIRED TO OVERCOME THE

NATIONAL COOPERATIVE SOIL SURVEY

North Central Regional Conference Proceedings

Osage Beach, Missouri
April B-l 2, 1974

COMMITTEE REPORTS OF NORTH CENTRAL REGIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE NATIONAL COOPERATIVE SOIL SURVEY

US DEPARTMENT OF AGRICULTURE
OSAGE BEACH, MISSOURI
April 8-12, 1974

National Cooperative Soil Survey
North Central Regional Technical Work-Planning Conference
April 8-12, 1974
Osage Beach, Missouri

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NORTH CENTRAL REGIONAL TECHNICAL WORK-PLANNING CONFERENCE OF THE NATIONAL COOPERATIVE SOIL SURVEY
APRIL E-12, 1974
TAN TAR A RESORT
OSAGE BEACH, MISSOURI

Monday, April 8

Morning

10:00 a.m.- 1:00 p.m.	Registration	

Afternoon

Afternoon	Auditorium	C. L. Scrivner, Presiding
1:00 p.m.	Opening Remarks and Introduction of New Members	
1:20	Welcome	Elmer R. Kiehl, Dean, College of Agriculture; Director, Agriculture Experiment Station, University of Missouri.
1:35	Welcome	Vernon Martin, Missouri State Conservationist, S.C.S.
1:50	Soil survey--A Tool for Modern Agriculture	James B. Boillot, Commissioner, Missouri Department of Agriculture.
2:20	Soil Survey at National Level	Klaus Flach, Director, Soil Survey Investigations Division, S.C.S., Washington, D.C.
3:15	Refreshment Break	
3:30	An Appraisal of Soil survey Reports	W. R. Oschwald, University of Illinois, Agricultural Extension Service.
4:00	Soil Classification, North Central Region	Maurice Stout, Jr. Principal Soil Correlator, North Central Region.
4:30	Business Meeting	
5:00	Adjourn	

Tuesday, April 9

Morning	Auditorium	Christian J. Johannsen, Presiding
8:00 a.m.	Is Increased Production Compatible with Conservation?	Harry M. Galloway, Purdue University, Agricultural Extension Service
9:00	Change in Publication Procedures	Maurice Stout, Jr.
10:00	Refreshment Break	
10:15-	separate Meetings	
12:00	Federal Agencies	Mike Stout, Presiding
	N.C.R. 3	Hollis Omodt, Presiding
12:00 a.m.	Buffet Lunch	

Tuesday
Afternoon

1:00 p.m.	Separate Meetings Continued	
3:00	Discussion Group 1	F. Ted Miller, Leader
	Discussion Group 2	Don Franzmeier, Leader
	Discussion Group 3	Larry Wilding, Leader
	Discussion Group 4	F. M. Scilley, Leader
4:00	Turf Management or Aquatic Environments	

Wednesday, April 10

Morning

8:00- 12:00 a.m.	Discussion Group 1
	Discussion Group 2
	Discussion 3
	4
	1
	2
	3
	4

Thursday, April 11

12:30	Buffet Lunch

Afternoon

1:30- 5:00	General Session

In our State of Missouri the uses that can be made of the soil survey have reached the point where there are seven counties that have hired a full-time graduate soil scientist through their local soil and water conservation district. This has all occurred during the past 12 months. The county planning and zoning commissions, the local county courts, and other citizens who have been exposed to the merits of the soil survey in the last few years have become insistent that this worthwhile endeavor be accelerated - insistent to the point they were willing to appropriate local funds for this purpose. The Soil Conservation Service, in this kind of arrangement, has also agreed to furnish a full-time soil scientist to work side by side the soil and water conservation district soil scientist.

It is sometimes very difficult to set priorities for soil surveys so that they can be put to maximum use. Over the years we have done the best we could to identify agricultural demands on the soil resources and how the soil surveys could assist these landowners in making wise decisions. During the last few years we have been influenced by some landowners near the expanding urban areas and have placed some priorities for soil surveys for uses other than agricultural. Apparently, all of us together have been selective enough that the value of this survey is now recognized in both urban and rural areas. For this reason, local contributions for soil surveys are coming from both sectors.

Many of you have been involved in attempting to get funds from local units of government for various purposes and recognize immediately that this is a most difficult arena unless you have a product that is identifiable with success to a large number of people. The soil survey program in Missouri has fit this description, and the cost-sharing from local sources is the end result. We anticipate that there will be other local units of government that will respond in a similar manner. The Soil Conservation Service will locate its soil scientists as much as possible in those areas where the local people have established this kind of a priority.

Soil Survey - A Tool for Modern Agriculture

James B. Boillot, Commissioner, Missouri Department of Agriculture, brought a welcome from Governor Bond and the Department of Agriculture. Mr. Boillot pointed out that we sometimes get involved in a particular area of work and fail to see the over-all influence of what we are doing. How do we in a special work area define the benefit to the over-all society? One of the governmental concerns is land use policy. Policy making must involve agriculturists as well as people interested in urban expansion. Must look at future food and fiber needs. There is a need for planned urban growth. Have to be concerned with interaction between people with different interests. Are we going to set aside the most productive soils for crop production? We must all become involved in making these decisions.

We need to decide if modern agriculture is compatible with soil conservation. What is the effect on various soil types

Special Area. Soil Surveys

Soil surveys on islands of the Pacific such as Guam, American Samoa, etc., are highly desirable for the planning and development of these areas. We have authority for making soil surveys of these islands, but limited resources end priorities have prevented their being made as yet. Studies are being made and recommendations developed. When the resources are available, soil surveys at the intensity needed for such areas will be made.

Resurvey of Obsolete Surveys

The normal useful life of a soil survey is about 25 years. Resurvey of an area is justified by advances in technology of soil science and by changes in land use that result in a more intense use of an area.

An area may be resurveyed when it is determined that the existing soil survey is obsolete because it has the wrong kind or level of detail, or both. A resurvey is carried out in the same was as any new soil survey.

Minimum Acceptable Standards

Soil surveys are the primary basis for many kinds of land evaluations (for taxation, rent, sale, loan, etc.) and for a host of use and management decisions many of which are extremely costly. Increasingly they are used to predict the environmental impacts of development activities and as a tool for land use and development regulation. Soil surveys must, therefore, be accurate, consistent, and reliable within defined limits. They all must be able to stand the twin tests of scientific and legal inquiry.

The minimum acceptable standards of quality of the National Cooperative Soil Survey are set forth in the Soil Survey Manual, soil memoranda, special handbooks, and official guides. Quality control of soil surveys is achieved normally through initial, progress, and final field reviews and established soil correlation procedures. Line and staff offices share responsibility for quality control of soil surveys.

Soil Survey Investigations

The goal of soil survey investigations is to support field operations and soil survey interpretations by scientifically sound research. The primary soil investigator in the soil survey program is the field soil scientist. In any soil survey, however, questions arise that cannot be answered with the tools available in the field or that require specialized knowledge in certain areas of soil science or related fields. The primary function of the soil survey investigations units is to provide help in these situations. The soil survey investigations units also conduct studies that by their nature are done more effectively at a regional or a national level, and they assemble information on soils or factors that influence the use and management Of soils and make it available to the soil scientist in the field. The use of remote sensing techniques is a part of these studies.

II

To make these soil surveys and interpretations available to large numbers of people for decision-making on a wide variety of uses. The most important uses are farming, ranching, forestry, recreation, highway planning, construction of pipelines and airfields, town-and-country planning of residential, industrial, and commercial development and locating areas of potential floor hazard. Soil surveys are needed for programs to protect the resources and improve the quality of the environment.

Individual land owners, engineering and development firms, and planning and regulatory agencies require soil surveys for decision-making. Currently, land-use planning activity at local and state levels is causing vigorous demands for more soil surveys.

Soil Survey Interpretations

The main objective of soil survey interpretations is to predict the behavior of different kinds of soils for specific uses, based upon observed relationships between soil properties and soil behavior. Interpretations are needed not only for current uses of the soil, but also for uses which may reasonably be expected in the future. Here we may be restricted by only two factors--one is the possible lack of knowledge about behavior in the potential use, and the other is lack of imagination or insight as to what are the potential uses of soils in given areas for which soil interpretations should be developed.

Reproduction and Distribution of Soil Surveys

Published Soil Surveys

It is an objective of the Soil Survey to publish soil surveys as soon as possible after the soil maps and the accompanying text manuscript are ready. The published soil survey is the principal record of the original data from each soil survey area. A standard series of Department of Agriculture publications is used.

Interim and Special Reports

The Soil Survey *is* responsible for making reliable soil survey information available to local users before it is published in the regular series. It is the policy to do this through interim and special reports. All of these reports must be thoroughly reviewed before they are released to ensure that they are of high quality, accurate, technically correct, and consistent. Duplication of effort in their preparation and the preparation of the manuscript for the published soil survey must be avoided.

Interim reports may be for part or all of a soil survey area. Such reports usually consist of copies of field sheets and supporting descriptions and interpretations.

Soil Information System

The Soil Information System is intended to improve the processing of soil survey data so that the large volume of soil information available can be effectively used by technicians and others to provide extent and location of soils suitable for specific crops and other uses; to reduce costs of soil survey publications by preparing tables, charts, and maps needed for publication and to recall data which will aid in the classification and correlation of soils nationwide.

Updating of Old Interpretations

Some published soil surveys have soil maps that are of good quality but the accompanying interpretations need updating. If new interpretations are needed, a supplemental text may be prepared to provide the needed interpretations. A plan for updating the interpretations should be prepared. The updated interpretations are prepared using the latest guides, criteria and standards.

III

To provide people with detailed interpretations for use in planning specific areas that are being developed.

Soil scientists, conservationists, and engineers are requested to make an increasing number of on-site technical soil investigations so that sound lend-use decisions will be made for specific sites or tracts of land. The number of these requests has increased yearly. On-site investigations are necessary for specific site selection and for design criteria for such uses as commercial, residential, or industrial development, as well as for dams and other structures.

Iv

To help SCS staff, legislators, cooperating agency people, and other governmental officials to understand the potentials of soil resources end the importance of knowing their limitations for various uses.

Users must understand soil information and be able to use it effectively. Training is necessary to insure that people understand the potential and limitations of soil resources for various uses. When soil information is released we should try to help users, representatives of user*, and key leaders and officials to understand the use and limitations of the soil information they have.

An Appraisal of Soil Survey Reports

Summary of presentation presented by William R. Oschwald, Professor of Soil Classification Extension, Department of Agronomy, University of Illinois at Urbana-Champaign. Urbana, Ill.

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Soil surveys are conducted to obtain facts about the soils of an area. The results are recorded in soil survey reports and may be used by people as an aid in making soil use decisions. People who use soil survey reports are potential target audiences for extension program efforts.

The purposes of this paper' are (a) to analyze soil survey reports as a means for communicating facts to extension audiences, and (b) to provide a focal point for discussion of reports and other methods of communicating soil survey facts. Hopefully, the analysis will result in discussion that will lead to improvements in the communication of soil survey facts.

Communication is the process by which messages are sent from a source to a receiver. A communication channel, such as a soil survey report, is a means for transmitting the message. The purpose of communication is to change the behavior of the receiver. The receiver may send a return message, or feedback, regarding the effectiveness of the communication process.

Soil survey reports are means for communicating soil survey facts to various audiences. Detailed (final), interim, and general soil reports are examples.

The modern soil survey report differs in map detail and emphasis from earlier models. The standard format of the modern report results in similar presentation and coverage of soil facts even in different geographic areas and for different audiences. Technical language, complexity of presentation, and time lag between field work completion and report publication are barriers to effective communication.

Potential users of soil survey reports are decision makers or advisers of decision makers. These potential users are likely to have little background in soil science and are likely to encounter difficulty in translating soil science terminology into their own language.

Soil survey reports can be improved so that soil survey facts are more effectively communicated to decision makers and other report users. Audience identification and preparation of reports for specific rather than general audiences are important first steps. The use of non-technical language where possible and clear definitions of necessary technical terms will help remove language barriers. Changes in format may be necessary to effectively reach target audiences.

Soil survey extension programs provide a means of improving communication of soil survey facts. Extension specialists can plan and implement educational activities to enhance communication efforts.

Research is needed to determine the effectiveness of various communication methods with different audiences. Soil survey methods are needed to provide soil facts quicker and at a lower cost without loss of benefit to users.

Soil Classification, North Central Region

Summary of remarks by Maurice Stout, Jr., Principal Soil Correlator, Soil Conservation Service, Lincoln, Nebraska

National Cooperative Soil Survey participants should get together more often than every two years. Would like to have the conference group cease to be an every other year organization. This could be partially accomplished through committee work over the two year period.

This region is probably leader in developing relations with local units of government to get inputs for soil surveys. In getting inputs we need to consider the whole job including publication.

The soil correlation unit in the MTSC correlated 45 soil surveys in 1973. There are 700 Soil-5 forms from this region in data banks at Ames, Iowa. The criteria for completing SCS-Soil-5 forms is not static and can be adjusted. Any change in criteria must be supported by data and documentation.

We should give careful thought to the workshop committees and to the objectives of the workshop. Members should function as a body continuously and meet every two years for personal contact.

We should arrive at methods for overcoming soil limitations.

Business Meeting

Chairman C. L. Scrivner asked Robert Grossman to summarize the meeting for publication. He accepted.

Material from the Soil Science Society committee on particle size distribution was handed out and discussed. Each discussion group was asked to consider the following question and report the results to the conference chairman.

> "Assuming that the professional organizations representing engineers, geologists, and disciplines other than soil science, would agree to common size limits of sand, 2 - .0625 mm; silt, .0625 - .002 mm; and clay, .002 mm; what should be the position of the soil science discipline?"

Joe Fehrenbacker, Don Bannister, and Larry Wilding were appointed as a nominating committee to select a secretary for the 1976 meeting of the conference to be held in Michigan.

Mike Stout reviewed the committee for recommending changes in soil taxonomy. The current committee members and length of tenure are as follows: Experiment Station members - Fred C. Westin, 1 year; Richard H. Rust, 2 years; Eugene P. Whiteside, 3 years. Soil Conservation Service - ~~Ted Miller~~, 1 year; Louis Buller, 2 years; Frank Sanders, 3 years.

Following adjournment of the conference session there was a meeting of the steering committee and discussion group leaders to outline the procedure to be followed in reviewing committee reports.

Tuesday am, April 9
Christian J. Johannsen, Presiding

Can Increased Agricultural Production Be Made Compatible With Soil Conservation?

Resume of talk by Harry M. Galloway, Ext. Agronomist, Purdue University.

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Farming has changed greatly since the 30's, farms are much larger, land values higher and gross returns much greater. For Indiana, average farms in 1935 had 102 acres; in 1969, 173 acres; acre values were $50.70 and $468.50 and all products sold $1,771 and $13,779. Farmers have become big businessmen with systems stressing timeliness and not always providing for protection of soil resources against abuse and particularly by erosion. Almost gone are the hay and small grain in rotation (51% 1935; 17% 1972). Financial pressures and low unit crop values have augmented this trend.

Between the two CNI inventory periods, 1959 and 1967, there was a remarkable decline in adequacy of treatment of erodible croplands in the heart of the corn belt (to an average 16% in Iowa, Illinois, and Indiana) but at the same time adequacy of treatment of land with wetness problems increased. Farmers have had to im-

The challenge is on the soil survey to describe for layman users such factors as where parallel terraces and other mechanical practices can be employed. Reports should indicate which tillage systems are adapted on important associated soils stressing the more conserving systems wherever adapted. Substrata characteristics dictating unusual ditch design and maintainance should be pointed out. Nitrate loss possibilities should be indicated by soils and those with possibilities of denitrifying N and thus making good sinks for waste disposal should be pointed out. Information on pesticide inactivation in surface soils, soil workability for primary tillage, probable irrigation response and dangers of soil losses in fall plowing would all be highly useful to farmers.

Environmental and planning agencies could benefit greatly by better quantification and indexing of facts known about behavior of soil individuals and soil groups shown on soil association maps. Among the needed facts are productivity indices, and erodibility and drainage class as well as septic tank indices.

Correlation of information available in a number of places will be necessary to get such facts into our reports so they can be used in teaching managers and regulatory agencies.

To be most useful soil and land characteristics and adapted practices should be presented in digital forms. They can then be entered for trials in the farm cropping models commonly used by university Extension programs to help managers assess advisability of important management changes. A good example is the quantifying of conventional and no till systems as to production potential, cost of operation and soil loss potentials. Values of soil losses can be estimated (losses of nutrients plus costs to community) and a production model can be easily run twice. On one run variable values for conventional tillage would be used; on the second those for no-till. With other cropping costs equal the two runs can quickly indicate relative advantage to the operator and help him estimate trade-offs.

Modern operators will accept and benefit from such facts presented so he can analyze them in his own context. He won't normally be influenced much by exhortations or threats to farm with more care nor will the public at large impose such restrictions on him unless he is a flagrant violator.

Hi& production with conservation will be possible to achieve but it won't be easily attained. The soil survey has some of the facts needed to make such harmony possible! Increased cooperation with university experiment stations and extension services as well as with other state and national resource agencies is more than ever needed in design of surveys and reports. Results can be improved so that values inherent in the surveys can be more fully realized.

Discussion Group 3
Leader: Larry Wilding

	Recorders
H. R. Finney	Committee 10
Jim Lee	Committee 8
Bill Eberle	Committee 9
J. Bouma	Committee 11
Bob Turner	Committee 4
Chas Fisher	Committee 5
Steve Shetron	
Dave Lewis	Committee 7
Edward Bruns	Committee 3
Richard Guthrie	
Mike Stout	Committee 6
Lacy Harmon	Committee 1
Ray Sinclair	
A. J. Klingelhoets	Committee 2
Jack Densmore	
Kenneth Hinkley	

Discussion Group 4
Leader: F. M. Schilley

	Recorders
Bill McKinzie	Committee 3
E. P. Whiteside	
W. R. Oschwald	
Neil Smick	
Gil Landtiser	
Kermit Larson	Committee 1
Delbert Mokma	Committee 5
John Elder	Committee 7
Paul Johnson	Comitee 8
Frank Sanders	Committee 2
Roger Haberman	Committee 10
Richard Jones	
George Huddleson	Committee 9
John Brubacher	Committee 11

Thursday am, April 11

An Ozarks field tour was held on Thursday morning. Narrators on the buses were J. W. Whitfield and Ron Ward, both of the Missouri Geological Survey and Water Resources. The following stops were made:

(1) Soils and solid wastes disposal in areas underlain by carbonate rocks. Soils - C. L. Scrivner, Solid Waste Disposal - Bill Whitfield.
(2) Sink hole - losing streams - Bill Whitfield.
(3) Ha Ha Tonka Spring - Jim Lee.
(4) Miangua Valley Overlook - Geomorphic history of the Ozards - Ron Ward.

Thursday pm, April 11
James H. Lee, Presiding

Committee chairmen for committees 1, 2, 3,4,5,7, and 8 reported to the members of the conference. Each chairman summarized the comments from the four discussion groups. Delbert Mokma reported on committee 5 for Ed Runge. The 10 committee reports were voted on individually and accepted by the conference membership. The committee reports are attached to the minutes of the conference.

Thursday Evening Dinner

Alex Atlow, U.S. Park Service, Van Buren, Missouri gave an entertaining talk and slide show about Ozark rivers.

Friday am, April 12
C. L. Scrivner, Presiding

Reports were given and accepted for committees 9 and 10.

Francis Hole was nominated by the nominating committee and was elected as secretary of the 1976 work planning conference.

Tom Fenton reported the NCR-3 had voted to extend the membership of Fred Westin, Richard Rust, and Eugene Whiteside on the national committee for soil taxonomy for one, two, and three years respectively.

Hollis Omodt and Tom Fenton were elected as NCR-3 representatives to the National Soil Survey Work Planning Conference.

Don Franzmeier reported that NCR-3 recommended that NCTWPC give a vote of confidence to the following proposal:

(1) We accept the offer of SSSA to print, distribute, collect subscriptions, and conduct other duties related to the publication of Soil Survey Horizons subject to the judgement of the editorial board.

(2) The content of Soil Survey Horizons will be the responsibility of the editorial board which is to be composed of people from the Regional Technical Work Planning Conferences.

(3) Composition of the editorial board should gradually shift from within the NCTWPC to representatives from all four Technical Work Planning Conferences.

(4) The present editorial board consists of D. Franzmeier, editor, J. Bouma, R. Guthrie, and C. Johannsen.

The conference approved the recommendation.

Mike Stout reported that all diacussicn groups favored the adoption of the change in the particle size distribution proposed by the Soil Science Society. The conference voted to support the adoption of the pmposed change.

Workshop chairmen, C. L. Scrivner, turned the session over to Rod Harner, incoming chairman. On behalf of the conference attendees Rod Harner thanked Chairman Scrivner end those who helped him for a well run conference in a relaxing atmosphere.

Rod Harner
Secretary

<u>1976 Officers</u>
Rod Harner, Chairman
Francis Hole, Secretary

<u>1976 Steering Committee</u>
Rod Harner
C. L. Scrivner
Francis Hole
Tom Fenton
Maurice Stout, Jr.

Separate Session, NCRTWPC
SOIL CONSERVATION SERVICE
Tuesday, April 9. 1974
Tan-Tar-A Resort, Osage Beach, Missouri

Maurice Stout, Jr., Chairman

TOPICS OF DISCUSSION

A. M. Session--10:00 to 12:00
P. M. Session-- 1:00 to 3:00

1. Task Force - Vaught Committee
2. Manuscript Problems
3. Progress Report on Interpretations, ADP
4. Soils Memorandum-12
5. Series Descriptions - Progress Report
6. Acceleration of Soil Surveys
7. Registration of Soil Scientists
8. Coordination of T/K Values
9. Soil Interpretative Maps - MIADS, AMS
10. Land Inventory and Monitoring

Other topics suggested:

Temporary Assignments, Technical Service Center, and other States
Ortho-color geological survey maps
Use of color, false color, infrared photography
Anticipated revision of Soils Memorandum-2
Training - University of Tennessee
Future interim reports - policy memorandum
Is ERTS imagery being used?
TSC - operating procedure during moving period
Coordination of class and subclass criteria
Handling of phases in official series

Mike Stout

Discussed ideas for published soil surveys including improving the section "How to Use the Soil Survey" so as to make the survey more easily used. List map symbols, mapping unit names and where to find information in the table of contents. This would eliminate the guide to mapping units. Put technical soil profile description in the back of the report. Have key mapping unit which has thumbnail description of the soil.

Roy Smith

Still getting manuscripts that have not been checked against the annotated checklist. Must be checked by the party leader and the state office. When he checks a manuscript he first checks the series classification, drainage, and premeability against the official series description. If any of these are wrong they create problems throughout the manuscript. Problems in manuscripts go back to the management of the survey from the very beginning including initial design of legend and organization of the handbook.

Members of the conference objected to not seeing changes that are made in edited copy of reports by other reviewers. Do not know what changes have been made until galley comes. Meaning is sometimes changed. Also the state doesn't know if suggested changes in the edited copy are being included in the galley copy.

Robert Turner asked if contract editor could send a copy of corrected pages back to state for review and then omit galley review.

Dick Johnson

Soils-5 forms will be submitted to Ames for variants. Camera ready copy will be returned to the state.

A problem with Soils-5 forms is that whole range of series is sometimes not covered, such as the whole range of textures. If there is disagreement with interpretations send in supporting data with recommended changes. Differences between states, such as crop yields, need to be worked out between states before Soils-5 forms are submitted. Many of the errors on the forms are because guidelines are not being followed.

Jack Densmore commented that the first species listed in the preferred species column on Soils-5 forms is the species ordinated to.

Joe Casey remarked that need to send original or first carbon of print-out material to cartographic for reproduction. Other copies do not reproduce well.

Mike Stout

The soil correlation staff will take part in more progress field reviews to solve problems earlier. Would it work to have a review about one year prior to completion to go over material in the office?

Post - Cooperating agencies want to go the field. They consider office time as not profitable.

Stout asked for suggestions to be sent in for participation from the Principal Correlator's office.

Proposed Soils Memorandum 12 was discussed. The consensus of the group seemed to be that the task of gathering data should be part of the state APO and involve all disciplines.

Registration of Soil Scientists

About six states are forming an organization for soil classifiers and working toward registration. North Dakota has registration program. Ted Miller briefly reviewed what has happened in North Dakota. Nineteen are registered to date. Application fee is $25.00 and $100.00 in addition if accepted. Robert Grossman is chairman of SSSA committee on registration of soil scientists. Committee is working on national certification program.

Robert Turner

Principal Correlator's office had an input into 500 series descriptions during past year. Established series are no longer coming out on yellow because of (1) cost, (2) time factor, and (3) there have not been many changes from yellow to blue copy. Standard series description and Soils-5 form are being published on two sheets, folded. Series descriptions must he updated to be printed with the Soils-s form. The range in characteristics and competing series section are sections that need most work. In range of characteristics underline the horizon designation the first time it is used in order to flag the horizon. A proposal has been made that phases (other than slope and erosion) will be listed following the range in characteristics. In the competing series paragraph all of the series in large families must be listed.

MINUTES OF THE 1974 NCR-3 MEETING
Osage Beach, Missouri
April 8-12, 1974

The meeting was called to order by Acting Chairman Scrivner at approximately 10:45 a.m., April 9, 1974. Chairmen Hollis Omodt was absent because of illness in his family. Those in attendance were:

Alaska - No representative
Illinois - J. B. Fehrenbacher, W. R. Oschwald
Indiana - D. P. Franzmeier, Harry Galloway
Iowa - T. E. Fenton
Kansas - W. N. Eberle
Michigan - E. P. Whiteside, [illegible]

for this group to get together to exchange ideas end to have discussions concerning the soil survey program in the region. It was also pointed out that at this particular meeting Extension people had been invited; The Extension people concerned with land use are closely tied to the people in soil survey, and there is a need to get together on a regional basis to discuss the problems associated with soil surveys and land use. Dr. Newman pointed out that in the past we have been meeting with NC-109, and that as long as NC-109 continues to exist we could meet with them on an annual basis and divide the time between NC-109 and NCR-3. Gene Whiteside noted comments by Mike Stout concerning a need for a regional meeting of the cooperating agencies involved in soil survey on a yearly basis.

Klaus Flach pointed out that the reason for meeting in alternate years on a regional basis was that the National Cooperative Soil Survey Workshop was held in years alternating with the regional meetings. Joe Fehrenbacher noted that fall meetings for NC-109 are a necessity because of the need to put together a research report. Gene Whiteside noted that the NCR-3 group had sponsored NC-109.

Clarence Scrivner expressed the view that there was a need to meet once each year to check notes and discuss the problems associated with the soil survey, and also that this committee doesn't need to get too involved with projects. The important thing is the interchange of ideas; the actual action the committee takes is not the most productive part of these meetings.

Wilding pointed out that not all states in the region may want to participate on a yearly basis. Franzmeier stated that the kind of thing NCR-3 is concerned with is coordination of soil survey activities. If we feel it is important. to meet on a yearly basis, we should let our directors know. Dr. Newman again pointed out that we could meet. with NC-109, with separate discussion times for NCR-3. Wilding stated he did not believe the "R" in NCR meant regional but stood for research. The Northeastern Committee, comparable to the NCR-3 Committee, recently changed its title to Coordination Committee. Wilding moved that the NCR-3 group go on record in favor of meeting at least once each calendar year. The secretary will so inform Dr. Davis & he in turn will transmit this message to directors in the region. Dr. Newman raised a question as to whether or not this would ever involve meeting more than once each year. Franzmeier pointed out that at the present time we are on an 18- and a 6-month rotating schedule. Joe Fehrenbacher seconded Wilding's motion, and there was a unanimous vote cast in favor of the motion.

Clarence Scrivner added that in coordinating the present meeting, the possibility of a joint meeting of NCR-3 and the Soil Conservation Service had been discussed. The idea of the joint meeting was that the things we discuss are not exclusive to our group, and that SCS people would like to hear what we are thinking. We, in turn, are interested in their meetings. However, according to Scrivner, Dr. Davis had advised that separate meetings be held.

Soil Taxonomy Committee

At the Rapid City meeting three men were elected to serve on the Soil Taxonomy Committee. Fred Westin was elected for one-year and three-year terms, Dick Rust for a two-year term, and Gene Whiteside for a three-year term. There has been no activity on this committee during this time period. Therefore, the question to be discussed is "Should we continue with this same committee and extend the time period for the people elected? Do" Franzmeier made a motion that we extend the expiration date of the Soil Taxonomy Committee members' terms of office for a z-year period. The motion was seconded by Chuck Frazee. The vote was unanimous in favor of the motion. Therefore, the time periods listed for Westin, Rust, and Whiteside will continue as indicated after their names from this 1974 meeting

Interstate Correlation of Laboratory Data (reported by Wilding)

L. P. Wilding briefly reviewed the thoughts behind establishment of this committee. The goal is to study the laboratory correlations on selected samples. Major questions to he answered are: What errors of laboratory determinations do we have? How do we apply the results obtained from different laboratories to taxonomy and classification? 1" our previous meeting in Madison, four or five states expressed interest in this committee.

Wilding stated that the committee is developing a questionnaire. He has talked with Bob Grossman, Director of the SCS Lincoln Laboratory. George Holmgren of the Lincoln Lab is working through the Soil Science Society of America project on sampling of 10 to 15 pedons for ASTM samples. Wilding pointed out that we can be involved in this type of project, but also it was felt there was a need for a regional supply of samples. On the regional basis we can expedite the project, and the regional committee would not be in conflict with the national committee. Wilding then distributed a limited number of the questionnaires that will later be sent to people in the region.

When the committee was formed, approximately five states expressed interest. Other questions to he answered include: What routine properties are measured in laboratories? How many samples should he analyzed? What kinds of samples? Who should the samples be distributed to? Should it be limited to the North Central Region? Or should it he limited to those interested in pedology? It was suggested that each person should be responsible for storing the samples he collects.

Such analyses as soluble salts are not. needed in some areas, so it would be necessary to indicate the analyses that are appropriate to the samples. Other questions raised concerned the following: Is fumigation of samples necessary? The idea of the committee is to attempt to generate inter-lab coordination. One way of comparing the data is for all to report data. What kinds of differences can we expect between labs? Reference samples would help resolve this problem. Dick Rust also pointed out that this would help to support correlation work.

Klaus Flach reported on the progress of the soil data bank. He reported there was some delay in the progress. One problem is where should the samples he stored? Twelve soils are involved, but they are very large samples.

The SCS labs in the past have exchanged samples. They are run through in one group. They are useful within labs and also for checking. Klaus pointed out that cation exchange capacity in the California lab has gone up 15 percent in

10 years, and stated that this is probably the result of long-time systematic changes. Klaus also spoke of the need for more analyses concerning clay minerals, liquid limits, and plasticity limits. Wilding replied that he thought these could be another phase of this particular project, that different labs are involved in different types of analyses. Klaus again mentioned benchmarks soils and the fact that it would be nice to integrate benchmark soils at the state, regional, and national levels. Klaus will have a cooperative soil survey program concerning this.

Don Franzmeier raised the question of replicates. At present SCS labs have only a single analysis. Neil Smeck reported that in Ohio duplicates are run on each analysis in their laboratory. They will accept a certain amount of error, but they feel duplicates are better. He felt there was a need for duplicates on this project, and this seemed to express the feeling of the group.

Gene Whiteside raised the question as to the kinds of soils the committee is interested in. Michigan might not be interested in the soils of the Great Plains States. Wilding pointed out that the purpose of the project is to collectively evaluate our confidence in the analyses. Again Whiteside pointed out that not every state is involved in every determination. Smeck pointed out that soluble salts are not run in every laboratory, and every lab may not want to do them.

Wilding raised the question as to the sort of distribution of the samples. What period of time? Each state to share its own samples? What type of preparation? Should they be passed through a 2-mesh sieve? 10-mesh? What type of uniformity? The methods to be used will be cited, and there is no direct implication by comparisons.

Klaus pointed out that in the laboratory publications there is a procedure for presenting data in reports. He would favor using the method code so that the method used can be coded. The correlation of methods would be appropriate. There should be a liberal policy on the data to be included in the reports.

Prime Agricultural Land (reported by Fenton)

Fenton reported on the progress of this committee. At this stage he reported that not all committee members had responded to a letter asking for ranking of criteria for soils in their (committee members) respective states. Some of the replies indicated there was a fair correlation between land areas they would consider their prime agricultural land and the Soil Conservation Service capability system of classification. In some states either Class I or Class I plus Class II would closely approximate prime agricultural land for row crop production. However, as pointed out by several states, the capability classification would not be a good indicator of prime agricultural land. An example given covered areas of muck soils which are Class III or lower, yet produce more dollars per acre when used for vegetable crops than much of the Class I land. Thus, it appears that each state will have to be asked to make a decision as to their ideas of the best use of the land and how they would classify that land for that particular purpose.

Thus, as Fenton summarized, there will be a need for different classes of prime agricultural land -- perhaps prime agricultural land for row crop production, prime agricultural land for vegetable crop production, etc. Fenton reported that when all subcommittee members have replied, he will summarize their recommendations and send them out to the entire NCR committee with additional requests for information. The feeling was expressed that this is a worthwhile project and that this group, if any group can, should be able to come up with some type of rating system for the soil areas in the North Central Region. The work of this committee will continue.

At the conclusion of this report a break was taken for lunch.

Dr. Newman's Remarks

The afternoon session was begun by Dr. Art Newman of CSRS. He has been involved in the Russian visitor program which is an exchange of scientists between countries.

pointed out that most administrators recognize the need for increased funding. Therefore, there may be a good chance for some increase. At the present time there is no time schedule for the budget, and it could be December before the funds are out. The question was asked of Dr. Newman if the funds would be earmarked. He replied that the directors of agriculture experiment stations do not like earmarked funds, but at present some assistants to the Secretary of Agriculture think earmarking of funds will be more prevalent in the future.

Soil Survey Horizons (discussed by Don Franzmeier)

The Soil Science Society of America has offered to published Soil Survey Horizons. There was some concern expressed at the National Meetings that soil scientists would lose control of the material published in Soil Survey Horizons under this arrangement. Franzmeier suggested the following recommendations from NCR-3 be taken to the North-Central Regional Planning Conference.

1. To accept the offer of SSSA to print, distribute, collect subscriptions, and conduct other duties related to the publication of Soil Survey Horizons, subject to the judgment of the Editorial Board.

2. The content of Soil Survey Horizons be in the hands of the Editorial Board which is to be composed of persons from the Regional Technical Work Planning conferences.

3. The composition of the Editorial Board to gradually shift from representatives within the North Central Regional Technical Work Planning Conference to representatives from all four technical work planning conferences. (The present Editorial Board consists of Don Franzmeier, editor, and J. Bouma, R. Guthrie, and C. Johannsen, associate editors.)

Some of the comments associated with these

<u>Format of Soil Surveys</u> (discussed by Harry Galloway)

Harry discussed in a general way the present format of the soil survey publications, stressing that there is a need for an educational tool. There is a trend toward more automation in the months and years ahead. The question that we must ask ourselves at this time: (1) Is the report organized so that it can be used as an educational tool? To try to answer this question, a series of questions were sent out to people on the committee.

IS it possible, or do people use the soil survey report independently of technical help? Are reports organized for technicians? Do limitations tell the story? We have various degrees of limitations. How might these limitations be overcome? Use of terms such as slight, moderate, or severe? A whole county can have severe limitations. Just to say this is not enough, in many cases. Tabular presentation of material is probably more difficult to use than the present format. Possibly material should be discussed in terms of association in tables, rather than an alphabetical list of series, etc. There is some confusion on engineering data. Does it come from specific sites, or are these actually estimated engineering properties?

<u>Soil Survey Reports and Introductory Meetings</u>

In many cases visuals in the report aren't in the proper format to use. How do we motivate an audience in soil survey meetings? There is a possibility that too much automation may limit the use of the soil survey report.

It is proposed that perhaps the report could be divided into two parts. One part would contain the facts on soils plus the maps; the second part would be an interpretive type of report. A series of reports could be oriented towards specific groups or audiences. It is important that a soil scientist take part in the meeting. Interim reports have provided a means of exploring new ways of presenting information. In some states experimentation has been in progress where reports were written for some specific user groups. It was Harry's feeling that reports should emphasize soil differences. He pointed out the use of management groups in Michigan to this end.

There are various needs, depending on the type of soil information requested. For example, reports could be centered around certain land resource areas of which there are 12 in the United States. There could be similar reports prepared on an area basis. Certainly interpretive reports could be prepared for a several-county area when soils are common to these areas. Another comment made was that the people of a survey area should be a part of the program. Another point was that the format of the present report is contradictory. It is said to be written so that a sixth-grade educational level could understand it, and yet descriptions that are very technical in nature are included. General comments from the group indicated that perhaps the present report does not completely satisfy everyone.

There is a need to strengthen the mapping unit section of the report. There is also a need to have specific types of interpretive reports directed to specific audiences. The view was expressed that the reports should include present technology and how to overcome limitations. There is a need for greater cooperation among different disciplines when the report is prepared. And certainly Extension needs to be a part of the program. At the present time, in terms of financial support, they are not a part of the present program. Also, the needs of the users need to be brought into the total educational program. Interdisciplinary research efforts that are pertinent to the survey area need to be recorded. Dr. Galloway stated that the work of this committee will be continued, and it will discuss other ways of suggesting changes for improvements in the soil survey report:.

NCR-3 Business

Dr. Joe Fehrenbacher was elected secretary and will serve with T. E. Fenton, incoming chairman, until the next meeting.

Hollis Omodt and T. E. Fenton will be the representatives from this region at the National Work Planning Conference in 1975.

Respectfully submitted,

T. E. Fenton, Secretary

North Central Region61 Technical Work-Planning Conference
of the Cooperative Soil Survey

Osage Beach, Missouri
April 8-12, 1974

Report of Committee 1, Engineering Application
end Interpretations of Soil Survtya

The charge of this caittee we6 to:

1. Review the "Guide for Interpreting Engineering Uses of Soils".
2. Ask what new interpretations are needed.
3. Concentrate on refinement of estimates for classes of dispersion of soil erodibility.
4. Review the "Guidebook for Users of Soil Surveys" that was prepared at the Western Regional Conference.

Recommendations for the "Guide for Interpreting Engineering Uses of Soils":

The guide for soil limitation6 for dwelling8 need6 to set limits on the thickness of horizons with moderate or severe shrink-swell that will effect the limitations for dwellings. For example, a 24-inch horizon with moderate shrink-swell in the upper 36 inches of the soil probably will not [illegible]

Systems using a numerical weight factor on items affecting use of a soil for a specific purpose needs to be studied for use in SCS. Purdue University developed a numerical procedure that ● nab1.s an individual to compare two soils, both having . severe limitation for septic tank absorption field,, to determine which soil has the soil properties less costly to overcome. At the present time, the wildlife guides use numerical values to determine suitability. The numerical weight factor may be more applicable when used locally or statewide. It will probably need to be in conjunction with

Delete OL, OH, and Pt from guide sheet 10 -- roil limitation ratings for local roads and • treetr and guide sheet 11 -- suitability ratings of soils . . sources of road fill. These unified soil groups can be covered by a footnote to indicate they are unsuited.

Recommendations on Advisory Soils-14 dated May 8, 1973, "Guide for Rating Limitations of Soils for Disposal of Waste," are:

- A quantitative definition of infiltration rate is needed. Infiltration rate is not synonomous with permeability of the Ap horizon. Definition of infiltration rate should be framed in terms of en operational procedure or test and for the vegetation of the soil at that time.

- Organic matter is an important soil constituent in regard to cation exchange. Since the amount of organic matter influences the soils ability to remove or inactivate pollutants from waste, it or CEC needs to be made part of the rating criteria.

- The available water capacity breaks at 7.8 inches in tables 1 and 2 and seems to indicate a degree of precision we do not have. The classes of available water capacity to a depth of 60 inches need to be used. They are slight - more then 9 inches, moderate - 3 to 9 inches, and severe - less than 3 inches.

Should guidelines be developed for lot sizes of homes having septic tank absorption fields? NO. Area needed for • eptic tank absorption fields can be determined but what is the environmental impact when considering hazard of pollution and wise land use? Some communities are recommending up to 10 to 20 • cre lot sizes in an effort to control development. Do we want to get into the decision making role? No. State and local governments need to make these decisions hopefully based on technical knowledge.

A list of footnotes for the SCS-Soils-5 need not be provided at the regional level. Although a list of commonly used footnotes could be helpful but should not be mandatory. Let's retain a spot where soil scientists can express • little individuality.

The use of percent elope on SCS-Soils-5 will be continued rather than using letter designations for slope.

The engineering subcommittee of the organic soils tank has developed a penalty rating system for interpretations. One application -- -11 buildings with basements -- was selected for trial. The subcommittee soon realized that interpretations for organic soils are of little use unless they correlate with interpretations for mineral soils. Attached is a copy of the penalty ratings developed by the subcommittee (a part of the Task Force Report to the 1973 National Work Planning Conference). This is a first approximation and is now being tested. A prime reason for the penalty system approach is to get a more quantitative com-

Following • re two ● wpectcu of the preceding discussion that warrants your suggestions:

- Should one system of interpretations be developed for mineral and organic soils?

- Should th6 penalty rating approach be explored more fully for application to soil interpretations?

The penalty rating approach needs to be explored more fully for application to soil interpretations. The penalty rating approach would help distinguish between various degrees within slight, moderate, or severe limitations. Must be careful because the use of numerical values could lead to the implication of more accuracy than actually exists.

With emphasis on production of farm crops and environment, ● groecaic interpretations such es fertility in terms of available P and K in the subsoil and organic matter content relationship to the use of herbicides need to be developed. In many soil surveys these types of interpretations will be used more thee many nonfarm interpretations.

Some of the terminology on the SCS-Soils-5's is confusing. The use of the term "percs slowly" for drainage, irrigation, etc., is misleading. Th6 term was developed for septic tank absorption fields. This term has been bounced back and forth - it is one of the reasons that some users and states fed it necessary to rewrite the interpretations or use separate state forms. The meaning of the term "percs slowly" needs to be clarified by changing it to "percs too slowly" so permeability class is not inferred. Additional terms need to be added, e.g., topography.

Guides for rating soils for lawns and gardens and golf fairways (attached) need to be in the "Soil Survey Interpretations Handbook". Use of these guides may not be required in all soil surveys but the guides will assist in answering questions when they arise.

- Criteria for soluble malts needs to be added in the guide for soils for lawns and gardens.

- Narratives are needed for guides for rating soils for lawns and gardens and golf fairways. They could possibly outline the use of recommended species, irrigation, etc.

What soil studies, with and without laboratory assistance, are needed so soil interpretations can be more exact? Also, what ways can a soil be manipulated to overcome 6 moderate or severe limitation in terms of uses involved with engineering? Study of resistivity, water tables, frost potential, and water movement on most soils would help in preparation Of many soil interpretations. For example, more information on resistivity of soils helps refine corrosivity ratings. The ways in which most soils cm be manipulated

Rey S. Decker's paper entitled "Identification and Influence of Dispersive Clays on Erosion Potential of Soils" may help refine the estimates for classes of dispersion of soil erodibility as related, for example, to "K" values. Have four classes based on the crumb test as described on page 5 of Rey's paper. The information needed to determine the class can easily be performed. Classes of dispersibility would relate to the operation. Dispersibility of a soil is not known but the reaction to the test is known. The user makes the judgment whether to accept dispersibility information as ● efficient or get more information. The recommendation is that Rey's procedure be used if it improves the accuracy of the "K" value.

The Western Regional Technical Work-Planning Conference of the Cooperative Soil Survey (January 1972) has a 96 page "Guidebook for Users of Soil Surveys". Advisory Soils-9 dated March 9, 1973 transmitted au outline for a "Soil Survey Interpretations Handbook". Is the handbook arranged in the most useable way and should certain sections similar to sections in the guidebook be added? Parts 2 and 3 of the handbook right logically follow sections 4, 5, and 6 rather than precede them? If the handbook is to be for "users" meaning the general public, the section IIC - Factors of Formation, and V - the National Cooperative Soil Survey of the guidebook would be good additions. The handbook and guidebook at this time serve two different purposes. The handbook states policy whereas the guidebook informs users about soil surveys.

This report contains the changes made at the meeting in Osage Beach, Missouri.

This committee should be continued.

Charges for the committee to consider in 1976 are:

1. Review guide for rating soils for potential frost action,
2. Review ● ystaas wing numerical weight factor on items affecting use of a soil for specific interpretation.
3. Review items affecting use in guides of soil limitations for specific interpretations.

1/ Rate slight if light silty clay loam with a mollic epipedon or mollic intergrade epipedon.

35

Coarse fragments in surface: percent by volume	Less than 3 pct	3-15 pct	More than 15 pct

ENGINEERING INTERPRETATIONS
for Small Buildings with Basements

PENALTY FACTORS AND RATINGS

DEPTH		ORGANIC (Including Limnic) OVER-				MINERAL OVER-	
	Rock	Frag. Skel. Rippable Bould.	Sandy Sediments GP,GN,SP SW,SC,SM CL/PI<15	Clayey Sediments or Platy Rock CH,MH	Loamy Sediments ML CL/PI>15	Rock	Frag. Skel. Rippable Bould.
< 1m (< 40")	200	140	100	90	80	80	50
1-1.5m (40-60")	200	160	130	120	110	50	20
1.5-3m (5'-10')	180	180	160	150	140	20	0
3-6m (10-20')	200	200	180	170	160	10	0
> 6m (>20')	200	200	200	200	200	0	0

<-- One or Other -->

SEASONAL HIGH WATER TABLE (Depth)	
< 75cm (<30")	80
75-150cm (30-60")	40
>150cm (>60")	0

FLOODING Percent Probability	
None	0
0-2%	50
2-10%	100
>10%	200

FROST ACTION	
GW,GP,SW,SP	0
GM,GC,SC,CH,OH	5
ML,CL,OL,MH,SM	10

ROCKINESS (Percent outcrop)	
< 2%	0
2-10%	20
>10%	40

STONINESS (Mineral soils only) (Aerial percent)	
<0.1%	0
0.1-3%	15
>3%	30

SHRINK-SWELL (Mineral layers only (COLE)	
co.03	0
.03-.06	5
.06-.09	10
7.09	20

UNIFIED CLASS (Mineral soils only)		
SANDY	GW,GP,SW,SP GM,GC,SM,SC CL/PI<15	0

North Central Regional Technical Work-Planning Conference
of the Cooperative Soil Survey

Osage Beach, Missouri
April 8-12, 1974

Report of Committee 2, Soil Morphology
and Soil Family Criteria

The charge of this committee was related to soil survey interpretations as affected by soil morphology and soil family criteria. In developing this charge, the committee members were asked to develop phases of selected families which contain series too diverse to assign one set of interpretations. Phase criteria such as slope and erosion affect interpretations in obvious ways. If these and other critical soil properties are identified for each family, then perhaps the family can be made more useful in making interpretations.

