

**NATIONAL COOPERATIVE SOIL SURVEY**  
**Northeast Cooperative Soil Survey Conference Proceedings**  
**Storrs, Connecticut**  
**July 17-22, 1978**