Depth to some kind of restrictive layer is the property mentioned most by committee members. At the 1972 conference, depth as a family criterion was discussed because of the major differences in interpretations among series of the same family in some subgroups. Using depth to a restrictive layer as a basis for separating phases of families would emphasize the distinctions we now make at the series level.

Another property related to interpretations that was mentioned frequently is permeability. Engineering uses of soils such as sewage lagoons, septic tank filter fields, and ponds are critically affected by this property. Differences in permeability readily account for interpretive differences among series of the same family.

A consensus of those responding indicates that the idea of interpreting families by phases deserves further study. The report of Committee 2 submitted to the 1972 conference suggests that major differences in interpretations within some families may have resulted in a failure to use families as interpretive groups, At least two responses reiterated the necessity for subdividing families in order to make logical interpretations.

Apparently there are no instances where soil families are being used as interpretive groups in this region. This discovery is not surprising when viewed in the light of past discussions. I was able, however, to obtain two examples from other regions for the MTSC files. Dr. F. F. Peterson at the University of Nevada, Reno sent me a copy of a Reconnaissance Soil Survey of Railroad Valley, Nevada. The mapping units in this survey were phases of families or groups of families. Another example came from the Northeast Technical Service Center, Principal Soil Correlator, Upper Darby, Pennsylvania. It consists of two parts: (1) an alphabetical index of soil series and their relationship to basic groups of similar soils and (2) a numerical index of basic groups arranged by levels of the soil taxonomy. The second part consisted of phases of families which were used to develop computerized interpretations for soil series in the Northeast.

In summarizing the activities of this committee, the following statements are offered as recommendations to be considered by the conference:

1. Phases of soil families are useful in grouping soil series for interpretive purposes. Application of this idea needs further study.

2. Neither families nor phases of families are being used in this region as interpretive groups. Unless a need is shown, there is no particular reason to promote their use.

3. The work of this committee should be continued in order to consider problems dealing with morphology and soil families. As the activities of the committee overlap those of Committee 4, these two committees should be combined. A new committee could consider any activity related to soil morphology and Soil Taxonomy. Perhaps the new committee could have a direct relationship to a regional work group responsible for processing changes in Soil Taxonomy. This recommendation has been discussed with the chairman of Committee 4, who feels that such an arrangement would give continuity to a group considering changes in the taxonomy.

Richard 1.. Guthrie - Chairman
March 21, 1974

Report of Committee 3: Organic Soils
North Central Region Work Planning Conference of the Cooperative Soil Survey, April 8-12, 1974

The committee report consists of three sections as outlined below. The appendix on agricultural interpretations mentioned in the first paragraph of Section II has been omitted. It is currently in the process of study and revision.

Addendum to Committee 3 Report

Summary of discussion of NCRWI

The Committee 3 report was discussed in three of the four discussion committees. Only a handful of persons in each group worked directly with organic soils. As a result, a high proportion of the discussion time was spent giving the groups background information on work of the National Committee on Organic Soils. Many of the participants felt unqualified to make decisions on the key issues.

Interpretations for Agriculture

The discussion groups indicated that one system of interpretations should encompass both mineral and organic soils and that the numerical approach for making interpretations should be developed and tested. Two groups wanted to use positive numbers rather than penalties, i.e. the best soil has the highest number. One group favored the penalty approach. One group thought the development difficulty aspects should be left to the user. Several thought the agricultural suitability groupings should be by geographic areas, i.e. climatic zones. Guides for specific crops should be formulated for a given region.

Comment by Chairman

The open-ended numerical rating and the penalty approach were used hand in hand for development and testing of the proposed system. The open-ended system allows one to array the soils in relative order without immediate concern over the fit of absolute numeric differences within a given scale. It is difficult to use a positive progression from poor to good with the open-ended system because one does not know what number to put at the top. Once the system has been developed and tested, and we have a better idea of the relative numeric order of various ratings, then the scale can be compressed and inverted to give a positive rating system if that is considered more desirable.

Interpretations for Engineering

Two discussion groups favored one system of interpretations for mineral and organic soils, and favored the numeric approach to making ratings. One discussion group framed the question "are interpretations for engineering uses needed for organic materials?". There were two votes yes and one vote no with nine abstentions. One strong objection to making engineering interpretations on organic soils was registered on the grounds that organic soils are unsuited for engineering purposes and further elaboration is unnecessary. There was also one strong objection to numeric ratings for engineering interpretations of mineral soils. One group suggested that a better example than "small buildings with basements" should be chosen for testing the numeric approach for making engineering interpretations. The term "trafficability" was objected to in reference to use with cattle grazing. One group thought that Form 5 should be revised as needed to encompass organic soils rather than have a separate form for organic soils.

Taxonomy

In general the groups did not feel qualified to comment on the taxonomic proposals. The general flavor was that the proposals for limnic materials and for dropping of unused taxa seemed reasonable and should be adopted. One objection to the limnic proposals was that materials of like genesis, i.e., aquatic deposition by animal life, were fragmented. One objection to dropping unused taxa was based on timing, not principle--perhaps it is too early to drop the taxa.

Research

One group seconded and emphasized the need for research on (1) the relationship between wilting point for plants and water content of the soil and (2) the field evaluation of wind erosion. There is currently work underway on some shear testing, principally comparison of measured shear strength with various parameters used to characterize Histosols.

Charges to Committee

The chairman thinks there is sufficient work to warrant committee action over the next two years. Formulating specific charges is rather difficult at this time. The present report along with reports of other regional committees will be considered by the National Committee on Organic Soils and that committee is to make recommendations to the National Work-Planning Conference. Presumably there will be another round of material for the regional committees to consider prior to the 1976 Regional Work-Planning Conference. The broad charge for Committee 3 would be to review the material that comes from the National Work-Planning Conference.

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE MTSC, Soil Survey Investigations Unit
1325 N Street, 4th Floor, Lincoln, Nebraska 68503

SUBJECT: 1974 North Central Regional Technical Work-Planning Conference of the National Cooperative Soil Survey, Osage Beach, Missouri, April 8-12, 1974. Report of Committee 3 - Organic Soils

March 25, 1974

TO: Participants of the Conference

This report lists comments by members of Committee 3 after their review of the report of the National Task Force on Organic Soils. Appended to this report is a memorandum from Bill McKinzie, National Task Force chairman. Bill's memo outlines a more extensive application of the penalty rating system for agricultural interpretations for both mineral end organic soils, and details proposed changes to Soil Taxonomy related to limnic materials.

In seeking comments from members of Committee 3 on the report of the National Task Force on Organic Soils, the chairman formulated a number of questions to guide the review. Seven committee members responded and three members systematically addressed comments to the questions. Others commented on various aspects that were pertinent. Replies and comments are tallied here in categories of

Research needs (general)
Agriculture
Engineering
Forestry
Wildlife
Commercial Uses of Peat

The Task Force work and report dealt primarily with interpretations so the comments thot follow are pertinent to the theme of the present conference. There is considerable sentiment for treating organic end mineral soils under one system of interpretive criteria, but this sentiment is not unanimous. Respondents generally consider the penalty rating approach to have merit but it needs further testing. There is need to bring in engineering expertise into the formulation of criteria on engineering interpretations more than we have done. Research needs most frequently mentioned involve water holding and transmission properties, i.e., available water (to plants), proper spacing of drainage tile.

Considerable dissatisfaction has been expressed over the way limnic materials are handled in the present taxonomy. (See addendum.) In the proposed changes, coprogenous earth materials are handled as Limnists in the order of Histosols. They must have ≥ 6% organic carbon. Marl and diatomaceous earth are handled as Limnaquents in the order of Entisols. They must have < 6% organic carbon.

In the opinion of the chairman, there should be sufficient work to justify continuing this committee another year.

Warren C. Lynn
Warren C. Lynn
Chairman, Committee 3

Comments on research needs:

Research or investigation needs - determining suitability for drainage and methods of drainage and spacing of tile drains. We are aware of some local areas of Carlisle or Linwood in which the installed tile is not effective in improving the drainage.

We have observed some limited areas with limnic material in which the drainage has reduced the volume sufficiently that moisture holding capacity is reduced significantly. Should this be recognized in the classification system.

-- One of' the more critical research needs is the study of hydraulic conductivity. It is needed on soils of Typic subgroups as well as on soils of subgroups with other kinds of materials.

-- Even under drained conditions I question whether 15 bar water content represents the permanent wilting point as it does in mineral soils. I feel we need some research to determine "the wilting point" of drained organic soils.

__ Research needs - Wind erodibility and methods of control. The ARS, Manhattan, Kansas has completed their initial work on the erodibility of organic soils. They have the equipment and it is my understanding that they are agreeable to continue this work.

__ We do need some better data on shrink-swell potential and frost action for organic soils. Available water capacity data needs was noted earlier. Permeability of benchmark soils under cultivation would also be helpful.

Agriculture

1. Should a suitability classification be developed to encompass both mineral and organic soils?

   Yes - 2 No - 2

2. How should the two concepts of "suitability groupings" and "development difficulty groupings" be applied?

   a. Suitability groupings
      - drained conditions only?
      - conditions expected after drainage imposed? 2 replies
      - conditions in undrained state? 1 reply

   b. Development difficulty groupings
      - undrained conditions only? 2 replies
      - drained but undeveloped conditions?

Comments:

- useful for evaluating potential of a given site whether drained or not.

-- rather stick to one system--i.e., capability system.

5. Should the realm of suitability groupings be subdivided into "management suitability" and "crop growth suitability"?

   The idea is to separate the factors applicable to developing and maintaining a mechanized agriculture from those that are specific for a given crop.

   Yes - 2 No - 1

Comments:

-- could be quite a project -- wide variety of crops grown on organic soils -- could result in quite a few groupings.

-- some crops are grown on a wide variety of soils, including organic

-- We should first test penalty ratings on wet mineral soils. If we are to use a penalty rating system, perhaps it should also be used for mineral soils.

-- Attachment by Bill McKinzie deals with wider application of penalty system.

6. Do you have comment on the kinds of rating factors listed in the Task Force report? Were factors omitted that you want incorporated? Do you have comments on any of the penalty factors assigned?

Comments:

-- Penalty factors undoubtedly will need refinement. This will take time, but that should not prevent the system from being used. Revisions and refinements are part of the game.

In general, it looks like a good start. The penalty approach seems quite reasonable providing the penalty grouping is accurate.

I think frigid is being a bit. too hard and the depth of peat is rated nearly the direct, opposite to what we used to think. The deeper the peat., the more difficult to manage. The penalty factors seem a hit too tough for

Soil, temperature - frigid
Coarse fragments - 1-5% and > 5%
Thickness of organic materiels - < 36 inches
Reaction - poor at pH > 7.0 (should be pH > 8.0)
(reference to Guide Sheet 1 for carrots, onion, of Task Force Report)

7. Subsidence - Interpretations guide for SCS Form 5. (Reference to TSC Advisory LI-1, January 14, 1974; not attached.)

Comments:

-- seems like an excellent method for getting quantitative values for subsidence.

-- data in the advisory look good - no further comment

-- I am not working with drained soils and perhaps not in a good position to judge, but after making a few calculations, it looks reasonable.

-- Let's keep subsidence due to desiccation and oxidation separate from consolidation potential of organic soil. Consolidation and settlement potential of these soils for engineering structures depends upon engineering properties (consolidation, shear strength, etc.), loads to be imposed, thickness of deposits, lateral deformation, etc. Determination of these properties and engineering behavior of these soils require detailed investigations, tests and analyses.

Engineering

1. Should a single form 5 be used for organic and mineral soils?

Yes - 4 Qualified - 1

Comment:

-- Suggest we either modify Form-5 to meet the changes recommended in the Organic Soils Task Force report or have a separate form for organic soils.

2. Should available water capacity apply only to drained conditions? Do we need research to find the "wilting point" on organics? Measurements of AWC or water retention difference (WRD) by Soil Survey Laboratory involves moisture contents at 1/3- and 15-bar and bulk density at 1/3-bar. The 15-bar water content depends, significantly, on whether the sample has been dried previously. How should we determine AWC?

(Note: Discussion of agronomic concerns has slipped in here--the fault of your chairman.)

Comments:

-- I have measured 15-bar water content; on a number of occasions. However, in all honesty, I really don't know what it means. I doubt that undrained peat materials ever reach 15-bar water content except perhaps in the surface. I feel we need some research to determine the "wilting point" of drained organic soils.

-- Refer to M.S. thesis by J. L. Brown, 1972, entitled, "Some physical properties of organic soil material." Univ. of Minnesota, St. Paul, Minnesota, 1[illegible]p. I think his ideas on AWC are realistic.

-- I feel that available water capacity should apply only to drained conditions.

-- Since these soils are usually saturated at or near the surface unless drained, we do not think available water capacity data is pertinent except for drained conditions. The wilting point on organics would be pertinent data--we think enough tests to establish benchmarks would be in order, and should be made on soils that have been cultivated for a few years.

-- We have observed some limited areas with limnic material in which the drainage has reduced the volume sufficiently that moisture holding capacity is reduced significantly. Should this be recognized in the classification system.

3. Should one rating system for engineering interpretations be applied to organic and mineral soils?

Yes - 3 No - 0

4. Are you in favor of the open-ended penalty rating approach?

(Note: There was some confusion as to what is meant by an open-ended penalty system, It means there is no upper to the numeric81 penalty rating. There is no attempt to place all soils between some limits, i.e., from 1 to 100.)

Comments:

-- I believe the open-ended penalty rating approach has some merits, but I would like to test it further.

-- It serves as a very useful tool especially in the developmental stages of' an interpretive system. Perhaps classes can be substituted later.

5. I would like you to help test the proposed penalty system for small buildings with basements. (Rating guides from the Task Force report were supplied to committee members.)

Please supply your best estimates for penalty assignments and for ratings for 011 the series you can. I would like to obtain as many independent evaluations for this one application as possible. Use phases of the series BE applicable.

-- Three lists of' ratings are attached.

Comments:

-- Since building codes in the State of Wisconsin rule out organics as suitable soils, we are not too concerned with rating organic soils.

-- There is enough disagreement now on interpretation of' limiting factors without trying to quantify these factors. For example: Why is 36" of mineral soil over rock so much better than 36" of organic over rock (penalty ratings of 80 and 200, respectively) for small buildings with basements? The 36" overburden will undoubtedly be removed in either case. I doubt that a water table et 3' is much better then a water table at 2' for a house with basement. Water table at or Above the floor level of the basement will require special attention. I would much rather have 8 basement on a 10% slope with water table at 4' in a pervious soil (GP, GW, SW, etc.) - penalty rating = 70 - than a basement on 8 1% slope with the water table at 5.5' in a CH soil - penalty rating,,= 70.

Let's just list the factors that affect design end construction and let the user decide (or get counsel) on which situation is most easily handled.

DEPTH		ORGANIC (In			ER-	MINERA	
		Frag. S R I		S G S C	Loamy Sediments MI. CL/PI>15	Rock	R
< 1m (<40")	200				80	80	
1-1.5m(40-60")	200				110	50	
1.5-3m(5'-10')	180				140	20	
3-6m(10-20')	200				160	10	
	200				200	0	

SEASONAL HIGH WATER TABLE

(Depth)	
<75cm (<30")	80
75-150cm(30-60")	40
>150cm (>60")	0

}

FLOODING

Percent Probability	
None	0
0-2%	50
2-10%	100
>10%	200

ROCKINESS

(Percent outcrop)	
<2%	0
2-10%	20
>10%	40

[illegible]

Ohio [illegible] Basements

SOIL	[illegible]	WATER TABLE	DRAINAGE	[illegible]	FROST ACTION	[illegible]	BEDROCK	[illegible]	[illegible]	SHRINK-SWELL	UNIFIED	WOOD	RATING
Carlisle (drained) Typic Medisaprist euic, mesic	140	30		50	0	0	0	NA	0	5	NA	45	320
Carlisle (undrained) Typic Medisaprist euic, mesic	140	30		200	0	0	0	NA	0	5	NA	4j	470
Linwood Terric Medisaprist, loamy, mixed euic, mesic	30	30		50	0	0	0	NA	0	5	NA	0	215
Willette Terric Medisaprist, clayey, illitic, euic, mesic	90	30		50	0	0	0	NA	0	5	NA	0	225
Adrian Terric Medisaprist, sandy or sandy-skeletal, mixed, euic, mesic	100	30		50	0	0	0	NA	0	5	NA	0	235
Muskego Limnic Medisaprist, coprogenous euic, mesic	110	30		50	0	0	0	NA	0	5	NA	0	245

RATING CHART FOR ENGINEERING INTERPRETATION

Minnesota

USE: Small Buildings with Basements

SOIL	PENALTIES: DEPTH	WATER TABLE OR DRAINAGE	FLOODING	FROST ACTION	PERMA-FROST	ROCKINESS	STONINESS	SLOPE	SHRINK-SWELL	UNIFIED	[illegible]	RATING
Adrian Series < 40" - IIC > 40" - IIC	100 130	80	0	0	0	0	NA	0	NA	NA	0 45	Low - [illegible] High - 225
Caron Series	140 200	80	0	0	0	0	NA	0	NA	NA	0	Low - 220 High - 2[illegible]0
Lupton Series	140 200	80	0	0	0	0	NA	0	NA	NA	45 90	Low - 265 High - 370
Millerville	140 200	80	0	0	0	0	NA	0	NA	NA	0	Low - 220 High - 250
Rifle	140 200	a0	0	0	0	0	NA	0	NA	NA	0 90	Low - 220 High - 370
Seelyeville	140 200	80	0	0	0	0	NA	0	NA	NA	0 45	Low - 220 High - 325
Waskish	140 200	80	0	0	0	0	NA	0	NA	NA	0 45	Low - 220 High - 325

TABLE I. RATING CHART FOR ENGINEERING INTERPRETATIONS

USE: Small Buildings with Basements

Minnesota Area III (Northeastern)

Soil	Depth	Watertable or Drainage	Flooding	Frost Action	Permafrost	Rockiness	Stoniness	Slope	Shrink-swell	Unified	Wood	Rating	
Beseman	80	80	50	0	0	0	NA	0	0-5	NA	0	210-215	
Unnamed 559	90	80	50	0	0	0	NA	0	10-20	NA	0	230-240	
Dawson	100	80	0	0	0	0	NA	0	0	NA	0	180	
Loxley	160-200	80	50	0	0	0	NA	0	0	NA	0	290-330	
Seelyville	140-160	80	0	0	0	0	NA	0	0	NA	0	220-240	
Lupton	160-200	80	50	0	0	0	NA	0	0	NA	0	290-330	
Greenwood	160-180	80	0	0	0	0	NA	0	NA	NA	0	240-260	
Mooselake	140-180	80	0	0	0	0	NA	0	0	NA	0	220-260	
Merwin	110	80	0	0	0	0	NA	0	0-5	NA	0	190-195	
Lobo	160-200	80	0	0	0	0	NA	0	NA	NA	0	240-280	
Waskish	160-180	80	0	0	0	0	NA	0	0	NA	0	240-260	
Mora	0	40	0	10	0	0	0	0	0	0	0	50	MOD
Insula	80	0	0	10	0	20	0	0-30	0	0	0	110-140	SEV
Indus	0	80	50	5	0	0	0	0	20	50	0	205	V. SE
Duluth	0	0-40	0	10	0	0	0	0-30	0-5	25	0	70-80	MOD
Cloquet	0	0	0	10	0	0	0	0-60	0	0	0	10-70	SLIGH TO MO

-- From the point of view of subsidence, oxidation, and preserving the natural resource as long as possible, the deeper the peat, the better. However, from the aspects of drainage, water control, and trafficability, I don't agree. Our drainage guide suggests it is easier to work with the shallower peats. Trafficability is a delicate balance on the peats. The variable of rainfall vastly outweighs the depth of drainage ditches in importance. Thr permeability of even Hemic peats or mucks is slower than we previously thought. I have no specific data to support this except an abundance of personal experience.

Once a machine becomes stuck, the support of the material beneath is very little. The deeper the pest, the greater the problem. Once an area is churned up, it is quite difficult to get it back to the same trafficable state.

-- Reference to Task Force Report:

Page 4 - Trafficability. This item refers to ability to graze cattle. It is not a good name nnd it is not an engineering use. Engineering applications for this land use might include limitations on construction of cattle walkways. Evaluating such Limitations requires on-site investigations since the permissible dimensions of walkways are directly dependent upon thickness of' deposit, shear strength end coefficient of compressibility.

-- As far as engineering uses of' organic soils are concerned - and this was the objective of' this committee - we think a statement such as follows would be appropriate.

"Organic soils are generally unsuitable for engineering uses and require detailed on-site investigation, evaluation and interpretation."

-- Reference to Task Force Report:

Engineering Interpretations of Committee Report, Page 2.

AASHO Designation M145-66 classifies organic soils as A-8.

The PCA Soil Primer is out of date in defining AASHO Croup Index values.

LL and PI. The Unified Soil Classification system (ASTM D2487) states, "Classify soil as organic silt or clay if liquid limit after oven drying is less than three-fourths of the liquid limit determined before drying."

Fore-try

Stephen Shetron, Chairman of Committee 9 on Forest Soils of the NCWPC, was also on the Organic Soils Task Force. He distributed the Task Force report on forestry interpretations to members of' Committee 9 for their comment. You should review Mr. Brink's letter in Attachment No. 3 before formulating your reply for this section.

1. Should one rating system encompass interpretations for forestry production on mineral and organic soils?

   Yes - 2 No - 0

2. Are rating systems on both productivity and soil properties needed? Now? Eventually? Can the two be combined?

   Yes - 2 No - 0

3. Should the penalty factors be used to figure the use potential groups?

   Yes - 2 No - 1

Comments:

-- Our experience with woodland on organics has shown that extreme variability may be expected in yield, depending upon a number of variables such asupon u.08049 265.9.1198.92q 40.3999934 cm BI /W183 /H 14 /BPC 1 /CS /G /D [1 0] I € €€€ð<?ð?ðûÀ}ð ø ðÿð

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We would hope that wildlife interpretations would be tied to soil series. Some series would certainly occur in close association with other soils but not necessarily in all cases. We are presently rating organic soils for dugout ponds, dikes, reservoir areas, and food and cover production areas for wildlife, using the same criteria as for mineral soils without any major problems.

2. What special uses pertaining to wildlife need suitability ratings? (e.g., construction of dikes, production of open water areas--others?) Indicate the pertinent rating factors for the use categories you suggest.

comment:

-- Regarding special uses related to wildlife, I think construction of dikes as you indicated is one need. Also, suitability of given soils for producing the type of habitat desired once flooded, as in the case of impoundments for ducks or fish spawning and perhaps even the susceptibility of peat floating once flooded should be considered. Several instances have been reported in Europe (Finland and USSR) where problems with flouting peat resulted after impoundments or reservoirs were built.

<u>Commercial Uses of Peat</u>

1. Should our Soil Taxonomy provide classification units that reflect suitability of the peat for commercial purposes? Does the present Soil Taxonomy have such classes in your estimation?

Comments:

-- Yes, the Taxonomy has several classes that are useful.

-- Yes, but, observations will have to be made to greater depths.

-- Commercial uses of organic soil is so specialized and of value to such a few people that perhaps this could be best. handled on a consultive or individual basis rather than a rating in the soil taxonomy system.

<u>Soil Taxonomy</u> - Re Proposals of Organic Soils Task Force

1. Most of proposals in Section I have been incorporated in the October 1973 draft of Soil Taxonomy.

2. Your comments would be appreciated particularly on proposals in Section III. The Task Force viewed these proposals favorably, but recommended additional testing and review. I think several possibilities for. research can be drawn from the proposals. Please suggest which lines of research can be most profitably undertaken in the next year or two.

Comments:

-- Comments on unneeded (unused) taxa in the Task Force report still apply. Here lies one of the most important ways of improving the taxonomy of Histosols.

-- The definitions for limnio materials - both marl and coprogenous - have given us difficulties. Thus we are interested in the 2/74 Proposed Additions and changes in the classification of Limnic Materials by Mr. McKinzie. These will be tested during the next field season as the opportunity arises during field reviews. It is possible that there might be some opportunity to use Limnists or Limnaquents but the acreages involved will be very limited. (Contact W. E. McKinzie if interested in a copy of the proposed additions and changes in soil taxonomy for the classification of limnic materials.)

HISTOSOL SUBGROUPS
(With Series Assigned and Without Series Assigned)
Prepared by W. E. McKinzie
April 1974

FIBRISTS

Borofibrists

With Series:

Typic
Hemic
Terric

Without Series:

Fluvaquentic
Hemic Terric
Hydric
Limnic
Lithic
Sapric
Sapric Terric
Sphagnic
Sphagnic Terric

Cryofibrists

With Series:

Fluvaquentic
Pergelic

Without Series:

Typic
Lithic
Sphagnic
Terric

Medifibrists

With Series:

Typic
Limnic
Terric

Medifibrists (con't.)

Without Series:

Fluvaquentic
Hemic
Hemic Terric
Hydric
Lithic
Sapric
Sapric Terric
Sphagnic
Sphagnic Terric

Sphagnofibrists

With Series:

Typic
Cryo
Hemic

Without Series:

Fluvaquentic
Hydric
Limnic
Lithic
Pergelic
Sapric
Terric

Tropofibrists

Without Series:

Typic
Fluvaquentic
Hemic Terric
Hydric
Limnic
Lithic
Sapric
Sapric Terric
Terric

FOLISTS

Borofolists

Without Series:

Typic
Lithic

Cryofolists

With Series:

Typic
Lithic

Tropofolists

With Series:

Typic
Lithic

HEMISTS

Borohemists

With Series:

Typic
Fibric
Hydric
Limnic
Terric

Without Series:

Fibric Terric
Fluvaquentic
Lithic
Sapric
Sapric Terric

HEMISTS (con't.)

Cryohemists

With Series:

Typic
Lithic

Without Series:

Fluvaquentic
Pergelic
Terric

Medihemists

With series:

Typic
Hydric
Limnic

Without series:

Fibric
Fibric Terric
Fluvaquentic
Lithic
Sapric
Sapric Terric
Terric

Sulfihemists

With Series:

Typic

Tropohemists

Without Series:

Typic
Fibric
Fibric Terric
Fluvaquentic
Hydric
Limnic
Lithic
Sapric
Terric

SAPRISTS

Borosaprists

With Series:

Typic
Hemic
Limnic
Lithic
Terric

Without Series:

Fibric
Fibric Terric
Fluvaquentic
Hemic Terric

Cryosaprists

With Series:

Typic
Lithic
Terric

Without series:

Fluvaquentic
Pergelic

Medisaprists

With Series:

Typic
Fluvaquentic
Hemic
Limnic
Lithic
Terric

Without Series:

Fibric
Fibric Terric
Hemic Terric

SAPRISTS (con't.)

Troposaprists

With Series:

Terric

Without Series:

Typic
Fibric
Fibric Terric
Fluvaquentic
Hemic
Hemic Terric
Limnic
Lithic

NORTH CENTRAL REGIONAL WORK PLANNING CONFERENCE
of the
NATIONAL COOPERATIVE SOIL SURVEY
Osage Beach, Missouri
April 8-12, 1974

Report of Committee No. 4 on Criteria for Series and Phase

The general theme for the 1974 North Central Regional Technical Work-Planning Conference is Interpretations. Committee 4 used this theme in their deliberations and built the report around it. The Committee members were sent a number of questions which served as the framework for the items considered. Their comments indicated different approaches, and emphasized different facets relating to the question. The conclusions to most questions were, however, surprisingly similar.

The questions and the first draft of comments from the Committee members were discussed by the Work Planning Conference, first in small groups, and then by the conference as a whole. The response to the following questions are those of the Committee 4 members, but also reflect the comments from the conference.

1. Small differences in soils within a family are frequently handled as phases. Discuss the feasibility of the cumulative effect of small differences, adding up to series criteria.

   A small difference is difficult to define and agree on. Small differences are often equated with the subtle and difficult to define properties. Large differences, on the other hand, are frequently equated with those properties that are easily observed. A large, easily observed difference such as soil color is easily recognized, and series are classified on the basis of this property, eve" though we may be unaware of any usefulness by so doing. Soil temperature, as a" example, is more subtle, and could be called a small difference. It can, however, cause a marked difference in behavioral response of two soils within a family. We are often reluctant to recognize two series in this situation.

   As a general guide, differences to be used as series criteria should:

   a. be observable or inferred with reasonable assurance;

   b. be larger than the normal errors of measurement, observation, or estimate by qualified me";

   c. be within the recognized limits of the series control section.

   A small difference in one situation is often a major difference in another set of circumstances. Defining and agreeing on the cumulative effect of more than one small difference is infinitely more difficult. This approach of using the cumulative effect of small differences should not be introduced as a basis for series criteria.

One committee member took issue with the inferrence in the question that phase differences are smaller than series differences. He pointed out that phase differences are attached to but not a part of the classification system. It is not a matter of magnitude, but of kind of difference which determines phase or series criteria.

2. Discuss the feasibility of using interpretations as criteria for series or phases.

Interpretations should not be used as criteria for differentiating between series. Interpretations should not be substituted for a diagnostic soil property which is series criteria.

The Committee was divided on the question of interpretations being sufficient for phase criteria. About half of the Committee felt phasing soils on the basis of one interpretation would negatively effect interpretations for other uses.

The other half of the Committee felt that soil characteristics not reflected in the nature of the soil or in the degree of expression of the horizons, but which are important for interpretive information are suitable as a basis for phases.

3. The Soil Survey Investigations Unit and the Soil Mechanics Unit are doing extensive chemical and physical property studies on five soil series in Lancaster County, Nebraska. Interpretations for urban use prompted these studies. What research do you think should be done at the series or phase level in order to make correct interpretations? Who should do the research? Should it be done on benchmark soils or key soils in each family? How should the research then be published, and who should do the publishing?

Research should be done by whoever is capable, interested, and able. The agencies most frequently mentioned were:

a. Experiment Stations
b. Agricultural Research Service
c. Soil Conservation Service
    (1) Soil Survey Investigations Unit
    (2) Soil Mechanics Unit

Research should be done on key soils which are selected to represent families, subgroups, great groups or as far up into the classification system as possible. Sites should be carefully selected, be representative of the series, and precisely classified. Field estimates for comparison with lab data should be made.

Research should:

a. Relate in quantitative terms the significance of soil properties to contemplated use.

b. Determine appropriate alternatives to overcome *limitations* for a specific use.

The Committee suggested a variety of ways to publish the research data. They were:

a. A Soil Survey Investigations Report with a set format;

b. Technical journals or bulletins;

c. Attachments to the series descriptions and interpretations sheets.

4. Discuss any item you see fit which falls within the framework of responsibility of Committee 4.

Two items were mentioned, and this Committee passes them on as a charge to be considered by the next Committee:

a. Reconsider the definition of the series control section, especially those soils with lithic or paralithic contacts, and soils which have development to depths greater than 40 inches.

b. Study the feasibility of standardizing phase criteria for soil series, and as far upward in the categories of soil classification as possible.

5. Should Committee 4 be continued? If your answer is yes, please list some items for consideration of Committee 4 at the 1976 meeting. If your answer is no, please indicate what new committee or committees you feel are needed, and also list some of the items which these committees should consider.

The areas of responsibility of Committee 4 and Committee 2 overlap, and these two committees should be combined. The new committee should consider the whole area of soil morphology and soil taxonomy. A member of the regional work group responsible for processing changes In the soil taxonomy could be a member of this committee. This arrangement would strengthen and give continuity to the group considering changes in the taxonomy. This recommendation has been discussed with the chairman

Summary

1. Defining and agreeing on the cumulative effect of small series differences is extremely difficult, and this approach should not be introduced as a basis for series criteria.

2. Interpretations should not be used as a basis for series criteria. Interpretations can be a basis for phases, but the concept needs more study.

3. Soil research for interpretive purposes should be conducted by all interested agencies and published.

4. Charges for the next committee to consider in 1976 are:

   a. Reconsider the definition of the series control section, especially those soils with lithic or paralithic contacts, and soils which have development to depths greater than 40 inches.

   b. Study the feasibility of standardizing phase criteria for soil series, and as far upward in the categories of soil classification as possible.

5. The present Committee 4 and Committee 2 have overlapping responsibilities, and should be combined.

This is the report of Committee 4 of the 1974 North Central Regional Work-Planning Conference.

Louie L. Buller
Chairman

Committee Members:

Alexander, John D.	McBee, Charles W.
Cummins, Joseph F.	Omodt, Hollis W.
Hinkley, Kenneth	Post, Gerald J.
Molowaychuck, N.	Riecken, Frank F.
Lee, James H.	Turner, Robert I.
Lockridge, Dale	Whiteside, E. P.

RECOMMENDATIONS FROM COMMITTEE 5 - SOIL MOISTURE AND CLIMATE IN RELATION TO SOIL CLASSIFICATION OSAGE BEACH, MISSOURI, APRIL 8-12, 1974

The following recommendations are a result of discussions from three groups. One discussion group did not have time to discuss the report. The recommendations are:

1. The USDA-ARS, USDAHL-70 or 74 Model of Watershed Hydrology should be the subject of an intensive 1/2 or 1 day session. Scientists involved in model development should be invited to discuss the model. People interested in the model should contact Dr. Charles England, US Hydrograph Laboratory, Beltsville, Maryland.

2. Those interested in determining AWC in the field should test the procedure recommended by Franzmeier, Wiersma, Brownsfield, Robbins, Shively and Wingard in RB904 titled Water Resimes of Some Indiana Soils. The bulletin is available from the Agricultural Experiment Station, Purdue University, West Lafayette, Indiana. SCS will purchase copies of RB904 to distribute to SCS personnel in each state. The procedure is reproduced here for your convenience.

PROPOSED PROCEDURE

This procedure is one that field soil scientists can use to estimate available water capacity in the field. It requires a minimum of equipment.

Eauipment

1. Bucket auger or hydraulic probe (around 2 to 3 inches in diameter).

2. Container for soil samples. (If weights are taken soon after the samples is taken, a perfect seal is not essential).

3. Balance. (A triple-beam balance with a sensitivity of around 0.1 g and ,a capacity of around 2500 g is adequate).

Procedure

Select a sampling site that will be in perennial vegetation for several years. For soils that are usually used for field crops, a wide fence row or lane is satisfactory. Describe the soil and estimate the clay content of the horizons.

Sample for the upper field limit at the beginning of the growing season in the spring, at least a few days after a rain.

Sample for the lower limit during any dry periods in summer or fall.

Measure the inside diameter of the widest part of the bits on a bucket auger or the inside diameter of the cutting head of a probe and use that value in calculating the volume of the soil removed.

Sample by horizons or subdivide horizons if there is a sharp moisture difference within a horizon. Place all the soil removed in a container and record the thickness of soil represented by each sample. Weigh the sample at field moisture content, allow it to air dry, and weigh it again. Convert air dry to oven dry weights by checking some samples and estimating the rest.

Volumetric water content can be calculated directly by converting the weight of water in the soil to volume and dividing by the volume of the total sample. Alternatively, the bulk density of the soil can be calculated and the weight percent water multiplied by bulk density to give volumetric water content.

Tabulate and plot the data as it has been reported in this study. To check if the dry readings are approaching 15-bar water contents, multiply the estimated clay content by 0.4 to estimate 15-bar water as a weight percent, and multiply by bulk density to convert to volume percent.

After several years' results, plot the upper and lower limits to get a field estimate of available water capacity.

3. Individuals interested in AWC may want to check field procedures by other procedures for determining AWC with the suggestions given by Dr. R. El. Grossman. He suggests using 0.06 bar for sands excluding very fine sand, 0.1 bar for very fine sand, loamy sand and sandy loam, and 1/3 bar for other textures.

4. Perched and apparent water tables are being studied by a national committee chaired by Dr. Ray Daniels. Items of concern should be referred to Dr. Daniels.

5. Field measurement of hydraulic conductivity are being determined primarily by the double tube method.

6. Further work is underway at the present time at the University of Missouri on developing the corn yield model in six states. Reprints from the present study should be available in about one year.

7. The following publications on water movement and waste disposal are available from the University of Wisconsin:

   a, Guide for the study of water movement above the water table. 1973. 200 pages. J. Bouma, Soil Survey Division, Soils Building, University of Wisconsin, Madison, Wisconsin 53706 cost - $3.00

   b. Soil absorption of septic tank effluent. J. Bouma, W. A. Ziebell, W. G. Walker, E. McCoy and F. D. Hole. Information Circular 20. Soil Survey Division, Soils Building, University of Wisconsin, Madison, Wisconsin 53706. Cost - $5.00

   c. On site disposal of domestic liquid waste. Overview of the small scale waste management project. 15 pages. No cost.

Respectfully submitted,

E. C. A. Runge
Chairman

North Central Regional Work Planning Conference

of the

National Cooperative Soil Survey

Osage Beach, Missouri

April 8-12, 1974

Sunrnary Report of the deliberations of Committee 6 - for improvement of teaching methods in Soil Science.

The work of the committee centered around an inventory of courses stressing interpretations taught in the region. It was found that most courses about soil morphology, classification and survey taught in the region include this subject as part of the course work. In addition Purdue (Joe Yahner) and the University of Wisconsin at River Falls (Roger Swanson) offer courses in rural-urban land use. Kansas State University (O. W. Bidwell) will soon be offering a course about soils and the environment to students in majors other than agriculture.

The consensus was that most of our training of soil scientists falls short of preparing them to work effectively with land use planning teams. No definite suggestions were set forth in regard to specific training needed, but courses such as those mentioned would help.

Most agreed that a travel course throughout the entire region is a rather large undertaking - too large in view of the fact that no one is available at present to organize such a course. It was suggested and approved that limited travel courses to specific areas in the region be considered by future committees.

Most also agreed that the future committee consider the need to supply additional training to soil scientists in the field. The consensus was that the upcoming conunittee work with the various institutions in the region to determine needs and set up such training sessions.

The topic of measureable behavioral objectives was briefly considered and the consensus was that this topic be explored further by the next committee. It was the opinion of the group that this committee be continued.

Respectfully submitted

David T. Lewis

David T. Lewis. Ass't Prof.
Soil Genesis and Classification

DTL:hp

NORTH CENTRAL REGIONAL WORK PLANNING CONFERENCE
of the
NATIONAL COOPERATIVE SOIL SURVEY
Osage Beach, Missouri
April 8-12, 1974

Report of Committee No. 6 - For improvement of teaching methods In Soil Science.

Following the workshop theme of interpretations, the committee set out to find out in what way interpretation of various soil units was incorporated in courses taught within the region, to determine whether or not the soil scientists graduated from our institutions are adequately prepared to work with the complex environmental issues that must be considered as a part of making soil Interpretations, and to discover what course objectives relate to soil Interpretations. In addition some of the problems with the travel course proposed in 1972 at Rapid City were discussed and there was a little bit of information passed back and forth about the benefits of establishing measureable behavioral objectives for soils courses.

Courses teaching Interpretation of soils as a topic in itself.

Purdue, The University of Wisconsin at Madison, and The University of Wisconsin at River Falls have courses underway which stress what are usually called urban or suburban interpretations of soils. Kansas State has a course proposed which will also emphasize soils and land use planning. The outlines of these courses are attached to this report. I should note that there may be others of which I am not aware in the region. There was not one hundred percent response from the committee.

In addition, all schools that responded indicated that one aspect or another of interpretation of soils is taught as part of one or several courses in soils. Soil Morphology, Classification, and Survey at Nebraska has two lectures and two three hour laboratories plus approximately one third of a soil survey report made by students from field data they gather devoted to this topic. Iowa, Kansas State, and Michigan apparently approach this problem In a similar manner.

About two years ago the instructor of Soil Morphology, Classification, and Survey at Nebraska worked up and proposed a course similar to that now proposed by Orville Bidwell at Kansas State. However, because of rather excessive opposition to such a course from other members of the Department of Agronomy at Nebraska, the proposal was dropped. But that's another story.

Apparently most feel that there Is a need for a course on Interpretation of soils for Soil Science majors and for students outside the College of Agriculture. Orville Bidwell indicated that he probably will draw 40 to 50 students from other colleges for his course. A survey of departments prior to writing of the course at Nebraska indicated a good Interest from the other biological sciences, architecture, and secondary education.

Joe Yahner at Purdue felt that while soil scientists may be well trained in the aspects of soil science and interpretations, they would probably benefit from a more widely developed background In the problems associated with community development. Before soil Interpretations can be made and applied, the soil scientist must first work with local officials, be aware of local ordinances, and understand the problems faced by those making the community plan. It has been my observation that many soils men either Ignore or are not aware of these things.

Arc we preparing our graduates In soils to work with the complex issues that arise while developing a community plan.

Not adequately trained	7 responses
Adequately trained	1 response
Didn't say	2 responses

Most expressed a need for more training in some of the things discussed In the previous section as well as for better communication between urban planners and soils people. It has been my experience that (as Joe Yahner pointed out) you can't train someone for every situation that might arise. Students can be trained in principles and helped to develop their thinking process and judgment using these principles, but it is a rare case where the instructor can predict, and train his students for every eventuality. It has also been my experience (from working with urban planners in New England for several years) that much of what one needs to know to work with these people falls within the realm of good human relations and good communication of thoughts and ideas. If these two things fall short, communication of technical aspects of soil use also fails short of the desired goals. As Dr. Beatty at Winconsin pointed out, our soils people are often too parochial In their outlook and fail to see the broad implications of soils information in our diverse contemporary society. To develop one needs by Lewis outlines the method of writing objectives and their application in Soil Morphology, Classification, and Survey at Nebraska. Writing the objectives for this course and for others is 'one of the more beneficial things I have undertaken to improve my teaching techniques. This feeling is in agreement with that expressed by Clarence Scrivner at Missouri who worked out behavioral objectives for their beginning soils course. For this reason I sincerely urge that this topic be explored further in the committee that follows this one.

Respectfully submitted

David T. Lewis, Chairman
Committee 6 - For the improvement of
teaching methods in Soil Science.

DTL:hp
Attachment: Course outlines

SOILS 315: SOILS AND LAND USE PLANNING

University of Wisconsin, Madison

Outline of Subject Matter:

I. Lecture and Discussion

A. Basic Pedologic Concepts (G-9 lecture-discussion periods plus field trips).

1. Soil and the soil individual.
2. Soil morphology and composition.
3. Soil taxonomy.
4. Soil landscapes - local and regional
5. Soil maps and soil survey reports - purpose, format, use.
6. Soil Interprotations - philosophy, collection and evaluation of pedological data.

6. Man's Use of Soils (1-2 lectures).

1. Historical - from hunting and gathering to grazing, gardening and irrigation; shifting cultivation; problems of erosion siltation, salinization, reduced fertility.
2. Contemporary - modern, highly mechanized agriculture and forestry, urban sprawl, rural homes, waste disposal on soil, modification of natural landscapes.

C. Land Use Planning (3 lectures).

1. Overview of the land use planning process and practice.
2. Relationships of land use planning to other planning programs.

D. Soils and Land Use Planning (14 lectures).

1. Soils and agriculture - capability classification systems, identification and preservation of "prims agricultural land", problems of assessment and taxation, ecological disturbance.
2. Soils and forest resources - site classification, suitability of soils for production, recreation and wilderness purposes.
3. Soils and homes in the country - sewage systems that work all year round, relationship of soil properties to percolation rate, engineering properties, etc.
4. Soils and urban expansion - properties of soils - application to community planning.
5. Soils of flood plains and wetlands - soil maps as a basis for zoning. The variety and possible uses of wetland soils.
6. Soils and wildlife - use of soil information in developing habitats suitable for various species of wildlife
7. Soils and large scale waste disposal- the use of soil maps for site selection; special problems related to soils and land forms.

E. Incorporation of Soils Information into Land Use Plans (8 lectures).

1. Development of land use plans.
2. Implementation of land use plans.

II. Projects.

A. Students enrolled in the course will develop projects, either individually or in small groups, using soil maps and other data to help solve planning pro5lems.

III. Field Work.

A. Students will learn the rudiments of soil morphology, classification, and soil mapping in the field.

9. Field studies will also be made in conjenction with projects.

Michigan State University

The objectives of SLS 390 and SLS 470 which are taught by Professor I. F. Schneider at Michigan State University are:

SLS 390:

1. To determine how water and wind erodes soils.
2. To determine the soil conservation practices necessary to prevent erosion and sedimentation.
3. To interpret soils for various land uses.

SLS 470

1. To determine the physical, chemical, and biotogtcal properties Of soils by actual field examination of soil profiles.
2. To interpret this basic information in relation to adapted field crops, soil conservation, drainage, Irrigation, highway engineering, wildlife, tax assessments, rural planning and zoning.
3. To present information about soil genesis, soil morphology, and soil classification.

Laboratory Exercise, Michigan State University

SOIL PROFILE NO, ____________

____
Date

Location ____

Horizon	Depth	Color	pH	Texture	Consistence Moist	Structure Type	Structure Grade
Example A2	6-10"	10YR 4/2	6.5	Silt loam	Friable	Platy	Weak

Natural Drainage ____

Slope Class ____

Erosion Class ____

Soil Type ____

Present Vegetation or Land Use ____

Soil Management Group ____

Soil Management Unit ____

Great Soil Group ____

Surface Formation ____

Laboratory exercise for Michigan State University

Evaluate this area for: (give advantages and disadvantages)

Corn -

Forest Nursery -

Alfalfa -

Suburban Development -

Highway Construction -

Christmas Tree Plantation -

State Parks

Golf Courses

You inherited 200 acres. What would you use it for?

REGIONAL TRAVEL COURSE

1. Agronomy 479-879. Soils and Agriculture of the North Central Region of the U.S. (3 semester credits, summer session) Lewis. Prereq. Agronomy 101, 153, 269, 204 or equivalent. Senior or graduate student standing in any of the Agricultural or Earth Sciences, permission.

   A travel course throughout the North Central Region emphasizing soils, agriculture, and land use differences and the possible reasons why differences in these things exist within the region.

2. Objectives: It is the objective of this course to show the student representative soils in the various parts of the region, to recognize differences in pedogenic factors that led to formation of the various features of the morphology of these soils, to show the student the different agricultural and land use practices within the region and to discuss with him the reasons for observed differences in agriculture and land use. The following measureable behavioral objectives will be met by the student before credit for the course is given.

   A. Describe in general terms differences in soils and geomorphic features within each soil resource area within the region.

   B. Interpret the differences in soil morphology noted in terms of the relative effect of each of the pedogenic factors on the soils in the various parts of the region.

   C. Describe the effect of soil differences on the observed differences in land use (including agricultural practices) within the region.

   D. Interpret the differences in agricultural practices within the region in terms of climate, distance to markets, plant disease possibilities, traditions of cropping, irrigation potential, and other factors of significance.

   E. Write a summary of the effect of the differing emphasis within research-teaching institutions in the region on the agriculture within the areas served by each institution.

3. Need for the course: It has been stated that soil science majors can learn more from a well planned field trip of a week or 10 days duration than from a semester in the classroom. This course will present such a field trip. It will acquaint the students with the soils in the various soil resource areas, agriculture, and land use within the region and draw together many factors the students have had in the classroom.

4. Methods: This course will be taught as a field trip'of 3 weeks duration within the North Central Region. Students from the various universities within the region are eligible for the course. Assembly point will be the University of Nebraska where a 2 day orientation session will be held on soils, climate, vegetation. agriculture, land grant colleges, and other pertinent factors about the region. This session will be conducted by experts in these various topics from organizations within the region. The field trip will include parts of the region significant to the course. Personnel from state and federal organizations will conduct on site discussions about the topics covered in the course. Grading will be determined by what each university considers appropriate, probably including a written report covering the criteria setforth by the objectives. Academic credit will be given based on the organization of the home university of each student.

5. Relation to other courses: This course will be a regional field coverage of many courses taught in Agronomy curriculums throughout the region. It will emphasize differences within the region and possible reasons for these differences. As such it will broaden the outlook received by students in Agronomy courses within their home universities.

6. Course Outline:
   A. Orientation
      (1) Soil-geology of the North Central Region
      (2) Climate of-the North Central Region
      (3) Agriculture of the North Central Region
      (4) Natural vegetation of the North Central Region
      (5) Research institutions within the North Central Region
   B. Field Trip
      (1) The loess plains of east central Nebraska
      (2) Loess mantled dissected till plains of NW Missouri or SW Iowa
      (3) The Ozark plateaus
      (4) Coastal plain and Mississippi Delta. SE Missouri
      (5) Till plains, Illinois, Indiana, Ohio, Ohio
      (6) Muck soils, Michigan
      (7) Coarse glacial till, sand plains, Michigan, Wisconsin, Minnesota
      (8) Lake Agassiz and Dakota plains, North and South Dakota
      (9) Missouri Coteau and Collapse features. North and South Dakota
      (10) Range land; bad land areas South Dakota. Nebraska
      (11) Stops at Universities along the way

KANSAS STATE UNIVERSITY

015-6XX SOIL INTERPRETATIONS FOR LAND-USE PLANNING.

3 hours of lecture and recitation. Several Saturday morning field tripe required at the atudeat'a expense.

Course Description: The effect of the physical land resource on land use and land-use planning.

Prerequisites: Junior standing. One course in planning, Environmental Geography, Landscape Architectural Design, or consent of Instructor.

Student Objectives: 1. To develop an appreciation and understanding of the physical land resource and its Importance to land use. 2. To identify and understand the physical properties significantly affecting land use. 3. To use a physical land inventory in the development of a comprehensive land-use plan. 4. To use a physical land Inventory in support of zoning.

Instructional Methods: 1. Classroom lectures and recitations. 2. Field trips to observe the influence of Reologlc materials and soils on land use. 3. Assigned problems and papers.

Reference Materials:

Bartelli, L. J., A. A. Klingebiel, J. V. Baird, and M. R. Heddleson. Soil Surveys and Land-uee planning. Soil Science Society of America. 1966, 196 pages.

McHarg, Ian L. Design with Nature. American Museum of Natural History. Natural History Press. Garden City, N. Y. 1969. 198 pages.

Reilly, William. The Use of Land: A Citizen's Policy Guide to Urban Growth. Thomas Y. Crowell Pub. New York. 1973.

Selected county soil survey reports: topographic maps.

015-6XX Soil Interpretations for Land-Use Planning.

Topical Outline

Subject	Classroom Hours
1. Introduction.	Approx. 20
A. Population pressures on physical land resource.	
1. Social, political, and economic relationships.	
B. Irreversibility of land-use changes.	
C. Need for physical land inventory in addition to topographic and demographic inventories for land-use planning.	
II. The Physical Land Resource.	
A. Geologic substrate	
B. The Soil as a Natural Body	
1. Its genesis	
2. Its morphology	
3. Aerial or geographic distribution	
4. Flooding, wetness, and drainage	
5. Steepness	
6. Aridity	
III. The National Cooperative Soil Survey and Soil Classification	
A. Organization and Operation	
B. American System of Soil Classification	
C. The Family of Maps	
D. Soil Maps	
IV. Soil Interpretations for:	
A. Community Development	28
1. Building sites for heavy buildings And dwellings	
2. Homesite foundations and basements	
3. Underground utility lines	
a. Pipeline support and corrosion of metals	
4. Sewage effluent disposal	
a. Industrial	
b. Domestic	
(1) Subsurface	
(2) Lagoon	
5. Streets and parking lots	
6. Planning and construction of highways	
7. Sanitary land fill and solid waste disposal	

IV. Soil Interpretationa for: (cont'd.)

A. 8. Earthen structures for flood control
9. Water/Conveyance and atorage (supply)
10. Lawns and landscapes
11. Cemeteries
12. Flood-plain use.

B. Planning Recreational Facilities

1. Campsites
   a. Tents
   b. Trailers
2. Buildings in recreational area
3. Paths and trails
4. Picnic and play areas
5. Athletic fields
6. Golf courses

C. Agriculture

1. Dryland soil management
2. Management of Irrigated soils
3. Range management
4. Feedlot waste management
5. Hydrologic soil groupings and drainage
6. Woodlands
   a. Natural
   b. Plantation

D. Fish and Wildlife Management

1. Openland wildlife habitat
2. Woodland wildlife habitat
3. Wetland wildlife habitat

E. Economic and Sociological Relationships

1. Single vs. multiple-use concept
2. Cost-benefit relationship6
3. Zoning ordinances

UNIVERSITY OF WISCONSIN, RIVER FALLS

Department of Plant and Earth Science

Rural-Urban Land Use 435 3 lectures 3 credits

Objectives:

To study the characteristics of soil. land forms, water and other natural resources as they influence rural and urban lan use.

a. plans for wise use of resources and proper development are needed;
b. suitable plans result only when 8 thorough knowledge of resources is possessed by planners.
c. resource inventories are available and are useful in the planning process.

Outline of the Course:

I. Introduction
What is Planning? What is Zoning?
What are Resources? Fixed Quantities--Some Renewable
Why do we Plan?
Put land use in harmony with needs of community and individuals

II. Geology
General nature of rocks as they affect uses. Land Forms, weathering, erosion.
Good hearing strength
Seepage and Drainage
Nature of aquifers, stream flow, storage
Location of mineral deposits--preservation of fossil fuels.
essential elements, aggregate building rocks.

Uses of maps of hard rock, drift and topography for predicting terrain, soils, drainage, catena, water movement, storage and runoff.

Kinds of analyses available -- uses and limitations.

III. Soils
Soil properties and morphology
Effects of parent material, climate, living organism, topography. time.

Relationship of properties (chemical, physical, biological) to land "se. Water movement in soils related to pore size. space, and distribution. Influence of topography and mineralogy on overland flow, erosiveness, seltatopm, etc.

Soil inventories--maps (various scales) analysis--reports, uses, limitations.

Mapping units--soil classification.

IV. water

Sources -- present, potential

Ground water

Surface Water--pond, stream ocean

Precipitation

Ownership--riparian, capture, appropriation

water laws

Watershed management

Characteristics of a watershed

Factors affecting vaterehedss--pp & n, Soil.

Different kinds.

Problems of Watersheds

Agricultural areas--siltation, fertilizer, biocides

Industrial areas--chemical pollution, siltration

Urban areas--siltation domestic pollution

Flood Plain areas

causes and effects of overflow, scouring, deposition, channel filling, meandering, urban influence

National Water Needs inventories, vater supplies. Uses and limitations of data.

V. Vegetation types and land uses.

Forest--products, land protection, vattr flow, Atability, wildlife, beauty, recration.

Grassland--forage, land protection, water flow, wildlife, beauty

Urban areas--streets, parks, floodplain recreational sites, conservancy areas

Agriculture--patterns that fit terrain and climate. Products of economics value.

Land Use shifts--potential and ramifications

Crop and paeture land to

forest and recreation

housing and factories, etc.

Forest And Woodland to

Housing and Insustrial

Cropland

Recreational uses and reservoirs

VI. Natural Beauty Area--Need to Preserve and Develop

Fixed quantities--unique characteristics

Special attributes of terrain, vegetation, sand dunes, valley sides, flood plains.

Need for access to vater, protection And orderly developrnt of unique areas such as belts of hills and valleys.

Need for areas of movement for wildlife between food, shelter, and water.

VII. Planning Process

Integrate land uses vith

Soil suitability for various uses--use roll maps

Terrain And topography--use topograph And geology maps

Water needs and vater control

Open Space, Recreation And Wildlife needs

Other Needs

Transportation, etc.

Class Schedule

Agronomy 585 Fall 1973

PURDUE UNIVERSITY

Week of:		Subject
Sept. 3	Lect.:	Soils and Land Use
	Lab.:	Soil differences - Agry 255
Sept. 10	No Class	
Sept. 17	Lect.:	Soil properties affecting land use
	Lab.:	Soil and other resource maps
Sept. 24	Lect.:	Soil properties affecting land use, cont'd.
	Lab.:	Field trip
Oct. 1	Lect.:	Soils for homesites - subdivisions
	Lab.:	Use of soil survey for site evaluation -Assign Proj. I
Oct. 8	Lect.:	Homesite waste disposal - Septics and alternatives
	Lab.:	Field trip.
Oct. 15	Lect.:	Soils and waste disposal - land disposal.
	Lab.:	Soils and land use on air photo's
Oct. 22	Lect.:	Soils and waste disposal - solid waste
	Lab.:	Generalization of soil nap - Hand in Project I
Oct. 29	Lect.:	Urban drainage, runoff ; erosion
	Lab.:	Comprehensive planning - Assign Project II
Nov. 5	Lect.:	Ag land evaluation; use of soil survey for tax assessmen
	Lab.:	Project II
Nov. 12	Lect.:	Soils for transportation and industrial sites
	Lab.:	Project II
Nov. 19	Lect.:	Soils for forestry and recreation
	Lab.:	Site selection problem
Nov. 26	Lect.:	Land planning - Natural resource data
	Lab.:	Class presentation - Project II
Dec. 3	Lect.:	Land Use regulation - Federal and state
	Lab.:	Class presentation - Project II
Dec. 10	Lect.:	Land use regulation - county level
	Lab.:	Class presentation
Dec. 17	Final exam.	

UNIVERSITY OF MISSOURI

OBJECTIVES FOR STUDENTS
ENROLLED IN AGRONOMY 100
"SOIL SYSTEMS"

LISTED BY WEEKLY UNITS:

UNIT I: THE SOIL SYSTEM

UNIT II: WHAT HAPPENS WHEN WATER IS ADDED TO A DRY SOIL?

UNIT III: WHAT HAPPENS WHEN A MOIST SOIL IS DRIED?

UNIT IV: PARTICLE SIZE DISTRIBUTION, TEXTURE AND STRUCTURE

UNIT V: WEIGHT, PORE SPACE, SOIL AIR AND SOIL COLOR

UNIT VI-A: SOIL WATER BUDGET

UNIT VI-B: INTRODUCTION TO SOIL MINERALOGY

UNIT VII: MINERALS, ROCKS AND WEATHERING

UNIT VIII: SOIL CHEMICAL ANALYSES

UNIT IX: ALTERATIONS OF SOIL CHEMISTRY

UNIT X: SOIL ORGANIC MATTER AND SOIL ORGANISMS

UNIT XI: SOIL FORMATION AND CLASSIFICATION

UNIT XII: SOIL SURVEY REPORTS AND FIELD STUDIES

UNIT XIII: FIELD OBSERVATIONS AND INTERPRETATIONS

UNIT XIV: WHAT AGRICULTURE DOES TO SOILS--SANBORN FIELD

UNIT XV: SOILS OF MISSOURI

AGRONOMY 100 : OBJECTIVES

UNIT I: THE SOIL SYSTEM

general: to develop the concept of the soil as a system of energy and matter: to identify the major inputs of energy and matter and their organization in the soil system

behavioral:

a) be able to describe the location and extent of the soil system in relation to earth (area,depth);

b) be able to relate the soil system and its nature to a series of cycles such as carbon cycle, nitrogen cycle, hydrologic cycle,diurnal and annual energy cycles;

c) be able to identify major kinds of soil horizons (O,A, B,C,R);

d) be able to relate the major kinds of horizons to past functioning of the soil system, given any one of six major kinds of soil profiles that are climate-related

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UNIT II: WHAT HAPPENS WHEN WATER IS ADDED TO A DRY SOIL?

general: to observe that soils and other porous materials have a capacity to retain water with measurable forces: to understand the nature of those forces

behavioral:

a) be able to diagram the structure of the water molecule and to relate that structure to the description of water as a"dipole;"

b) be able to relate the radius of curvature (r) on an air-water interface to the pressure or tension on water at that interface;

c) be able to express soil moisture tension in either atmosphers, bars, or centimeters of water;

d) be able to predict capillary rise if the radius of the capillary is halved, quartered, or doubled, given the radius of one capillary tube and the height of capillary rise:

e) be able to select the best statement from a series of statements concerning adhesion, cohesion, soil moisture tension, approximate depths of water penetration into dry soil;

f) those enrolled for 5 credit hours: be able to describe the tensiometer and the way in which it records soil moisture tension: explain the "water trick" with sponges in terms of height of water, pores, etc.

UNIT III: WHAT HAPPENS WHEN A MOIST SOIL IS DRIED?

general:

a) to observe that, as water is withdrawn from a soil, the soil moisture tension on the remaining water increases, and to relate increasing water tension to ease of removal by plant roots or other energy sources

b) to develop from Units II and III concepts of available water storage capacity and water movement in soils

behavioral:

a) be able to relate plant-availability of water to soil moisture tension:

b) be able to relate soil moisture tension to distance from solid surfaces:

c) be able to interpret a moisture release curve in terms of amounts of plant-available water:

d) be able to relate general soil textural names to capacities to store plant-available water;

e) be able to relate hydraulic conductivity to amount Of water in soils:

f) those enrolled for 5 credit hours: be able to describe four methods of measurement of soil water;

be able to discuss some relationships between: hydraulic conductivity and temperature; hydraulic conductivity and air porosity: depth to R horizon and vegetative canopies in the Ozarks

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UNIT IV: PARTICLE SIZE DISTRIBUTION, TEXTURE AND STRUCTURE

general: be able to understand the nature of a) particle size distributions in soils, b) the combination of individual particles into aggregates, and c) the combined effects of particle size and aggregation upon porosity and water in soils

behavioral:

a) be able to relate diameters of particles to names for Soil separates:

b) be able to calculate the surface associated with 1 cm^3 of solids when it is subdivided into any given particle size;

c) determine the textural class name when percentages of sand silt and clay are given:

d) be able to compute percentages of sand silt and clay; given data from a hydrometer study;

e) be able to recognize an illuvial B horizon from a graphic plot of the profile of clay content;

f) those enrolled for 5 credit hours: be able to define particle density and to compute its value from laboratory data: be able to relate dispersion and flocculation of clays to structure and to rluvial-illuvial horizon formation

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UNIT V: WEIGHT, PORE SPACE, SOIL AIR AND SOIL COLOR

general: to consider the soil volume from the standpoints of a) weight, b) pore space, and c) air and water contents, and to relate the air water relationship to the behavior and nature of the soil system

behavioral:

a) be able to determine bulk density and total pore space in soils;

b) be able to convert data regarding bulk density and water in the horizons of a soil into a profile of soil volumes of solids, water, and air;

c) be able to describe color in terms of the Munsell system:

d) be able to use soil color as an estimate of the drainage or aeration under which a soil system operates:

e) for those enrolled for 5 credit hours: be able to differentiate between open and close packing of uniform sized spheres and the resulting density from each kind of packing: be able to relate soil color to oxidation reduction, iron and organic matter

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UNIT VI-A: SOIL WATER BUDGET

general: to entend the study of soil water into the area of weather events and their influence upon the soil system

behavioral:

a) be able (given a water balance diagram) to identify periods of soil moisture depletion, soil moisture recharge, and probable periods of maximum runoff (if any):

b) be able to discuss the major variations in water balances for the state of Missouri;

c) those enrolled for 5 credit hours: be able to relate slope and aspect to local variations in evaporative demand; be able to relate summer deficits of water to yields of a crop

UNIT VI-B: INTRODUCTION TO SOIL MINERALOGY

general: to study the mineralogy of the soil particles, thereby providing the link between water and chemistry of the soil system

hehavioral:

a) he able to name the 8 chemical elements that make up most of the earth's crust and be informed as to their relative amounts;

b) be able to name 6 or 7 of the common minerals in soils:

c) be able to describe quarts in terms of silicon, oxygen, and tetrahedral arrangement of those elements;

UNIT VII: MINERALS, ROCKS AND WEATHERING

general: to continue the study of mineralogy of soil particles, their chemical composition and their effect upon the soil solution

behavioral:

a) be able to distinguish between minerals and rocks by definition if not by identification of hand specimens:

b) be able to distinguish anions from cations:

c) be able to calculate milliequivalent weight, given the atomic weight;

d) hc able to compare or contrast the chemical formulas for quartz and orthoclase and discuss in terms of Si^{++++}, Al^{+++}, K^{+} and tetrahedral pores;

e) bc able to evaluate statements concerning kaolinite, illite, muscovite and montmorillonite and their structures in terms of silica tetrahedra and aluminum octahedra;

f) know the chemical formulas of quartz, orthoclase, calcite, dolomite and gypsum and be able to show the anion-cation pairs for the last 3 in the listing:

g) if enrolled for 5 credit hours: be able to relate the negative charge on clays to Al+++ in tetrahedral pores and Mg^{++} in octahcdral pores: know the approximate exchange capacities of montmorillonite, illite and kaolinite; be able to relate loss of potassium and silicon to weathering of silicate clays: be able to relate chemical profiles to broad climatic groupings

UNIT VIII: SOIL CHEMICAL ANALYSES

general: to study the ion content of soil solutions, the factors affecting the content and the means for analyzing it

behavioral:

a) know the ion forms in which plants use nitrogen, phosphorus, potassium, calcium, and magnesium;

b) be able to evaluate a series of statements concerning cation exchange and the soil solution:

c) be able to discuss cation exchange in terms of the major cations in soil systems and equivalent weights of cations:

d) from a table of data showing the exchangeable cations, be able to determine 1) exchange capacity, 2) base saturation, and 3) saturation by any one cation:

e) be able to determine soil pH and to interpret pH in terms of acidity and alkalinity and hydrogen ion concentration:

f) those enrolled for 5 credit hours: be able to read a standard curve for colorimetric determination of phosphorus by the molybdate blue test; be able to use the molybdate blue test as a qualitative field test; be able to interpret a titration curve for soils in terms of milliequivalents of neutralizeable acidity in 100 grams of soil/ be able to describe the general relationships between base saturation and pH.

UNIT IX: ALTERATIONS OF SOIL CHEMISTRY

general: to examine the objectives and methods of altering the chemical nature of the soil

behavioral:

a) be familiar with the concept of optimum pH range for plants:

b) be able to relate optimum pH ranges to availability of nutrient elements;

c) be familiar with methods for raising or lowering soil pH and be able to work problems dealing with lime as a method for raising pH;

d) be familiar with the nature of plant response curves and methods for relating plant response to soil test values;

e) be able to calculate amounts of calcium, magnesium, and potassium required to change an acid soil to a slightly acid soil with a proper balance of calcium, magnesium and potassium;

f) be familiar with the general fate of chemical elements added to the soil in terms of crop removal, fixation or reaction with the soil and losses from the soil;

g) those enrolled for 5 credit hours: be able to convert a fertilizer analysis to amounts of N, P, and K; be familiar with sources and general manufacture or processing of commercial fertilizers: be familiar with the special naturepf saline and sodic soils and means of correction: be able to examine a report of the dissolved substances in sewage effluent and from that, to point out possible important interactions as that effluent is added to the soil

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UNIT X: SOIL ORGANIC MATTER AND SOIL ORGANISMS

general: to view organic matter in soil systems as the steady state between production and decomposition; to study the role of organisms in that equilibrium: and to study the impact of organic matter and organisms upon the functions of the soil system

behavioral:

a) be able to discuss the concept of organic matter in soils as the steady-state condition where gains=losses.

b) be able to contrast forest with grassland ecosystems as regards amounts, and profile distributions of organic matter;

c) describe the major physical and chemical effects of organic matter upon the soil system;

d) be able to sketch a nitrogen cycle illustrating fixation, ammonification, nitrification, denitrification, and leaching;

e) recognize the roles of groups of microorganisms in carbon and nitrogen transformations:

f) those enrolled for 5 credit hours: be able to estimate amounts of nitrogen made available to plants by decomposition of soil organic matter; be able to estimate half-life times for organic matter where rates of decomposition are known; relate organic matter decomposition and nitrate contamination of water supplies

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UNIT XI: SOIL FORMATION AND CLASSIFICATION

general : to consider the major kinds of soil features which result from the continual operation of the soil system and to use those soil features as a basis for classification

behavioral:

a) be able to name the 5 major factors influencing soil formation and bc able to evaluate a series of statements concerning the influence of each factor

b) know the abbreviated definitions of the following list of diagnostic horizons: mollic epipedon, argillic, natric, spodir, oxic, calcic, gypsic;

c) be familiar with the ten orders of soils as defined in the U.S. System of Classification:

d) be able to identify, given a classification name such as Typic Albaqualf, the parts of the name which refer to the classification categories of: order, suborder, great group and subgroup:

e) be able to describe the general locations of the soil orders, aridisol, mollisol, alfisol, spodosol, ultisol and oxisol with reference to the United States.

f) those enrolled for 5 credit hours: be able to describe the world distribution of major areas of the soil orders aridisol, mollisol, alfisol, spodosol and oxisol; be able to outline the major kinds of changes which have transformed loess of northern Missouri into the soils that exist today; be able to explain, for the soils of northern Missouri, profiles of particle size distribution, organic matter and pH in terms of the soil-forming processes.

UNIT XII: SOIL SURVEY REPORTS AND FIELD STUDIES

general: to study soils in the field setting near Columbia and to relate some major variations in soils to the factors of parent materials, vegetation and topography

behavioral:

a) be able to locate a tract of land on a soil map when given a legal description according to the rectangular system:

b) be able to describe the kinds of parent materials for soils that are characteristic around Columbia, Missouri, and be able to evaluate a series of statements concerning the expected stratigraphy of materials:

c) for Pleistocene sediments know the four stages of glacial advance: be familiar with the approximate ages of those stages and the soil forming periods that might be found around Columbia, Missouri;

d) be able to describe the general distribution of forest and prairie landscapes in Boone County and Missouri;

e) be able to evaluate a series of statements describing soils or contrasting soils seen on field trips;

f) those enrolled for 5 credit hours: be able to use a modern, detailed soil survey report to answer questions concerning a specified tract of land

UNIT XIII: FIELD OBSERVATIONS AND INTERPRETATIONS

general: to consider a method by which field observations of soils can be interpreted in terms of land use and to apply those methods to one tract of land

behavioral:

after completing the field exercise, prepare outlines for one-page (approximately 200 words) discussions of each of the following topics which relate to the tract visited. one.of the topics will be assigned as your weekly examination:

a) the Pattern of Soil Drainage or Wetness on the Tract and Possible Movements of Water from One Soil to Another:

b) The Use of the Tract for Septic Tank Filter Fields--Where Would They Function Best and What Possible Effects Might Filter Fields in one Area Have on Adjoining Areas:

c) Possible Explanations for the Obvious Organic Matter Accumulation in the Alluvial Part of the Landscape;

d) the Suitability of the Tract for Agricultural Production and the Soil Characteristics which Might Impose Limitations

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UNIT XIV: WHAT AGRICULTURE DOES TO SOILS: SANBORN FIELD

general: to study the long-time effects of agricultural management upon a soil

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UNIT XV: SOILS OF MISSOURI

general: to summarize the studies of soil systems by applying some major concepts to one area and volume of the earth's surface. Missouri

behavioral:

a) no specific objectives shall be listed here. Rather, it is recognized that those who study this unit may have a wide array of objectives. The unit should be considered optional, with each person concentrating upon those parts he or she considers useful

NORTH CENTRAL REGIONAL TECHNICAL WORK-PLANNING CONFERENCE

OF THE COOPERATIVE SOIL SURVEY

Osage Beach, Missouri
April g-12, 1974

Report of Committee 7. Soil Correlation and Classification

The charge given to Committee 7 is listed in my letter of February 21 which is attached to this report. Our efforts were concentrated in the area of the relationship of this committee to soil interpretations and the charges from the previous committee.

As I consider the role of our committee in regard to interpretations, two thoughts come to mind. The first comes from the Soil Survey Manual: "Soils are landscapes as well as profiles." The second thought is perhaps less profound and is borrowed from the field of Computer Science, but it does direct attention to the importance of soil correlation and classification in the field of Soil Interpretations: "Garbage in, garbage out."

A point of concern raised by a committee member is the present tendency to base all soil correlation decisions on the present interpretations being made. We should keep in mind an objective of a soil survey is to record soil characteristics, and that in the future we may be asked to interpret these characteristics for uses not presently recognized. The topics considered by this committee and a summary of the comments under each of the topics are presented in the following paragraphs.

I. General Questions Concerning Interpretations

A. What interpretations are needed and by whom?

1. Interpretations are needed for every soil concerning its behavior under all uses, both agricultural and nonagricultural. They are needed by all land users and those who assist in planning uses of land.

2. More quantitative interpretations are needed in the categories we are using and perhaps a hierarchy of interpretations is needed to parallel soil taxonomy, for example, at the family or subgroup level.

3. Soil interpretations and data are needed at several levels -- urban areas, county, multicounty, and state. There is a continuing interest in interpretations for agricultural sections and an ever increasing demand for interpretations from nonfarm users.

4. More users are interested in being provided the interpretations and answers, rather than the data. We find interpretations concerning herbicide and/or pesticide soil interactions as a function of soil properties such as particle-size and organic matter content are needed. Seedbed preparation costs for varying soil characteristics are needed.

B. What research is needed in order to make correct interpretations? Who is or should be doing research?

1. Additional research is needed in the area of yields, hydrologic conductivity, electrical resistance, and all physical and chemical properties. Especially important are soil permeability, drainage class, shrink-swell potential, frost action, soil water table, soil stability, and shear strength.

2. Additional research is needed concerning the effect of erosion on net income per acre and the effect of erosion and sedimentation on pollution and quality of the environment,

3. More effort and emphasis should be placed on characterizing composition of the mapping units by all field men and correlation staff in the National Cooperative Soil Survey. Michigan is presently using a technique of mapping unit characterization to update the old soil surveys in that state.

4. Research and record keeping are needed on all soils, and particularly key soils. There is a special need in the area of interpretations as related to sanitary facilities.

5. Presently interpretations are based on many estimates and few measurements. Also, more observations are needed on soils, especially mapping units that have been properly identified.

6. Research related to interpretations should be cooperative with civil and sanitary engineers, climatologists, recreation planners, all land use planners, and weedicide and pesticide distributors.

7. Research needs and the plan to accomplish the research could be incorporated into the work plan of the county soil surveys.

8. Research is needed concerning users of soil reports and the users' needs.

C. What publications are needed for soil interpretations, and who should publish?

1. It was suggested that two levels of publication would be desirable. One would be more technical in nature; the second would contain some data but be presented at a general level that would be readily understood by the user. It was suggested that a publication of this type would probably be done by state and federal agencies.

2. It was suggested that publications are needed for all key interpretive groupings such as sanitary landfills, sewage lagoons, etc. It was suggested that the benchmark-soil approach might be used, with the publication being a joint effort between state and federal agencies.

3. SCS Advisory Soils-9, dated March 29, 1973, provides for the publication of a soil survey interpretations handbook which is intended as a guide for making soil survey interpretations.

4. It was reported that several states have divisions of natural resources and extension services involved in publication of interpretive information. This is generally a joint publication, again between state and federal agencies. It was also stated that the publication should involve those in classification and mapping and those who conduct the research.

5. Interpretations should be published as separate documents from the soil survey report. Also, the interpretations should be written for specific users. The agriculture experiment stations and extension service could be cooperating agencies in publishing these reports. A portion or all of the cost could be borne by local interest groups.

II. Specific Questions Concerning Interpretations

A. How does the work of our committee relate to waste management?

1. The classification of some soils does not help on sanitary landfill site interpretations because it does not go deep enough.

2. There is a need to abrogate our NCSS rule and obtain information on lower depths (greater than 10 feet) for landfill site interpretations. Geologists should be encouraged to participate in this activity.

3. Soil napping unit symbols have been prefixed by a "T" to denote soil landscapes in Iowa where loess is underlain by alluvium rather than glacial till. Some difficulty has been encountered in correlation of these units when loess thickness exceeds 10 feet. However, an understanding of the landscape enables these units to be predicted and mapped. The "T" areas have lower potential for development of sanitary landfill sites than those that are underlain by glacial till.

4. Criteria selected for mapping unit differentiation at depths below about 10 feet might legitimately be a geology mapping job, rather than a part of soil survey. However, if soil behavior is different for soils that look alike but are in different positions, properties within the soil could be used as class differentiae.

5. Landscape position can aid in the prediction of materiel at depths exceeding 5 feet. Presence of alluvium at a defined depth in a certain part of the county could be noted in the mapping unit description if the information was needed.

6. In one county in Illinois, outwash areas with greater than 60 inches of loess, but usually less than 80 inches, were show" as Tama and associated soils, because it was reasoned by some that if the loess was greater than 60 inches, the underlying material was not important. Most areas of Tama and associated soils in the county were underlain by a Sangamon paleosol (till). Thus, these differences were not show" on the soil map. A geological map was constructed to show the differences in the two areas because of a tendency to bury this information in the soil report.

7. There is a need for better understanding of absorption rates of soils, hydraulic conductivity. percolation rates, and landscape hydrology to aid in classification and correlation of soils so that better interpretations can be made about waste management.

B. How does the work of our committee relate to soil hydrology?

1. The position and duration of water tables are reflected in our classification system.

2. The nature of runoff as a function of landscape and stream valley characteristics is a part of soil hydrology.

3. Derivations of some of the hydrologic coefficients do not adequately integrate the landscape characteristics.

C. How does the work of our committee relate to pesticide and herbicide usage?

1. Organic matter content, soil textural class, and rainfall are three variables that tend to control the fate and behavior of pesticides in soils. In classification and correlation, slope and erosion phases can be used to better define organic matter content and texture. Phases of soil units should be justified based on soil properties and then interpretations made. In many cases interpretations are used to justify the phases.

2. The majority of committee members commented on the importance of organic matter content and textural characteristics as related to pesticide fate and behavior. The sensitivity of these materials to soil variations emphasizes the importance of designing mapping units and adequately mapping these units so that they can be quantitatively defined in terms of soil properties, and thus be consistently classified, correlated, and interpreted.

D. How does the work of our committee relate to soil characteristics that determine the desirability of land for agricultural production?

1. The earliest soil surveys of record were made for the express purpose of evaluating land for its agricultural potential. The dominant use of soil classification in the Cornbelt is still for agricultural uses. Increased concern about the land as a limited commodity and land-use legislation have directed attention to "prime" agricultural land.

2. The energy crisis with the shortage of fertilizer and gas has made us more aware of inputs necessary for production. A recent study by Beasley (Univ. of Missouri) concerning degree of erosion reported increased production costs of 20 and 56 percent, respectively, for moderately and severely eroded Missouri soils, as compared to slightly eroded soils. Differences in net income per acre (as compared to slight) ware $18.32 and $33.20 for the moderately and severely eroded units.

3. A recent 'Tennessee study (Overton et al.) reports the effect of various degrees of erosion on long-time corn yields.

Degree of erosion	Corn yield (bu./A)
Uneroded	105
Eroded	98
Severely eroded	71

4. The importance of organic matter content in soils is being recognized in stripmining areas of Illinois and Iowa where regulations will require stockpiling of the surface horizons.

5. Classification problems concerning the thickness of the mollic epipedon are not uncommon in the region. In some categories the dark surface coincides with the Ap horizon. In others, plowing to a depth greater than 10 inches can change a mollic intergrade surface to a mollic epipedon. Many moderately eroded phases of Mollisols are classified as taxadjuncts because of thickness of the mollic epipedon.

6. Depletion of soil productivity by erosion has long been recognized. However, in recent years concern has increased about the effect of erosion and sedimentation on the quality of the environment. The Corps of Engineers estimates that the average annual sediment damage in the upper Mississippi River basin is 25 million dollars. Classification and correlation of the soils subject to erosion is an essential step in the application of proper management practices to reduce soil loss.

E. How does the work of our committee relate to the energy problem which is now upon us?

1. If the energy input (gas, fertilizer, etc.) for agricultural production had to be reduced by 25 percent, which soils would you select and which crops would you grow? We have the knowledge to answer questions of this type.

2. Concerning crops as energy sources, the more fossil energy we put into cultivating, fertilizing, etc., lower-fertility-greater-management problem areas (eroded soil areas), the less efficient energy converters our crops become.

III. Miscellaneous

A. How can cooperative efforts in soil survey be improved?

1. A report was prepared by an experiment station worker on a final field correlation of a county survey. He was not present at the final correlation but was informed that his notes and suggestions were much appreciated and thoroughly reviewed by the correlator -- and every suggestion was not accepted.

2. During the course of the survey many decisions are made on field reviews by responsible individuals. Also, much thought goes into the initial legend that is set up and continually revised during the course of the survey. Often different decisions, especially concerning mapping units, are made at the regional level on final correlation. By this time much time and effort have been expended, and the cost savings for combining mapping units at this stage are questionable. Participation in the initial field review, and especially during the early stages of the survey, by all agencies concerned with mapping unit detail should be encouraged. More emphasis on series concepts among states, designing and coordinating interstate soil series studies, and striving for uniformity of mapping detail among states, would seem to be more fruitful areas of concern at the regionaàsevele.
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B. Degree of agreement of soil name and composition of mapping units in various landscapes with varying intensities of surveys.

1. The scale of 1:24,000 for some areas in Minnesota will result in more undifferentiated units if series mapping continues. Series "boxes" may be a bit too rigid, with a tendency to use too many variants and taxadjuncts.

2. Composition of mapping unit studies have been used to aid in updating old surveys in Michigan.

3. Kansas reports three studies in which the percentage of named soils in a unit varied from approximately 55 to 75 percent, with an extreme range of 50 to nearly 100 percent. The mean reported was approximately 70 percent.

4. Nebraska soil transect studies on two different soils are reported. In three transect studies of Pierre silty clay, 65 to 92 percent of the observations ware within the range of the series. In four transects of Keith silt loam, 57 to 82 percent of the observations were within the range of the series.

5. Other states report studies to estimate composition of mapping units, but no regular or systematic program has been developed.

6. Ohio and Iowa report significant variations (approximately 3:1) in numbers of series correlated between adjacent counties with similar landscapes at state boundaries.

7. Ohio reports the proportion of pedons in map delineations that fit a series name is considerably less than normally required. In some counties complexes have been correlated using only a single series name.

8. Naming of variants is a problem when the series name does not occur in the county.

9. Missouri questions the desirability of attempting to study the degree of agreement between only soil names and composition of mapping units. They feel a high percentage of the mapping unit is being classified with the current use of soil taxonomy.

10. Combinations of slope and/or erosion classes in correlation does not improve the relationship between agreement of name and composition of mapping unit.

C. Proportion of landscape actually being classified with current use of soil taxonomy.

1. Ohio reports problems in handling complexes and undifferentiated units, especially in their state land capability plan. They are presently "merging" properties.

2. Missouri reports that approximately 95 percent of the landscape is actually being classified by describing mapping units.

3. Kansas reports 75 to 100 percent of the soils are being classified by soil taxonomy.

4. There appears to be some disagreement among committee members as to how to determine the proportion of landscape actually being classified with soil taxonomy. Does it include the composition of the mapping unit? Interpretations are accomplished using a named mapping unit, assuming a range in composition. Arc series ranges being interpreted too rigidly, resulting in the use of an excessive number of variants and taxadjuncts?

D. Measurement of soil temperature on selected toposequences

1. Minnesota has requested field parties to obtain these measurements over a 3- to 5-year period, along with water table observations. In addition to supplying data for the mesic-frigid line, it is believed that the data will he of value for interpretations relating to crop adaptation, nitrogen recommendations, shrub and tree plantings, etc.

2. There appears to be little interest in this charge, judging by committee response.

V. Recommendations

A. This committee should be continued.

B. This committee should investigate ways that each mapping unit can he better quantified in terms of properties and composition, rather than being qualitatively compared to other units. This information should be carried through the survey and published in the report in the mapping unit section.

C. For series phases based on landscape (including substratum phases), the complete name should be given in correlation. Important non-typical phases should carry their name throughout all surveys.

D. Geomorphology with accompanying accessory properties can constitute series criteria.

E. Encourage additional research studies on the effect of erosion on fertility levels, crop yields, and quality of the environment.

F. Encourage initiation of additional studies that will supply more quantitative data as a basis for interpretations.

G. Summarize and analyze existing data and encourage additional research studies on the effect of erosion on fertility levels, crop yields, and quality of the environment.

H. Develop means to better integrate the soil landscape in our classification, correlation, and interpretive work.

I. Soil association area writeups should be more comprehensive and emphasize where soils occur on the landscape and develop better descriptions of the areas.

J. All cooperating agencies should be encouraged to participate in the early stages of the soil survey to minimize combination of mapping units after completion of the survey.

- Committee 7

James R. Culver	Ted Miller
Joseph F. Cummins	Alexander Ritchie
J. B. Fehrenbscher	R. H. Rust
Don Franzmeier	Frank Sanders
Roger Haberman	Geo. M. Schafer
Lacy Harmon	Stephen Shetron
Kenneth Hinkley	Mike Stout
N. Holwaychuk	Neil Stroesenreuther
Richard Jones	E. P. Whiteside
James H. Lee	Larry Zavesky
Dale Lockridge	T. E. Fenton, Chairman

SUMMARY OF COMMITTEE COMMENTS TO COMMITTEE 8 REPORT

The report was reviewed by three of the four different discussion groups. Several recommendations were forwarded to the chairman. Following is a summary of these recommendations:

It was suggested that the name of the committee be changed to "Communicating Soils Information." The additional heading which is presently used includes "for the improvement of the environment" and this seems to date the formation of this committee. It is felt that this committee should deal with communicating soils information for all purposes. The shorter name of the committee

North Central Regional Technical Work-Planning Conference
of the Cooperative Soil Survey

Osage Beach, Missouri
April 8-12, 1974

The Report of Committee 8
Communicating Soils Information for the Improvement of the Environment

The committee chairman sent a letter to the 27 committee members asking them for specific comments on the three theme questions proposed by the conference chairman. Twelve members responded to the initial letter and a reminder letter.

This report will attempt to summarize the comments of the respondents. The report emphasizes interpretations since this is the theme of our conference. It was found that the three major questions posed by the conference chairman were very well adapted to the purposes of this committee.

No. 1 - What Interpretations are Needed? By Whom?

For practical reasons many interpretations are not included in the soil survey reports but the basis for making these interpretations are. Interpretations are usually emphasized that are deemed of greatest importance to the greatest number of users in a given geographical area. Our primarily rural states such as Kansas, Nebraska, South Dakota, and North Dakota are now receiving requests for the same type of interpretations that are very common to the more densely populated states.

There appear to be several areas which need increased emphasis when considering specific interpretations. A few comments will be made about these specific interpretations but the original intended audience of the soil surveys should not be forgotten. These are the owners and operators of farms and ranches who need information about their soil, especially when they are considering new tillage equipment, fertilizer placement, and other cultural practices.

There is an increased need for information pertaining to the irrigation of municipal effluent. More information is needed on the infiltration capabilities of soils and locations where irrigation has not been previously considered. The ability of these soils to absorb nutrients, reactions with heavy metals; effect of organic materials and other related studies need to be made.

Several areas are using soil surveys as a basis for tax assessment. Productivity indexes, yield potential, response to different management practices and other expressions are becoming more common. The ability to predict yield with changes and cultural practices, varieties and other factors becomes very difficult. A blanket approach in establishing guide-lines should not be taken since the tax laws, the assessment procedures, and the farming practices vary greatly across the North Central Region.

Land Use Planning has become another popular term. Emphasis on land use planning with provisions for state land use plans and inventory of natural resources should cause us to reevaluate what interpretations are made for different land uses and how we have established the criteria for these interpretations. Information about soils can be very helpful but we need to communicate this information to our planning officials.

There are many types of land uses which depend upon the workability of the soil or the ease with which the soil can be worked at different moisture contents. Most farmers know when they can cultivate or till their land, but persons moving into the area, or farm managers not readily acquainted with the area could make costly mistakes. This information would be helpful to fertilizer dealers in the movement of product and rental equipment to know which soils can be worked a few days earlier than others. It would also be helpful for construction companies to know how readily a soil will dry down so that it can be worked with greater ease.

Now we reach the question of "By Whom" would need these interpretations. The list could become very long, but it is appropriate to make some comments about several specific groups of users.

a. State Divisions of Planning - Even though the National Land Use Policy Act has been temporarily sidetracked, most of our states have identified the state agency which will be responsible for developing a state land use plan. Many of these state agencies have asked for soils information and would like to have this presented in a variety of formats.

b. State Highway Department - Most states have a cooperative effort with the state highway department in obtaining engineering test data. Ohio is currently providing test data to the Ohio Department of Transportation for a highway soil manual. South Dakota indicated in the 1972 NCR conference that the Department of Highways is an important user of soil surveys as a result of the identification of more than 20,000 soil samples taken along proposed highway routes.

c. Health Departments and Sanitary Engineers - This group has been primarily concerned with the functioning of the septic tank at different sites. However, they also are interested in delineating of the flood plains, potential&r effluent irrigation, locations of sewage lagoons, a suitability for a site of a sanitary landfill.

One soil survey report, or one interim report, will not meet the needs of the above clientele in a specific area. These groups need to be worked with individually and the amount of information given will depend greatly upon the policies of the organization and the confidence and willingness of the staff to work with soils information. More flexibility in our approach providing information to these people should be considered.

No. 2 - What Research Is Needed in Order to Make Correct Interpretations? Who Is or Should be Doing the Research?

Some of the needed interpretations expressed in the previous section also indicate the need for specific research. When emphasizing any specific research, one needs to be aware of the potential user. What type of answers does this user need?

Each university appears to be concentrating on the most pressing problems for that particular state. Some problems are not attempted because of the lack of equipment. lack of personnel, or possibly because the magnitude of the problem is not that far reaching. Perhaps here is an opportunity for regional coordination in looking for those research areas which may be slipping between the cracks.

Some additional research areas which should be emphasized are summarized as follows:

a. Quantification of soil limitations to replace "slight, moderate, severe, very severe" ratings. Wisconsin has received a positive public response to the current quantification of soil ratings as to the suitability for absorbing liquid waste. There are many other areas such as corrosion potential, bearing strength, and other interpretations which could be quantified.

b. Relationship of engineering test data to known soil properties. Several states have established a good working relationship with the state highway departments in obtaining engineering test data.. Correlations of this data with such soils information as texture, depth of profile, color, etc.. need to be studied.

c. Methods for solving limitations. Research efforts need to be expended to determine the best method for removing an unsuitable rating. Some unsuitable ratings can be simply removed by such acts as draining or building a levee but others such as a poor bearing strength, high corrosive potential, poor permeability and others need research to provide a solution.

d. Soils and landscapes. The 1972 committee report indicated the need to study the relationships of soils within a landscape. It might be helpful to first organize, refine, and put into more effective use the facts already known about the obvious relationships between soils, landscapes, hydrology, and hydro-kinetics. The landscape approach is also adapted to remote sensing techniques. This might be a source of funds for developing such projects.

e. Determining criteria for prime agricultural land. Planning groups are asking this question more often. The criteria vary, depending upon geographical location and distance to a prime urban center. There are many soil characteristics that should have a prime influence on decision on what prime agricultural land should be saved for agriculture.

[redacted] physical varibility of mapping units should be conducted in cooperation with the Soil Conservation Service. Since the universities are rarely involved in the mapping process, the communication of problems needing solutions in the field sometimes don't reach the universities. It is felt that the annual review process at the county level should involve the participants from the Soil Conservation Service, researchers from the

Agricultural Experiment Station and representatives from the Extension Service.

No. 3 - What Forms of Communications are Needed for the Distribution of Interpretations? Who Should Initiate Each Form of Communication?

The value of the published soil survey report met with varied responces from the committee. A quote from one of the respondents appears to best summarize these feelings, "The basic procedure of a thorough study of an area of land and the compilation of the soils data in a series of maps and tables by professional people results in a very useful body of knowledge. However, from this point, I think we can make the assumption that the rest of the world should be just as interested in this information as we are and ready to grab it and use it. Therefore, we put all of this technical data together in a 130 to 230 page book and publish it, - enough copies for everybody in the county."

The procedure for writing the report received some comments. The party chief is given the primary responsibility for authoring the report with assistance from specific discipilines of the State SCS Office. It is interesting that many times the party leaders are moved to the next mapping assignment before they have the opportunity to complete this important document. This puts the author in a difficult situation of trying to coordinate and begin a new job while trying to put the ribbon around the old one. It is also noted that Extension Specialists are rarely involved in the preparation of soil survey reports. There is considerable expertise in that area that can offer aid in identifying audiences and audience characteristics and in developing interpretative materials that may more effectively communicate soil facts to soil survey users.

Information and educational programs should be developed for the distribution of soils information in the following situations:

(1.) Counties not being mapped progressively. Information about soils and the interpretations of the soils need to be developed for these counties to be used with individual mapping sheets. Also an educational program needs to be developed to inspire residents of the county to ask for a soil survey and to provide funds for that end. (2) Counties currently being mapped. Educational programs need to be developed for the potential users in these counties. There are many opportunities for organized tours, specific interim reports and many other activities. (3) Counties with mapping completed but awaiting publication. If no educational activities have been developed to this point, it is difficult to spur interest in the potential users of soils information. They usually want to wait until the publication arrives. There are many opportunities in these counties to provide copies of field sheets and interim type reports. (4) Completed soil survey. Counties with a modern soil survey report need to develop ways for acquainting the users with the information in the report. Meetings for potential users explaining the major soils in the county, how the maps were made, and some possible interpretations included in the report are very helpful. Several states have developed soil survey exercises which promote an understanding and use of the reports for specific audiences.

The need for intensive use of computer technology in providing soil survey data and information was stressed by all respondents. The stage has been set for the possibility of specialized interpretative material designed for specific audiences. The possibility of' rapid retrieval of the desired information and produced in a form most helpful for the user invites some exciting possibilities.

Not only can the data be provided in interpretive tables but computer maps showing specific soil ratings for a specified use could bc developed. Thus, a rapid interim report might be developed with a certain user in mind.

Several respondents indicated that interim reports seem to be slipping into the same category as our published soil survey reports. Letters have been developed by several state offices of SCS which dictate the standard form that should be used for interim reports including a standard cover. It would appear that involvement of local participants and users is one of the main criteria in developing interim reports. The user gains much from the experience and also he feels that it belongs to him.

It might be well for us to observe several different categories of users and to note who categories contact for information. The following is just a sample listing of some of these user categories:

Category	Contact
Commercial farmers -	
fertilizers and herbicides	Extension agent and ag chemical dealer
erosion control and drainage	SCS and contractors
crop varieties and crop selection, farm plan	Agronomists and farm management specialits, SCS
Home owners -	
selection of lots	Real estate firms, planners
gardens and home landscaping	Garden stores, nursery horticulturists
special problems - (wet basement, sewage)	Contractors
Local government	engineering firms, planning firms, specialized staff of county or city
Regional and state government	Specialized staff

Wisconsin has developed a scheme for the communication of the distribution of interpretations. A copy of this scheme is attached.

FORMS OF COMMUNICATJON FOR OPTIMUM USE OF SOIL SURVEY INFORMATION

	Activity or Information	Audience	Communication	Initiator
1.	Existence of soil surveys	Engineers Govt. Officials Planners Sanitarians Developers Etc.	Written & personal contacts	Univ. Ext., Soil Cons. Disti SCS
2..	Introductory facts & explanations of soil survey uses & limitations	Same	Workshop, Field trip, Demonstration, Person to person discussions, Brochures	Same (reinforced by audience member: who now are user
3.	Detailed uses of soil surveys with interpretations	One or more of above, as appropriate (not all at once)	Specific demonstration & testing	SCS soil scienti Univ. soil scier SCS Conservatio
4.	perfection & redevelopment of interpretations	Experienced engineers, Sanitarians or planners & Soil Scientists	Intensive group work sessions	Any of the participants
5.	Recycling & reuse of the information transfer process	Same	Depends upon group needs as defined in 4	Any of participants

Comments:

This is basically a cyclic system which begins with a series of events listed as 1 through 4 and recycles to new applications using the same sequence after initial experience has been gained. For repetitive cycles of this information exchange, work can start at points 2 or 3 unless new participants come into the program who require initial training beginning with step 1.

Committee 8 Members:

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Bouma, Johannes
Bowles, James
Brans, Edward L.
Casey, Joseph T.
Christman, Richard T.
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Fox, Robert
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Harmon, Lacy I.
Hole, Francis
Holmgren, George
Jackson, Richard K.
Johannsen, Chris. J. , Chairman
Johnson, Paul R.
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Oschwald, W. R.
Radeke, Robert E.
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Rust, Richard H.
Smeck, Neil E.
Swanson, Roger A.
voss, Earl E.
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NORTH CENTRAL REGIONAL WORKSHOP
Of the
COOPERATIVE SOIL SURVEY

Osage Beach, Missouri
April 8-12, 1974

Report of Committee No. 9

Last fall, November 1973, a memo was sent to all committee 9 members concerning the Forestry Committee report of the Organic Soils Task Force meeting held at St. Paul, Minnesota, November 1972. Each committee member was asked to review and comment on this report. They are summarized as follows:

(1) Yields for productivity classes should be comparable to others in USC. U. S. Forest Service Resource Report No. 20 uses 5 classes as follows: 120, 85 to 120, 50 to 85, 20 to 50, and 20 cu. ft. /Ac/ Yr. The Forestry committee developed 5 classes with lower yields: 100, 60 to 100, 30 to 60, 10 to 30, and 10 cu. ft. /Ac. /Yr. Provisions should be made to continually update yield and site index values for each species and that specific components of the soil profile or site, as related to a species requirement, be used to develop penalty ratings. Present system would act as an interim until enough site data has been collected to develop this concept. Yield and site index *data* should reflect regional as well as local growth.

(2) Under Appendix A for Factor and Penalties the following suggestions were made:

Factor - Water table - individual tree species should be listed along with water table requirements.

Depth to bedrock - 16" should be increased to 27" for a penalty. Experience has shown that anything less than 2' would bc a windthrow hazard. Other penalties would be adjusted accordingly.

Slope - Values should be reduced by ten percent as follows: 25% to 15%, 25 - 45% to 15 - 35%, 45% to 35%. Penalty values should also be reduced from 0, 20 and 50 to 0. 10 and 40 respectively.

Surface tier - thickness of continuous sphagnum layer should be defined.

The general consensus of the replies concerning this part of the committee assignment was that this initial effort was good. However, since the primary charge of the Forestry Committee of the Organic Soils Task Force was to develop a rating system for the United States and Canada, should a single classification system be used to define productivity? Forested organic soils range from Florida to Alaska with great differences in climate, length of growing season and species composition. The following suggestions were made: (1) subdivision of United States and Canada into regions of similar climate and forest species. This would tend to reduce the magnitude of the range in a species productivity. Each region would have its own values for the five classes. For example, Balsam Fir in northern Michigan may have a different range in productivity than in Canada along the north shore of Lake Superior. (2) Productivity should be presented by species according to its site requirements. Each organic soil series, or grouping, should reflect site indices and yields for several alternative tree species. (3) More work is needed in organic soil classification for forestry interpretation purposes. Especially on those organic soils that occur over a large area. For example, develop broad classes within a region that would include organic soils having similar productivity for tree growth.

As far as this committee response to the North Central Regional work planning chairman's charge concerning soil survey interpretations for forestry, we can only re-emphasize this committee's reports for 1968, 1970 and 1972.

Conclusions

The forest soil committee recognizes the fact that these problems concerning interpretation, soil survey legends, have been raised at past meetings and will continue to be areas of debate and work. Only through cooperation and pooling of knowledge between soil survey organization and federal, state and University experiment stations can these problems be alleviated.

Forest Soil Committee Membership

*Shetron, S., Chairperson
Boelter, Don H.
Boyle, J. R.
Carey, Rex
Carmean, Willard H.
Gilmore, A. R.
*Klingelhoets, A. J.
*McKenzie. William E.
Meeker, Ralph L.
Mesenger, Steve
Nelson, DeVon

*Present at Osage Beach, Missouri

ADDENDUM TO REPORT OF COMMITTEE NO. 9
April 12, 1974

Submitted to
North Central Regional Workshop
or the
Cooperative Soil Survey

Stephen G. Shetron - Chairperson

Comments from the two of the four discussion groups concerning the task of Committee No. 9 for the 1974 session of the NCR workshop indicated that clarification is needed for: (1) subject material, and (2) yields for forest productivity classes on organic soils.

As stated in the committee report, the forest soils committee was asked to review the report of the Committee on Forestry of the Organic Soils Task Force meeting (Nov. 27 - Dec. 1, 1972). The discussion groups indicated that this subject should have been covered by the Organic Soils Committee (No. 3) of the NCR Soil Survey Workshop. It was not the intent of Committee No. 9 to circumvent committee No. 3, but rather to collect comments from another group about the Organic Soils Task Force Committee on Forestry report. This Forestry report is the first step in developing guidelines for interpretation for organic soils as used for the production of forest products. Thus, committee No. 9's role in disseminating this report to an audiance that differs from committee No. 3. Most of the members of committee No. 9 are foresters who may have to use the guidelines. Their exposure to this report and their comments are essential. A copy is included with Committee No. 9 report.

The second item that is in need for clarification is yield *classes.* Five cubic foot volume growth per acre per year classes were developed to conform to existing U. S. and Canadian data. However, as recommended by Committee No. 9 members, site index data should be integrated with the cubic foot volume growth per acre per year, and the productivity classes should be comparable with existing U.S.C.S. ordination classes for mineral soils. This would standardize both organic and mineral soils productivity for forestry purposes. Also, as more site index data becomes available, existing classes should be re-evaluated and adjusted, especially by species and their site requirements. The Committee on Forestry for the Organic Soils National Committee should re-examine the present five productivity classes for organic soils.

Recommendations collected from the discussion groups are presented as follows:

1. Subdivision of the United States and Canada into regions of similar climate by forest species. This would tend to stabilize variability in growth, emphasize a species site requirement, and perhaps refine our concepts of organic soil series. Initial stratification should follow present land resource areas.

2. The following points need further clarification and refinement by the Committee on Forestry, National Committee on Organic soils.

   a. Yields should follow Memo 26 or L1-2.
   b. Water table factor should be tied to individual species. For example, Black Spruce vs Tamarack.
   c. Depth to bedrock increased to 27" from 16".
   d. Slope should bc a regional penalty in preference to nation-wide penalty.
   e. Thickness of continuous sphagnum layer should be defined.

3. More work is needed in organic soil classification for forestry interpretation.

4. Forestry Committee of the Organic Soil National Committee should consider the above recommendations and suggestions in order to refine this first attempt of developing interpretation for organic soil as used for the production of forest products.

The function of the Forest-Soils Committee is to deal with problems involving soils, both organic and mineral, and forest productivity. Discussions with other members of the NCR Soil Survey workshop and the current emphasis on soil-survey interpretation, suggests that perhaps the Forest-soils committee should concentrate its efforts on one of the following for 1976.

1. Urban - forest soil interpretation for -

   a. Subdivision.
   h. Noise barrier.
   c. Erosion control.
   d. Species suitability to disturbed soils.
   e. Parks and critical area plantings.

2. Mine waste reclamation interpretative guideline for forestry.

3. Continue to work on organic and mineral soil interpretation.

4. Continue to stress communication between soil scientist and foresters with respect to developing mapping unit legends and interpretative guidelines.

Organic Soils Task Force Meeting
St. Paul, Minnesota
November 27 - December 1, 1972

Report of the Committee on Forestry

The forestry committee met on Wednesday and Thursday, November 29, 30, 1972, principally to discuss interpretations for organic soils as used for the production of forest products.

Two rating systems were developed and are outlined here. One is based strictly on productivity. The other system outlines use potential groups based on ratings assigned to selected indicator properties.

Productivity Classes

Productivity is rated in cubic feet produced per acre per year, in terms of merchantable stands for pulp or other use with a higher economic return. The minimum acceptable size is an 8-foot log with 4-1/2 inch base diameter and 4-inch top diameter.

Class	Estimated yield cu. ft. /acre/year
1	100
2	60-100
3	30-60
4	10-30
5	10

Classes were based on data from:
- Silvics of North American Trees
- Preliminary Draft Michigan Ordination of Soil Series
- Soil Series Interpretations Sheets
- Partial Summary of Measurements of Site-index of Several Trees on Histosols of Minnesota
- Miscellaneous publications of U.S. F. S. and Michigan Universities

Use Potential Groups for Forestry on Organic Soils

The attached table outlines use potential groups for forestry sites based on each of several indicator properties. The overall rating for the site corresponds to the most limiting case found from assigning the individual ratings. For instance, a site on a 30 percent slope that is otherwise excellent is placed in Group 3. A site on a 30 percent slope with bedrock at less than 10 inches but otherwise excellent is also placed in Group 3. The same criteria are applied to drained and undrained sites.

A series of penalty factors (see Appendix A) were assigned to selected indicator properties and used as a tool to outline the Use potential Groups. The penalty factors do not relate directly to the Use Potential Groups as adopted, and are not used in computing a rating for the soil.

The Use Potential Croups and the Productivity Classes were tested through analysis of three thormic, one mesic, and three frigid soils. Series included Allcmands, Pamlico, Washkish, Moose Lake, Caron and Beseman. All keyed out satisfactorily in the system. A worksheet for the Beseman series is attached.

The Forestry Committee would like to have the system of Productivity Classes and Usc Potential Croups reviewed by appropriate persons in universities, colleges, the U.S. Forest Service and the U.S. Soil Conservation Service. It is hoped that comments and suggestions for modification can be returned to the Forestry Committee for evaluation before a working system is put out for trial.

Respectfully suhmitted,

The Forestry Committee:

Edwin Neumann, Chairman
D. Boelter
H. R. Finney
S. Rieger
Stephen Shetron
R. E. Smith

Forestry--Appendix A

Relative penalty ratings for individual factors that bear upon forestry product ion. The lower the number, the better the site. The penalty ratings were used as a tool to arrive at the Usc Potential Croups, hut arc not used to compute suitability ratings in the system adopted.

Factor	Penalty
1. Soil Temp. (climate)	
Hyperthermic	0
Thermic	10
Mesic	30
Frigid	50
Cryic	65
Pergelic	80
2. Water Table (controlled-uncontrolled) in growing season	
depth to	
O-6”	50
6-18”	20
18-30"	0
30”	20
‘3. Reaction in Root Zone (0.01M $CaCl_2$)	
4.5	30
4.5-7.0	0
7.0	20
4. Salinity mmhos/cm	
Water at 5 cm tension	
o-4	0
4-8	20
8-16	50
16	75
5. Depth to Bedrock	
16”	0
10- 16”	20
5-10"	30
5”	40
6. Sulfur (Wt. % within 1 meter)	
0.4%	0
0.4%	100
7. Flooding	
Prolonged flooding in growing season will cause serious damage or death. No ratings assigned.	
8. Slope	
25%	0
25-45%	20
45%	50
9. Surface Tier	
Discontinuous or no sphagnum	0
Continuous sphagnum	20

Use Potential Groups for Forestry

FACTORS	GROUPS				
	1	2	3	4	3
Temperature Regimes	Hyperthermic Thermic	Mesic*	Frigid*	clyic*	Pergelic
Water Table in Growing Season	———— 18-30"---------		6-18" 30"	O-6"	
Reaction in Root Zone (CaC1)	4.5-7.0	7.0		4.5**	
Salinity	0-4mmhos/cm	4-8mmhos/cm		8-16mmhos/cm	16.0mmhos/cm
Sulfur	none	0.4%			0.4%:
Depth to Bedrock	16"	10-16"	S-10"	5"	
Slope	0-25%		35-45%		45% —
Composition of Surface Tier	Discontinuous Sphagnum		Continuous Sphagnum		
Underlying Material Other than Bedrock	Use agricultural criteria if drained; not significant if not drained				

*High rainfall maritime climate to be rated one class higher.
** This pH does not apply to maritime climates with 70" annual precipitation.

Use Potential Groups for Forestry on Organic Soils

Series: Beseman Phase:

Classification: Terric Borosaprist, loamy, mixed, dysic

For Production of: Black spruce for pulp

Factors	GROUP		Remarks
	Reclaimed	Native or Unreclaimed	
Temperature		3	
Depth to water		3	
Reaction		4	
Permafrost		-	
Salinity		1	
Decomposition		1	
Sulfur acidity		1	
Suitahility rating for site		4	

Yield: 10 to 30 cubic feet/acre/year

Site Index: 10 to 30

NORTH CENTRAL REGIONAL TECHNICAL
WORK-PLANNING CONFERENCE
of the
NATIONAL COOPERATIVE SOIL SURVEY
Osage Beach, Missouri
April 8-12, 1974

Report of Committee 10 - Soil Surveys for Urban, Range, and Forest Areas (Amended as of final conference session 4/12/74)

This committee was established because of the growing concern over the degree to which our detailed soil surveys are meeting the pressing needs in special area*. Our charge is to initiate the study discussion, and possible re-orientation, of the National Cooperative Soil Survey effort in order to make it an effective force in meeting the new demands for soil data. In keeping with the theme of the conference and the three general questions suggested by our chairman, the following report expresses only a general summary of the view and comments of about half of the committee and is intended only as a starting point. The general questions were slightly tailored to fit this particular subject and are expressed briefly as follows:

Question 1

What are the new demands, problems, and pressing needs for soil surveys and soil interpretations in the urban, range, forest, and mine reclamation areas?

A. Urban demands

a. Requests for soils data are being made at every level of generalization. These requests are many, complex, and extremely diverse.

b. Special groups and agencies seeking information are partly a* follows:

1. City, county, and regional or multiplanning agencies or commissions.

2. State planning divisions or departments.

3. Zoning commissions and special recreational and developmental authorities.

4. Realtors, home builders, and land developers.

5. Construction and engineering firms, consultants, public utilities, and private power and pipeline companies and the like.

6. **Private** planning consultants.

7. County and state tax assessment and equalization agencies **and** departments.

8. Public health departments, sanitation engineers, and environmental protection agencies and civic organizationa.

9. City, county, **state,** and federal road and highway **departments,** departments of public works, **and** the like.

c. Kind6 Of information **requested.**

1. Generalized soil maps of all kinds and proportions.

2. Detailed **soil** survey6 for metropolitan area6 and the surrounding lands to a distance of about 3 miles.

3. Soils data and ratings of soils for septic tank filter fields, sanitary landfills, effluent irrigation systems, sewage lagoons, and a myriad **of** waste **disposal** type projects.

4. Interpretations and data of the material below the normal **soil survey** depth6 of 5 feet and above the hard bedrock.

5. Specialized material6 for identifying critical area6 and roil condition6 involving the writing and enforcement of **local** sediment and erosion control ordinances and land use planning regulations now being formulated.

d. **Problems** involved in urban request6 are probably more numerous than practical to state, but the immediate obstacles seem to at least include the following:

1. The wide range of map scales desired and the extremely variable level6 of detail and generalization requested. Each request tend6 to require unique kind6 of map6 and data with little chance of reuse in other areas.

2. Time interval involved between the need for the data by the user and the ability **of** the soil survey program to provide it within their timetable6 which is the **shortest** time **possible.**

3. Uniformity is needed in use of mapping unit symbolization in multicounty use of soil surveys for urban and community type planning uses. Many users become confused by symbols that are used to identify two different series.

4. Communication and educational gap between the users who are requesting sol.1 information and the suppliers of soil survey data.

5. Quality control and validity of data that the soil survey program is supplying to urban interests and its proper or improper use.

e. The pressing needs for urban use of soil surveys are mainly involved in being able to supply the required data in a professional, accurate, useable form in the shortest length of time,

B. Range demands

a. Detailed soil surveys are presently supplying more information and detail than is really needed in some areas.

b. Mapping units could be redesigned according to needs of present users and the projected future that would be adequate for most uses.

c. Marginal lands need consideration in mapping unit design that would assess their suitability and probable response to irrigation.

d. Problems are mainly involved in providing more general information at less cost and in shorter lengths of time.

3. Pressing needs are to redesign the kind of soil survey mapping units and provide for the conveyance of the latest research and agronomic advancements in the soil interpretative materials.

C. Forest demands

a. Much has been said about the needs of forest interests in other conferences, and the five levels of soil survey recommended by the task force committee concerned with this particular problem is probably our best source of information and discussion. The forest demands for soil surveys was only briefly mentioned by contributing members of this committee.

b. Forest demands for soil survey data are mentioned in light of needs being brought on by multipurpose uses of recreation, flood prevention, land use planning, and surface mine reclamation projects.

c. Problems seem to be mostly in the ability to determine the kind of mapping units and detail needed for specific sites and areas and to set up legends and procedures for mapping and making the subsequent interpretations.

d. Pressing needs are probably best expressed in the follow-up actions and development of the task force's suggested five levels of soil surveys. The design of mapping units should be devised to meet the demands of the forest users and planners and developed within the soil taxonomy at whatever level is best suited for their use.

D. Mining area demands

a. New legislation both on the state and federal levels could throw soil surveys and the cooperative soil survey agencies into a very intricate and commanding position involving surface mine area reclamation and mining waste stabilieatlon projects.

b. Soil survey techniques and skills are being requested in developing methods and agronomic practices to stabilize mine dumps, toxic wastes, tailing piles, and the like.

c. Problems are tremendous and little research, experience, and soil survey criteria are available for quick solutions and program development.

d. Pressing needs will become acute if legislation puts the responsibility of reclamation and stabilization on members of the cooperative soil survey program.

1. Research is essential.
2. Mapping criteria will be needed.
3. Communication and exchange of information will be important at all levels, private, state, and federal.

Question 2

What are the new methods, ideas, criteria, materials, operational structures, training, quality controls, time, finances, and manpower needed to meet these new demands of soil surveys?

A. Almost without exception was the exclaimed need for better aerial photographs for use as base maps.

a. Quick available sources.

b. Financial arrangements and cost-sharing allocation or reimbursement-type participation by interested parties.

c. Flexible scales, imagery, and coverage.

B. Use of remote sensing and EARTS type of techniques and equipment.

C. Computer use in simplifying map and soil interpretation printout operations made available.

D. Standardize, where possible, procedures, scales, and formats of interpretative-type handout materials and provide these material.6 through the Cartographic Section to reduce cost and time intervals and to provide uniform and professional products with similar categories, terminology, and kinds of materials.

E. Set up some kind of training program or system that will increase the basic knowledge of the users of soil surveys as to the kinds of information available, its limitations and its benefits.

a. Provide for, or encourage, training in soil survey and soil classification at the undergraduate and graduate school levels in the fields of Planning and Community Development, Forestry, Engineering, and the like.

b. Establish a working relationship between users of soil surveys for the interchange of experiences, ideas, and needs.

1. Develop a system of liaison between professional groups, associations, and organizations, both local and national.

2. Provide a method to circulate and assimilate the kind of feed-back information that would be gained from such an interchange of experiences.

F. Make an overall assessment of our whole soil survey program in light of developing a more flexible approach to our willingness, readiness, and mobility in meeting the new demands for soil surveys. One suggestion was to summarize the demands in chart form in order to visualize the total picture. Analysis from this point would help to concentrate our efforts in the areas where soils data could make the greatest contribution and help us to adjust our programs accordingly,

G. Provide some kind of leadership training or facilities to make interpretations available for the soil materials and geologic deposits below our normal 5-foot soil survey information and above the solid bedrock.

a. Provide geology training for soil scientists.

b. Provide geologic information through cooperation with state geologists. The Missouri State Geological Division is now in the process of determining criteria for a program in mapping the surficial deposits of Missouri. They are cooperating with the soil survey program of both the Soil Conservation Service and the Forest Service. Progress and data are limited to date.

Question 3

What kinds of materials should be made available to these new users of soil survey and soil interpretations?

A. Many good kinds of publications are now being produced and it is suggested that these be reviewed critically and standardize the best of these products to cut costs, reduce the time lag, and produce the most professional kind of product.

B. Special emphasis was suggested in seeking help from the various informational specialists and staffs in devising educational programs, soil survey promotional activities, and overall communication type programs.

a. Washington level type formulation of communication and informational programs with flexible formats for individual state and local soil survey program inputs.

b. Use of outside communication and informational consultants in an effort to overcome the rather sterile and stereotype products that have become traditional with the past governmental and institutional type publications and program salesmanship.

c. TV displays using computer type printouts in color.

C. Further development in providing interim report type soil survey data is suggested with emphasis on making this form of information available for any size of area desired at any stage of total completion for a particular survey area.

D. Use of remote sensing and ERTS Satelite map6 for general soils maps of states and multicounty area6 such 66 recently published in South Dakota.

E. Computer uses are certainly a household word in soil survey6 today and all reporting members mentioned its coming importance. Possibly the conference discussion will be more enlightening, but to date there is not much to show for the effort but input. The Oklahoma computer printout of soil interpretation maps for Oklahoma County seemed like a refreshing breakthrough.

F. Suggest better use or planned use of the soil extension specialists in providing training, liaison, and interchange of needs between the soil surveyor6 and the users of soils data a6 mentioned in d3 pert of question 1.

This report represents only part of the committee members' ideas and comments. We look forward to the discussion and addition6 to be made at the conference.

Recommended further action6

It has been recommended that the committee be continued and that the charge for the next conference be restated to include the need to explore further the question of what criteria, design, and amount of detail of the mapping unit6 are needed in the urban, range, forest, and mining areas.

Possibly this committee should be a sort of clearinghouse for new demands, needs, etc., to be channeled down to the more specific committees, such as forest, soils, etc., or to point up need for other committees, etc.

Sincerely,

Gilbert R. Landtiser
Chairman, Committee 10

NORTH CENTRAL REGIONAL TECHNICAL WORK-PLANNING CONFERENCE (WORKSHOP) OF THE NATIONAL COOPERATIVE SOIL SURVEY

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8 people.

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2 term schedules
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NATIONAL COOPERATIVE SOIL SURVEY

North Central Regional Conference Proceedings

Rapid City, South Dakota
April 17-21, 1972

University of Missouri - Columbia

COLLEGE OF AGRICULTURE
Department of Agronomy

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April 30, 1973

To: 1972 Participants, North Central Regional Technical Work-Planning Conference, Rapid City, South Dakota

Attached are committee reports from the North Central Regional workshop which was held at Rapid City, South Dakota, April 17-21, 1972. These are for your use and files.

My office phone is Area Code 314, Telephone 882-7026.

Sincerely,

C L Scrivner
ms

C. L. Scrivner
Chairman

Attachments

MINUTES
NORTH CENTRAL TECHNICAL WORK-PLANNING CONFERENCE OF THE NATIONAL
COOPERATIVE SOIL SURVEY
Howard Johnson's Motor Lodge - Rapid City, South Dakota
April 17-21, 1972

MONDAY, APRIL 17

The Work-Planning Conference was called to order by Conference Chairman, R. L. Bannister, at 1:00 p.m. in the Howard Johnson's Motor Lodge, Rapid City, South Dakota.

The workshop was welcomed to South Dakota by two persons; by Dr. Duane Acker, Dean of the College of Agriculture and Director of the Agricultural Experiment Station and Extension Service, SDSU and by Vincent W. Shally, South Dakota State Conservationist, S.C.S.

Dean Aker's Welcome

Dean Acker compared the discovery of gold in the Black Hills with the later discovery of the "gold mine" of agricultural resources and also compared it with the as yet not completely developed "gold mine" of talent and knowledge. His charge was that we must continue to expand not only our knowledge but also the impact of our knowledge.

He pointed out the open ended nature of the work of the National Cooperative Soil Survey that is brought about by the new problems and demands of users of soil resources. The expansion, between 1889 and 1971, of acres of detailed mapping and of kinds of soils recognized was related to our increased knowledge of soils. The 1990 target date for completion of soil surveys for all of the United States was seen as a time to begin updating.

Some of the new demands upon soil survey were quoted from the "Framework Plan" of the Soil Conservation Service. Pollution by sediments and from livestock feedlots were cited as were the needs of urban planners and developers.

New techniques were pointed out as needs. Automatic data processing was given as an example. Monitoring and remote sensing were seen as another example. The forthcoming ERTS satellite was foreseen as an important step in resource monitoring. South Dakota has a major installation in the EROS at Sioux Falls. Dr. Charles Frazee of SDSU is conducting the soils research related to remote sensing and monitoring. He and Dean Acker caution that it will be considerable distance in the future, if ever, that ground survey will be replaced.

Dean Acker contended that one of the problems with soil survey is that we are not fully using, by far, the information now available and we will be forced to work much harder than before just to keep up with data being obtained.

Soil Survey Operations at the National Level

Dirk van der Voet, Director of Soil Survey Operations, S.C.S., Washington E.D. summarized the direction of Soil Survey Operations by relating highlights of messages from the Administrator of the S.C.S.

a. Acceleration of Publication of Soil Surveys

In FY 1971 60 manuscripts were sent to the Government Printing Office. It is planned to send 80 manuscripts in FY 1972 and 90 in FY 1973. It is hoped that in the future the use of electronic equipment in preparing manuscripts, soil correlations, interpretations, etc. will help in this acceleration.

b. Soil Survey Accomplishments

In FY 1968 approximately 50,000,000 acres were mapped; in 1971, 38,000,000 acres were mapped. This is a decrease of 12,000,000 acres. The Administrator asks that we make every effort to increase our current rate and reach a goal of 50,000,000 acres again as soon as possible consistent with other high priority items.

c. Reconnaissance Soil Surveys

We need to consider doing more reconnaissance soil surveys. Reconnaissance surveys are appropriate in areas of extensive use such as on much of our rangelands, forested lands, mountainous, rough, and steep lands, arid lands, some wetlands, and areas that are continuously cold. During the planning stage and prior to the development of the work plan determine whether a reconnaissance soil survey is the kind of survey needed for all or parts of the area. Make this same evaluation in soil surveys already underway at the time of the next progress review.

A task force has been appointed to prepare and recommend tentative additional guidelines for field operations, nomenclature, legends, handbooks, interpretations, correlation, and publication of reconnaissance soil surveys.

You arc encouraged to make reconnaissance soil surveys where they will provide information needed. Th is may be for a complete soil survey area or for a part of i 1..

d. Keeping the Public Informed

We all need to be alert professionally and personally for opportunities to talk to anyone about soil surveys, maps, and interpretations. We need well prepared talks and pictures to impress the public. We have so much to offer and we need to let people know. Too few people know about soil surveys.

The Role of the S.C.S. in Pollution Abatement

C. A. Tidwell, Assistant Director, Midwest RTSC, S.C.S., Lincoln, Nebraska discussed this topic with the workshop. Me pointed out that programs of control of sediment were applicable to urban as well as to agricultural lands.

Growth into the area of animal waste was seen as taking the direction of providing guidelines to state enforcement agencies. Up to 900 tons of manure per acre has been applied to corn, wheat and sorghum in Texas. Information concerning capacities of soils to function in waste and water renovation is sorely needed.

In the design of sanitary landfills, the prevention of seepage is the problem.

Soil Management for Maximizing Surface Water Quality

W. E. Larson, Research Investigations Leader, ARS, St. Paul, Minnesota showed data for quality of runoff water. Contents of fertizer nitrogen and phosphorus in runoff are small except when fertilizers are broadcast. Phosphorus contents of water were observed to be large after green plants are frozen. Fecdlots were shown to be large pollution sources but even there, the maintenance of green vegetation in waterways helped in pollution abatement. When manures were added to frozen ground, large amounts of pollutants were in the runoff water.

The Treynor Iowa Studies show that level terraces and grass greatly affect hydrology. Streamflow from level terraced areas was the same as for grassed areas but runoff was the major loss on grassed areas whereas water passed through the soil in levelled areas. Nitrogen and phosphorus losses were chiefly as attachment to sediments.

Considerations in sewage sludge applications were listed as (1) excess water (2) heavy metal content (3) nitrate content and (4) pathogens and viruses.

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Dr. McClelland suggested that the workshop should consider some action that would make provisions for changes or revisions in Taxonomy.

Workshop members were given a copy of "Progressive Soil Correlation", a 12 page mimeographed document prepared for correlation training workshops. The document spells out the steps in a soil survey and outlines the key points, identifies responsibilities and references memos or forms that give more detailed information

Workshop Business Meeting - 4:30-5:15

Workshop chairman D. L. Bannister informed participants Of the week's schedules.

The possibility of a formal report of the meeting was raised by R. B. Grossman. Discussion centered around the need capsulization of the meeting to be prepared for publication in Journals such as the Journal of Soil and Water Conservation.

It was moved by Ed Runqe, and seconded by Gene Whiteside, that the workshop prepare a report of the meeting and that the report be coordinated by Francis Hole. The motion carried.

The business meeting adjourned at 5:15.

TUESDAY, APRIL 18 8:00-12:00 a.m.

Separate meeting were held by Experiment Station members of NCR-3 and by the Soil Conservation Service along with other Federal employees. Minutes of those meeting are attached.

TUESDAY, APRIL 18 1:00-5:00 p.m.

The Workshop convened with R. Ii. Rust presiding. Three committee reports were presented. The committee work and reports had been completed prior to this meeting and they were presented and discussed in the general session. Final reports were to be completed after the discussion and those reports will accompany this set of minutes. Therefore, only points of discussion shall be included in these minutes.

Organic Soils - Committee 3

Gerhard Lee, chairman of Committee 3 called upon subcommittee chairmen who had assembled comprehensive reports. William McKinzie reported on the review of "Organic Soil Capability Classification for Agriculture" prepared by the Soil Science Department, Ontario Agricultural College, University of Guelph, Canada.

L. J. Bartelli - Why not use the term and concept of "potentials" rather than "limitations" in capability classification?

R. B. Grossman - A Cat-Clay Conference in the Netherlands is to be held soon. Someone from the Cooperative Soil Survey should attend.

Don H. Boelter presented a subcommittee report on "Use Capability Classification of Histosols for Forestry. In general there is a serious lack of research and information on this topic. In Finland waste disposal is being accomplished in histosol areas. Literature references were listed.

William McKinzie presented a subcommittee report prepared by Warren Lynn on the composition of representative Histosols. A series of recommendations for classification were presented.

Gerhard Lee moved that the report be accepted. The motion was seconded and passed.

Forest Soils - Committee 9

Stephen G. Shetron, chairman of committee 9, gave a report which was approved by the workshop.

L. J. Bartelli pointed out that there was a Task Force for Collecting Information for Development of Mapping Legends in Forested Areas.

Improvement of Teaching Methods in Soil Science - Committee 6

Tom Fenton, chairman of committee 6 presented the report through subcommittee chairman. Burt Ray reported on the possibilities of a Regional Credit Travel Course in Morphology, Genesis and Classification. Richard Fenwick reported on possible exchange of educational materials and Al Beaver reported on a canvas of courses taught. Bob Grossman commented that the Regional Technical Center has video-tape capabilities as well as illustrators. The workshop accepted the report.

Statistical Summary of Soil Analyses by The South Dakota State Highway Department - Special Topic

Mr. Jordan Thomas, Research Assistant with the South Dakota State Highway Department told the Workshop of the statistical summary of 22,000 samples that had been analyzed by the Department. The analysis permitted the prediction of many values and properties. This evaluation of data already collected resulted in a cost reduction of 75% for the testing program.

WEDNESDAY, APRIL 19 8:00-12:00 a.m.

Lacy Harmon presided over the morning session which consisted of three committee reports and a special report on remote sensing.

Communicating Soils Information for the Improvement of the Environment - Committee 8

Ed Runge, chairman of committee 8 presented the committees report and called upon two persons to present special topics not specifically covered in the report.

Bob Grossman presented ideas on techniques of information gathering and dissemination. Among the techniques were: modular writing, rapid assembly of files, portable offices, copy equipment, "girl" Fridays, correspondence courses, miniaturization and A.D.P.

Francis Hole reviewed work by J. Bouma on Soil Potential for Disposal of Septic Tank Effluent. Grossman observed that we need data for unsaturated conductivities.

Ed Runge requested that future charges to committees be more specific and recommended that research on water regimes be encouraged.

Don McCormack questioned the wording in statement 3 f of the committee report concerning soil survey reports. The statement was "It would appear that we are spending too much time and effort in putting "everything" in the report only to find that most of the interpretative information is of little use when the report is published. Somehow we need to devise a way of distributing rapidly out-dated material other than through soil survey reports". The conference accepted the report.

Soil Morphology and Soil Family Criteria - Committee 2

F. Ted Miller, chairman of committee 2 presented the report which focused upon the usefulness of soil families for interpretations. Included was a series of charts, prepared by Frank Riecken, which suggested that family grouping were too broad for interpretations of productivity or soil-plant properties,

The workshop accepted the report.

Remote Sensing Research

This special topic was organized by Charles Frazee to acquaint the workshop with onqoinq research and potentials for various kinds of imagery. Gerhard Lee told of studies in Wisconsin. Flood plain delineation was possible and Panchromatic film was as as color. In a northern Wisconsin study, Highway Department Planes were used co photograph with 3 films; Panchromatic in April, Aero Ectachrome in April and Color Infrared in August. Slope was best shown in color and poorest on infrared. Color in April appeared to be best but black and white was almost as good.

Jan Cipra of LARS decribed the work with spectral characteristics of soils.

Several workshop members plan to participate in the ERTS program. Jim Drew and Dave Lewis of Nebraska will concentrate on the Sandhills. Dr. Delbert Mokma of Michigan State will be studying land use planning and will work with Michigan University in the Detroit area. Jan Cipra of LARS will study 3 counties under the ERTS program. Charles Frazee of South Dakota will also be involved.

WEDNESDAY, APRIL 19 1:00-5:00 p.m.

Automated Map Compilation

Jerry Gockowski, Director of Cartographic Division, Washington D.C. told the workshop of the S.C.S. AMS (Automated Mapping Service) Automatic drafting machines are being installed. Soil maps will be digitized and recorded on x-y coordinates. Data will be stored on magnetic tape and those can be edited and corrected. Approximately four days will be required to compile the map for one county.

Soil Moisture and Climate in Relation to Soil Classification - Committee 5

Charles Frazee, chairman of committe 5 presented the committee report which was accepted by the workshop.

Soil Correlation and Classification - Committee 7

H. R. Finney, chairman of committee presented the report which had been prepared from the work of four subcommittees dealing with the topics: Use of Taxadjuncts; Clay-Size Carbonates in Particle-Size Classes; Mapping Legends Using Higher Categories of Soil Taxonomy and Combining the Final Field Review and Final Correlation. The workshop accepted the report.

Business Meeting

Workshop chairman, Don Bannister conducted a short business meeting.

Rodney Harner invited the workshop to meet in Michigan in 1976 and the workshop accepted the invitation by unanimous vote.

C. L. Scrivner described tentative plans that would locate the 1974 meetings in the Ozarks of Missouri.

Bob Grossman asked that graduate student participation be encouraged. He pointed out that it was important because many of the graduate students were heading for a career that would send them to similar workshops.

The meeting adjourned at 5:20.

THURSDAY, APRIL 20 — 7:45 a.m. - 1:00 p.m

A field tour of the Black Hills had been planned by F. C. Westin and R. E. Radeke. The tour was preceded by a presentation of the Geology of the Black Hills Region by John C. Mickelson, Head, Department of Geology and Geological Engineering, S. D. School of Mines, Rapid City. The tour featured geology, soils, vegetation history and land use in the area. It took the group up the flood plain of Rapid Creek through expanding city and resort developments and terminated at Mt. Rushmore.

THURSDAY, APRIL 20 — afternoon & evening

J. R. Culver presided over a workshop session at which two committee reports were presented.

Criteria for Series and Phases - Commitee 4

Paul Carroll, chairman of committee 4 presented the report with assistance from subcommittee chairmen Mike Stout, Richard H. Rust, Robert I. Turner and Gerald Post. The workshop accepted the report.

Engineering Application and Interpretation of Soil Surveys - Committee 1

Earl E. Voss, chairman of committee 1 presented the report which was accepted by the workshop.

Agriculture in New Lands Area in Western Siberia

At an evening session, J. E. McClelland used slides to help tell of his experiences while on tour in Western Siberia.

FRIDAY, APRIL 21

Workshop chairman Don Bannister presided over the general session.

Soils of the Great Plains

Andy Aandahl reported to the workshop on his forthcoming publication "Soils of the Great Plains" and he treated them with a set of 60 slides of soils and landscapes.

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Dr. Aandalh pointed out that no Experiment Station existed in the Great Plains Proper.

The Naming of Miscellaneous Land Types

J. E. McClelland led discussion of procedures in naming miscellaneous land types. After discussion a vote was taken on a proposal that all names of land types be within the taxonomic system. Non-soil was excluded from the proposal. The vote was: 18 for and 9 opposed.

Registration of Soil Scientists

Hollis Omodt described developments among soil scientists of North Dakota that were viewed as important to the profession. The entry of soil scientists into the area of professional consulting requires that organizations be set up and laws passed for certification of soil scientists in a manner similar to that adopted by engineers. Organizations of professional soil scientists will need to be established independent of existing organizations.

ADP Techniques in the Soil Survey Publication Program

Lindo Bartelli, Principal Soil Correlator, South RTSC described progress in the Ft. Worth office in using computers to store input data for publications. The objective is to have the capability of press-ready output. Procedures have been tried on two counties in Texas. One strict requirement will be quality-control of input.

It is possible that through ATS, a typewriter in each state office will provide access to the input-output capabilities.

Single-factor interpretation maps can be printed by computers using the MIAD Program of the U.S. Forest Service.

Business Meeting

Workshop chairman, Don Bannister, turned the workshop session over to C. L. Scrivner, incoming chairman for the final business meeting.

0. W. Bidwell moved that the workshop express their gratitude to Don Bannister for his seemingly untiring efforts which led to this successful workshop. The motion was seconded and passed. C. L. Scrivner also thanked others who had helped.

In response to soils memorandum - 57, describing procedures for making changes in Soil Taxonomy, the NCR-3 reported upon selections to the regional and national committees.

Selections were:

4 years - F. C. Westin
3 years - E. P. Whiteside
2 years - R. H. Rust

F. C. Westin was named as a state representative on the national committee for the part of the current year remaining plus a regular 3-year term.

J. E. McClelland nominated Stephen Shetron to be recommended as a North Central Regional representative Task Force for Collecting Information for Developing Mapping Legends for Forested Areas. G. B. Lee seconded the nomination and it carried. McClelland was named to inform the Task Force of the workshops wishes.

C. L. Scrivner announced that the 1974 meetingswould be held in Missouri at the Tan-Tar-A Lodge, Lake of the Ozarks, Osage Beach, Missouri. The date will be April 8-12, 1974.

The workshop was adjourned.

<u>1974 Officers</u>

C. L. Scrivner, Chairman
Rodney Harner, Secretary

<u>1974 Steering Committee</u>

C. L. Scrivner
D. L. Bannister
Rodney Harner
Don Franzmeier
J. E. McClelland

NORTH CENTRAL REGIONAL TECHNICAL WOK-PLANNING CONFERENCE
OF THE NATIONAL COOPERATIVE SOIL SURVEY

Separate Session
SOIL CONSERVATION SERVICE
April 18, 1972
Rapid City, South Dakota

Mike Stout, Chairman

A G E N D A

Tuesday Morning

8:00	Soil Survey Operations	Dirk van der Voet Director, Soil Survey Operations, SCS, Washington, D. C.
8:30	Panel - Map Compilation; High Flight Photography	Maynard Scilley, Chm. Don McCormack Jim Culver Lacy Harmon
9:15	Laboratory	Robert B. Grossman
9:30	Soil Series	W. E. McKinzie
9:45	Coffee Break	
10:00	Question and Answer Period	John E. McClelland Correlation Staff State Soil Scientists R. B. Grossman
11:45	Cartographic Information	Joseph T. Casey

The following topics are those most commonly suggested for discussion:

Problems in coordination of soil interpretations: Interstate coordination; format and use of interpretation sheets; form SCS-5, ADP program; research for improving soil interpretations; priority of computerized program in relation to completion of series interpretations (blue).

Cost-share of soil surveys: Who contacts local people; how funds used in soil program, setting of priorities; how does cost share result in speedup with personnel ceilings and no-hire situations?

Survey operations: How mesh with RC&D, Watershed and River Basin needs; how about funding.

MINUTES TO THE SOIL CONSERVATION SERVICE SEPARATE MEETING
NORTHCENTRAL NATIONAL TECHNICAL WORKPLANNING CONFERENCE
RAPID CITY, SOUTH DAKOTA, APRIL 18, 1972
Mike Stout, Chairman

Soil Survey Operations - Dirk van der Voet, Director, Soil Survey Operations

The following notes were taken from Mr. van der Voet's presentation and condensed for the minutes of this report. Topics are listed in order as they were brought up and discussed.

1. Soil Memorandum - 61 (draft) - Kinds of Soil Surveys. Several reasons percipitated the revision of Soils Memorandum-66 which covers kinds of soil surveys. These included (1) a state soil memorandum from a midwest state which indicated thata soil survey was not needed for making a conservation plan, (2) state soil survey appraisals made by the Washington office indicated a lack of uniformity in the use of code 107 throughout the country and, (3) soil maps were not being used in someconservation planning. He pointed out conservation planning without use of soil survey information is not in line with SCS policy.

The administrator is concerned about the drop in acreages mapped nationwide. He feels that the states are not setting realistic goals and not attaining the ones they set. Furthermore, the administrator states that soil survey needs to be just as good for conservation planning as for other uses. He accepts the fact that there may be some later revision needed in mapping for conservation planning.

The director indicated comments and suggestions concerning the draft had been received from the states. Thirty-one states concurred in the contents of the draft. Seventeen states indicated that they had real problems. The majority of these states are from the midwest and a few from the west where much range land occurs. The remaining states expressed no opinion. The director indicated that a conference will be held to make final decisions on the contents of the proposed revision for Soils Memorandum-61. Several proposals were offered from members of the session but no decisions were forthcoming concerning the disposition for revision of Soils Memorandum-61.

2. Soils Memorandum-3 concerning preparation of annual plans of operations is under revision and should be out in the field by May 15, 1972. This revision calls for the preparation of annual plans of operation in a uniform manner and includes a list of items to be included and the order in which they are to be arranged.

3. The director indicated that the soil survey production nationwide is down. He said that states need to investigate the ways to increase production through better use of time during mapping season.

4. Soil Survey Appraisals. There will be a revised format for state soil. survey appraisals. Some parts have been revised and updated. State soil scientists should think through the answers before filling out the appraisal form. The use of the appraisal is one way the Washington staff has of getting in contact with the field.

5. Soil Survey Organization. The proposed personnel Advisory-Personnel 245 is structure of the service. The soil survey party is considered to be cloven to a work unit and is ordinarily under the direction of an area conservationist depending upon the circumstances.

Additional comments from the director included brief remarks concerning the professional soil scientist. He stressed a professional attitude to self, other people and to the service. He indicated that soil scientists should work on self improvement, on their professionalism, on personal appearance, and they should meet well with people and transmit a good image.

In closing the director said that most of us at the meeting has an opportunity to express feeling and opinions on policy as it is being formulated. Once decisions are made and the policy is firm, he indicated we do have an obligation to follow the policy of the soil conservation service.

Panel-Map Compilation; High Flight Photography

Maynard Scilley, Chairman
Don McCormack
Jim Culver
Ray Dideriksen
Lacy Harmon

Chairman Scilley called on members of his panel to review some of the work that had been done within their states on map transfer and to briefly discuss problems and/or techniques which confronted them.

Don McCormack (Ohio):

Problems with highflight photography. Extreme distortion is making joining difficult. Distortion is largely due to relief.

Ohio is working on transfer of nine counties. The average cost is $11,000 and ranges from $6,000 to $16,000. GS-9 and GS-11 soil scientists are doing the transfer. Girls have been used to make transfer but so far has not worked out satisfactorily. Presently, they have two students who are working out well.

The average rate is approximately 3 square miles per day. They are experiencing problems in checking after the work is done. He suggests adding more road names and other landmarks to help the user locate himself.

James Culver (Nebraska):
Problems include the lag time between ordering and delivery of photos for use. This is averaging about one and one-half years delay. This lag time affects budgeting situations. Orders made during one fiscal year are often carried over into the next fiscal year. This affects the budgeting and planning of the fiscal people. Nebraska is using high flight photography in two counties. One county is using field symbols and the other is using publication symbols. Publication symbols will be placed on an overlay at the conclusion of the survey.

Nebraska has worked on six counties and are using GS-9 and GS-11 soil scientists with some clerical assistance. The cost has ranged from $6,500 to $9,500 per county. They spend one to two days in training people for transfer work and supervision is given at the state level. Ozalid prints are used for color checking. Clerks do some inking after the soil scientist transfer is complete. Harlan County was transferred using overlays for roads, symbols, names, etc. Lines, soil lines and drainage were placed on positives with other detail on overlays. These will be published directly with new symbols lettered on an additional overlay. These symbols which were placed on overlays during map transfer were not adequate for publication.

Lacy Harmon (Iowa):
Iowa has two permanent draftsmen and twelve soil scientists who help during the winter months. The average costs is $10,000 per county. The main complaint is the drudgery of map transfer and checking. Transferred surveys sometimes go through three color checks. Iowa finds that the biggest problem in transfer is attributed to differences in scale.

Maynard Scilley (Minnesota):
The transfer of older mapping in Minnesota upgrades the product. Transfer of a survey in the field causes a party leader to take a hard look at legends. In addition, through this experience the state staff is better equipped to make progress field reviews.

L&oratory Activities - Robert B. Grossman
The following activities were noted in the discussion of the laboratory's work during the past year.

1. The laboratory has cut down on large characterization determination and has increased the number of smaller individual projects.

2. Laboratory will be asking the states to use standard input forms when material is sent to the lab. The lab has utilized ADP to keep track of data.

3. Laboratory wishes to start imputting morphological information into the pedon data bank. Grossman has been working on indexing microfilming and building files.

4. The laboratory determinations that are being made include: fine clay, pedological strength, micro penitration resistance, paralithic fragments characterization, thin sections, clay mineralology, Histosol characterization, and 15 bar water.

They have developed field kits to be used in testing Histosols, consistency, and in determining water status.

In the environmental soil science field, Holmgren is working on chemical aspects, Jordon on sanitary landfill, and Grossman is involved in water movements and erosion potential.. In addition, work on manual revision is being carried on concerning water and consistence. The lab is also reviewing interpretations for series and manuscripts.

Soil series - William E. McKinzie

The soil series descriptions which are received in the principal soil correlator's office are much better than they were 12 to 18 months ago. There arc still a few problems which persist. These generally concern the following items:

1. Identification - The status of the series description is not properly identified in the upper left and right hand corners. It is important to indicate whether they are initial, revised or whether they are proposed, tentative, established or inactive proposed for reactiviation.

2. There is a need of a record of action on

6. Competing series - Dr. Simonson has indicated that we must list all series in the same family and differentiate these series from the soil being described. These are followed by the competing series in other families. They are listed alphabetically for those in the same family as well as other competing families. (Bartelli indicated that he would like to list only the competing series in the same family. He thought the classification already differentiated these series from the one described.)

Question and Answer Period - J. E. McClelland, Chairman

The following items were discussed by J. E. McClelland before opening the discussion up for questions and answers.

1. Greater care and preparation need to be made on the general soil maps and soil information which is included in RC&D and Watershed plans. We need to make an effort to include good soils information in these documents.

2. Form Soils SCS-5 is an input form for placing soil interpretations into the data bank. It is not likely to replace the regional form single sheet which is being used to accumulate these data. Correlators for interpretations will be meeting next week to make format decisions on this form before distribution and use.

3. The statements on joining field sheets, general soil maps, and coordinating the interpretations across county and state lines are essential. These statements are not being received with the field correlation. A statement is needed from the party leader concerning the match or mismatch and a summary from the state soil scientist.

4. The manuscripts received at the regional technical center are not always consistent to respect to terminology used. It is recommended that the authors use the tables which Mr. Jackson has forwarded to each state to make certain that terminology and values are consistent.

5. The memorandum on progressive soil correlations distributed.earlier is to be reviewed. This will form basis for future guidance.

6. Reference to laboratory data originating in the survey area is being included in the correlation memorandum. These include data from the Lincoln Soil Survey Laboratory, from laboratories of the state univerisities and also includes the data on soils tested by the state highway department. These data are listed according to names of soils as they were sampled. the laboratory number, and the approved name. The soil correlation memorandum also includes a conversion legend for map compilation.

7. Soils Memorandum-57 was discussed and it was indicated that land-grant colleges have been asked to select representatives for regional and national committees. The principal soil correlator will designate the membership from the region from the Soil Conservation Service. Grossman suggested that engineers be included in this membership at the national, regional and also at the state level.

Mintues, Northcentral National Regional Workplanning Conference, (cont)

There was considerable discussion relating to the communication with engineers and the need to get together with this discipline was emphasized. We need to work together. It was pointed out that our design engineers are primarily interested in large structures and therefore are more interested in geology than in soil information such as we offer.

Jerry Cocowski contributed the following comments:

1. About one-eigth to one-fourth inch overlap is being provided outside the need line for soil surveys in non-sectionized country.

2. Minor civil divisions are allowed in substates (townships and county roads etc.) to better located the user on the atlas sheets. Use care not to clutter.

3. Where photobase sheets are used for field mapping the subsequent map preparation is simplified by using an overlay for the placement of correlated symbols.

4. There is not a long period of time available having suitable weather for making highfligbt photography. If timing is critical then contracts must specify time limits.

5. There is approximately four and half months waiting period for availabilty of highfligbt photography from flying time.

6. States need to prepare two forms SCS-19's in requesting high altitude photography. This question is in answer to Jim Culver's comment concerning map orders spanning two fiscal periods. If the flying is done in the fall then the photography is usually available during that fiscal year.

Comments from states

Indiana - Will code 107 surveys be dropped automatically?

Vandervoet - It is proposed that some code 107 can be salvaged as code 184 before all code 107 is dropped.

Indiana - If code 107 is dropped, Indiana will still plan to use the surveys for whatever use that be made of them. (Others echoed the same comment.)

South Dakota & Missouri - Indicated that the decision on the utility of the mapping was made when the surveys were placed in code 107. There is no need to re-evaluate these acres again.

Iowa - There is still confusion on the requirements for minimum documentation needed to call surveys code 184 in old conservation surveys and in non-progressive soil surveys.

Wisconsin - If code 107 is dropped, Wisconsin will loose 3 million acres.

Cartographic procedures - Joe Casey

Mr. Casey's comments are mostly in response to earlier discussions. He shared his time with Jerry Gocowski, head of Cartographic.

1. There is need for only one color check.

2. Cartographic Unit uses the drainage as an indication to the quality of the transfer job.

3. There is a vast improvement in the quality of materials coming to the cartographic unit.

4. Soils men need to direct the transfer operation. Draftsmenship doesn't need to be expert, just legible.

5. Placement of lines should be with accuracy to show pattern of soils not just to accomplish pretty draftsmanship.

Jerry Gocowski commented on the ERTS program and pointed out that in 1969 an ERTS resources committee was appointed and Orvedahl and Gocowski of SCS were appointed on this committee from the Department of the USDA. A memorandum is now being drafted on the background of this program and will include these projects and objectives which are involved,

ADJOURNED

Robert Turner and Louie Buller, Recorders

MINUTES OF THE NCR-3 COMMITTEE

Howard Johnson's Motor Lodge,
Rapid City, South Dakota

April 18, 1972

Participants

Illinois - J. B. Fehrenbacher
E. C. A. Runge
B. W. Ray
J. D. Alexander

Indiana - D. P. Franzmeier

Iowa - T. E. Fenton

Kansas - O. W. Bidwell

Michigan - E. P. Whiteside
D. Mokma
S. G. Shetron

Minnesota - R. H. Rust

Missouri - C. C. Scrivner
J. C. Baker

Nebraska - D. Lewis

North Dakota - H. W. Omodt
F. Schroer

Ohio - N. E. Smock

South Dakota - F. C. Westin
C. J. Frazee

Wisconsin - F. D. Hole (Madison)
G. B. Lee (Madison)
J. A. Bowles (Stevens Point)
M. Harpstead (Stevens Point)
A. J. Beaver (River Falls)

USDA-ARS - W. E. Larson (St. Paul)

USDA-SCS - J. E. McClelland (Lincoln)

Administrative Advisor - R. R. Davis (Wooster, O.)

Chairman, O. W. Bidwell, presiding:

The meeting began at 8:00 a.m., was recessed at noon and reconvened at 7:30 p.m.

Minutes of the April 21, 1971 meeting were corrected by adding the name of F. D. Hole, Wisconsin, to the list of participants and approved.

Report of Administrative Advisor, R. R. Davis:

1. The North Central Experiment Station Directors approved the NC-109 project to June 30, 1976.

2. NCT-103 prepared a proposal, "Utilization and Disposal of Municipal, Industrial, and Agricultural Processing Wastes on Agricultural Land." The project has been approved. (Now approved by CSRS as NC-118.) Dr. R. W. Kleis, Nebraska, is the administrative advisor.

3. The Regional Planning and Coordinating committee is responsible for developing the long-range planning of research by experiment stations and the U.S. Department of Agriculture. It is composed of four experiment station directors, four USDA administrators (ARS, CRS, ERS, and FS), and several representatives from other academic areas and industry. he committee will study research activities in universities, government, and industry and make recommendations for future plans. There are six program groups: Natural Resources (including soils); Forestry; Crops; Animals; People, Communities and Institutions; and Competition, Trade, Prices and Income.

4. The Federal Executive budget called for an increase of $3.79 million in Hatch funds, but as of the meeting the bill had not been acted on by Congress. This increase about keeps up with inflation.

5. NC-98, Nutrient Enrichment of Waters, is very active and has met jointly with NCR-12, Irrigation and Drainage, and is assisting that group with chemical methods for analyzing water for quality.

6. North Central Experiment Station Directors had required an annual report from NCR committees, but now require only that the minutes of their meetings be sent to the Directors. (About 85 copies should be furnished for Davis and he will make the proper distribution.)

Report of SCS Representative, J. E. McClelland:

He reported on the meaning of the status of soil series. If a series is on the inactive list the name will not be used for another soil without first consulting the state, but the classification of the series will not be listed. If states wish to maintain an inactive series, it should be updated to avoid the possibility of another state submitting a new name for the same series concept. If states wish to maintain a series now on the tentative list, it should be described according to the modern format. Experiment stations should work closely with SCS state offices on series descriptions. States should develop lists of the series they wish to continue to use. The minimum requirement for establishing a series is to have at least 10 pedon descriptions of it.

The procedure for revising Soil Taxonomy is described in Soils Memorandum-57 (Rev. 1) (A draft copy, 2-11,72, was distributed). The regional committee should represent geographically the major suborders of soils.

NCR-3 should select one or two members to represent the committee in the 1973 National Technical Work Planning Conference.

Registration of Soil Scientists:

The Nebraska legislature considered a bill to establish a policy of registration or certification of soil scientists. Engineers and some other professional groups objected to It. McClelland suggested that states should first establish an organization of soil scientists before proposing legislation. With county and municipal governments hiring soil scientists it is important to establish professional requirements. McClelland also suggested that soil surveyors and soil classifiers also establish a national committee independent of existing organizations.

Omodt and the North Dakota soil scientists are also considering proposing legislation along these lines.

Future of NCR-3:

Bidwell

sets of single purpose interpretation maps for the region, (3) doter-mine the composition of important mapping units of the region by roil series and other categorial levels.

A motion was passed that NCR-3 continue to meet annually and that its meetings be held in conjunction with, but separately from, the meetings of the North Central Regional Technical Work Planning Conference or NC Committees related to

Each state representative briefly reviewed the situation in his state relative to planning the survey and the participation of the stations in it. The activities and programs of the individual state verisd widely. In general there was good cooperation between the stations and the SCS soil scientists in the field and in the state office. There apparently was poorer cooperation between the stations and the SCS state administration (other than soil scientists) Many of the university people working with the soil survey are becoming more involved in teaching or administration and therefore have less time available for participation in field activities of the soil survey program. Except in the states in which the experiment stations have access to state or county cost-sharing funds, the number of graduate assistantships assigned to soil survey and soil genesis and classification research is decreasing.

Davis suggested, and the group concurred, that this type of questioning be done on a more formal basis for the next meeting.

National Technical Work Planning Conference. Charleston. South Carolina, January 22-26. 1973:

Omodt and Franzmeier, with Whiteside as alternate, were elected to represent NCR-3.

Soil Survey Horizons:

Encourage field soil scientists to submit articles.

Changes in SCS Soil Survey Administration:

During the last few years several of the positions of administration in the SCS Soil Survey have been filled by new men and in the next few years several others will change hands. This period of change in personnel is a logical time to make changes in administrative procedures if they are necessary. If NCR-3 members have suggestions for such changes, they should be directed to the Principal Correlator of the Midwest Regional Technical Service Center.

Meeting adjourned, 9:20 p.m.

D. P. Franzmeier
Secretary
May 24, 1972

NORTH CENTRAL REGIONAL TECHNICAL WORK
PLANNING CONFERENCE OF TBE COOPERATIVE SOIL SURVEY

Rapid City, South Dakota

April 17-21, 1972

Report of Committee 1, Engineering Application
and Interpretation of Soil Surveys

The National Committee asked the regional committees to study and sake recommendations for the following items:

1. Submit revisions thought to be needed in the revised "Guide for Engineering Uses of Soils."
2. Develop and test new interpretations not previously covered.
3. Develop an outline for a "Handbook of Soil Survey Interpretations."
4. Deal with the problem of refining the estimates we make of engineering properties including permeability, corrosion, allowable soil pressure, subsidence, landslides, dispersions, or any other property.

This report is a consolidation of comments received from members of the North Central Region Committee and discussed at the workshop.

1. The committee submits the following recommendations for Incorporation in the "Guide for Interpreting Engineering Uses of Soils."

   (a) That the charts showing laboratory criteria, field identification procedures, relative properties, and relative characteristics related to the Unified Soil Classification be Included in the appendix. These are given as figures 8-2(a), 8-2(b), 8-2(c), 8-2(d), 8-2(e), and 8-2(f) in Chapter 8 of the manual for Basic Soil Mechanics (Course SM-10) dated January 1966 (Rev. 8/69).

   (b) That a footnote be added to the unified soil group item in the guide for rating soils for dwellings on page 31 saying, "Applies to layers at and below the depth of the foundation," Also add footnote to ML and CL in the "moderate" column that says, "Upgrade to slight if shrink-swell potential is low."

2. We suggest the following interpretation guide be developed and tested.

   (a) That a guide be prepared to use in interpreting soils as to their limitations for golf course fairways, Add the rating guide to the "Handbook of Soil Survey Interpretations," or as a supplement to or a part of a revised Soils Memorandum-69. Attached to this report is a guide modified from one that was used to coordinate this interpretation for soils in MLRA's 95, 105, 108, 110, 111, 114, and 115.

3. The committee proposes the outline attached to this report for a "Handbook of Soil Survey Interpretations."

4. We received a meager response to the item dealing with the refining of estimates of engineering properties.

   (a) Use of permeability terminology is over generalized frequently. This has been noticed in septic tank filter field interpretations where the permeability at and below the filter field may be either faster or slower than that commonly given for the solum of the soil series. In footnote #1 on page 23 of the new guide, we are cautioned about this.

   (b) There is a need for improved guidelines and tests for dispersion. The geologists and engineers in Illinois have experienced poor correlation between field tests and tests performed at the soil mechanics laboratory. The crumb test in particular has not been successful.

It is recommended:

1. The committee be continued.

2. That the committee concentrate on the refinement of estimates wc make of engineering properties, specifically:

   (a) Develop classes for dispersion,

   (b) Develop terms to express "Soil Erodibility Potential" for major horizons.

   (c) Consider a firmer quantitative designation for organic soils in engineering classifications. Coordinate with Committee 3, Organic Soils.

   (d) Maintain a continuous liaison between engineers and soil scientists.

It is moved that this report and its attachments bc submitted in its entirety as the North Central Region's recommendations to the National Committee.

Committee Members

Francis A. Bahr
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*Workshop

Tentative
April 1972

GGLF COURSE FAIRWAYS

Inevaluating soils for "se in golf courses, consider only those features of the soil that influence their use for fairways. Greens, traps, hazards, and tees are man-made, generally from disturbed, transported soil material. For best use, fairways should be well drained and firm, be free of flooding during "se periods, have good trafficability, contain a minimum of coarse fragments or stones and have slopes that are not too steep, They should be capable of supporting a good turf. Loamy soils are best, but coarser textured soils serve equally well if irrigated. very poorly drained mineral and organic soils have severe limitations but they may be used for pond sites to provide esthetic values or water for turf maintenance. Sandy soils likewise may be designed for hazards or used as a source of sand.

Items Affecting Use	Degree of Limitation: Slight	Moderate	Severe
Depth to water table	Below 20" during season of "se	During season of use may be above 20" for short periods	Above 20" and often near the surface during season Of use
Soil drainage class	Somewhat excessively drained, well drained, and moderately well drained	Excessively drained and somewhat poorly drained	Poorly drained 1/ and very poorly drained soils
Permeability in upper 24 to 30 inches	Rapid, moderately rapid, moderate	Very rapid, moderately slow	Slow, very slow
Surface stoniness 2/	0	1	2, 3, 4, 5
Surface rockiness 2/	0	0	1, 2, 3, 4, 5
Flooding	None during season of "se	May flood 1 or 2 times for short periods during season of use	Floods more than 2 times during season of use
Surface texture	sl, fsl, vfsl, 1, sil	cl, scl, sicl, ls, and s other than loose sand	Loose sand, sc, sic, c, and textures with coarse fragments
Slopes	0 to 7 pct ± 2pct	7 to 12 pct ± 2 pct	Greater than 12 pct

1/ Upgrade poorly drained soils to moderate when large areas are artifically drained and other features are not limiting.

2/ See definitions in Soil Survey Manual, pp. 217-221.

Outline for

"Handbook of Soil Survey Interpretations"

Part I. -- Introduction -

5. Woodl and
   (a) Ordination of Soils According to Suitability for Woodland (Classes, Subclasses, Groups)
   (b) Tree Planting Guide

B. Interpretations for Developing Areas - Includes Commercial and Industrial land, Community Services land, Recreation land, Residential land, and Transportation Services land (Excerpt definitions from Planning Handbook)

1. Soil Limitation Rating Guides for
   (a) Septic Tank Absorption Fields
   (b) Sewage Lagoons and Reservoir Areas
   (c) Shallow Excavations
   (d) Dwelling With and Without Basements
   (e) Sanitary Landfills
   (f) Local Roads and Streets
   (g) Camp Areas
   (h) Picnic Areas
   (i) Playgrounds
   (j) Paths and Trails
   (k) Golf Course Fairways

2. Suitability Rating Guides for Soil as a Source of
   (a) Road Fill
   (b) Sand and Gravel
   (c) Topsoil
   (d) Material for Embankments, Dikes, and Levees

C. Other Interpretations
1. Interpretation Classes for
   (a) Available Water Capacity
   (b) Corrosivity
   (c) Organic Matter Content
   (d) Permeability
   (e) Potential Frost Action
   (f) Reaction
   (g) Salinity
   (h) Shrink-swell Potential
   (i) Soil Erodibility Potential

Part IV. -- Coordination of Soil Survey Interpretations

Part V. -- Glossary of Terminology

Part VI. -- Bibliography

Part VII. -- Appendix

NORTH CENTRAL REGIONAL TECHNICAL WORK
PLANNING CONFERENCE OF THE COOPERATIVE SOIL SURVEY

Rapid City, South Dakota

April 17-21. 1972

Report of Committee 2, Soil Morphology and Soil Family Criteria

Subjects for discussion at the workshop meeting of this committee included evaluation of family-interpretive relationships as recommended by the Committee on Soil Family Criteria of the National Technical Work Planning Conference held in Charleston, South Carolina on January 25-28, 1971. In addition, committee members reported and discussed specific problems relative to soil morphology and soil family criteria within their respective states.

A summary of comments from committee members indicate widely different attitudes concerning the usefulness of soil families for interpretive purposes. All persons who replied indicated that meaningful interpretations could not be made at the family level without some modification, either in family criteria, or as phases of families. Several members indicated that meaningful interpretations could not he made at the family level and that such attempts will not be made within their states in the foreseeable future.

Soil Family Criteria

The intent and purpose (objective) of family groupings are defined in Chapter 5 (the categories of the system) of the new Soil Taxonomy. "I" this category, the intent has been to group the soils within a subgroup having similar physical and chemical properties

Usefulness of Soil Families in Terms of Making Meaningful Interpretations

Since our system of soil taxonomy is designed so that we may make statements pertaining to interpretations at all levels of the system, it follows that we can make meaningful interpretations at the family level. All statements made for categories above the soil family can be collectively made for all soils at the family level. The specificity of interpretations are determined to a large extent by the degree to which the soil properties are expressed in the criteria of the taxon used. More precise statements can be made at the family level than at those levels above. Each higher level merits more general and less precise statements.

Soil families do not provide all the criteria needed and phases of families must be used. For example - slope of soil, bedrock at 20 to 40 inches, bedrock at 40 to 60 inches, and character of underlying material (till with high bulk densities versus loamy alluvium, etc.) all significantly affect agricultural and non-agricultural uses. When a number of series belong to the family, phases can be used to group. Phases of families are more precise than the soil family.

There are and will be interpretations needed that cannot and should not be made at the family level. Yield differences that arc the result of slopes, erosion, salinity, etc. are examples.

[illegible]

Where and How Have Family Groupings (or phases of families) Been Used?

Committee members responding to this question indicate that at this time little use has been made of interpretations at this level. Most attempts have been in regard to soil family and crop yield relationships. Possibly the lack of acceptance of family-interpretive relationships is due to the fact that most people evaluate the effectiveness of the family for interpretations by using statements more precise than can be made at the family level.

To date, relationships between interpretations and soil families have not been fully tested. This is likely due to the fact that much of the work to date has involved crop yields. This in all likelihood is not a fair test. Yields for similar mapping units in adjoining surveys are rarely compatible. Certainly yield data for soils of a family would hardly be expected to be similar on a regional basis - nnd would be impossible on inter-regional situations. Some interpretations are nearly impossible to relate satisfactorily no matter what level of the system is used. Others, such as engineering interpretations, are reasonably constant - statements are usually applicable at all levels.

Efforts should he directed towards famlly-interpretation relationships other than yields. The relationship between soil families and engineering interpretations should be evaluated. It would seem that many of the statements we make about limitations of soils for septic tank filter fields, sewage lagoons, dwellings, sanitary landfills, etc., may he just as valid at the family level as they are at the series level. Since soil families have not been used extensively

2. Soils formed in till having B and C horizons with high bulk density are grouped with soils formed in loess or loamy alluvium having lower bulk density II and C horizons.

3. In some fine families, the clay range of 35 to 60 percent in the control section is a problem in making interpretations.

4. Problems with soils formed in two materials which do not qualify for contrasting textures (fine-silty over fine-loamy).

5. Some families contain clayey Paleosols low in fertility which differ considerably from other series in the same family.

6. Separations are often needed between series within a family because of landscape position. Some sites receive water while others discharge water. Some are subject to flooding and others are not.

Many of the problems could be overcome by defining more criteria at the family level. Additional families such as fine-silty over fine-loamy, and fine-loamy (etc.) over lithic or paralithic could be used. We may, however, be opening the door to creating excessive "numbers" which defeats the purpose of classification at the family level.

The other alternative is to make interpretations at the phase level of families. These may be slope phases or any other phase which is significant to use and management. For example, a family hns two series as members: one with bedrock within 20 to 40 inches and the other with bedrock between 40 to 60 inches. With only two series I" the family, each in a sense, performs as a phase of the family. When a number of series belong to the family, phases CR" be used to group.

Validity of Series Within Families

All committee members agree that continued attention should be given to testing of the validity of series within families. Large numbers of series in some families do not however "ecessarily question the design of the family or adequacy of the series. Some families, by necessity, will he composed of numerous soil series. The large number of series in some families in the Mollisol and Alfisol orders in the mesic zone is an example. This is a general area of intensive agriculture use; thus the soil surveys made intend to define the series with narrower limits.

The use of additional family criteria would improve the classification

Entisols, Inceptisols, Mollisols and Histosols appears desirable and reasonable. This would be equivalent to considering bedrock as contrasting material within depths of 40 inches in these orders. This separation would improve interpretations for agriculture and engineering purposes. Recommendations for recognition of moderately shallow phases when lithic or paralithic materials occur between depths of 20 and 40 inches have been made in the past.

Testing of the validity of series within a family is a continuous process and with time more comprehensive data will be obtained to test, to improve and to add to criteria now used. Duplicating series do in all probability exist in large families, but in time, through proper choice during the correlation process, many of the duplicate series will be eliminated. Periodic review via A.D.P. information and the use of A.D.P. to refine families is recommended.

In line with the above discussion, the following recommendations are submitted:

1. Studies should be made to determine the level or levels of the classification system that can be used in making meaningful interpretations. These should include all of the higher levels of the system as well as possibilities of grouping taxa for specific interpretation purposes. These studies should include both "engineering" properties as well as "soil-plant" properties. The level selected would depend on the interpretation made.

2. A detailed discussion of the philosophy of family separations should be prepared.

3. Automatic data processing information should be used to refine families and to evaluate soil family-interpretation relationships.

4. Recognition at the family level of lithic or paralithic materials occurring between depths of 20 and 40 inches.

SOIL MORPHOLOGY AND FAMILY CRITERIA

The attached charts prepared by Dr. Riecken Illustrate some of the problems encountered in soil family-interpretation relationships.

This study involved the "Mahaska" family of which there are 20 members.

Chart 1 is a plot of corn yields versus slope. In A slope, yields are from 70 to 140 bushels per acre. Chart 2 shows the range in corn yields. Not all yields (as 3 erosion) are shown. Chart 3 shows capability range. Permeability ranges are in Chart 4 by B and C horizons. Shrink-swell ranges are in Chart 5, also by B and C horizons.

It appears that for the Mahaska family there is least "scatter" of the series by some "engineering" properties (shrink-swell In Chart 5, for example). In all probability L.L. and P.I. values would also have a somewhat lower scatter. In contrast, corn yield estimates have a much wider scatter.

As stated by Dr. Riecken, "It seems that soil-plant 'properties' are much more sensitive than 'engineering' properties. And we may need narrower classes if we are stressing plant behavior systems than if we stress engineering properties. It may well be that the two objectives are not compatible."

AQUIC ARGIUDOLLS - FINE, MONTMORILLONITIC, MESIC

Series	Corn Yield (bushels per acre) 140		120		100		80		60		40
Adair											
Chase							=				
Doxie						=					
Flanagan	=										
Greenton							=				
Grundy						=					
Ipava	=										
Keller											
Lagonda						=					
Lamoni											
Macksburg			=								
Mahaska		=									
Malvern											
Mayberry										:	
Rutland											
Seymour											
Shorewood						=					
Tama						=					
Wymore								=			

AQUIC ARGIUDOLLS - FINS, MONTMORILLONITIC, MESIC

Series	I	II E	II W	III E	III W	IV E	V	VI E	VII
Adair				X		X		X	
Chase			X						
Doxie		X		X					
Flanagan	X								
Greenton		X		X		X			
Grundy		X		X		X			
Ipava	X								
Keller									
Lagonda		X		X		X			
Lamoni				X		X		X	
Macksburg	X	X							
Mahaska	X	X							
Malvern				X		X		X	X
Mayberry				X		X			
Pawnee		X		X		X		X	
Rutland									
Seymour									
Shorewood		X		X		X			
Tina			X						
Wymore		X		X		X			

(Column header: Capability Class — I; II (E, W); III (E, W); IV (E); V; VI (E); VII)

AQUIC ARGIUDOLLS - FINE, MONTMORILLONITIC, MESIC

Series	Permeability (inches per hour) > 2.0 B	> 2.0 C	2.0 B	63 C	.63-.2 B	.63-.2 C	.20-.06 B	.20-.06 C	< .06 B	< .06 C
Adair						□	□			
Chase							□	□		
Doxie							□	□		
Flanagan			□	□						
Greenton			□	□						
Grundy					□	□				
Ipava			□	□	□					
Keller										
Lagonda							□	□		
Lamoni								□	□	
Macksburg					□	□				
Mahaska					□	□				
Malvern							□	□		
Mayberry							□	□		
Pawnee							□	□		
Rutland										
Seymour								□	□	
Shorewood				□	□	□				
Tina							□	□		
Wymore							□	□		

AQUIC ARGIUDOLLS - FINE, MONTMORILLONITIC, MESIC

Series	Shrink-Swell L R	L C	M R	M C	M-H R	M-H C	H R	H C
Adair				X				
Chase								
Doxie			X	X				
Flanagan		X	X					
Greenton								
Grundy								
Ipava				X				
Keller								
Lagonda								
Lamoni								
Macksburg								
Malvern								

AQUIC ARGIUDOLLS - FINE, MONTMORILLONITIC, MESIC

Series	Range in Slope 0-2	2-5	5-9	9-14	14-18	20+
Adair			X	X		
Chase	X	X				
Doxie	X	X	X			
Flanagan	X	X				
Greenton		X	X	X		
Grundy		X	X			
Ipava	X	X				
Keller						
Lagonda		X	X	X		
Lamoni			X	X		
Macksburg	X	X				
Mahaska	X	X				
Malvern			X	X	X	
Mayberry		X	X	X		
Pawnee	X	X	X	X		
Rutland						
Seymour	X	X				
Shorewood	X	X	X	X	X	
Tina	X					
Wymore	X	X	X			

PRORLEMS RELATIVE TO SOIL MORPHOLOGY

AND SOIL FAMILY CRITERIA

Committee members were asked to report on specific problems relative to soil morphology and soil family criteria within their respective states. Time did not permit discussion at the conference of these problems. A number of common problems however were reviewed in the discussion on soil family-interpretation relationships. comments from committee members who replied follow.

MICHIGAN STATE UNIVERSITY East Lansing, Michigan 48923

Department of Crop and Soil Sciencce - 101 Soil Science Building

April 7, 1912

TO: **Committee 2**
North Central Regional Work Planning Conference

Conclusions from a study of families of soils represented in Michigan.

(1) The number of families is apparently larger than necessary for a most practical grouping between the series and the sub-groups. This is particularly noted in the large number of mono-oerics families (e.g.; Alfisols, 17 of 41 families; Entisols, 6 of 3.6; Histisols, 17 of 27; Inceptisols, 14 of 25; Mollisols, 6 of 22; nnd Spodosols, 23 of 39) in the Histisols, Inceptisols and Spodosols.

(2) In spite of this large number of families there is considerable heterogeneity in many for common management practices and responses to management; because of bedrock within 20-40", coarac-loamy over sandy control sections, thin sola, (Thin argillic horizon soils, nay < 10" and within 20" of the surface, need to consider more than this horizon in the control section!) stratified materials, overflow hazard and gravelly or cobbly phases of mineral soils. Making these subdivisions increases the families or sub-families further.

(3) Groupings of familiesor their subdivisions will obviously he needed for practical purposes. Here are some proposed examples: (slope phases of these will commonly be needed for croplands).

(a) Histisols - euic and dysic families without and with clayey. loamy, marl, or sand substrata.

(b) Gravelly, cobbly or stony phases of mineral soils not subject to overflow.

(c) Entisols and Inceptisols - Overflow phases of mineral soils of sandy, coarse-loamy and fine-loamy families in aeric plus aquic subgroups.

(d) Bedrock at 20-40" in sandy, lonmy, and clayey mineral soils or organic soil.3 and bedrock at < 20" in organic soils; mineral soils of aquic subgroups, aquic great groups or aquic suborders; nnd better drained soils.

Hope I can do more on thio next week.

E. P. Whiteside

EPW/pjm

PROBLEMS IN ILLINOIS RELATIVE TO SOIL MORPHOLOGY AND SOIL FAMILY CRITERIA

George O. Walker

1. We need more definite criteria for properties in lower sola from 40 to 60 inch depths. Can B3 horizons be considered on equal par with diagnostic horizons at these depths when a different parent material exists in which these horizons are formed?

2. Could we agree to split families for various depths to bedrock, gravel, sand, etc? If so, what criteria should we use?

3. Landscape positions have been discussed a great deal. How do other soil scientists feel about using landscape on a par with other differentiating properties?

4. Can sufficient interpretations be made to reflect underlying material when we confine the control section to 10 to 40 inch depths? Should we use a control section to 60 inches7

5. Should we have a review of the definitions or difficulties in identifying diagnostic horizons? Are the present symbols sufficient to designate fragipans, argillic horizons, buried horizons, the use of t, b, and g, etc? Should the little g be shown on C horizons? Should a description contain an A3 with a B1 or should they be written with one or the other ond can soil scientists be consistent in describing or designating these? How will a soil scientist distinguish between what some call a weak A2 nnd A3 in our Udolls? Where does a B3 horizon stop and a C horizon start? Should a C horizon he so designated if it has any structure? Can we have better guidelines for cambic horizons? How can we use a g horizon without it being camhic?

6. Should we as soil scientists be making more use of the chemistry of soils? We use reaction and depth to carbonates quite often, but shouldn't we be using phosphorous and potassium also?

PROBLEMS IN INDIANA RELATIVE TO SOIL MORPHOLOGY AND SOIL FAMILY CRITERIA

Ray Dideriksen

Soil Morphology:

1. Definition of a cambic horizon.
   Soils which formerly classified as Fluventic Dystrochrepts and Fluventic Eutrochrepts now classify as Typic Udifluvents. (i.e. Haymond series).

   It seems we need to strengthen the definition of a cambic horizon to exclude weakly developed B horizons or subsoils if some of the soils in the alluvial position are to be Udifluvents. Might a cambic horizon be permitted in Entisols if there is an irregular decrease in organic matter with depth?

2. Tonguing in Ochraqualfs.
   There is no provision to intergrade a soil with numerous skeletans, but lack the dimensions for tonguing, to glossic for the Ochraqualfs. There seems to be a wide range in skeletan evidence between Typic Ochraqualfs and Typic Glossaqualfs. (i.e. Clermont series).

3. Soils

   Might we consider an intergrade between Typic Fragiaqualf and Typic Ochraqualf? Possibly a Fragic Ochraqualf? This would be more meaningful for interpretations than intergrading them toward Glossic or leaving them with the Typic Ochraqualfs.

4.

5.

the upper 10 inches of the soil must contain 1.5% organic carbon and contain organic coatings of 3.5 value or darker when moist and chromas of 3.5 or less when moist.

6. Wetness versus subgroups.
After seeing a number of series considered to be moderately well and somewhat poorly drained in Indiana, I see little reason to continue having different modifiers for subgroups for the Mollisols versus the Alfisols. Typic Argiudoll versus Aquic Hapludalf - moderately well. drained Aquic Argiudolls versus Aeric Ochraqualf - **somewhat poorly drained.**

Family Criteria.

1. Soils with two-storied profiles but not contrasting texture.

   For engineering interpretations it would be useful to separate, at the family level, soils that have developed in loess over high bulk density till, loess over stratified alluvium, etc. i.e. fine-silty over fine-loamy.

2. Soils with hard bedrock at 20 to 40 inch depth.
   It would he more useful to us if soils underlain by bedrock at 20 to 40" were separated at the family level from those greater than 40" to bedrock. We do not'like to have these soils in Typic.

3. Sloping families.
   I think it would be desirable to recognize families which are sloping versus those that are not. However, this would probably split series as we now use them unless we defined the family as sloping for the predominant situation rather than a full range of slopes. We might consider permitting a series to fit a sloping family even though mapping units of A, B, nnd C slope are recognized.

PROBLEMS IN IOWA RELATIVE TO SOIL MORPHOLOGY AND SOIL FAMILY CRITERIA

Charles Fisher

Dr. Fenton of Iowa State University, in his work on one of the subcommittees dealing with taxadjuncts, went through the correlations of 11 Iowa counties correlated between 1966 and 1971. He listed those series in which all or part was classified as a taxadjunct and the feature which caused it to be so classified. There were 73 taxadjuncts. It seemed worthwhile to take a look at his work to see what characteristics were involved most often.

Small acreage was a factor involved in some decisions to correlate the taxadjuncts. Also, some involved only parts of or some areas of a particular series. But by and large, I don't think looking at the whole is misleading. Here is how an accounting of the offending characteristics looks:

1. Mollic epipedon too thin - 20. Most were severely eroded phases of Mollisols, but a few were Mollic subgroups of Alfisols.

2. Lower chroma in A horizon than range of series or other problems such as low-chroma mottling higher in the profile than allowed in the series - 10.

?. Soil reaction outside range of series - 12.

4. Higher percentage of sand than allowed in series range, or problems with percent of various fractions - 7.

5. Less clay than defined range of the series - 5.

6. Lack of argillic horizon - 6.

7. Lack of contrasting textures - 3.

6. Others where some textural characteristics had caused the soil to be outside the range - 6.

9. Other miscellaneous causes involved thickness of solum, depth to bedrock, and available phosphorus curve.

If I have interpreted and counted correctly, 8 of the taxadiuncts involved crossing family-boundaries. All were related to the textural classes and involved fine-loamy vs. coarse-loamy, fine-silty vs. coarse-silty, or lack of strongly contrasting textures for those requiring them.

The characteristic that surprised me in being involved in so many of the correlations of soils as taxadjuncts was soil reaction. Even though only one series repeated itself in the group, it seems to point out to me that we could well take a look at this kind of range in some series to make sure we aren't too restrictive.

In the part of the state in which I had most of my responsibilities until recently, it seemed to me that the 5-inch limit for the transition zone in strongly contrasting families was causing party leaders some problems in selection of representative profiles. This was mainly for fine-loamy over sandy or sandy-skeletal families and series such as Wadena, Cylinder, or Biscay. The nature and thickness of the transition zone tends to be variable within a mapped area in many places. We are satisfied with the placement of the series as far as the family is concerned. Expanding the thickness of the allowed transition zone a few inches would probably solve most of our problems, because the offending horizons seldom seem to be much outside the allowed thickness. And I doubt it would change very much we could say about water retention or movement. Nebraska, in their correlation of Dakota County, raised the same question about the Modale series (fine-silty over clayey). In that county it apparently was difficult to get the transition within 5 inches. It seems doubtful if adjustment of the limits would be logical for all families, but might be for some.

I believe something which had its origin about 3 years ago bears mentioning. Minnesota's placement of the Hayden series as a Glossoboric Hapludalf had caused considerable consternation in Iowa. It was in March of 1969 in Lincoln that people from Minnesota and Iowa discussed getting together in the field to study the characteristics involved in that classification, that is, the presence of tongues and interfingers of the albic horizon into the B horizon, and the nature of the A2 horizon and underlying horizons. It was over a year later, in July 1970, that this came about. A total of 25 soil scientists, including Dr. Simonson from Washington and Dr. McClelland and others of his office, participated and studied Alfisols in northern, central, and southern Minnesota. As a result of the study, some tentative redefinitions were proposed for some of the class distinctions, and there was sentiment on the part of some for dropping Glossoboric Hapludalfs. To our knowledge, neither the redefinition nor the proposal to drop the class were acted upon. But Hayden was changed back to Typic (questioned for Glossoboric), and this took care of our objections.

It seemed to be a universal opinion that this was a good way to approach a problem that is difficult to cope with or communicate about other than to see it in the field.

The study in Minnesota prompted Iowa to host a second meeting of the "Friends of the Soil Horizons" in July 1971. A number of Midwest States sent representatives. We looked at a number of profiles of somewhat poorly and poorly drained soils. The problem involved is that in many of our Aquic Hapludolls and Typic Haplaquolls, the mollic colors fluctuate around the 24-inch thickness limit for the Typic or Aquic subgroups. The problem seems to be greatest in the Aquolls. Some series in this category are Nicollet, Webster, Biscay, and Primghar. In the Aquic subgroups the problem seems to come up most often in concave landscape positions. Some points made in the discussion were:

1. The pachic concept has been considered for the Udolls.

2. We might require an irregular decrease in organic matter for the Haplaquolls as well as the Hapludolls.

3. Perhaps we need to bring other features into the picture. Among those mentioned were water table and structure.

4. Could we have a tolerance figure of + or - from the 24-inch figure? Some objected to this. Fluctuations in characteristics of soils across landscapes is involved here.

As we understand it, Michigan intends to host a field study this fall. There and in other places the problems with thickness of mollic epipedon tend to be on the other side of the thickness range. In Iowa we seem to have problems on both ends! So, as I understand it, their intent is to continue the mollic epipedon study.

One last problem brought to my attention by John Worster, Soils Specialist, involves soils in Jasper County. They are mapping a Tama-like soil, mainly on C and D slopes, that have common to many low-chroma relict mottles or a deoxidized zone in the lower part of the B horizon. They are also mapping the prairie-forest transition soil. A study to attempt to better understand the nature of the weathering zone sequences and to understand the relationships of the soils to their positions on the landscape is underway. Introducing a new series or expanding the range of the Tama series to include grayish mottles higher in the profile are possibilities for coping with the problem.

As far as our thinking concerning soil interpretations and soil families is concerned: I hope I am summarizing it correctly when I say that we are concerned that some families are just so heterogeneous that it would be difficult to be very precise about most interpretations. A number of people have expressed the idea that phases of families or subfamilies might be used rather than new families, and this seems reasonable. Using new criteria such as depth to bedrock, bulk density, and slope has been mentioned. One of our state staff expressed the idea that for interpretive work a fine-silty over loamy family or perhaps others would be useful. I believe Illinois expressed a similar view in their routed comments. It seems the first thing we must do is decide what kinds and the precision of interpretations we want to make at the family level.

PROBLEMS IN WISCONSIN RELATIVE TO SOIL MORPHOLOGY AND SOIL FAMILY CRITERIA

A. J. Klingelhoets

Perhaps our single biggest problem is simply lack of sufficient laboratory data to support decision making. This is especially true of soil areas in the State where only scattered or limited acreage has been classified.

A major problem is the classification of fragipans. We are still waiting for better guidelines as to what constitutes a

A problem that many of us are going to have to become more concerned with in the future is the separation of soils that, in effect, have a high ground water table versus those that may be saturated for portions of each year due to slow permeability. We are talking about ground water tables versus perched water tables. We are now recognizing that some of our poorly drained soils do not have a high ground water table. The poor drainage is due to restrictive layers in either the subsoil or underlying material. This problem is even more prevalent in our somewhat poorly drained soils.

Even the use of a taxadjunct in the same survey area to indicate a series occurring in both climatic zones may be questioned. If we are expecting other people to use our product, the soil survey, we are going to have to be scientific and yet practical.

The terms sandy, loamy, clayey, etc., used to denote surface textures in soil descriptions and reports is quite often confused with texture disignation of soil families. People in other disciplines are quite prone to using family textural classes in place of surface textures. This is further complicated by the fact that in some stratified material the Bt control section for family classification may be two or three textural classes away from the surface texture. I don't know what we can do about this situation, but it is a real problem.

PROBLEMS IN NEBRASKA RELATIVE TO SOIL MORPHOLOGY AND SOIL FAMILY CRITERIA

J. R. Culver

The present criteria do not clearly differentiate some soils in Typic Hapudolls from the Udic Haplustolls; i.e., Napier versus Alcester, Moody versus Galva, etc.

PROBLEMS IN NORTH DAKOTA RELATIVE TO SOIL MORPHOLOGY AND SOIL FAMILY CRITERIA

Major problems in North Dakota relate to the classification of Calciaquolls. Consideration of clay-size carbonates as silt-size particles causes a shift in family particle-size class in many of these soils.

Since this subject is discussed at length by Subcommittee 7b of the Committee on Soil Correlation and Classification, it is not repeated here, Data from North Dakota has been submitted to that committee for consideration.

PROBLEMS IN MISSOURI RELATIVE TO SOIL MORPHOLOGY AND SOIL FAMILY CRITERIA

Frederick L. Gilbert

The specific problem encountered in Missouri pertaining to soil morphology and soil family criteria relates to assignment of horizon designations in the upper part of subsoils. This problem is most apparent in making decisions about the assignments of the subscript "t" to the upper transitional part of the subsoil. We have advanced as a group, somewhat, to a mutual understanding of where argillic horizons begin. The application of this knowledge is, however, more erratic. Different points of view exist as to the assignments of the subscript "t" depending on the bias existing as to the relative weight given to estimated genesis, or observed morphology

The committee recommends that the Committee on Soil Morphology and Family Criteria be continued.

Committee Members:

Miller, F. Ted, Chairman

Alexander, John D.
Beaver, Albert
Bouma, Johannes
Bowles, James
Buller, L. L.
Carroll, Paul H.
Culver, James P.
Dideriksen, Ray
Fehrenbachcr, J. B.
Fenton, T. E.
Fisher, Charles S.
Fisher, Richard F.
Franzmeier, Donald P.
Gilbert, Frederick L.
Guthrie, Richard L.
Hole, Francis D.
Holmgren, George
Johnson, Paul R.
Klingelhoets, A. J.
McBee, Charles W.
McClelland, John E.
Omodt, Hollis
Ray, Burt
Riecken, F. F.
Runge, E. C. A.

North Central Regional Technical Work-Planning

Conference of the National Cooperative Soil Survey

Report of Committee 3 - Organic Soils
April 18, 1972

The Committee on Organic Soils consisted of the following:

G. A. Lea. Chairman

H. F. Arneman
D. H. Boelter
D. E. Buchanan
J. W. Carr, Jr.
R. S. Decker
R. S. Farnham
A. E. Ferber
H. R. Finney
N. Holowaychuk
W. Lynn
W. McKinzie
E. W. Neumann
A. Ritchie
H. R. Sinclair, Jr.

The first order of business for Committee 3 was to review recommendations of the former N. C. Regional Committee, and of the National Committee on Organic Soils, along with suggestions made by various members of the present Committee, in order to determine what projects should be undertaken. It was immediately apparent that there was much work to be done, and that the Committee could only do a small part of this work in the time available. With the latter constraint in mind four goals were chosen for Committee action as follows:

1. Compile a progress report on the classification of Histosols in the N. C. Region along with a list of descriptions to date. William McKinzie and co-workers.

2. Develope an Agricultural Use and Capability Classification Scheme for Histosols. Subcommittee consisting of Wm. McKinzie, Chairman, R. S. Decker, R. S. Farnham, H. R. Finney, N. Holowaychuk, W. Lynn, A. Ritchie, R. Sinclair, L. Tyler, R. Dideriksen, and T. E. Fenton. The last three members were not members of the parent committee but represented Illinois, Indiana, and Iowa respectively.

3. Initiate development of a Forest Use and Capability Classification Scheme for Histosols. This to be done by a subcommittee in cooperation with committee 9 (Forest Soils - Steve Shetron, Chairman). The Committee 3 subcommittee consisted of D. H. Boelter, Chairman, H. F. Arneman, J. P. Boyle, D. E. Buchanan, R. S. Farnham, E. W. Neuman and C. J. Milfred.

4. Determine the composition of representative Histosols from the several states in which they occur in the N. C. Region, with particular respect to fiber content and solubility in sodium pyrophosphate. Warren Lynn and co-workers at the USDA Lincoln Lab in cooperation with soil scientists in several states.

Results of progress to date on the various projects described are summarized in the attached reports.

In addition to Committee work, individual contributions and suggestions were made. These are summarized in the Appendix to the final report.

Recommendations of Comittee 3 are as follows:

1. That the Comittee be continued and its present projects completed.

2. That the Committee continue to work closely with the National Committee and other Regional Committees.

3. That State and Federal soil scientists in the various states of the North Central Region be encouraged to devote increased effort to the study of Histosols.

Report of North Central Organic Soils Committee - 1972

Addendum

1. Progress Report on Classification of Histosols.

   (a) Thirty five series descriptions of Histosols have been prepared in the North Central region out of a total of 115 in the United States.

   (b) Minnesota has an up-to-date toxonomic key to Histosols in that state. About 50 pedons have been described.

   (c) There is a lack of data regarding the temperature regime of Histosols. Michigan has initiated a study. Needed data include soil and air temperature (diurnal and by season), length of frost-free season, beginning and ending date of frost-free season; all in relation to temperature regimes of surrounding mineral soils.

   (d) There is a continued need to improve terminology relating to classification of Histosols so that it is as meaningful and consistent as possible.

   (e) The same applied to investigative techniques.

   (f) Not enough data is available for a meaningful evaluation of rubbed fiber limits.

2. Agricultural Use and Capability Classification.

   (a) See report for comments.

   (b) Saprists appear to be rated too low in Canadian system.

3. Forest Use and Capahility Classification.

(a) This appears to be an area where much research is needed, and considering the large acreage of forested Histosols in the Lake states, an area of research that would be very remunerative. As good upland sites are used up, Histosols will become increasingly important sites for forestry and other non-farming purposes.

(b) Influence of ground water (flow-through or stagnant; aerated or not) needs to be considered; potential for water table manipulation highly important.

(c) Effects of disturbance factors e.g. road building affects species composition; rapid lowering (or rise) of water table will cause spruce to go out. Potential for water table manipulation important.

4. Composition of Representative Histosols in North Central Region.

(a) This study was undertaken by Dr. W. Lynn and co-workers at the Lincoln Soil Survey Lab in cooperation with field soil scientists in six states. The purpose of the study was to (1) compare several properties of histic materials over a wide geographic range in the N. C. Region using tests developed by laboratory personnel, and (2) compare laboratory results with field estimates, Results and recommendations are given in the attached report.

Families and series of the North Central Region. State responsible for each series is shown along with status of description. Series having interpretations prepared are also indicated.

(T) = Tentative Status

Fibrists

Borofibrists

Hemic Borofibrists, euic

Brophy (MN) Yellow 1-26-71 Interpretations prepared

Medifibrists

Limnic Medifibrists, coprogenous, euic

(T) Mctogga (MN) Init. 12-70 Interpret. prepared

Sphagnofibrists

Typic Sphagnofibrists, dysic, frigid

(T) Waskish (MN) Yellow 5-25-71 Interpret. prepared

Hemic Sphagnofibrists, dysic. frigid

(T) Lobo (MN) Yellow 5-26-71 Interpret. prepared

Hemists

Borohemists

Typic Borohemists, dysic

Greenwood (MI) Blue 7-16-70

Spalding (MI) Old format 4-21-60

Typic Borohemists, euic

Rifle (MI) Blue 4-17-70

Hydric Borohemists, dysic

Tahquamenon (MI) Old format 1-19-40

Limnic Borohemists, coprogenous, euic

Millerville (MN) Yellow 5-13-71 Interpret. prepared

Limnic Borohemists, marly, euic

Carlos (MN) Yellow 1-28-71 Interpret. prepared

Terric Borohemists, loamy, mixed, euic

Tacoosh (MI) Blue 7-16-70

Medihemists

Typic Medihemists, euic, mesic

(T) Boots (WI) Init. 2-17-71 Interpret. prepared

Limnic Medihemists, coprogenous,

(T) Caron (MN)

Saprists

Borosaprists

Typic Borosaprists, dysic
Loxley (MI) Blue 2-1-66

Typic Borosaprists, euic
Lupton (MI) Blue 7-16-70
Seelyeville (MN) Blue 11-19-70

Hemic Borosaprists. euic
Carbondale (MI) Blue 6-16-70

Limnic Borosaprists. marly, euic
Rondeau (MN) Blue 11-19-70

Lithic Borosaprists. euic
Chippeny (MI) Blue 7-17-70

Terric Borosaprists. sandy or sandy-skeletal, mixed, dysic
Oawson (MI) Blue 7-16-70

Terric Borosaprists, sandy or sandy-skeletal, mixed, euic
Markey (MI) Blue 4-30-70
Tawas (MI) Blue 7-17-70

Terric Borosaprists, loamy, mixed, euic
Cathro (MI) Blue 4-17-70

Medisaprists

Typic Medisaprists, euic, mesic
Carlisle (MI) Yellow 2-26-69
Houghton (MI) Blue 7-16-70
Lena (IL) Init. 9-71 Interpret. prepared

Fluvaquentic Medisaprists, euic, mesic
Kerston (MI) Old format 11-3-58

Limnic Medisaprists, marly, euic, mesic
Edwards (MI) Yellow 5-25-71 Interpret. prepared

Limnic Medisaprists, coprogenous, euic, mesic
Muskego (WI) Blue Z-71-71 Interpret. prepared

Terric Medisaprists, sandy or sandy-skeletal, mixed, euic, mesic
Adrian (MI) Blue 7-17-70

Terric Medisaprists, loamy, mixed, euic, mesic
Linwood (MI) Init. 12-23-70 Interpret. prepared
Palms (MI) Blue 7-17-70

Terric Medisaprists, clayey, illitic, euic, mesic
Ogden (MI) Old format 5-26-55
Willette (MI) Old format 4-21-60

The following

North Central Regional Work-Planning Workshop

of the National Cooperative Soil Survey

Rapid City, South Dakota
April 17-21, 1972

Subcommittee Report - Agricultural Use and
Capability Classification of Histosols

The subcommittee was charged with reviewing the "Organic Soil Capability Classification for Agriculture" prepared by the Soil Science Department, Ontario Agricultural College, University of Guelph, Canada. The committee members were asked to comment if the Ontario classification or a modified form of the classification would be useful in characterizing and rating organic soils for various uses.

The following comments represent summary of the major comments received from the committee members:

General Comments Received

Suitability classes and subclasses

1. Question if we need seven suitability classes

2. Some committee members questioned the need for all the suitability subclasses

3. Members from states with small acreage of organic soils were of the opinion that the suitability classification would be of little use in their state

4. Modification of some of the criteria in the Canadian system could be applied to the U. S. system and as a result would greatly improve the present way we are grouping our organic soils for use

5. As written some criteria segmentizes some of the series into as many as 3 classes

6. Subclasses would have high importance in determining use and management of organic soils for high value crops

7. Subclass criteria helpful in grouping soils into capability units

a. Subclasses are good criteria for characterizing organic soils

9. Revision of classes within the subclasses to apply to urban interprotations would be very useful

10. Question if 2 to 3 feet of organic soil underlain by sand and gravel that is easily drained should be rated according to Canadian system.

Development Difficulty Classification

1. The development difficulty rating brings into the classification system the factor of reclamation or economics. This allows all factors to play an equal rate in making wise decisions and not just the morphology and physical and chemical characteristics of organic soils.

2. Recommend only 3 classes be used, namely:

   1. Minor reclamation.

   2. Major reclamation - large areas with no existing outlet. Soils suitable for agriculture.

   3. Serious hazard - small area with no outlet and soils unsuitable for agriculture.

Baaed on comments from committee members and discussions with other scientists working with organic soils I recommend the following:

(1) A working committee representing scientists from the various disciplines (agronomy, forestry, engineering and soil scientists) use the Ontario guide and prepare a draft showing how the various soil characteristics can be used in rating organic soils for various uses.

(2) Furnish the national committee copies of material prepared for their review and comment.

(3) Recommend that the name of the system be changed from Organic Soil Capability Classification for Agriculture to Suitability Classification of Organic Soils for Agriculture or other use specified., Also in place of subclasses I recommend the use of limitations or hazards or both.

William E. McKinzie
William E. McKinzie
Subcommittee chairman

Draft for Discussion Only

Suitability Classification For Organic Soils for Agriculture

(based on "A Use Capability Classification for Organic Soils, Dept. of Agriculture and Food" Ontario, Canada)

Assumptions

1. The organic suitability classification is an interpretive classification designed to assess the limitation of individual organic soils to development for and production of crops.

2. Good soil management, crop growing and conservation practices that are feasible under a mechanized system of agriculture are assumed.

3. The soils within a suitability class are similar with respect to the degree of limitation but not necessarily similar with respect to the kind of limitation. The limitation subclass provides Information on the kind of limitation or hazard and the class indicates the intensity of the limitation. Suitability class 1 has no limitation to crop production or to argicultural development. Suitability class 7 has the most severe limitations to agricultural production and to development for agricultural purposes.

4. Organic soils which have been reclaimed and developed for agriculture are classified according to any continuing limitations which may affect the production of agricultural crops. Soils in the natural state will be classified not only for the agriculture capability but also will be classified according to the apparent degree of difficulty in reclamation and development.

5. The location, distance to market, efficiency of transport, financial state of the market, farm size, sociological influences and the skill and resources of individual operators do not constitute criteria for suitability groupings.

6. Suitability groupings and suitability definitions are subject to change as new information and methods concerning the manipulation of organic soils become available.

Suitability Classes

Class 1

Class 1 soils have no limitations which restrict their use for the production of agricultural crops. These soils, at an intermediate (Hemic) stage of decomposition have no drainage, topographical, salt or pH limitations which reduce their agricultural potential. They are deep, (75 feet of organic soil) not liable to crop damage from overflow and have a mesic soil temperature or warmer.

Class 2

Organic soils in class 2 have one limitation which resticts their use for agriculture in a minor sense. This limitation may cause lower crop yields but does not pose a threat of crop loss under good management. They are deep (> 5 feet of organic soil) have a high to medium productivity for a wide range of crops. One of the following limitations prevents them from being class 1 soils:

- Wood layer<3 inches thick in the upper 51 inches of the profile
- pH 4.5 - 4.0
- layer of loamy material) 2 inches and < 12 inches thick in the upper 51 inches of the profile
- mounds, hummocks, ridges, plateaus < 1 foot high or holes <1 foot deep (do not constitute a continuing limitation - used for assess-ment of development difficulty)

Class 2 soils are hemic soils with hydrologic characteristics which do not retard drainage, create droughty conditions or lessen the likelihood of obtaining maximum crop yields. They have no salinity or permafrost problems and the climatecategory i or ii is suitable for a wide range of crops.

Class 3

Organic soils in this class have moderately severe limitations that restrict the range of crops or that require special management practices. With good management these soils have a medium to high productivity for a fairly wide range of crops.

Their limitations to agriculture may be a combination of two of the hazards outlined in class 2 or one of the following:

- 12 to 51 inches of profile is in an advanced stage of decomposition - Sapric
- frigid soil temperatures, or local climate conditions pose a threat of some minor crop damage but no crop loss
- pH of 4.5 - 3.5 or pH 7.0 - 7.5
- overflow frequent or intense enough to cause minor crop damage but no crop loss
- 4 to 5 feet of organic soil underlain by loamy or sandy materials
- layer of coprogenous earth >2 inches thick within depths of 35 to 51 inches
- layer of soft wood > 3 inches thick; or layer of hardwood <2 inches thick in the 20 inch to 51 inch depth

- layer of sand > 2 inches and < 12 inches thick in the top 51 inches of the profile

- minor effect by salinity

- mounds, hummocks, ridges or plateaus 1 to 2 feet high; or holes 1 to to 2 feet deep.

Class 4

soils in class 4 have limitations which severely restrict the range of crops or which require special development and management practices. Even with intensive development and a high level of management the productivity of crops will be medium to low. Only specially-adapted crops will produce high yields. Reclamation and management costs will be high and warranted only where high value crops can be produced.

class 4 soils may have two or more of the limitations which characterize class 2 and 3, or one of the following:

- inundation or excess water occurring frequently enough to cause moderate crop damage and the slight possibility of one crop loss within the growing season

- organic material within depths of 12 to 63 inches of the profile is undecomposed - Fibric

- 3 - 4 feet of organic soil underlain by loamy materials; 4 - 5 feet organic soil underlain by clayey materials or marl; or 5 - 6 feet of organic soil over bedrock

- frigid soil temperatures or local climate such to shorten the growing season or cause moderate crop damage

- layer hardwood 2 inches or less in thickness in the upper 20 inches of the profile or layer of hardwood 2 inches to 12 inches in thickness in the 20 inch to 60 inch depth of the profile

- the presence of salts such as to reduce the yields of all crops and severely restrict the range of crops

- permafrost below 63 inch depth and unaffected by cultivation

- mounds, hummocks, ridges or plateaus72 feet high; or eroded holes > 2 feet deep

- layer of clayey material or marl 2 to 12 inches thick in top 51 inches of the profile

- coprogenous earth) 2 inches thick within depths of 35 inches.

Class 5

Class 5 soils have such severe limitations that they are restricted to the production of perennial forage or other specially adapted crops. They may be improved for the production of these crops but it is not feasible to undertake large scale reclamation for the establishment of other crops where the risk of crop loss is high and the probable productivity of the crop low. Limitations to agricultural production might be:

- frequent inundation or excess water causing crop loss once within the growing season

- 2 - 3 feet or organic soil underlain by loamy materials; 3 - 4 feet of organic soil materials underlain by sandy, clayey materials or marl; or 4 - 5 feet of organic soil underlain by bedrock

- pH > 7.6

- frigid or isofrigid soil temperatures, or local climatic conditions causing likelihood of crop loss

- layer of hardwood)2 inches thick in upper 20 inches of the profile

- salts are so concentrated that crops will not survive. Only salt-tolerant nature species will thrive.

Class 6

Class 6 soils are capable of producing only idigenous crops and improvement practices are not feasible. The naturally occurring vegetation may have some limited agricultural use such as grazing. Limitations which may be present and which may be so severe so as to exclude the practicality of agricultural development are:

- excess water and overflow occurring so frequently that if crops could be established the loss of the crop is likely two or more times within the growing season

- 16 to 24 inches of organic soil underalin by loamy materials; 2 - 3 feet of organic soil material underlain by sandy or clayey material or marl; or 3 - 4 feet of organic soil underlain by bedrock

- soils are so salty that the successful maintenance of any plants other than nature salt-tolerant species is impossible

- permafrost occurs within the upper 63 inches of the profile during the growing season.

Class 7

Organic soils in class 7 have no capability for agriculture. These soils have such severe limitations that any improvement or developement for agriculture is impractical. Limitations may include:

- bedrock occurring in the upper 3 feet of the profile
- growing season too short or soil temperature too low for crop production
- wood so prevalent in the profile that it excludes any possible development for agriculture
- salt problem is so severe that no useful plants can exist
- permafrost influence is so severe so as to exclude any possible agriculture development
- sulfur content too high for development for agriculture
- wood so prevalent in the profile that it excludes any possible development for agriculture.

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Limitations for Agriculture

Climate
(Limitation C)

Class 1 (More 8°C (47°F.))

Mesic	Isomesic
Thermic	Isothermic
Hyperthermic	Isohyperthermic

Class 2 Frigid (Less 8°C (47°F.))
Boreal

Class 3 Frigid (Less 8% (47°F.))

Warmer than cryic in summer

Class 4 Cyric (Less 8% (47°F.))
Frozen in some layer within control section about 2 months after the summer solstice. Soils very cold in winter but warm up slightly in summer, or never frozen below 5cm.

Class 5 Pergellic (Less 8% (32°F.))
Permafrost

Depth to Profile and Underlying Mineral Materials

(Limitation D)

Class 1 5 feet or more of organic soil.

Class 2 5 feet or more of organic soil.

Class 3 4-5 of organic soil over loam or sand,

- layer sand 2-12 inches thick in the upper 51 inches of the organic profile.

Class 4 - 3-4 feet or organic soil over loam

- 4-5 feet of organic soil over clay or marl
- 5-6 feet or organic soil over bedrock
- layer of clay or marl 2-12 inches thick in the upper 51 inches of the organic profile.

Class 5 - 2-3 feet of organic soil over loam

- 3-4 feet of organic soil over sand, clay or marl
- 4-5 feet of organic soil over bedrock.

Class 6 - 16-24 inches of organic soil over loam

- 2-3 feet or organic soil over sand, clay or marl

- 3-4 feet organic soil over bedrock.

Class 7 - 16-24 inches of organic soil over sand, clay or marl

- less than 3 feet of organic soil over bedrock.

Erosion

(Limitation E)
(Wind)

Fertility

(Limitation F)

	Acid Sol ls	Alkaline Soils
Class 1 pll	4.5-7.0	
Class 2 pH	4.5-4.0	
Class 3 pH	4.0-3.5	pH 7.0-7.5
Class 4 pH	3.5	pH 7.6-8.0
Class 5 pH		pH 7.8.0

Inundation and Excess Water

Limitation I or W (I (Inundation)
(W (Excess Water)

Class 1 - no inundation or excess water to damage crops

Class 2 - inundation or excess water occurring occasionally, with slight crop damage during the growing season

Class 3 - frequent inundation or excess water causing minor crop damage but no crop loss

Class 4 - frequent inundation or excess water causing moderate crop damage and slight possibility of one crop loss

Class 5 - frequent inundation causing crop loss once during growing season

Class 6 - very frequent inundation or excess water causing a crop loss 2 or more times during growing season

Class 7 - yearly inundation or excess water preventing establishment, growth or harvesting of agricultural crops.

Permafrost

(Limitation G)

Class 1 - no limitation

Class 4 - permafrost below 5 feet from soil surface during the growing season and not interfering with crop production

Class 6 - permafrost in the upper 5 feet of the profile during the growing season.

Wood in the Profile

(Limitation L)

Class 1 - no limitation

Class 2 - layer of soft wood*>3 inches thick in upper 51 inches

Class 3 - layer of soft wood)3 inches thick in the 20 to 51 inch depth

- hardwood 2 inches or less in diameter or layer less than 2 inches thick in the 20 to 51 inch depth.

Class 4 - hardwood 2 inches or less in diameter or layer less than 2 inches thick in upper 20 inches of the profile

Class 5 - hardwoodthick .7033 Tw -161.04in

Degree of Decomposition - Permeability

(Limitation P)

class 1 - hemic soli materials in the 1 to 5 foot depth

class 3 - sapric soil materials in the 1 to 5 foot depth; or comprogenous earth22 inches thick in the 35 to 51 inch depth of the profile

Class 4 - fibric soil material in the 1 to 5 foot depth, or coprogenous earth > 2 inches thick in the 12 to 35 inch depth of the profile.

Acidity

(Limitation S)

Class 1 - no limitation

Class 4 - have a sulfuric horizon that has formed as a consequence of draining sulfidic materials (cat clays) with an upper boundary within 20 inches of the surface.

Class 6 - have a sulfuric horizon with an upper boundary 20 to 51 inches below the surface.

Surface Roughness

(Limitation T)

Class 1 - no limitations

Class 2 - mounds, hummocks, plateaus or ridges less than one foot in height, or eroded holes less than one foot in depth

Class 3 - mounds, hummocks, plateaus or ridges one or two feet in height and eroded holes one to two feet deep

Class 4 - mounds. hummocks, plateaus or ridges greater than two feet in height or eroded holes greater than two feet deep.

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Series Greenwood Phase

Classification Dysic, Typic Borohemists

Soil Limitation	Class eclaimed	Native Unreclaimed	Remarks
Climate (C)	2	2	
Depth (D)	1	1	
Erosion (E)	NR	NR	
Fertility (Reaction) (F)	3	3	
Water (I .W)	1	7	
Permafrost (G)		Na	
Wood (L)	5	5	Wood 1-8" dia. throughout C.S.
Salinity (N)		-	
Decomposition (P)	4	4	
Acidity (Sulfur) (S)		-	
Surface Roughness (T)		1	
Suitability Rating For Agriculture	4w	7W	

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Series Brighton **Phase**

Classification Dysic, hyperthermic Typic Medifibriste

Soil limitation	Cla Reclaimed	Native Unreclaimed	Remarks
Climate (C)	1		
Depth (D)	1		
Erosion (E)			
Fertility Reaction (F)	1		
Water (I. W)	1	7	
Permafrost (G)			
Wood (L)	1		
Salinity (N)			
Decomposition (P)	4		Fibric material
Acidity (Sulphy) (S)			
Surface Roughness (T)			
Suitability Rating for Argiculture	4P	7W	

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Series Houghton

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Suitability ratings of Soils for ________

Item affecting Use*	Degree of S 1 Suitabilit		
	Good	Fair	Poor
Climate (C)			
Depth (D)			
Erosion (E)			
Fertility (Reaction) (F]			
water (I.W)			
Permafrost (G)			
Wood (L)			
Salinity (N)			
Decomposition (P)			
Acidity (Sulfur) (S)			
Surface Roughness (T)			

*The severity of the limitation or hazard classes would vary according to the use for which the soil is rated. Example: A soil with 16 to 24 inches of organic soil over clay would have a depth class of 7 for agriculture and possibly a depth class of 1 or 2 for roads.

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DEVELOPMENT DIFFICULTY CLASSIFICATION

Organic soils in the native unreclaimed state may be given a "development difficulty rating" from one to seven. This rating is based on an estimation of the relative degree of difficulty which may be encountered in the development of the soil.

Class 1, 2, or 3 - only minor reclamation is required. Minor reclamation is considered to be those operations which can be carried out by a single operator and which do not require co-operation between adjoining operators. Such operations would include drainage, levelling Tough surfaces, removal of surface woody layers and land clearing.

Class 4 - require major reclamation, but where agricultural suitability class is 1, 2 or 3 is usually warranted. Major reclamation is considered to be those operations which require co-operation between adjoining operators or which may require outside financial assistance. Such operations could be drainage, construction of dams or levees and correction of very low or very high pH.

Class 5 - require major reclamation schemes which will be warranted only where agricultural suitability is class 1, 2 or 3 and high value crops can be produced.

Class 6 - very large reclamation projects. Seldom warranted because the hazards are so serious that they constitute some continuing limitation.

Class 7 - unlikely development warranted.

April 4, 1972

TO: Gerhard B. Lee, Organic Soils Committee

FROM: Don H. Boelter, Subcommittee Chairman

SUBJECT: Prelininsry report of the Subcommittee on Use Capability Classification of "Histosols" for Forestry and Related Uses.

The above committee was appointed since the last workshop to begin work on the development of a capability classification of Histosols for forestry and related uses. All committee members were contacted by mail to get their ideas and several responses were received.

Presumably the major use for which a capability classification is needed is the growth of various tree species. It appears that some information is available relative to the growth of black spruce on organic soils. (See the attached list of references.) However, information on other species is more limited.

Dr. Miron Heinselman (personal communication) feels that the most critical factor relating to the growth of black spruce on an organic soil are nutrient characteristics related to mineral influenced water. Other characteristics such as peat decomposition, peat depth, pH, and indicator plants can serve to identify the productivity, but only to the extent that they are related to the mineral influence and nutrient status. More direct measures of the mineral influence or nutrient status would no doubt be better correlated to growth but no such comparisons have been made that we are aware of.

Apparently the growth of northern white-cedar and tamarack are also related to the degree of mineral influence. However, northern white-cedar will not grow on acid sites irregardless of the nutrient status. Black spruce can produce well on acid sites (if the nutrient status is good) the pH requirements of tamarack are apparently intermediate. Information for other tree species is generally unavailable.

Use capability classification for other uses such as drainage, peat harvesting, wild rice paddies, etc. should also be considered.

It was evident from the few comments received from subcommittee members that further discussion is needed in order to make real progress towards the subcommittee's objective.

Don H. Boelter

April 4, 1972

Sources of Information:

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1963. Forest sites, bog processes, and peatland types in the glacial Lake Agassiz Region, Minnesota. Ecolog. Monograph 33:327-374.

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Perala, Donald A.
1971. Growth and yield of black spruce on organic soils of Minnesota, U.S.D.A. Forest Service, North Central Forest Exp. Sta., Res. Paper NC-56, 16 p.

North Central Regional Committee on Organic Soils - 1972

Productivity of Histosols for Timber in the Upper Great Lakes Region[1/]

Soil Series		Forest Type[2/]	No. Plots	Vol./growth annually/acre	Tot. Vol. per acre
				ft^3	ft^3
Carbondale	1.	Balsam fir, red maple, paper birch	2	11	190
	2.	Black spruce and balsam fir	5	23	670
	3.	N. White cedar (saw log size)	4	20	722
	4.	N. White cedar	1	88	3,425
	5.	Black ash, Am. elm, red maple	2	18	450
	6.	Black spruce, balsam fir, red maple	2	34	1,090
Cathro	1.	Yellow birch	2	62	2,710

1/ Personal communication Dr. S. Shetron, Ford Forestry Center, L'Anse, Mich. 49946. Data from Cooperative Soil - CFI Project; Michigan College of Mining and Technology, Michigan Agricultural Experiment Station, USDA Soil Conservation Service.

2/ Pole-size stands unless indicated otherwise.

Tawas

North Central Committee on Organic Soils - 1972

Site Quality for Black Spruce as Related to Type and Pepth of Organic Deposits 1/ 2/

Site Quality	Soil and Site Conditions
Good (Site Index 40-50)	Surface horizon of fihric sphagnum < 10 cm. thick and consisting primarily of live growing sphagnum mosses; low horizons moderately to well decomposed peat (dark reddish brown to black). Total organic deposit < 1 meter deep. Mineral influenced water (perhaps could he identified by pH, conductivity and/or indicator plants such as speckled alder, red-osier dogwood, paper birch, and grasses).
Medium (Site Index 30-40)	Surface horizon of fibric sphagnum ranging from IO-30 cm. thick. Other characteristics intermediate between good and low site.
Low (Site Index 20-30)	Surface horizon of fibric (poorly decomposed and yellowish brown) sphagnum > 30 cm. in depth. Site away from mineral influence (perhaps could be identified by pH, conductivity and/or indicator plants such es leather leaf, bog laurel, and bog rosemary).

1/ In Upper Great Lakes Region.

2/ P. H. Boelter, after W. F. Johnston (1971) and JJ. A. Perala (1971).

Comparison of Histosol Samples

Warren Lynn and Bill McKinzie

Approach:

Laboratory personnel wished to compare Histosol samples from several areas by tests developed to characterize organic materials, and to compare the laboratory results with field estimates for several properties.

Sampling:

Field personnel were asked to collect and send to the laboratory one-pint bulk samples and two undisturbed cores from three layers of a Histosol pedon, plus a small sample of the most fibrous material encountered in the pedon. Duplicates of the one-pint samples and the "most fibrous" material were to be kept in the field office for reference. Field personnel were asked to estimate fiber volume (rubbed and unrubbed) mineral content, and bulk density at the time samples were collected. (Samples from North Dakota were from a separate project.)

Samples:

Location	Series	LSL Numbers
Kendall County, Illinois	Lena	72L051-72L053
Marshall County, Indiana	Houghton	72L054-72L056
Eaton County, Michigan	Houghton	72L057-72L059
Anoka County, Minnesota	Lupton	72L060-72L063
Sawyer County, Wisconsin	Rifle	72L064-72L066
Pembina County, North Dakota	Peat	72L1303-72L1308

Analysis:

The analysis scheme is detailed in an addendum at the end of this report. Two dispersing techniques were applied prior to determination of unrubbed fiber. Roth utilized one-half teaspoon of Calgon in about 400 ml solution as a dispersant.

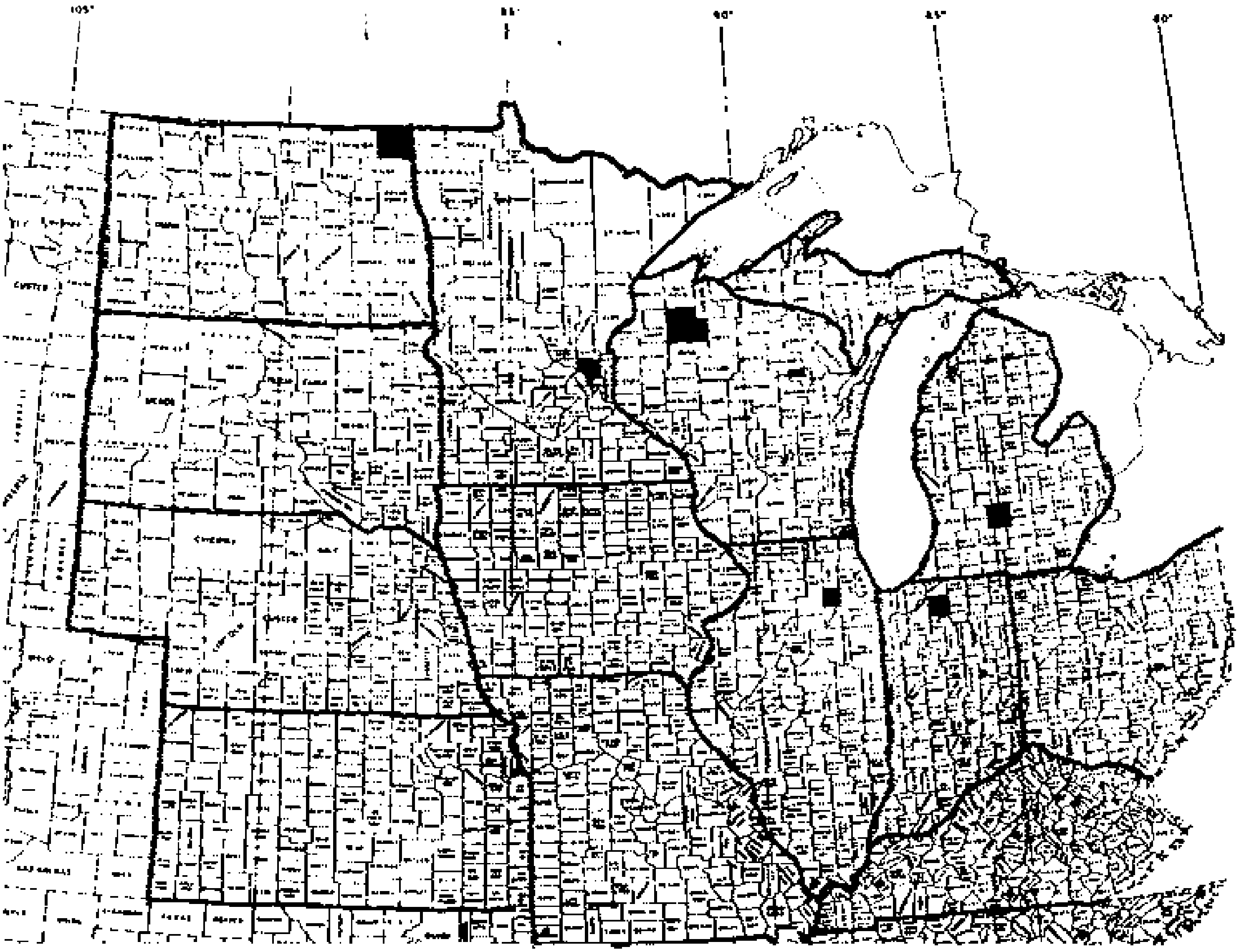
1) Sample mixed with egg beater, allowed to stand overnight, and mixed again with egg beater.

2) Sample shaken for several hours on a rotary shaker, allowed to stand overnight, and shaken again for several hours.

Data:

Copies of the data and descriptions are attached at the end of this report. The data sheets include the laboratory analyses plus visual estimates of properties made in the field and in the laboratory.

HISTOSOL COMPARISONS - Location of Sample Sites



Data Interpretations:

1. Laboratory determinations of rubbed fiber and pyrophosphate color arc reasonably aligned for suborder placements.

2. Laboratory determination of unrubbed fiber is unreasonably high for horizons that have been air-dried in the field. Dispersion is a problem.

3. Duplication of rubbed fiber volume with the half-syringe method was generally 2% absolute or less. Visual estimates varied, but were more often higher than the half-syringe estimates.

4. Volume and weight estimates of rubbed fiber are nearly the same. Values should diverge as fiber content increases.

5. Volume estimates for unrubbed fiber tend to be higher than the corresponding weight estimates.

6. In most cases the mineral content of the fiber separates is similar to mineral content of the whole sample. Snail shells in the Illinois sample concentrate in the fiber separates and increase the mineral content.

7. Determination of the water content at low tensions in two pedons showed little loss of water up to 50 cm H_2O tension.

8. Bulk densities for the organic component (mineral component calculated out) are from 0.09 to 0.13 g/cc, except for two air-dried surface samples.

Recommendations--Taxonomy:

1. Base suborder placement--fibric, hemic or sapric--on the rubbed fiber percentage and the pyrophosphate color test.

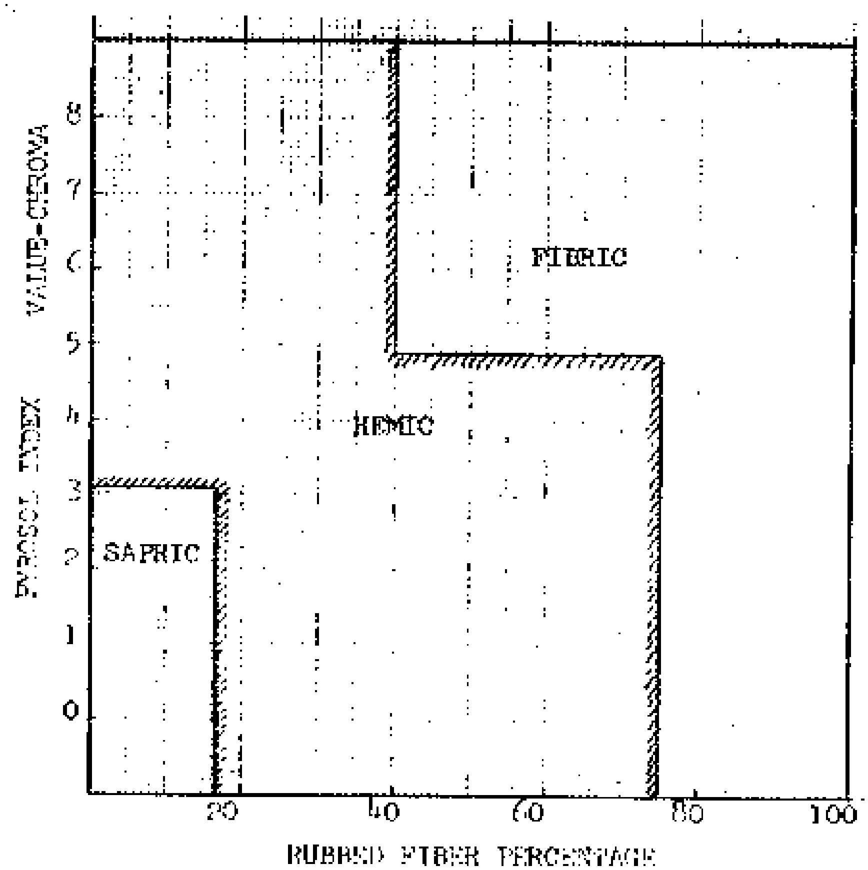
2. Modify pyrophosphate color requirements to include 6/1 (modified chart attached) as fibric and write rules so that:

   Fibric : Numerical difference between value and chroma is 5 or greater. **(Pyrosol index)**

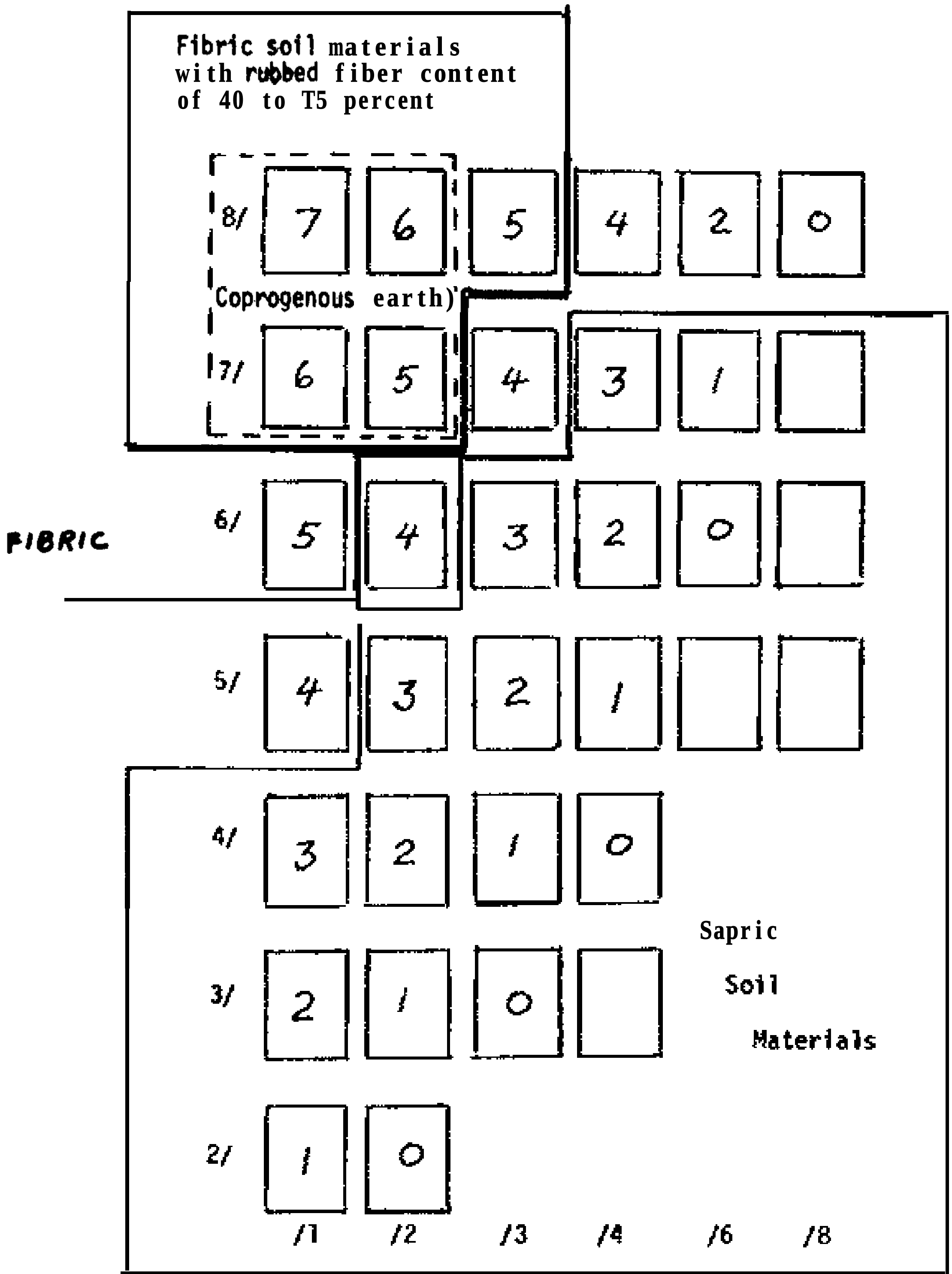
   Sapric: Numerical difference between value and chroma is 3 or less. **(Pyrosol index)**

3. Retain the visual field estimate of unrubbed fiber volume, but drop the laboratory determination. Do not use unrubbed fiber as a criterion for suborder placement.

4. Express the fiber percentages on the base of the volume of the whole material rather than on the organic volume.



VALUE-CHROMA
PYROSOL INDEX
FIBRIC
HEMIC
SAPRIC
RUBBED FIBER PERCENTAGE



Numbers within boxes **represent** the numerical differences between the value and the chroma.

Typic Borosaprist

This soil consists of deep, nearly level, very poorly drained organic soils. These soils are in seep areas and depressions on the sandy portion of the glacial lake plain.

In a representative profile the surface layer is black calcareous peat about 3 inches thick. Below this is dark reddish brown mottled calcareous peat about 5 inches thick. The next layer is very dark gray peat about 42 inches thick. The underlying material is peat. It is gray in the upper part and very dark gray in the lower part.

Permeability is moderately rapid and the available water capacity is low. The organic matter content is very high. Natural fertility is medium.

All areas of this soil are in native woods. A few areas are used for pasture.

Representative profile of Typic Borosaprist, native woods, 300 feet east, 50 feet north of the SW corner of Sec. 26, T. 162 N., R. 56 W.

Oa1 0 to 3 inches, black (5Y S/1) and black (5Y 3/1) rubbed and pressed; about 32 percent fiber, about 2 percent rubbed; weak fine granular structure; nonsticky; sodium pyrophosphate light yellowish brown (10YR 6/4), many snail shells; strong effervescence; mineral content 72 percent; moderately alkaline; abrupt smooth boundary.

Oa2 3 to 8 inches, dark reddish brown (2.5YR 3/4) and dark reddish brown (2.5YR 3/4) rubbed and pressed; many fine distinct gray (5Y 5/1) mottles; about 40 percent fiber, about 4 percent rubbed; weak very fine granular structure; nonsticky; ● odium pyrophosphate dark yellowish brown (10YR 3/4) common snail shells, mineral content 73 percent; violent ● ffcrvwwmcr; moderately ● lkslina; clear smooth boundary.

Oa3 8 to 24 inches, very dark gray (5Y 3/1) olive gray (5Y 4/2) rubbed and pressed; many medium prominent red (2.5YR 4/6) mottles; about 36 percent fiber content, 2 percent rubbed; weak moderate platy ● tincture; nonsticky: sodium pyrophosphate dark brown (10YR 3/3), many snail ● helle; mineral content 69 percent; ● ttwnR ● fferrasceaca. moderately alkaline; gradual smooth boundary.

Oa4 24 to SO inches, very dark gray (5Y 4/1), and very dark gray (5Y 4/1) pressed and rubbed; many fine distinct red (2.5YR 4/6) mottles, about 40 percent fiber, about 2 percent rubbed; weak fine blocky structure; nonsticky; sodium pyrophosphate dark brown (10YR 4/3) many snail shells, mineral content 69 percent; violent effervescence, moderately alkaline; gradual smooth boundary.

Oa5 50 to 56 inches, gray (5Y 5/1), and dark gray (5Y 4/1) rubbed and pressed, about 36 percent fiber, about 2 percent rubbed, weak Tory fine granular s tructure; nonsticky, ● edlum pyrophosphate brown (10YR 5/3), many snail shells, mineral content 71 percent; strong e ffervescence, moderately alkaline, gradual smooth boundary.

Oa6 56 to 60 inches, very dark grayish brown (2.5Y 3/2), very dark brown (10YR 2/2) pressed and rubbed; weak fine granular structure; nonsticky, ● diar pyrophosphate dark brown (10YR 4/3), many snail shells, mineral content 71 percent; strong effervescence, moderately alkaline.

SOIL CLASSIFICATION- TYPIC MEDISAPRISTS; [illegible]

SERIES - - - - - - - - LEN

STATE - - - - - - - - - ILLINOIS   COUNTY KENDALL

GENERAL METHODS - - - -

SAMPLE NOS.- 72L051-72L053

[illegible] DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA

	DEPTH CM	HORIZON	MINERAL CONTENT [illegible] PCT	UNRUB FIBER PCT	RUB FIBER PCT	[illegible] PCT	[illegible] PCT	[illegible] PCT	[illegible] PCT	UR PCT	R PCT	[illegible] COLOR	[illegible]	[illegible]	pH 0.01M $CaCl_2$ FIELD STATE		CLASSIFICATION BY LAB TESTS
72L051	0-25	Oa1	56,58	53	84	62	2a	68,70c	2b	41	1	10YR 2/1		.25,.28	7.3	(Sampled 8-15 cm)	Sapric
72L052	25-61	Oa2	34,36	37	70	76	2	78,80c	3d	57	4	7.5YR 4/2		.09,.11	7.3	(Sampled 38-46 cm)	Sapric
72L053	61-173	Oa3	57,54	43	59	50	2b	46,42	4	35	3	10YR 5/3		.12,.11	7.5	(Sampled 76-84 cm)	Sapric
	173-208	Oe1															
	208-264	Oa4															
	264-279	IIC															
72L053	76-81 (Most fibrous)	Oa3			62	52	6	48c	4b			10YR 3/4			7.5		Sapric

DEPTH CM	HORIZON	BULK DENSITY FIELD STATE G/CC	FIELD STATE PCT	AT SAT PCT	[illegible] TENSIONS				LABORATORY MINERAL CONTENT PCT	LABORATORY FIBER UNRUB PCT	LABORATORY FIBER RUB PCT	FIELD MINERAL CONTENT PCT	FIELD FIBER UNRUB PCT	FIELD FIBER RUB PCT	BULK DENSITY G/CC	SODIUM PYROPHOSPHATE COLOR
0-25	Oa1	043,048	122,111	149					50	10	1	2-3	5	TR		
25-61	Oa2	019,0.21	93,577	459					60	20	3	3	15	2		
61-173	Oa3	024,022	334,336	346					40	30	8	2	15-20			
173-208	Oe1											1	33-67			
208-264	Oa4											8-10	5-10			
264-279	IIC															

SOIL CLASSIFICATION- HEMIC MEDISAPRISTS: EUIC, MESIC

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA

SERIES - - - - - - - - HOUGHTON MUCK

STATE - - - - - - - - - INDIANA COUNTY MARSHALL SAMPLE NOS. - 72L054-72L056

GENERAL METHODS - - -

Sample	Depth (CM)	Horizon	Fiber content: Field state (PCT)	Fiber content: Unrub fiber (PCT)	Fiber content: Rub fiber (PCT)	[illegible] (PCT)	[illegible] (PCT)	[illegible] (PCT)	[illegible] (PCT)	UR (PCT)	R (PCT)	Sodium pyrophosphate color	[illegible]	[illegible]	pH 0.01M CaCl2 field state			Classification by lab tests
72L054	0-23	Oap																
	23-51	Oa2	24,24	47	64	84	1	>100a	1	61	2	10YR 3/3		.16	4.9	Sampled 0-81 cm		Sapric
	51-81	Oa3																
72L055	81-107	Oe1	11,12	13		56	2	56,58	2	43	2	10YR 4/3		.06,.04	6.1			Sapric.
72L056	107-130	Oa4	25,29	26	15	46	1	52,62a	[illegible]	43	1	7.5YR 3/2		.04,.06	5.6			Sapric
72L055	81-107 (Most fibrous)	Oe1			7	70	4	64	9			10YR 6/3			5.9			Sapric

Sample	Depth (CM)	Horizon	Bulk density field state (G/CC)	Water content field state (PCT)	Water content at sat (PCT)	9 CM (PCT)	19 CM (PCT)	25 CM (PCT)	33 CM (PCT)	49 CM (PCT)	Laboratory fiber: Water content (PCT)	Laboratory fiber: Unrub (PCT)	Laboratory fiber: Rub (PCT)	Field fiber: [illegible] (PCT)	Field fiber: Unrub (PCT)	Field fiber: Rub (PCT)	Bulk density (G/CC)	Sodium pyrophosphate color
72L054	0-23	Oap												2	10	TR	0.5	
	23-51	Oa2	0.30,0.29	215,185	256	250	247	245	242	234	55	25	2	2	20	2	0.35	
	51-81	Oa3												2	20	5	0.3	
72L055	81-107	Oe1	0.10,0.[illegible]	788,717	750	731	723	718	708	689	60	35	5	2	70-80	10-15	0.15	
72L056	107-130	Oa4	0.13,0.[illegible]	666,465	720	653	628	610	590	555	50	30	7	10	5	TR	0.5	

a. Incompletely dispersed.

95

12/17/71

HOUGHTON SERIES

S71IND-50-3

Typifying Pedon: Houghton muck - cultivated
(Colors are for moist soil)

Oa5 --42-51"-Dark reddish brow (5YR 2/2, broken face, dark reddish brow 5YR 3/2 rubbed and pressed) sapric material; about 5 percent fibers, a trace rubbed; massive structure; slightly sticky: very dark gray (10YR 3/1) in vertical channels about 1-3 mm in diameter; sodium pyrophosphate brown (10YR 4/3) with thin filter paper and thick blotting paper; herbaceous; less than 10 percent mineral; strongly acid (pH 5.4 in $CaCl_2$); estimated bulk density .G g/cc, One-pint samples and moisture can samples numbers 220 & 222 collected and labeled Oa3, 42-51" S71 IN 50-3-3*

722056

All samples collected were carved out from large clods so are undisturbed as possible.

Type Location: Marshall County, Indiana. 400 feet west and 1200 feet south of NE corner of NW ¼ of SE ¼ Township 33-N Range 1-E Sec. 5

Classification: Hemic Medisaprists, euic, mesic family

Method of Examining Soil: Pit

Crop: Mint

Microrelief: Broad flat

Size of Area: 80 acres

Proximity to Mineral Soil: 200 feet

Depth to water: 36 inches - muck has been drained

Purpose of sampling: Collect data on analysis of fiber, pyrophosphate color, mineral content, bulk density, and pH by Lincoln Soil Lab.

Samples collected by: Ival Persinger and Hezekiah Benton, Jr.

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Rifle Peat — Orville Haszel & Erling Nelson

Wisconsin — Sawyer — 1-11-72

Typic Borohemist, euic

About 1000 feet south of NE corner of NE¼, NE¼, Sec. 35, T38N, R7W, and about 70 ft. west of center of road — frigid

pit

Tamarack, bl. spruce, few wh. pine; understory of leatherleaf, lab. tea & bog rosemary

low — 0

Depression in outwash plain

Area not surveyed, and it is difficult to determine size under snow cover

about 400 ft.

12" — --

Live roots to 6" depth. Approx. 12% of volume of pedon to 44" depth is undecomposed wood > 2cm. (stumps and roots). Drainage ditch on opposite side of road approx. 100 feet east of sampling site.

Horizon	Depth	Kind of Fiber	Fiber Content% Undisturbed	Fiber Content% Rubbed	Color Broken Face	Color Rubbed	Color Pressed	Sodium Pyrophosphate Test	Mineral Content % 1/	Structure	Reaction H2O	Reaction 0.01M KCL	Consistence	Boundary
	2-0		Sphagnum Moss											aw
[illegible]	0-14	/1	50	20	5YR 2/2	5YR 2/2	5YR 3/2	10YR 7/2	0	1 t. pl	4.5		fri	cw
[illegible]	14-21	/2	60	30	5YR 2/2	5YR 2/2	5YR 3/2	10YR 7/3	0	1 t. pl	5.0		fri	cw
[illegible]	[illegible]	/3	65	35	7.5YR4/4	5YR3/3	5YR 3/2	10YR 7/3	0	1t. pl	5.5		fri	gw

Remarks:

/1 Approx. 10% wood, 90% herbaceous
/2 Approx. 10% wood, 90% herbaceous
/3 Approx. 10% wood, 90% herbaceous
/4 Approx. 5% wood, 95% herbaceous
Thin (2-3 cm.) layers of highly fibrous material (+90%) occur throughout profile.

Suggested additional characteristics to note:

1. Thin strata or inclusions of other kinds organic and inorganic horizons too thin to separate.
2. Layers of charcoal.
3. Salinity or alkalinity.
4. Amount and size of live roots.
5. Presence of logs, stumps, roots, etc.
6. Presence of free water below organic soil.
7. Evidence that changes in composition of vegetation is taking place, indicating change in the environment.

1/ State soil texture class for mineral horizons.
Thickness of Control Section ____________"

SOIL CLASSIFICATION - HEMIC MEDISAPRISTS; EUIC, MESIC

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
[illegible]
LINCOLN, NEBRASKA

STATE - MICHIGAN COUNTY - EATON

SAMPLE NOS. - 72L057-72L059

Sample	Depth (cm)	Horizon	Field state pct	Unrub fiber pct	Rub fiber pct	[illegible] pct	[illegible] pct	[illegible] pct	[illegible] pct	Wt pct	[illegible] pct	Color	[illegible]	[illegible]	pH field state	[illegible]	Classification by lab test
	0-30	Oap															
	30-43	Oa1															
72L057	43-56	Oa2	21,26	11	8	88s	4	76,68s	6	61	7	7.5YR 5/4		.05, .04	5.9		Sapric
72L058	56-81	Oa3	20,21	12	4	64	6	52,52	8	55	8	7.5YR 6/4		.04	5.9		Sapric
72L059	[illegible]	Oe1	3,6	9	6	72	8	64,70	12	72	13	10YR 7/2		.02	5.5		Hemic
72L059	[illegible] Oe1 ("Most Fibrous")				5	66	15	52	14			10YR 7/2			5.1		Hemic

Sample	Depth (cm)	Horizon	Bulk density field state g/cc	Water content field state pct	Water content at sat pct	[illegible]	[illegible]	[illegible]	[illegible]	Visual estimate [illegible] pct	[illegible] pct	[illegible] pct	[illegible] pct	[illegible] pct	[illegible] pct	[illegible] g/cc	Sodium pyrophosphate color
	0-30	Oap											3	5	Tr		
	30-43	Oa1											3	10	3		
725057	43-56	Oa2	0.14,0.12	569,619	609,655					40	40	15	2	20	7		
72L058	56-81	Oa3	0.13,0.1[illegible]	327,642	70,667					25	60	15	2	25	3		
72L059	[illegible]	Oe1	0.10,0.1	835,827	920,907					25	10	20	2	45	20		

[illegible]

Sampled for Lincoln [illegible] — [illegible] and McKinzie — [illegible]

SCS-SOILS-36
5-70
CODE SOILS-11

HISTORICAL DESCRIPTION

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Series Houghton, hemic subsoil variant Observer(s) GR Landtiser

State Michigan County Eaton Date 12-29-71 No. 2nd site in unit - see Descrip #1 8/5/70 near Benton

Classification Hemic Medisaprists, euic, mesic

Location SE¼ SE¼ NE¼ SE¼ Sec 36, T4N-R4W Onieda Twp
170 ft W of Rd (centerline) & 276 ft N. of ditch (centerline) BFB-86 Est. M.A. Soil Temp.

Method of Examining Soil Pit to 58 inches

N. Veg. or Crop fallow cultivated field (vegetables or corn in spring)

Microrelief nearly level — very slight convex rise from S to N Slope <1%

Physiography Old glacial impondment in wide glacial outwash channel cut through a ground moraine

Size of Area approx 200 acres

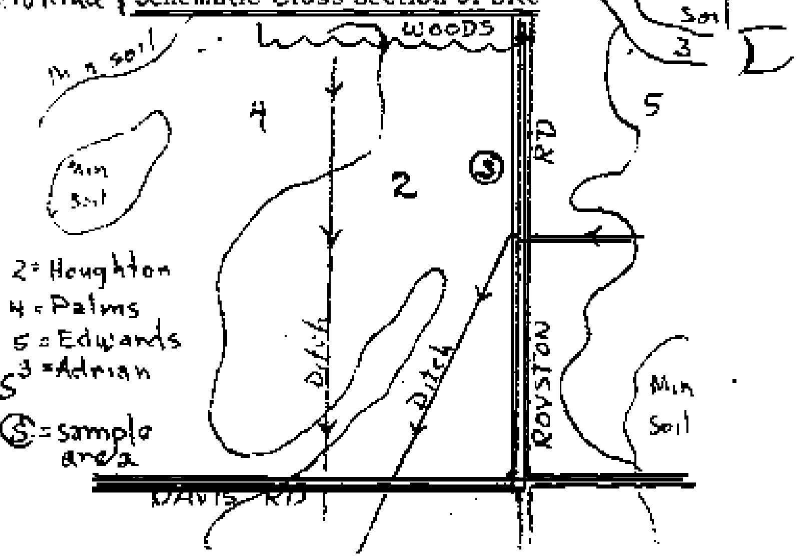
Distance to Adjoining Mineral Soil 1200 ft to closest and about 3000 ft to farthest mineral soil

Depth to Water Table Water in nearby ditch at 24 inches below berm edge. Only water to come into pit came in from sides at 17-33 inch depths Depth to Permafrost

Evidence of Subsidence little visible — but area ditched, tile drained, and cultivated for many years at least 10 yrs after tiling.

Additional Notes This profile represents a taxonomic inclusion in the mapping unit for the Houghton series of from 10-20% of the individual areas mapped to date. This is representative of the hemic materials as they occur in combination and sequence with sapric materials throughout the County. The upper 17 inches of the profile is largely derived from Woody materials (70%) with some Herbaceous. Woody upper layers are common on 35 to 50% of all Houghton soil areas in this part of the County.

Schematic Cross Section of Site



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Houghton, hemic subsoil variant Eaton Co. Michigan Histosol Descrip Lynn + McKinzie

Layer or Horizon	Depth	Botanical Origin of Fiber	Fiber Content % Undisturbed	Fiber Content % Rubbed	Color Broken Face	Color Rubbed	Color Pressed	Sodium Pyrophosphate Color Test	Mineral Content %	Structure	Reaction H_2O	Reaction 0.01M $CaCl_2$	Consistence	Boundary	Roots
Oap	12"	Woody + Herb	5%	trace	7.5YR 3/6	5YR 3/1	5YR 3/1		3%	2f+m sbk		—	vfri	as	c-fine
Oa2	17"	Woody Herb	10%	3%	5YR 2/1	5YR 2/1	5YR 2/2		3%	2c+vc sbk		—	firm	as	f-fine
S72-Mi-23-[illegible] 72L057 Oa3	26"	Herb	20%	7%	5YR 2/2	5YR 2/2	5YR 2/2		2%	c platy	6.3	—	firm	cs	f-fine
S72-Mi-23-7 72L058 Oa4	33"	Herb	25%	9%	5YR 2/2	5YR 2/2	5YR 2/2		< 1%	mass	6.8	—	firm	as	f-fine
S72-Mi-23-[illegible] 72L059 Oe1	58"	Herb	45%	20%	5YR 3/3	5YR 3/2	7.5YR 3/2		< 1%	[illegible] platy	6.3	—	non sticky	—	v.f. [illegible]

Remarks:

Oap – est 3% coarse woody fragments 1/4 to 2" diam by 3/4 to 4" long

Oa2 – est 10% coarse woody fragments (pieces of branches, roots, trunks, and twigs) 1/4 to 3" diam by 2 to 10" long

Oa3 – est 1% coarse woody fragments 1/4 to 3/4" diam. by 3/4 to 2" long

Oa4 est 1% same size range as Oa3

Oe1 est 1% or less, same size range as Oa3 (a log was hit with auger at 40-50" depth large enough to restrict further boring)

1/ State if texture class for mineral horizons.

Mineral content = silt or clay or very fine sand mostly

Note if present: other kinds of horizons or strata too thin to separate such as layers of charcoal; evidences of salinity or alkalinity; volume of logs, stumps, and other coarse woody fragments; worms; layer of water below the soil; evidence of change in kind of vegetation; evidence of irreversible drying; marked changes in pH on drying; iron sulfate mottles (straw-colored), carbonates; other [illegible]ant features.

Bulk Density samples

2 qts, cans 80 and 81 = Oa3 at 19-23"

2 qts, cans 82 and 83 = Oa4 at 27-31"

2 qts, cans 84 and 85 = Oe1 at 40-50"

2-Poly-Con containers

Both in Oe1 at 40-50"

SOIL CLASSIFICATION- TYPIC BOROSAPRISTS; EUIC

SERIES - - - - - - - LUPT, MUCK

STATE - - - - - - - - MINNESOTA   COUNTY ANOKA

GENERAL METH. [illegible]

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA

SAMPLE NOS.- 72L060-72L063

Sample	Depth (cm)	Horizon	Fiber content: Field sample (pct)	Rubber (pct)	Rub fiber (pct)	[illegible] (pct)	[illegible] (pct)	[illegible] (pct)	[illegible] (pct)	CR (pct)	3 (pct)	Color	[illegible]	[illegible]	pH field state	Classification by lab tests
72L060	0-23	Oa1	26,22	5	11	54	8	54,52a	6	54	5	7.5YR 3/2		.06,.07	5.1	Sapric
72L061	23-122	Oa2	24,24	9	23	46	8	44,36a	7	40	7	7.5YR 2/2		.06	4.9	Sapric
72L062	122-147	Oa3	15,15	3	9	62	12	54,48	12	48	12	7.5YR 4/2		.05,.04	5.4	Sapric
	147-178	Oa4														
	178-203	Oa5														
72L063	13-18 (high iron)		58	9		48	4	44,34	4	33		7.5YR 3/4			5.3	Sapric
	64-69 (most fibrous)	Oa2			28	70	12	72	16			7.5YR 4/3			5.0	Sapric

Sample	Depth (cm)	Horizon	Bulk density field state (g/cc)	Water content field state (pct)	At sat (pct)	Mineral content (pct)	Fiber (pct)	[illegible] (pct)	Mineral content (pct)	Fiber (pct)	[illegible] (pct)	[illegible] (g/cc)	Sodium pyrophosphate color
72L060	0-23	Oa1	.016,027	483,409	540	40	25	5	20	10	1-2	0.40	
72L061	23-122	Oa2	015,0.15	534,517	597	60	20	[illegible]	20	20	<5	0.[illegible]	
72L062	122-147	Oa3	.012,011	695,767	730	50	30	12	30	35	10	0.30	
	147-172	Oa4							20	40	5	0.35	
	178-203	Oa5							50	5	0	0.40	
72L063	13-18 (high iron)					60	30	5					

a. Fibers include large proportion of relatively large sheath (root?) material.

Form TSC-LI-8
(11-17-57)

ORGANIC SOIL DESCRIPTION FORM
(Tentative)

Series *Lupton muck* Observer(s) *Chamberlain - Finney*

State *Mn* County *Anoka* Date *11-10-71* No. ______

Classification *Typic Borosaprists, euic*

Location *3900' W - 2640' N of SE cor. of Sec 27, T34N R23W* Temp. Zone ______

Method of Examining Soil *"McCauley" Peat Auger*

N. Veg. or Crop *White Cedar, Bog Birch (few only)*

Microrelief *Sloping 1% (where level - hemic materials occur)* Slope *1%*

Physiography *Sandy outwash plain*

Size of Area *Several hundred acres*

Proximity to Mineral Soil 1/ *200'*

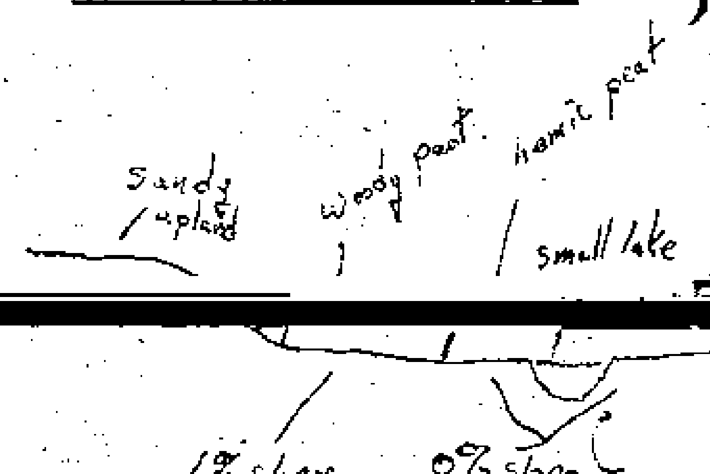
Depth to Water *2 inches* Depth to Permafrost *—*

Subsidence *—*

Evidence of Subsidence *—*

Additional Notes ______

Schematic Cross Section of Site:



1/ Distance to boundary of mineral soil.

8.L-25,584 (1OF2)

SOIL CLASSIFICATION- TYPIC BOROHEMISTS; EUIC

SERIES - - - - - - - RIFLE PEAT

STATE - - - - - - - WISCONSIN   COUNTY SAWYER

GENERAL METHODS - - - -   SAMPLE NOS. - 72L064-72L066

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SOIL CONSERVATION SERVICE
SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA

	Depth CM	Horizon	Fiber content: Field state PCT	Fiber content: Unrub fiber PCT	Fiber content: Rub fiber PCT	Unrub PCT	Rub PCT	[illegible]	[illegible] PCT	UR PCT	R PCT	Color	[illegible]	[illegible]	pH $CaCl_2$ field state		Classification by lab tests
72L064	0-36	Oe1	6,9	9	13	64	13	64,68	12	56	12	7.5YR 5/6		.02,.05	3.0		Sapric
	36-53	Oe2															
72L065	53-94	Oe3	9,6	9	4	48	12	40,35	11	43	14	10YR 6/4		.04,.02	3.2		Sapric
72L066	94-147	Oe4	8,6	7	5	48	12	41,36	10	44	12	10YR 6/4		.04	3.2		Sapric
72L065	64	Oe3			4	50	16	38	16			10YR 6/4			3.3		Sapric
	(Most fibrous)																

	Depth CM	Horizon	Bulk density field state G/CC	Water content: Field state PCT	At sat PCT	3.5 CM PCT	7 CM PCT	22 CM PCT			Mineral content PCT	Fiber unrub PCT	Fiber rub PCT	Mineral content PCT	Unrub PCT	Rub PCT	[illegible] G/CC	Sodium pyrophosphate color
72L064	0-36	Oe1	0.09,0.14	78,549	992,635	634	609	548			20	85	20	0	50	20		10YR 7/2
	36-53	Oe2												0	60	30		10YR 7/3
72L065	53-94	Oe3	0.13,0.09	669,929	645,977	646	631	602			50	60	10	0	65	35		10YR 7/3
72L066	94-147	Oe4	0.13,0.1[illegible]	70,607	72,640						40	40	6	0	60	20		10YR 7/3

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SOIL CLASSIFICATION

SERIES ... PEAT

STATE ... NORTH DAKOTA COUNTY PEMBINA

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA

DEPTH (CM)	HORIZON	MINERAL CONTENT FIELD SAMPLE PCT.	UNRUB FIBER PCT.	RUB FIBER PCT.	FIBER VOLUME UNRUB PCT.	FIBER VOLUME RUB PCT.	DISPERSED UNRUB PCT.	DISPERSED RUB PCT.	WT UR PCT.	WT R PCT.	SODIUM PYROPHOSPHATE COLOR	pH		pH CaCl2
0-8		72			32	2					10YR 6/4			
8-20		73			40	4					10YR 3/4			
20-61		69			36	2					10YR 3/3			
61-127		69			40	2					10YR 4/3			
127-142		71			36	2					10YR 5/3			
142-152		71			38	4					10YR 4/3			

DEPTH (CM)	HORIZON	BULK DENSITY FIELD STATE G/CC	WATER CONTENT FIELD STATE PCT	WATER CONTENT AT SAT PCT	WATER CONTENT LOW TENSIONS					VISUAL ESTIMATES LABORATORY MINERAL CONTENT PCT	LABORATORY FIBER UNRUB PCT	LABORATORY FIBER RUB PCT	FIELD MINERAL CONTENT PCT	FIELD FIBER UNRUB PCT	FIELD FIBER RUB PCT	BULK DENSITY G/CC	SODIUM PYROPHOSPHATE COLOR

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INITIAL REVIEW DRAFT

Established Series
Rev. GOW-JEP-JDA 9/71

LENA SERIES

The Lena series is a member of tho euic, mesic family of Typic Medisaprists. The anile formed chiefly in herbaceous organic deposits more than 51 inches thick. Lena soils typically have black, highly decomposed organic surface, subsurface, and lower tiers. The soils are calcareous.

Typifying Pedon: Lena muck (grass)
(Colors are far moist soil unless otherwise noted.)

Oa1 -- 0-10" -- Black (N 2/ broken face and robbed)

Sampled
3-6"
72L051

Oa2 --

Sampled
15-18
72L052

Oa3 --

Sampled
30-33
72L053

Oa3 -- 68-82" -- Black (N 2/) and dark brown (7.5YR 3/2) broken face and black (N 2/) rubbed, hemic material; between 1/3 and 2/3 fibers in the organic volume; less than 1 percent mineral matter; massive; few snail shells; mildly alkaline (noncalcareous); gradual smooth boundary.

Oa4 -- 82-104" -- Black (N 2/ and 5Y 2/1 and 2/2) broken face and very dark gray (5Y 3/1) rubbed, sapric material; about [illegible]

and broken; strongly alkaline (calcareous); abrupt smooth boundary

IIC -- 104-110" Dark gray (5Y 4/1) with some very dark gray (5Y 3/1) fine sandy loam, massive, very friable, moderately alkaline (calcareous)

Type Location: Kendall County, Illinois; west side of Millhurst Camp Resort in T. 36 N., R. 6 E., Section 6 - NE260, NE60, 27 feet east of center of road just east of drainage ditch culvert, or 210 feet south of east-west road and 27 feet east of center of north-south road.

Range in Characteristics: The organic layers are more than 51 inches thick. The organic materials are primarily herbaceous but in some bogs a small percentage of woody material may occur. Layers in the control section have hue of N, 10YR, 7.5YR, or 5YR, values of 2 or 3, and chroma of 0 through 3. In some pedons, marl layers may occur within the control section and these will have higher value and/or chroma. Chroma and value may change from 0.5 to 2 units from broken face to rubbed colors. The control section is typically calcareous throughout; however, some hemic layers may be noncalcareous. The mean annual soil temperature is estimated to range from 47° to 54°F. Layers in the surface tier have structure ranging from thin to thick platy to weak, fine to coarse granular or subangular blocky. Structure in the subsurface and lower tiers range from weak thin to thick platy to weak to moderate, fine to coarse, granular to subangular to massive. In some pedons thin, less than 5 inches thick, layers of fibric material may occur.

Competing Series and Their Differentiae: Series in the same family include Carlisle and Houghton. Other related series are Adrian, Carbondale, Edwards, Greenwood, Linwood, Lupton, Palms, Rifle, and Willette. Carlisle soils have more woody fiber. Houghton soils are noncalcareous. Adrian, Linwood, Palms, and Willette soils have mineral substrata at depths between 16 and 50 inches. Carbondale, Greenwood, Lupton, and Rifle soils have frigid soil temperatures. Edwards soils have marl substrata between 16 and 49 inch depths.

Setting: Lena soils are in bogs within lake plains, outwash plains, till plains, and moraines. Bogs range from small depressions to over 100 acres in size. Slope gradients are less than 2 percent. The climate is humid with cold winters and hot summers. The mean annual precipitation ranges from about 24 to 35 inches, and mean annual temperature is about 48°F.

Principal Associated Soils: These are the Adrian, Edwards, Houghton, and Palms. Poorly or very poorly drained Aquolls are also associated in similar landscapes and sometimes on the outer edges of bogs.

Drainage and Permeability: Very poorly drained. Surface runoff and internal drainage are very slow. Permeability is moderately rapid.

Use and Vegetation: A considerable part of these soils are used for cropland such as vegetables, corn, and sodcrops. Some are too wet to cultivate. Native vegetation was primarily marsh grasses, sedges, reeds, and cattails.

Distribution and Extent: Northern part of Illinois and possibly Minnesota, Wisconsin, Michigan, Indiana, and Ohio. Known extent is small but maybe moderate depending on extent in states other than Illinois.

Series Established: Freeport project, Stephenson County, Illinois, 1938.

Remarks: Some areas in Stephenson County, Illinois have loamy mineral material at depths less than 51 inches. These areas have been included with the Lena soils.

National Cooperative Soil Survey
U. S. A.

NORTH CENTRAL REGIONAL TECHNICAL WORK PLANNING CONFERENCE (WORKSHOP)
OF THE NATIONAL COOPERATIVE SOIL SURVEY

Report of Committee 4 on Criteria for Series and Phases

Rapid City, South Dakota
April 17-20, 1972

The recommendation given to this committee by the previous NCR Committee 4 in 1970 was that we consider further and in greater depth the issues raised on such topics as:

1. The rationale for subdividing large families, or the bases for distinguishing soil series within families;

2. Depth to bedrock as a basis for subdividing soils at the family level;

3. Definition and use of soil phases; and

4. Taxadjuncts and variants.

The first two of these topics have been accepted, in general, as charges by Committee 2 on Soil Morphology and Soil Family Criteria, and the last topic is being discussed by the Taxadjunct Subcommittee of Committee 7 on Soil Correlation and Classification. Consequently, Committee 4 has centered its attention on and assigned subcommittees to three additional topics. Topics, in part, have been selected from the recommendations of Committee 4 of the 1970 NCR Workshop but also from questions raised or recommendations made at the 1971 National Technical Work Planning Conference at Charleston, S.C., end from suggestions received from current Committee 4 members.

Chairmen of the following subcommittees, in making their reports, are asked to (1) name their subcommittee members, (2) discuss their individual charges as titled and outlined below, and (3) submit their recommendations to this 1972 Workshop. Discussion or comments from the floor are invited at the conclusion of each subcommittee report. Subcommittee assignments are:

Subcommittee 4a: Discussion of Soils Memorandum No. 66 - Application of the Soil Classification System in Developing or Revising Series Concepts and in Naming Mapping Units.

Mike Stout - Chairman

Soils Memorandum No. 66 has been on the agenda of the work planning conference at least once before; however, it was never thoroughly presented nor discussed. The subcommittee chairman is given the charge to make a critical appraisal of this memorandum, summarizing comments and questions from subcommittee members.

Subcommittee 4b: Definition and Use of Soil Phases.

Richard H. Rust - Chairman

Subcommittee 4b is charged by the Committee 4 Chairman to give further consideration and in greater depth than was done by the 1970 committee, to the redefinition of soil phases.

The following ideas were proposed and discussed by the 1970 committee: "Phase criteria should include soil and site characteristics of importance to soil behavior; series criteria should include morphological characteristics related to and important to soil genesis." The presentation on soil phases should take into consideration the item on soil phases in Soils Memorandum - 66.

The Chairman of this subcommittee regrets that he received no comments from members of his subcommittee. The Chairman did, however, make several comments and raised a few questions concerning Dr. Cline's Chapter 6 of the revised Soil Survey Manual. He suggests that conference members may wish to react to them.

(If time permits, these questions and comments will be discussed after the other subcommittee chairmen have made their reports.)

1. "While Cline's discussion is primarily directed to phases within series, should there be additional thought and effort to development of phases within families or subgroups of soils? We are thinking of the possible interpretations of the more generalized kinds of taxonomic classification. Possibly physiographic setting should be elaborated. Some needs arise in hydrologic interpretations.

2. "A good part of Cline's reasoning derives from agricultural applications. We feel that an equally strong case might be made in engineering application or, more generally, in the non-agricultural uses of soil. I understand, e.g., that rocky phases are among those highly sought by Vermont and New Hampshire realtors for summer(?) homes. If we find a body of soils within a series (as mapped) which contains an unusually high amount of lead or some other heavy metal of environmental concern, should this condition be phased?

3. "Phase names seem to become rather lengthy when more than one or two conditions are indicated. Should there be a limit of two conditions in any phase naming, e.g., slope and eroded condition, slope and depth to contrasting material?

4. "In the mapping of phases, there is often an additional complication. First, we have the problem of series inclusions or taxadjuncts within the mapping unit. Secondly, we may be superimposing two or more phase conditions. Dr. Cline (page 113-114, Proc. of National Workshop, 1971) has posed some alternatives to the problem. Which do you favor? Or neither?

5. "In regard to the use of phases we might consider the development of the single sheet interpretations. While we list the kind and nature of phases that occur within a given series, it does not seem that we do a" acceptable job of relating these to particular interpretations. Agree or disagree?

6. "We would suggest that the correlation and interpretation of phases be as nearly a matter of 'within-state' concern as possible and minimally involve the regional staff except in the clearly interstate series where the choice of phases may have to be 'negotiated."'

Subcommittee 4c: Classification of Series Criteria.

Robert I. Turner - Chairman

Subcommittee 4c is charged by the Committee 4 Chairman to direct its attention to:

1. Problems and benefits to be derived from extending the series control section to greater depths.

2. A discussion of the influence on family placement of contrasting, two-storied soil materials.

3. Depths at which free carbonates are important in separating one series from another, assuming the parent materials of the two are the same or very similar.

4. The preparation of a list of series criteria within families.

5. The weighing of combinations of small differences between two sets of soils within a family as series criteria.

Subcommittee 4d: Discussion of the recommendations of the NTWPC Committee 8 on "Criteria for Classification and Nomenclature of Miscellaneous Land Types," 1971.

Gerald Post - Chairman

This subcommittee was charged to provide a critical estimate of the above proposal by the 1971 NTWPC Committee 8.

SUBJECT: Subcommittee Report (4s) Application of Soil Classification System in Developing or Revising Series Concepts and in Naming Mapping Units - Soils Memorandum-66, October 9, 1967; Committee 4 Criteria for Series and Phases, North Central Regional Work-Planning Conference (Workshop) of the National Cooperative Soil Survey, Rapid City, South Dakota, April 17-21, 1972.

Committee Members:
Guthrie, Richard L.
Riecken, F. F.
Bannister, D. L.
Miller, F. T.
Carroll, Paul H.
Stout, Mike - Chairman

Soils Memorandum-66 on Application of Soil Classification System in Developing or Revising Series Concepts and in Naming Mapping Units was issued October 9, 1967. This memorandum established the Soil Conservation Service policy for using the soil classification system adopted January 1, 1965. The memorandum outlines interim guides for applying the system in developing and revising series concepts and in naming mapping units in the interim before a correlation manual is prepared.

Considerable testing and adjusting has been made with the soil classification system during the last four to five years. The soil taxonomy system has undergone vigorous testing, has been revised and is presently being edited preparatory to printing.

The contents of Memorandum-66 concerns the application of the soil taxonomy system in developing or revising our series concepts and in naming mapping units. It is time that we review this document in line with the experience and testing of the soil taxonomy as well as the rules of application set forth in this document. This memorandum remains the interim guide in the application of the taxonomy system until a correlation manual is compiled.

A brief review of the structure of Soils Memorandum-66 emphasizes the dependency of much of this memorandum on Soil Taxonomy and also points out that the subject matter is also under discussion by other committees of this workshop. Therefore, the recommendations concerning the revision and content of this memorandum is dependent on first, the changes within the Soil Taxonomy itself and secondly, decisions which are made during this workshop concerning each of the items pertinent to this memorandum.

The four basic parts of this memorandum are as follows: A statement of policy on page 1; Development and revision of series concepts on page 2; Naming mapping units beginning on page 8; and Conventions for naming mapping units beginning on page 12. The policy statement merely points out that the soil classification system (soil taxonomy) will be used in developing and revising series concepts and in naming mapping units and that this memorandum will serve as an interim guide for applying the system in these activities.

The development and revision of series concept portion concerns the accumulation at the series level of differentiae of higher categroies, series control section, establishing norms and class limits for series, and recognition of new series. The normal errors of observation, combined differences in characteristics and considerations of extent are also discussed here.

The section concerning naming mapping units is short. It deals primarily in naming mapping units as phases of soil series, soil types, complexes, soil associations, undifferentiated groups, variants and miscellaneous land types. Mapping inclusions are discussed as are the maximum portions of inclusions. The important portion of the section deals with the definition and examples of similar and dissimilar classes.

The conventions for naming mapping units is contained in the last section of this memorandum. Two alternatives are set forth for naming the phases of soil series. These establish the proportion of similar and dissimilar soils comprising the mapping unit to be named as phase or phases of soil series. The remaining proportion of this section deals with the conventions that are used for soil complexes, soil associations, undifferentiated groups, variants and miscellaneous land types.

The review of this memorandum and the comments and questions received from members of the subcommittee on the application of the soil classification system may be summarized as follows:

1. The guidelines contained in Soils Memorandum--66 have not been widely accepted and applied in the correlation processes during the life of the surveys or at the conclusion of the survey.

2. Many of the guidelines and discussions pertaining to them need to be updated or corrected in line with soil taxonomy and other more recent guiding memorandums. Specific dimensions to classes need to be corrected and the discussion of much of this memorandum is not timely.

3. Discussion of limits and intent of many guidelines as written in the present memorandum is probably premature, however, we must comprehend the guidelines as they are presently written in order to intelligently recommend revisions of these guidelines.

4. Several members of the committee felt that the guidelines presented in Soils Memorandum-66 concerning the application of the soil classification system included but a small portion of the guidelines required. The recommendation was made that a more complete set of guidelines be compiled which would comprise a correlation manual in line with the statement on page 1 of Soils Memorandum-66.

5. It was the consensus of opinion that guidelines such as presented in this memorandum are needed and necessary. However, various members of the subcommittee wished to emphasize that only consistent application of the system will ensure the uniformity in soil classification which we desire and which is the objective of a set of guidelines such as this.

In line with this discussion, the following recommendations are submitted:

1. The guidelines contained in the present Soils Memorandum-66, October 9, 1967, be updated and revised consistent with soil taxonomy and other conditions prevalent at this time. The revisions of guidelines of applications of the system may be compiled in the form of a revision of Soils Memorandum-66 or better still a manual on application of the system and correlation.

2. That all soil scientists become better acquainted and more familiar with guidelines presented in this memorandum or in a revised version so that a more consistent application can be realized. This is particularly important that correlation staffs at all levels be fairly familiar with guidelines on applications of the system.

This subcommittee report on application of the soil classification system in developing or revising series concepts and in naming mapping units is respectfully submitted to the workshop and recommended it be accepted as a part of the report for Committee 4 - Criteria for Series and Phases.

North Central Regional Work-Planning Conference
of the National Cooperative Soil Survey,
Rapid City, South Dakota
April 17-21, 1972
Committee 4 - Criteria for Series & Phases
Subcommittee 4c - Clarification of Series Criteria

Robert I. Turner - Chairman
Walker, Geo. 0.
Alexander, John D.
Whiteside, E.P.
Schafer, Geo. M.
Sanders, Frank

The principal items discussed by this committee are listed below.

1. Extension of the series control section to 80 inches.

This subcommittee apparently considers that the control section as now defined is satisfactory. A record of the advantages and disadvantages of the extended control section follow:

Advantages:

A. Decrease the number of phases.

B. Help in differentiating soil series from each other.

C. Would allow more precise interpretations to be made for each series to depths of 80 inches, without using substratum phases.

D. Probably would let a series name mean more to engineers and other people that were interested in soils more as a material

E. Eliminate the need to determine whether diagnostic horizons actually are in materials in the lower part of the soil and there would be only one series control section except for cryic soils and very shallow soils.

Disadvantages:

A. Possible proliferation in number of series to an unworkable total.

B. Increased problems in correlation between soil survey areas

C. Possible reduction in speed of mapping.

D. Make geological material rather than soil genesis one of the prime justifications for a soil series.

E. Rigid application might result in setting up series that were not really needed.

There were no proposals for a definition so the subcommittee chairman suggests for testing the following as item 4 under All Other Mineral Soils, page 18-14 of Soil Taxonomy, December 1970.

A. In addition to conditions covered in item (3) it is permissible to extend the series control section to 60 inches if:

a. a lithic or paralithic contact is between 40 and 60 inches, or

b. the soil material above depths of 40 inches averages more than 50 percent finer than the No. 200 mesh sieve (USDA silt + clay + finest 1/2 of very fine sand), the soil material between 40 and 60 inches has a horizon 6 inches or more thick and continuous to a depth of 60 inches or more which has less than 35 percent material finer than the No. 200 mesh sieve, or if the material above depths of 40 inches averages less than 35 percent finer than the No. 200 mesh sieve, the soil material between 40 and 60 inches has a horizon 6 inches or more thick and continuous to a depth of 60 inches or more which has more than 50 percent material finer than No. 200 mesh sieve.

This proposal would permit but not require the use of a lithic or paralithic contact between 40 and 60 inches as series criteria and would allow major shifts in engineering classification to be used between 40 and 60 inches if important. This proposal would recognize changes between coarse-grained and fine-grained in the Unified Soil Classification System and between granular materials and silt-clay materials in the AASHO Classification System.

2. The influence on family placement of contrasting two-storied parent materials.

These are materials that are not strongly contrasting as defined on page 18-5 of Soil Taxonomy, December 1970. It is suggested that this item would be more appropriate as a subject for committee #2 which deals with family criteria. The subcommittee notes that the application of this type of family criteria does have some influence on series definitions.

An example is a series formed in various thicknesses of loess and underlying glacial till. In general, over the years, we have established series for (1) <20 inches of loess; (2) 20 to 40 inches of loess; and (3) $>$ 40 inches of loess. Application of the criteria in Soil Taxonomy commonly indicates that (1) will be in a fine-loamy family, and that (2) and (3) will be in a fine-silty family.

The range of the minimum loess thickness that classifies into the fine-silty family is variable. In soils without argillic horizons the family control section is commonly from a depth of 10 to 40 inches. In soils with argillic horizons the family control section is the upper 20 inches of the argillic horizon unless the argillic horizon is less than 20 inches thick; in which case it is the entire argillic horizon.

In soils without argillic horizons, the minimum thickness of loess in a series classified as fine-silty is dependent on the sand and gravel content of the material below the loess component. In soils with argillic horizons, the minimum thickness of loess in a series classified as fine-silty is dependent on the sand and gravel content of material below the loess, thickness of argillic horizon (only applicable for thin soils), and depth in the soil at which the upper boundary of the argillic horizon starts. For example, in Glossoboralfs the argillic horizon often has an upper boundary at depths greater than 20 inches,

With variables as outlined above the minimum thickness of loess for series in a fine-silty family could well range from about 20 inches to as much as 36 inches. It is suggested that the minimum range of loess thickness should be that which gives a reasonable expectation of remaining in the same family when the other textures of the family control section are averaged with it. The rest of the former range in loess thickness could be considered as taxadjuncts to the series or inclusions in the mapping units.

3. Depths that free carbonates are important in the separation of one series from another when parent materials are the same and the concentration of calcium carbonates.

Various comments were received on this item. It was suggested that depth to carbonates is closely associated with other characteristics that are criteria for series. The subcommittee chairman assumed solum thickness is one of these characteristics. In many soils the depth to free carbonates is easier to ascertain than the solum thickness. Several members of the subcommittee suggested that free carbonates within depths of 40 inches should be considered as series criteria. It was also suggested that the calcium carbonate equivalent measured at depths of less than 40 inches in the lower part of the B horizon or C horizon should be series criteria. The following classes based on percentage of calcium carbonate equivalent were suggested: (1) less than 40 percent; (2) 40 to 60 percent; and (3) greater than 60 percent. The influence of large amounts of free carbonates, classes 2 and 3, on the chemical and physical properties of soil should be studied. Probably the amount of calcium carbonate in the clay fraction is more important than the total amount in the soil.

The subcommittee chairman notes in this region that depth to free carbonates has been used as a series criterion. Most commonly it has been used at depths of less than 40 inches along with solum thickness as differentiae from thicker soils. It is suggested that further study is needed relative to the significance of total amount of free carbonates before setting up classes for series criteria.

4. Provision of a comprehensive list of series criteria used within families.

   Subdivisions of any of the criteria used in Soil Taxonomy at the family and higher categories can be used as series criteria within a family. The list by the North Central Committee reported on page 71 of the 1969 "Proceedings of the National Technical Work-Planning Conference of the Cooperative Soil Survey" includes the most common criteria used for series differentiae within families in this region. Some additional criteria were suggested and are listed below:

   (1) Coarse silt-fine silt ratio. It has been used as greater than 1.5 to indicate coarser loess and less weathering and as a variable ratio down through profile to suggest that parent material is silty alluvium rather than loess;

   (2) Ratio of exchangeable calcium to magnesium;

   (3) Presence of minor elements in near toxic amounts;

   (4) The length, width, and total amount of albic material that is in tongues in soils with glossic properties;

   (5) Base saturation;

   (6) Presence of buried diagnostic horizons with their upper boundary between depths of 20 and 40 inches.

   It was suggested that the listing of depth to water table, dates, and the duration of saturation would aid in the classification and comparison of series.

5. Combinations of small differences between two sets of soils within a family as series criteria.

   The subcommittee did not investigate this item at this time.

This subcommittee report on Clarification of Series Criteria is submitted with the recommendation that it be accepted as a part of the report for Committee 4 - Criteria for Series and Phases.

Subject: Subcommittee 4d: Discussion of the recommendations by the National Technical Work Planning Conference, Committee 8 - Criteria for Classification and Nomencalture of Miscellaneous Land Types - 1971.

Gerald Post - Chairman
Johnson, Paul R.
Jones, Richard B.
McBee, Charles W.

In compliance with charges to this subcommittee by the Committee 4 Chairman, we have conducted a critical review of the above report prepared by Committee 8 of the NTWPC, 1971. The following comments and questions are directed specifically to the Committee 8 report:

1. Page 167, item I, parenthetical statement: The statement is misleading in that it can be interpreted to mean that each made land mapping unit must exceed 200 acres in size. They probably mean the total acreage in the survey area should exceed 200 acres before including the unit in the legend, Size of mapping units should be handled similarly to other units in the legend except that, with the use of spot symbols on small areas, the smallest size of this mapping unit could be somewhat larger than the normal mapping unit.

2. Page 167, item I: The definition provided here of "Made Land" may place much of the solid waste disposal areas in that category. Although the surface cover of earth material exceeds 20 inches, it is expected that many such areas will have less than 50 percent of earthy material in the "control section." Presumably the "control section" refers to the 10- to 40-inch section. Areas with over 20 inches of surface cover may be considered as arable. However, the statement under miscellaneous land types on the last page of Memorandum-66 states that "made land is now held for largely non-arable fills."

3. Page 169. 2nd paragraph: Isn't there a conflict between the permissible inclusions of "Rock outcrops" as here defined and "Rock land" as defined in the SSM, p.309? We are advised that "Rock outcrop" can have up to 25 percent of very shallow soil (<10" thick?) and up to 15 percent moderately deep or deep soils (>10" thick)? the SSM tells us that the upper and lower limits of rock outcrops in "Rock land" are 90 and 25 percent, respectively, of the area mapped and that, where a mappable area contains more than 90 percent rock outcrop, the whole is classified ss "Rock outcrop." The 15 to 25 percent inclusions recommended by Committee 8 ranges into the definition of Rock land as now defined. Will "Rock land" be redefined to avoid what appears to be an overlap in definition?

4. Page 169, Beaches: In order to be called "Beaches" must the sandy, gravelly, or cobbly deposits (shores) be washed presently by water? There are old beaches in places that follow the old shoreline of extinct lakes and oceans. Are these to be called "beaches" or possibly as "Entisols, gravelly"?

5. Page 169, Dumps. Traditionally, "Dumps" has meant areas of refuse disposal. As defined here, it is areas of accumulations, or piles, of waste rock incapable of supporting plants because of particle size or toxicity. It might be better to call these areas "Waste Rock Dumps" rather than just "Dumps."

6. Page 170, Pits: Mapping units such as Gravel pits, Sand pits, and Clay pits are used in survey legends. Most of these areas can and do support at least limited plant growth. Must these areas, because they are capable of supporting some plant growth, be named something other than pits?

7. Page 170, Rubble land: Does "Rubble land" include only "stones and boulders" (> 10" in diameter)? If so, what about detritus of cobblestone size?

8. General - Under which of these miscellaneous land types does "Tidal flats" now fall? It is described as barren of vegetation, periodically covered by water. These areas are quite different from "Salt flats" of old lake playas.

With the above questions resolved, the Committee 8 proposal of the NTWC-1971, probably can be implemented and used as suggested in the report.

Committee 4 Recommendations

It is recommended to this conference that Committee 4 be continued and that it work closely with the National and, if possible, with other regional committees.

The following are suggested as charges by this committee to Committee 4 of the North-Central Regional Work Planning Conference in 1974 and to other concerned committees of the National Technical Work Planning Conference in 1973. It is recommended:

1. That the 1973 National Work Planning Committee which is concerned with The Application of the Soil Classification System undertake to update and correct the guidelines and discussions of Soils Memorandum-66 in line with soil taxonomy and other more recent guiding memorandums. It is further recommended that a study be made of the means whereby soil scientists and soil correlations at all levels can be made more familiar with the guidelines suggested above.

2. That Committee 4 of the 1974 North-Central Regional Work Planning Conference study the feasibility of weighing combinations of small differences between two sets of soils within a family as series criteria.

3. That Committee 8 of the 1973 National Work Planning Conference resolve the questions raised in the preceding Committee 4c report; following which, it is further recommended that this report of Committee 8 be adopted.

The present Chairman of Committee 4 wishes to express his appreciation to all subcommittee chairmen for their prompt acceptance of and response to subcommittee assignments and to those committee members who contributed to the subcommittee reports.

This report was presented to the Workshop by Paul H. Carroll, Committee 4 Chairman, on April 19, 1972, with the recommendation that it be accepted.

The report was accepted by the Conference.

North Central Regional Technical Work-Planning Conference
of the National Cooperative Soil Survey

April 17-21, 1972 - Rapid City, South Dakota

Committee 5 - Soil Moisture and Climate
in Relation to Soil Classification

The items considered for discussion by this committee were:

1. A draft of the section on soil moisture in the new soil survey manual.

2. A discussion of available water capacity as used on the interpretation sheets that accompany standard soil series descriptions.

Specifically, the following items were considered.

1. Definitions of soil water states and usefulness of field clues for estimating soil water states.

2. Criteria and usefulness of perviousness classes.

3. Interpretation problems encountered with the use of hydrologic soil groups.

4. Concept and usefulness of soil water states classes.

5. Comparison of discussion on available water capacity in revised manual and for interpretation sheet. Problems in use of AWC.

This report is a summary of the comments received from committee members.

1. Definitions of soil water states and usefulness of field clues for estimating soil water states.

   The definitions of soil water states are adequate. The field clues for estimating soil water states are useful, especially for medium textured soils in humid climates. In order to use these field clues, it will be necessary for the soil scientist to establish more precise guides for his state or region.

2. Criteria and usefulness of perviousness classes.

   Perviousness refers to potential of a soil or soil horizon in the natural state to transmit water internally. This term corresponds to permeability as used in the second edition Of the soil survey manual.

   The use of perviousness rather than permeability will not necessarily avoid the confusion caused by soil scientists using permeability to denote different concepts about the soil. The perviousness classes may be less precise than using permeability classes which have numerical values assigned to them.

3. Interpretation problems encountered with the use of hydrologic soil groups.

   The hydrologic soil groups are broad and suitable if used for their intended purpose. Adjustments will have to be made for certain soil series phases.

4. Concept and usefulness of soil water states classes or patterns of soil water states.

   This concept is quite useful because it relates or classifies the patterns of change of soil moisture states with time. What is now needed are the quantitative criteria for these classes.

5. Comparison of discussion on available water capacity in revised manual and for interpretation sheet.

   The discussion in the revised manual is satisfactory. The difference between water retention difference and available water capacity is important. A main problem with the present use of AWC is that the amount of the available soil water used by plants is not indicated. The rooting habits of plants are not indicated. What is needed is the amount of soil water exploited by various plants under average conditions. The profile depth to which AWC for horizons is summed is dependent upon climate and type of vegetation. One suggestion was to use a depth of 36-40 inches except where root-limiting materials are present.

   The soil classification problems arising from the present soil moisture concepts were concerned with the aquic moisture regime. Illinois indicated problems with interpretation of moisture states in aquic subgroups, gray soils without mottles and Cumulic Mollisols from soil morphological festures. Several of the aquolls, aquults, and aqualfs in Missouri probably do not have aquic moisture regimes as defined.

It is recommended:

1. This committee be continued.

2. This committee exert an effort to collect climatic information on soil water states classes.

A charge was given to this committee to develop suitable available water values for use in the engineering tables of soil survey reports. These values are to be based upon available water held between specific tensions. Considerable discussion was held concerning moisture tensions to be used.

Committee 5 -- SOIL MOISTURE AND CLIMATE IN RELATION TO SOIL CLASSIFICATION

Frazee, Charles J. - Chairman

Bahr, A. Francis
Bouma, Johannes
Carr, J. W. Jr.
Culver, James R.
Didericksen, Ray
Farnham, R. S.
Fehrenbacher, J. B.
Fenton, T. E.
Ferber, A. E.
Franzmeier, Donald P.
Gilbert, Frederick L.
Grossman, R. B.
Harmon, Lacy I.
Holmgren, George
Holowaychuk, N.
Lee, James H.
Lewis, Dave
McClelland, John E.
Meeker, Ralph L.
Omodt, Hollis
Runge, E. C. A.
Scilley, Maynard
Scrivner, C. L.
Sinclair, H. Raymond
Smalley, Miles W.
Smeck, Neil
Tyler, Lloyd
Westin, Fred C.

NORTH-CENTRAL REGIONAL TECHNICAL WORK PLANNING CONFERENCE
OF THE NATIONAL, COOPERATIVE SOIL. SURVEY

Rapid City, South Dakota
April, 1972

Report of Committee No. 6
For Improvement of Teaching Methods in Soil Science

Committee 6 was formed as a result of discussions at the 1970 Conference. The charge given the committee was rather indefinite and seemed to include Merv Stevens' suggestion concerning distribution of soil information in the over-all environmental field in addition to improving teaching methods. However, Committee 6 decided that Merv's suggestion would be within the charge of Committee 8.

We selected three general areas for consideration. Subsequent to this, Met-v explained his ideas more fully in a letter to me. He detects the need for soil scientists with stronger "ecologic" understanding and the ability to fill positions created by an urbanized society. Also, he recommends that training should be given in the area of inventory of ecosystems with varying ecologies. This could perhaps include a "comp" during the last quarter or semester of the senior year to "put it all together." However, subcommittee assignments had been made prior to receipt of Merv's letter, and this area was not discussed by correspondence prior to the Rapid City conference.

Committee 6 was divided into three subcommittees to consider the three general areas selected. The reports, together with changes and additions suggested by the Conference members, are presented in the following pages.

I. Subcommittee Report: Credit Travel Course in Morphology, Genesis, and Classification

A. Charge to subcommittee. Determine interest in region and the feasibility of such a course; make subcommittee recommendation on proposal and, if favorable, prepare a tentative outline including any suggestions or comments that are thought pertinent.

B. Background. Travel courses for credit have been organized and taught by many institutions, including some in the North-Central Region, where emphasis has been placed on general agriculture, agronomy, or some other discipline. Field trips which emphasize soil morphology, genesis, classification, and interpretations have traditionally been a part of formal course work, but have often been limited to one-day or weekend trips in a local area, or if for longer periods over broader areas, have been conducted rather informally with small numbers of students and often with no formal credit received.

Among suggestions for committee consideration was the possibility of rather formal organization of a travel course in morphology, genesis, and classification within the North-Central Region of short duration involving university, SCS, and Forest Service personnel in instructional roles. This could involve the entire region, but more practically a 3- to 5-state area. More than one course might be organized within the region, with all being offered annually or scheduled on a rotational basis. Interchage with other regions might develop.

C. Committee response to course feasibility and a theoretical itinerary. Attached to this report is the information sheet that was sent to all Committee 6 members and made available to 15 individuals who are not committee members. The summary of the responses of the 28 individuals is presented to aid in evaluating opinions on the interest in and feasibility of such a course.

Information sheet, item 1: Twenty-three indicated such a course could serve a useful purpose and should be given a trial. Five indicated reservations but believed further consideration was warranted.

Information sheet. item 2: Summary of favorable comments: Such a course or some field work should be required of all soil science majors. Soils majors can learn more from a well-planned field trip in a week or 10 days than from a semester in a classroom. Understanding of relationships between landscapes, genesis, and morphology is best gained by being on the site. We have been well pleased with short summer study trips in the past, and field study and observation are essential elements for this area of study. We have had good student reaction to similar trips within our state. Good opportunity for university cooperation in teaching.

The coverage of soils over a several-state area is very much needed. California has had a similar program for over 30 years. Soil scientists in SCS have benefited from the California program. Such a course would be valuable in the training of soil scientists. This could be a valuable experience for persons majoring in soil science, forest soils, resource development, geography, and geology. Students should have classroom background in preparation for field trip.

Summary of concerns: Most times selected would probably conflict with other commitments. Cost to students and conflict with money-earning schedules. Difficult to accomplish goals if student backgrounds are not similar.

Information sheet, item 3: 16 indicated yes, 10 perhaps, 2 no.

Information sheet, item 4: Student interest was expressed but cannot be well defined in Kansas, Nebraska, Wisconsin, Iowa, and Illinois, involving both graduates and undergraduates.

Information sheet. item 5: General comments and suggestions offered were: Hope interested SCS personnel can be drawn into such a course, both as instructors and as students. Soils should be studied as landscape packets, perhaps one or two per state traversed. If the group is small and students are adequately motivated and interested in soils, it could be a very educational experience; if not, the trip might become one more of soil geography and the gain not worth the effort. Would like to see an attempt to involve earth science, geography, geology, and related areas as well as soil science. Might consider shorter courses and different times, such as Easter vacation. Attempt to reduce costs to a. minimum would be necessary to have much involvement from our institution. SCS soil scientists could assist in selecting sites and discussing soils. Credit and costs to students will require considerable study and thought. If all institutions in the region cooperate, number of students could be a problem.

Soil interpretations should be a part of all discussions. Graduate students can become better acquainted with soils outside their school, area by being involved in interstate correlations and reviews.

Tour leaders could be rotated among cooperating institutions. Processes external to the soil, such as geology and geomorphology, plus internal soil processes should be discussed and demonstrated. The proposed itinerary sounds good; I think we should give it a try. There would be a need to plan to accommodate females as well as males. Course should begin immediately after spring quarter.

D. <u>Comments and suggestions</u>

<u>General administration</u>: One university and one or two highly interested individuals would need to accept major responsibility in getting such a course officially approved and organized. Instructional credit could be recognized for individual contributions by personnel in states on itinerary. Mechanisms are available and being used, such as course cross-listing, credit transfer, and tuition payment at home institutions to allow full institutional cooperation in currently taught travel courses. Presently approved special problems or experimental courses in some institutions could be utilized. Continue to investigate possibilities of offering this type of course.

<u>Course time. duration, and credit,</u> This will require detailed study. The period from June through August may be best, but to get greatest institutional cooperation, a study should be made of individual calendars to find the most opportune time. Three weeks or possibly four have been suggested for duration, with some period of nontravel at beginning and conclusion. Credit should be commensurate with duration and intensity of study, but a minimum of 3 semester hours, 4½ quarter hours, or 3/4 unit graduate credit is suggested.

<u>Mode of travel and type of lodging</u>. Successfully conducted courses of this type have usually used a chartered bus equipped with an amplifying system for enroute lecturing. Maximum use should be made of low-cost dormitory and organized housing facilities at campuses. Sleeping bags and air mattresses can be utilized with hotel and motel facilities used only when deemed necessary.

Student number, type, and prerequisites. Perhaps 30 to 35 students (40-passenger bus) would make a" optimum size class. People with experience in such courses have indicated that as numbers increase over 30, problems increase. The larger the class wihhout crowding the bus the less transportation cost per student. It seems logical that advanced undergraduates, graduates, and some nondegree students be accepted who have background and knowledge in the general field. Non-soil science majors should probably not be excluded. Dctailcd prerequisites will work themselves out with course experience.

Itineraries. types of stops, emphasis. There are numerous itinerary possibilities, depending on objectives and emphasis desired. Itineraries will be dictated considerably by interest in individual states. Soil properties and developmental factors and processes would probably receive main emphasis, with diagnostic horizons and classification carefully considered. Geology, geomorphology, land use, productivity, engineering properties, and various interpretations should receive proper emphasis. This would be basically a soils course, but other interests need not bc completely excluded. At field stops, existing exposures and probe truck cores could be utilized. Specially dug pits, although very desirable, would probably be too costly. Other stops, such as university campuses, Lincoln Soil Survey Laboratory, Midwest Region Technical Service Center, parks and monuments, could be worked in as desired for variety.

Costs and special funding. This item may be the major obstacle in making such a course attractive. Costs of other travel courses can be studied to serve as guides. Charter buses are expensive, costing as much as up to $200 per day. Seventeen days of traveling could cost between $2900 and $3400. For a 3-week course, lodging and meals per student might average between $150 and $200, depending on individual desires of the students. Tuition might be estimated at $100 to $150.

Several individuals mentioned the possibility of seeking special funding, especially for the transportation. Perhaps if the Work Planning Conference or NCR-3 Committee would sponsor such a" activity, funding would be a possibility. Sources outside the universities should be explored. Special funds might become available for use as special individual scholarships for such a course. Some foreign students would perhaps be eligible for AID funds.

Assessing student interest. No good suggestions have been brought forward on this subject. Perhaps this can only be ascertained after such a course is announced and publicized and good cost estimates presented.

E. Recommendations

1. Opinions and evaluation of this activity should be gathered from department chairmen and other interested individuals.

INFORMATION SHEET

1. Indicate your evaluation of tbis suggested activity.

   A credit travel course in morphology. genesis, and classification could serve a useful purpose and should be given a trial.

   should perhaps be further considered, but I have enough reservations to question whether it could develop into a workable course.

   is impractical and not worthy of further consideration.

2. Reasons for my answer above are:

3. If a course of this type becomes a reality, would you be interested in becoming involved?

   ______yes perhaps ______no

4. I am presently teaching or advising students who have an interest in this field and will discuss such a course with them to evaluate their interest. I will report my findings by March 10.

   ______yes ______no

5. Other comments or suggestions:

____
(Signature)

(Return to B. W. Ray, Agronomy Department, Turner Hall, University of Illinois, Urbana 61801.)

2. 0" the basis of individual interest indicated, we encourage the organization and offering of such a course contingent upon the development of strong interest within a university willing to assume major responsibility.

3. The course objectives, outline, and organization should be developed by the university assuming primary responsibility in consultation with all of the cooperating states.

4. Special effort should be made to hold student expenses to a minimum and to seek special funding for a part or all of the transportation costs.

Subcommittee members:

B. W. Ray, Chairman	G. B. Lee	N. E. Smeck
H. F. Arneman	D. Lewis	M. Stevens
0. W. Bidwell	W. Lynn	

II. Subcommittee Report: Use of and Possible Exchange of Educational Materials

A. Charge to subcommittee. Determine interest for exchange of slides, transparency material, and soil monoliths in the region, prepare a short evaluation of materials presently used, make suggestions for improvement, and possibly prepare a demonstration of slides, transparencies, and/or monoliths for viewing by the entire committee at Rapid City. Submit written subcommittee report to Fenton by March 30, 1972.

B. Committee response. Limited response was received concerning the request for suggestions on use of educational materials. Those who did reply favored the use of and exchange of educational materials. Interest was expressed in the use of slides of different soils and landscapes in the region. A set of slides from each state showing major soils and associated landscapes could be made available. These could then be incorporated into one set for use throughout the region.

A" additional item of interest is the type of advance reports that are being used in the region. The present long interval between completion of the field work and publication of the final report stimulates the use of some type of advance report, especially in those surveys supported in part by local funds.

C. Recommendations

1. Continue to investigate the possibility of assembling a slide set for the region, to include soil profiles, landscapes, and soil features, and the use and exchange of other materials. There appears to be considerable interest in the slide set for the region. A survey would be needed to determine the availability of material and also a list of the major areas of interest. Exchange of monoliths can best be handled on a one-to-one basis.

2. Survey the types of advance reports that are presently available in the region. The advance reports provide a means of testing various methods of presenting soil survey information. We should take advantage of this opportunity.

Subcommittee members:

Richard Fenwick, Chairman	J. A. Elder	W. R. Oschwald
D. E. Buchanan	R. Fisher	I. F. Schneider
Albert Beaver	R. K. Jackson	Earl Voss
James Bowles	H. L. Kollmorgen	

III. Subcommittee Report: Content of Courses Dealing Specifically with Soil Morphology, Genesis, Classification, Mapping, or Interpretations

A. Charge to subcommittee.

1. Compile a list of courses in the above areas that are taught in the region by universities represented at the NCR Workshop. Summarize the information judged to be pertinent in answering questions concerning teaching methods and use of field exercises.

2. (optional) Collect for inspection of Workshop a set of outlines for courses listed.

3. Submit written subcommittee report to Fenton by March 30, 1972.

B. Committee response. Information was received about courses in soil genesis, morphology, classification, mapping, and interpretation from the following universities in the North Central Region:

University	Correspondent
Iowa State University	T. E. Fenton
Kansas State University	O. W. Bidwell
Ohio State University	N. E. Smeck
University of Illinois	B. W. Ray
Michigan State University	D. L. Mokma
University of Minnesota	R. H. Rust
University of Missouri	J. L. Baker
University of Wisconsin-Madison	G. B. Lee
University of Wisconsin-River Falls	Albert Beaver
University of Wisconsin-Stevens Point	James Bowles

Courses Taught	Credits	Laboratory	Field Trips	Enrollments
Iowa State University:				
Agronomy 473 Soil Genesis & Survey (advanced undergrad. & graduates other than Agronomy)	Five quarter Spring & Fall	Yes Field mapping	2 (weekends)	
Agronomy 575 Soil Morphology, Genesis & Classification (graduate and qualified undergrad)	Three quarter Winter	No	No	
Agronomy 675 Advanced Soil Genesis & Classification (graduate)	Two quarter Alternate Springs	NO	NO	
Kansas State University:				
Agronomy 400 Development & Classification of Soils (advanced undergrad. and graduates other than Agronomy)	Three semester Spring	3 hrs./wk.	One 2-day, one ½-day	10-30
Agronomy 920 Soil Genesis	Two semester Spring (odd years)	No	NO	2-5
Ohio State University:				
Agronomy 550 Pedalogy and Edaphalogy (graduate level courses also taught in Soil Minerality & Advanced Soil Classification)		Weekly	NO	60

Courses Taught	Credits	Laboratory	Field Trips	Enrollments
University of Illinois:				
Agronomy 301 Soil Survey, emphasis Illinois soils (undergrad. and graduates)	Three hrs. on or 3/4 unit spring	Indoor and outdoor field mapping	2 one-day	
Agronomy 306 Dynamics of Soil Development (undergrad. and graduates)	Three hrs.	No	2 weekends	
Agronomy 403 Genesis, Morphology and Classification of Soils (graduates)		NO	Field trips	
Michigan State University:				
SLS 390, Soil Conservation and Land Use (undergraduates)	Three quarter	NO	NO	
SLS 470, Soil Classification and Mapping (undergrad. & graduate)	Four quarter	No	½ of course	
Soil Science 870 Soils (their morph., genesis, class. & mapping) and Land Classification	Four quarter	No	NO	
University of Minnesota:				
Soils 125, Genesis, Morphology, and Classification				
University of Missouri:				
Agronomy 320, Soil Genesis, Classification and Mapping (graduate and qualified undergrad.)	Four semester	Yes	Yes	

Courses Taught	Credits	Laboratory	Field Trips	Enrollments
University of Wisconsin-Madison:				
Soils 325, Soil Morph, Classification and Mapping	Three semester	Indoor & outdoor field mapping	Yes	
Soils and Land Use Planning (proposed course)	Three semester			
Soils (and Geography) 431 - Soils of the World	Three semester	Indoor demon.	3 one-day	
University of Wisconsin-River Falls:				
Soils 340 - Soil Classification and Mapping (undergrad.)	Four quarter	Indoor & outdoor labs. field mapping	Weekends	15-20
Soils 360 - Soil Genesis and Geography (undergrad.)	Three quarter	None	One	15
University of Wisconsin-Stevens Point:				
Soils 362 - Soil Genesis, Morph., and Classification	Three	Yes	None	
Soils 762 - Advanced Soil Genesis, Morph., and Classification (graduates)	Three			

Audio-tutorial or video systems are not being used in teaching courses identified in this study. Several institutions are using these systems in introductory soils courses. Perhaps we could identify possible teaching situations that would be facilitated through the use of this instrumentation.

Course outlines were obtained for many of the courses Listed above. Copies may he obtained for examination by writing to T. E. Fenton.

Additional Items

Robert Eikleberry suggested the possibility of a training course in Wisconsin to study Dr. Bouma's work on the field methods of saturated and unsaturated hydraulic conductivity. The principal objective of Dr. Bouma's work is to improve the prediction of soil behavior when used for the disposal of septic tank effluent.

Another item of interest concerns the use of videotape recorders. Dr. Grossman suggested the Soil Conservation Service has this type of equipment for educational purposes. The head of the Employee Development Unit is interested in trying these types of materials and would be a good addition to this committee.

Recommended: That this report be accepted and the committee continued.

Committee Members:

T. E. Fenton, Chairman	J. A. Elder	Warren Lynn
H. F. Arneman	Richard Fenwick	W. R. Oschwald
Albert Beaver	Richard Fisher	B. W. Ray
O. W. Bidwell	G. F. Hall	I. F. Schneider
James Bowles	R. K. Jackson	Neil Smeck
D.E. Buchanan	H. L. Kollmorgen	Mervin Stevens
G. H. Earle	G. B. Lee	Earl voss
R. W. Eikleberry	David Lewis	

H. R. [illegible]

May 1972

Report of Subcommittee (Of No. 7)
Taxadjuncts

In order to determine the extent of taxadjuncts in the North Central States, each state was asked to supply information on taxadjuncts correlated in 1970 and 1971. Data received is summarized in the attached table.

Nearly 1 million acres, or 6.5 percent, of the 14+ million acres correlated in 9 states consisted of taxadjuncts. About 51% of the taxadjuncts were in a family other than that of the named series, and the other 49% were within the family. Eroded Mollisols accounted for the largest acreage. The mesic-thermic boundaries accounted for well over 100,003 acres. These two situations combined accounted for about one half of the total acreage of taxadjuncts to families. The other aberrant features were mostly pH or base saturation, texture, solum thickness, and color. In most cases, the property was only slightly outside the family limits.

More than 400,000 acres correlated were taxadjuncts to the named series but within the family of the named series. Many different soil properties caused the soils involved to be considered taxadjuncts, and most were only slightly outside the series limits.

One respondent pointed out that most of the surveys being reported were started six to eight years ago, about the time the Soil Taxonomy was placed into use. He speculates that use of taxadjuncts will be much less as surveys now being started are correlated. It was also noted that the ranges of several mapping units as defined a few years ago are sufficiently wide that as much as 50 percent of the area is a taxadjunct, as the soil is currently being correlated. These problems should be -educed significantly in surveys now being started.

Most respondents feel that limited use of taxadjuncts is satisfactory, although one indicated that they were undesirable and that separate series should be recognized. There are several cases where minor changes in series descriptions would obviate the need for taxadjunrts. Rather than designate such soils as taxadjuncts in final correlations, a note should be placed in the series folder calling attention to that part of the range of the series that should be revised to accommodate the soil in question. Examples might include a) the presence of a two-inch B&A horizon where none was mentioned in the series description, or b) the presence of sufficient sand that the texture is clay rather than silty clay where the clay content is the same (series description calls for silty clay but does not include clay).

Where taxadjuncts are used, it is imperative that notes be placed in the series folder of the state and the regional offices, not only of the series named but also any closely competing series, indicating the nature of the taxadjunct, the county in which it was correlated and the date. Thus, we will not "lose track" of taxadjuncts.

In some cases en adjacent state may be considering the proposal of a new series for the condition being correlated as a taxsdjunrt. Communication with that state during correlation might make clear the need for a separate new series instead of correlation as a taxadjunct.

Close adherence to good guidelines for selection and application of series criteria should in the future reduce the need for taxadjuncts. More careful study and description of soils in early stages of soil surveys, as required by SOILS MEMORANDUM-~, should do so also, as most of us would be hesitant, to establish in new legends mapping units for soils to be considered taxadjuncts throughout the survey.

However, there is likely to cmtinue to be cases where rigid adherence to a fluctuating or rather vaguely defined or difficulty identifiable limit, such as a soil temperature boundary, does not appear to be reasonable; and thus where we recognize the need for a continuing provision for the use of taxadjuncts.

Table - Use of Taxadjuncts in NC Region in 1970 and 1971

State	Total Acreage Correlated 1970-1971	Acreage and Percent of area correlated as Taxadjuncts					
		Family	%	Series	%	Total	%
Illinois	518,400						
Indiana	341,120						
Iowa	Not reported						
Kansas	1,213,931						
Michigan[1/]							
Minnesota							
Missouri							
Nebraska							
Ohio							
South Dakota							
Wisconsin							
Totals (excluding Iowa and Nebraska)							
Totals (including Iowa and Nebraska)							

May 1972

Report of Subcommittee (of No. 7) -
Clay-size Carbonates in Particle-size Classes

Carbonate clay data was supplied by North Dakota, Kansas, Iowa, and Minnesota. The soil families represented in the data were mostly of Typic Calciaquolls, Haplaquolls, Hapludolls, and Haploborolls.

Iowa reports most carbonate clay in silt size range. Minnesota data shows carbonate clay, where present, ranging from about 15 percent to 50 percent of total clay, Kansas data, in 3 examples supplied has carbonate clay up to about 65 percent of all clay. North Dakota data shows carbonate clays ranging from about 50 to 80 percent of total clay.

In Calciaquolls the carbonate clay maximum generally coincides with CCE maximum and the maxima are most commonly in the Ca horizons, as described.

As may be noted from the examples illustrated, mostly Calciaquolls, the family particle-size class is changed in about half of the examples. The texture class of the control section (weighted average) also changed in about half the examples. In these examples the very fine sand was considered as silt.

In other soils, notably Haplaquolls, calcareous, and some examples of Haploborolls the amount of carbonate clay generally was less than 15 perrent of total clay except for Ca horizons in which carbonate clay ranges up to 50 percent of the total clay,

The question has been raised that, if the carbonate clay is consider4 as silt and the textures revised accordingly, a new difficulty arises in field determination of texture class. Not only do we ask the fieldmen to "subtract" organic matter in their field estimate, we would now be asking them to "subtract" carbonate clay.

While it is certainly valid that moisture holding properties, exchange capacity, and a number of other horizon properties will be different if a significant amount of clay size material is carbonate, our judgment would be that these properties should be clearly established by laboratory or other special determination, i.e., not inferred.

Of the soils we have reviewed the carbonate clay fraction seems to be a matter of most import in the subgroups of Calciaquolls. Perhaps concern could be limited to these soils.

There seems to be the possibility that the amount of carbonate which is clay size may increase on a general transect from north-central Iowa to north-central North Dakota.

CONSIDERATION OF CARBONATE CLAY AS "SILT"
ANO EFFECT ON SOIL FAMILY CLASSIFICATION

Selected Minnesota Profiles, Mostly Calciaquolls

					All		Carb.	N-Carb
Harps		Silt (+)	VFS (=)	"silts"				
A1Ca	9-16	40.5	9.2	49.7	Clay	Sand	Clay	Clay
A3Ca	16-23	43.5	9.6	52.8	35.8	14.7	16.5 9.0	19.3 14.9 23.4
B2g	23-33	43.1	9.8	52.9	26.1	14 21.1	9.0 3.8	21.4 22.3
Clg	33-40	40.1	12.6	52.7	20.9	26.6	2.6	18.3
			Avg	52	28	20		21

Effect: No particle size class chanoe. Control section texture class sicl to sil.

Vallers								
-C-i---	11-18	39.0	6.2	45.2	36.2	18.8	16.1	20.1
C2			4.9					15.6
C3 24-30	18-20	51.2 53.1	4.9	58.0 56.1	30.5 29.9	11.6 14.1	14.9 9.4	20.5
c4	30-40	38.2	J:O	45.2	22.1	32.9	5.2	16.9
			Avg	50	30	20		18

Effect: No PSC change. CS texture sicl to sil.

Hamerly								
ClCa	11-20	36.1	9.9	46.0	27.0	27.1	12.0	15.0
C2	20-33	37.8	14.2	52.0	17.0	31.2	3.7	13.3
			Avg	49	21	30		14

Effect: Fine loamy to coarse loamy. CS texture loam to sil.

Arveson								
ClCa	J-14	17.7	25.2	42.9	12.3	45.0	21.0	0
C2Ca	14-22	3.5	45.3	48.8	8.7	42.6	6.7	2
c3	22-40	2.3	12.3	14.6	3.7	81.8		3.7
			Avg	30	6	64		2

Effect: No changes

Bearden								
ClCa	8-18	54.1	N.D.	54.1	41.5	4.6	17.0	24.5
C2Ca	18-28	60.1	N.D.	60.1	38.0	2.0	9.3	28.7
c3	28-38	66.9	N.D.	66.9	31.9	1.4	3.1	28.8
			Avg	60	37	3		28

Effect: No changes

Colvin	Silt (+) VFS (=)	"Silts"	All Clay	Sand	Carb. Clay	Non-Carb. Clay
		31.9	54.3	17.8	35	19.3
		33.0	49.1	22.9	29	20.1
		32.2	49.4	22.4	31	18.4

May 1972

Report of Subcommittee (of No. 7) -
Mapping Legend3 Using Higher Categories
of Soil Taxonomy

Members of the subcommittee were asked to respond to the following situation.

Mapping Legends Using Higher Categories of Soil Taxonomy.
In northern Minnesota we are starting a survey of a large county that mostly is forested. We are planning on mapping at a scale of about 2 to 3 inches to the mile and recognizing taxonomic entities above the series category. The category for naming mapping units and recognizing taxa will not be uniform throughout the legend because it will depend on the nature of the soils in mappable bodies. Some examples of tentative names of mapping units are (1) Loamy Boralfs, sloping (2) Deep Borohemists(3) Coarse-silty and coarse-loamy Ochraqualfs, (4) Sloping Psamments, and (5) Nearly level Alfic Udipsamments. We think that such a survey will provide sufficient soils information for most uses for many year5 to come. On-site investigations or detailed maps can be made where more information is needed. However, such a legend and survey presents several problems which we are not accustomed to handling. Some of these follow:

1. Naming
   For example, do we want Loamy Boralfs, sloping or Boralfs, loamy, sloping? Also what kinds of name5 will be used in the published report? A name such as Loamy Boralfs, sloping has not been well received by potential users of the soil survey. A name such as well and moderately well drained loamy soils has been better received. Could they be given a geographic name similar to the soil series such as Nordland taxon?
2. Correlation
   Should any attempt be made to correlate such taxonomic entities as we now do with series?
3. Interpretation5
   We have attempted to put our interpretations of some taxonomic entities on the single-sheet with fair success. What other ways might they be handled?

I am asking the subcommittee members to consider and react to these problems among others that might arise from such a survey and submit them to the subcommittee chairman.

I should add that not much pedological work has been done in this county or in similar soil-geomorphic areas. Thus, few of the soils are in the limits of named soil series.

Comments by members of the subcommittee are summarized below.

1. Naming

Few preferred that names of subgroups or higher categories of soil taxonomy be used as published names of mapping units. Instead, such names would be used only in the section on genesis, morphology, and classification of the final report. Also, such names would of course be used in the descriptive legend and correlation documents. Most preferred that common descriptive terms be used for naming mapping units. However, such a procedure becomes rather cumbersome where the legend consists of many mapping units as it would for this survey. In regard to using a name such as "Nordland Taxon" most thought that that approach would only be confused with the soil series names.

This survey would qualify for a reconnaissance survey and the mapping units primarily would be equivalent to associations of series. Thinking in terms of this premise, some suggested that dominant soil series in each association be used in the name of the mapping unit. As was stated previously, few of the soils in the area are in named series. To follow such a procedure would mean that several new series would need to be established. One of our reasons for not using series was to avoid the time (and cost) of establishing new series. However, in the long run this may be the best course of action.

2. Correlation

Most indicated that a correlation should be prepared of all mapping units that are used in the survey. This primarily would involve an accounting of all mapping units that are on the field sheets and arriving at a final "best" name for each. Also, the composition of each unit might be recorded at the family category or as phases of families. Of course several such entities would be in most of the mapping units. Further, it is doubtful if there would be any correlation between these units and similar units correlated in other surveys at some distance apart. However, there should be sound correlations of similar units of adjoining survey areas.

3. Interpretations

Some did not think that it would be feasible to use the single-sheet approach for soil survey interpretations because many of the units would contain contrasting soils. However, the taxonomic entities recognized would not include strongly contrasting soils. Thus, some mapping units would consist of contrasting taxonomic entities such as loamy Ochraqualfs and loamy Boralfs, and both entities would be recognized in the mapping unit. Also, single sheet interpretations would be made for both entities.

May 1972

Report of Subcommittee (Of No. 7) -
Combining the Final Field Review and Final Correlation

The charge of this subcommittee of committee 7 was to consider the possibilities of combining the final field review and the final correlation.

A summary of comments from committee members, both in form of memorandum and personal communication, indicate widely differing attitudes concerning the combination of the final field review and field correlation. All persons who replied felt that such a goal was desireable but one not immediately possible to achieve. All except one indicated that they should like to try such a combination if the opportunity permitted. One reply indicated that they were not in favor of such a combination at this time because it would mean a drastic revision of the present program in effect. All members felt that such a combination was not possible except in rare instances at this time. To achieve this in the future would require prior planning and scheduling of all activities concerned with soil survey.

To have the field and final correlation occur at the same time, subcommittee members pointed out that the following must occur during the life of the survey:

1. First, the survey must be controlled and have mapping units which are described and defined as early in the survey as possible. The legend is tested again and again and the definitions of the mapping units and series used are compared, revised, and adjusted to best reflect the concepts of the soils and mapping units within the survey area.

2. Progress field reviews are essential parts of the correlation processes. Mapping units and soils are studied thoroughly during each review and classified and named as finally as available knowledge permits. Mapping units named using conventions normally employed during final correlations. If progressive correlation is carried out as the survey progresses, little is left at the conclusion of the survey except to tie up the loose ends and prepare an overall summary.

3. Simultaneously, the soils must be studied for appropriate use interpretations. The interpretations of the soils of the survey area must be compared with those of the standard series with which they are indentified. Soils and interpretations of the area must be joined with those of adjoining areas - within and without the state.

4. Activities concerned with the development of the manuscript must be carried out during the survey and the initial draft assembled at the completion of field work or before the final field review. Operation schedules must include time for obtaining suitable photographs, developing yield data on crops typical of the survey area, etc. so that all parts of the manuscript are completed about the same time.

5. To have all these activities terminate successfully in a combined final field review-final correlation would involve management somewhat different than practiced by most states. Even though all would wish to attach such a goal, the activities cannot be immediately manipulated to achieve this in a short period.

6. Several committee members felt that even though such a goal is possible that any progress toward achieving the objective stated above would greatly enhance the soil survey program and would make for a better survey and correlation. They pointed out however that combining the field and final correlation into one act depends upon many factors that cannot be immediately manipulated. Such a combination may not be possible in some states for several years and perhaps never in some survey areas. To achieve this is an accomplishment of great magnitude and requires planning and scheduling of most activities at earlier dates than presently being accomplished.

Possible Charges for Committee 7 -
Soil Correlation and Classification -
for the 1974 Conference

Some possible charges for the canmittee on Soil Correlation and Classification for the 1974 Conference were suggested as requested by some present members of the committee. These charges follow:

1. Continue consideration of clay-size carbonates with particular emphasis on (a) assembling data or collecting data on water-holding properties, exchange properties, etc., on the pedons reported on in this report and (b) determine more precisely the problems of the field man in dealing with texture and particle-size classes in soils with free carbonates.

2. Investigate degrees of agreement of soil names and composition of mapping units in various landscapes with varying intensities of current surveys.

3. A consideration of proportions of landscapes that are actually being classified with the current use of Soil Taxonomy. This should consider composition of the units as well as variants, taxadjuncts, and mapping inclusions unclassified by series name.

4. Measure soil temperature (mean annual and summer) on selected toposequences of soils which have a considerable range in slope, both gradient and aspect.

Planning Conference of the National
Cooperative Soil Survey, Rapid City, S.D.,

Report of Committee 8
Communicating ... Improvement the Environment

This committee is a combination of two former North Central Committees - 1. The committee on technical monographs and benchmark soils, and 2. The committee on coordination and dissemination of laboratory information. The following committee reports of the National Technical Work-Planning Conference have charges relative to this committee - 1. The committee on technical soil monographs, 2. The committee on handling soil survey data, and 3. The committee on environmental soil science. Committee members were contacted and the following report reflects this contact and the discussion at Rapid City.

1. Defining a soil landscape unit It was recommended previously that slope class be added to the typifying pedon, however that will only solve part of the problem. It would appear that the problem can be divided into segments and that each segment could have classes that are suitable for ADP. A shift to an energy concept moy be desirable -how is the energy of the water at a specific landscape position reflected in the soil profile?

   a. Energy status of landscape - Most soil landscapes (associations) can be ranked into energy categories. The highest energy landscapes appear to be those like Fayette and Dubuque along the major rivers. While the lowest energy landscapes are those like the level glaciated areas of the Midwest. Row long after a rain do these landscapes discharge surface runoff? The potential for sediment and water loss to downstream positions varies with the energy status of the landscape. Landscapes with integrated vs. non-integrated surface drainage need identification.

   b. Relationship of soil series within a landscape - We need to view individual landscapes as energy dividers and relate soil series to the landscape energy positions. Some sites discharge water while others receive water (and consequently sediment and anything dissolved in the water is lost or gained) - loss vs. gain positions. Is the soil a loss site (runoff) or a rain site (runon)?

   c. Relationshi. of soil series within a landscape to subterranean water flow - The energy available from subterranean water flow (internal to profile) is small, however it may cause large changes in constituents that are dissolved in the water.

2. Audience-identification - Soil information is supplied to many different agencies and to individuals of diverse backgrounds. It would appear that we need to identify principal users and cater more specifically to their needs.

   a. On-site sewage disposal - This user group was identified by nearly all who responded. Many individuals are one-time users. However, health departments, planning commissions, etc. are repeat users of this information. We need to think more what can be done to make sites usable for on-site disposal (cost in dollars or some broader category). The work of Dr. Bouma and colleagues (Bouma, J., et. al. June 1, 1972. Soil Potential for Disposal of Septic Tank Effluent. Information Circular No. 20. Geol. and Nat. Hist. Survey, Univ. of Wis., Madison. $5.00) was reported on by

Dr. Dole. They have successfully tested mounds for the purification of septic effluent on otherwise unsuited soils. Dr. Dole's short discussion was given the title "Latest methods of measuring, monitoring and altering the capacity of a soil to absorb liquid waste."

b. Location and operation-of landfills - This audience is growing fast and requires information below the control section. What should we say about soil materials below the control section? To what depth should we concern ourselves? Can soil series be rated for uniformity of C horizon material?

c. Audiences concerned with environmental quality - This audience encompasses a and b above but is listed separately. Most of this audience is concerned With regulation. Also involved are individuals concerned with the preparation of environmental impact statements. The Illinois Pollution Control Board is concerning itself with fertilizer use with the possibility of setting limits on its use.

d. Audiences concerned with developing small towns into more viable communities - The main group seems to be involved with RC and D programs. Also involved but less widely known are the River Basin Development projects.

3. Present soil survey reports - Soil survey reports seem to be communicating soils information adequately to inadequately depending on the responder. The following comments were taken from your response.

a. The report is too technical and difficult to read for most users.

b. The report is a good first step but interpretive maps are a must if the report is to be used.

c. Much of the information, particularly interpretations, are out of date when the report is published.

d. The interpretations are too general, particularly those on engineering. Environmental limitations are vague for lack of data.

e. Where do people go for information not in the report?

4. Environmental problems that can be reduced if soil survey information is used more extensive&_ - The areas identified are familiar to us but have added importance at this time.

a. Erosion control and sediment loss.

b. Structures on unsuitable soils.

c. On-site waste disposal systems (see 2a).

d. Overdevelopment of lakeshores and ground water pollution.

5. New information that is needed to help advise clientele concerned with environmental quality - Two broad areas (a and b) were identified repeatedly. The other areas were identified by one or more people.

a. Nutrient and heavy metal recycling - Some of the emphasis here is concerned with the capacity of the soil to degrade wastes (animal and digested sludge). Specifically mentioned were N, P, Hg, As, Pb, Cd as well as pathogens and organic materials. The work of Dra. Singer and Rust titled "A model for phosphorus cycling in a forested watershed" was reported on by Dr. Rust. They have measured the magnitude of the major sources (compartments) of P in the watershed and have determined the rate of transfer between some of these compartments.

b. Hydrologic properties of soil - Do we continue to infer whet the hydrologic properties are or do we Increase our effort to quantify the data? One respondent mentioned that our recommendations are primarily based on observation and morphology which rely on past conditions while little effort has been expended on how we can improve a soil for a specific use. Movement of water in uniform and non-uniform soil material was singled out for study. How do we set out to measure these hydrologic properties? See pp. 177-197 of National Technical Work-Planning Conference of the Cooperative Soil Survey Proceeding, Jen. 25-28, 1971.

c. Problem of strip mine spoils - The material here is mixed soil end can be thought of as a new geologic material. Can we develop information that will predict how much time is involved for various transformations to occur?

d. Pedon vs. landscape studies - More attention needs to be given to the landscape (groups of related pedons) and less to individual pedons in moat problems related to environmental quality.

e. Effect of past history on soil series properties - Little information exists on how various uses effect soil properties. A virgin soil often has very different properties than the soil we are presently working with. Many combinations could be given.

f. Public vs. private interests - Row are public needs reconciled with private rights in property?

g. Communication - Techniques in better communication need to be explored. The ADP program may help us implement special reports for specific needs. What type of an ADP system will benefit the most people? The centralized ADP system is one approach. What alternatives do we have? What can we ef ford?

h. C and R horizons - More emphasis needs to be given to soil below the control section for some interpretations.

i. Impact of SO_2 reased - Row will increased SO_2 levels effect mineral weathering, recycling, etc.? This problem la acute downwind from fossil fuel smokestacks and smelting Installations.

6. **Automatic** data processing -

7.

8.

9.

E. C. A. Runge

E. C. A. Runge, Chairman

cc: D. L. Bannister

Committee 8 Members:

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NORTH CENTRAL REGIONAL WORKSHOP
of the
COOPERATIVE SOIL SURVEY
RAPID CITY, SOUTH DAKOTA

April 17-21, 1972

Report of Committee No. 9

For this bi-annual meeting of the North Central Regional Workshop, Committee reports will be prepared prior to our April 17-21 meeting. This report is a summary of those responses returned in answer to two memos dated February 15, 1971 and January 17, 1972. Responses by committee members were good. As chairman I appreciate the time and thoughts of each member.

A review of previous Committee 9 reports revealed several continual problems: (1) communication between soil scientists and foresters; (2) lack of adequate forest growth and yield data by soil taxonomic units; (3) soil legends for multiple use of forest lands. Because of their complexity and time that could be spent on each individual problem, specific parts of items 2 and 3 were selected for study. Communication between soil scientists and foresters is a continual job and is recognized by all of us as an important aspect of our work.

Three specific problems were selected for consideration: (1) the use suitability classification of Histosols; (2) status of Soil Conservation Service woodland ordination groups and automatic data processing; (3) development of soil survey legends and interpretation for forested areas. A fourth item, forest-soils bibliography, is a hold-over from the 1970 sessions. The present committee report follows:

1. Use suitability classification of Histosols - Dr. Lee, chairman of the Organic Soils Committee, appointed a subcommittee to prepare

a report concerning the "Use Suitability Classification of Histosols for Forestry and Related Use." Since there is an overlap in membership between the two committees, the organic soils subcommittee has assumed the leadership. A formal subcommittee report is presented in the organic soils committee report. Our committee response shows a need for Histosol use suitability classification. It is evident that further subcommittee "Discussion" is needed. This committee recommends a meeting concerning this subject during the week of April 17-21. 1972. The main thrust of this discussion should establish particular problem areas for Histosol suitability classification.

2. Status of Soil Conservation Service woodland ordination groups and automatic data processing - Responses by members of this committee have emphasized several important problems. First and foremost is the selection of tree species for ordinating soils at the woodland suitability group level. This problem becomes pronounced when working with other states. For example, the selection of sugar maple (*Acer saccharum* Marsh.) for Michigan or Wisconsin for the same soil taxonomic units, whereas trembling aspen (*Populus tremuloides* Mx) is considered for Minnesota soils. Selection of two species for the same soil units indicate perhaps several controlling factors: 1) unknown soil differences between states for the same soil taxon that have influenced species composition; 2) past management; 3) soil-fire effects; 4) lack of sufficient replicated data; 5) microclimate; 6) species genetic differences. As a result of using different species and site index classes, different ordination classes and subclasses are set up for the same soil taxa. This defeats the purpose of the ordination. The lack of adequate data, particularly site index, for a species on the same soils between states was stressed as the most important problem between states.

   Automatic data processing of woodland information is relatively new and this committee is not in a position to identify specific problems. However, this committee does recommend bi-annual inquiry for problems and continued consideration to developing guidelines for gathering and analyzing forest site information.

3. Development of soil survey legends and interpretation for forestry-- Committee members gave this the most thought and consideration. Responses indicate a basic problem in "of what future use will the the soil survey be put to'?" Are present soil survey mapping legends adequate for future use? This committee recognizes that each area under consideration for soil survey has its own unique sociological, economic and natural resource potential. Too much detail for a mapping legend is questionable and even of negative value in practical terms until subsequent experiences in land use, or changes, have

taken place. And this may require remapping after the original survey. It is the opinion of this committee that effective lines of communication are essential between foresters, soil scientists, researchers, etc. for exchange of information prior to development of mapping legends and during the course of the survey. We need to recognize and state objectives of the survey and design mapping legends for them. Each land use must be examined closely and decisions made as to whether the present soil mapping legend is adequate to potential users needs. To cite some examples, potential sanitary land fill or human and industrial wastes areas, forest soil permeability rates for watershed and hydrologic groupings and location of logging roads for winter and summer operations. The committee further recommends a classification scheme be used that is compatible to the needs of the survey and composed of categories of the comprehensive system of soil classification. As information becomes available during the course of the soil survey, groupings can be developed based on actual field observations. For example, combinations of slope and erosion units that may be pertinent to forest lands would eliminate much of the detail generally included in soil surveys of more intensive use areas.

4. Forest soil bibliography - Dr. Willard Carmean has completed a final draft of the forest soil bibliography containing over 700 references. As our committee has stressed communication and lack of data appear to be the paramount items for this report, the bibliography represents this committee's contribution to compile known sources of forest data which should be used for developing soil legends and forest interpretations.

Conclusions

The forest soil committee admits that these problems and questions have been raised at past meetings and no doubt will continue to grow as woodlands and forests become intensively used. Our committee has just started to recognize the major problem areas. For example, the lack of relevant data for the potential use of our woodlands and forests and the need for close communication and exchange of information between those involved in developing and implementing soil survey and land use.

In line with the above discussion, the following recommendations are submitted:

1. Histosol suitability classification - that the committee continue to work closely with the organic soils committee in developing a forestry suitability classification of organic soils.

2. Propose guidelines for developing mapping legends of forested areas - Input from this committee for identification of problems or steps to proper planning and coordination of resource personnel in the development of the survey, &specially in areas where very little is known about soils in the area.

   Suggested Steps:

   1. Cost of survey.

   2. Level of mapping Intensity and map scale - Recon. or low intensity, 2 or 4 inch to the mile maps.

   3. Collection of information - what kinds of information are needed; (logging hazards, sedimentation, time of year to log an area) and who will collect it.

   4. Level of classification - series, family. subgroup. Categories of the comprehensive system of classification.

   5. Quality Control - coordination and input of other disciplines and adjustments during the soil survey as needs or new data become available. The survey should be flexible.

3. Encourage woodland conservationist, soil scientist and foresters to pool their knowledge in compiling soil-tree growth relationships - A guide or chart be developed for use in preparing ordination groups, or mapping legends. The guide would serve several purposes: 1) check the validity of soils that have been studied for soil-tree growth relationships that may be currently inactive and used for forest soil surveys; 2) establish lines of communication between disciplines; 3) establish range in growth on various soil units:

   Exameres

It is moved that this report be submitted for approval by the North Central Regional Soil Survey Workshop.

Forest Soil Committee Membership

*Shetron, S., Chairman

Arneman

*Boelter

Bourdo

Boyle

*Carr

*Carey

Carmean

Farnham

Ferber

*Klingenhoets

Messenger

*Neuman

*Radeke

*Scilley

Stevens

*Member present at Rapid City, South Dakota.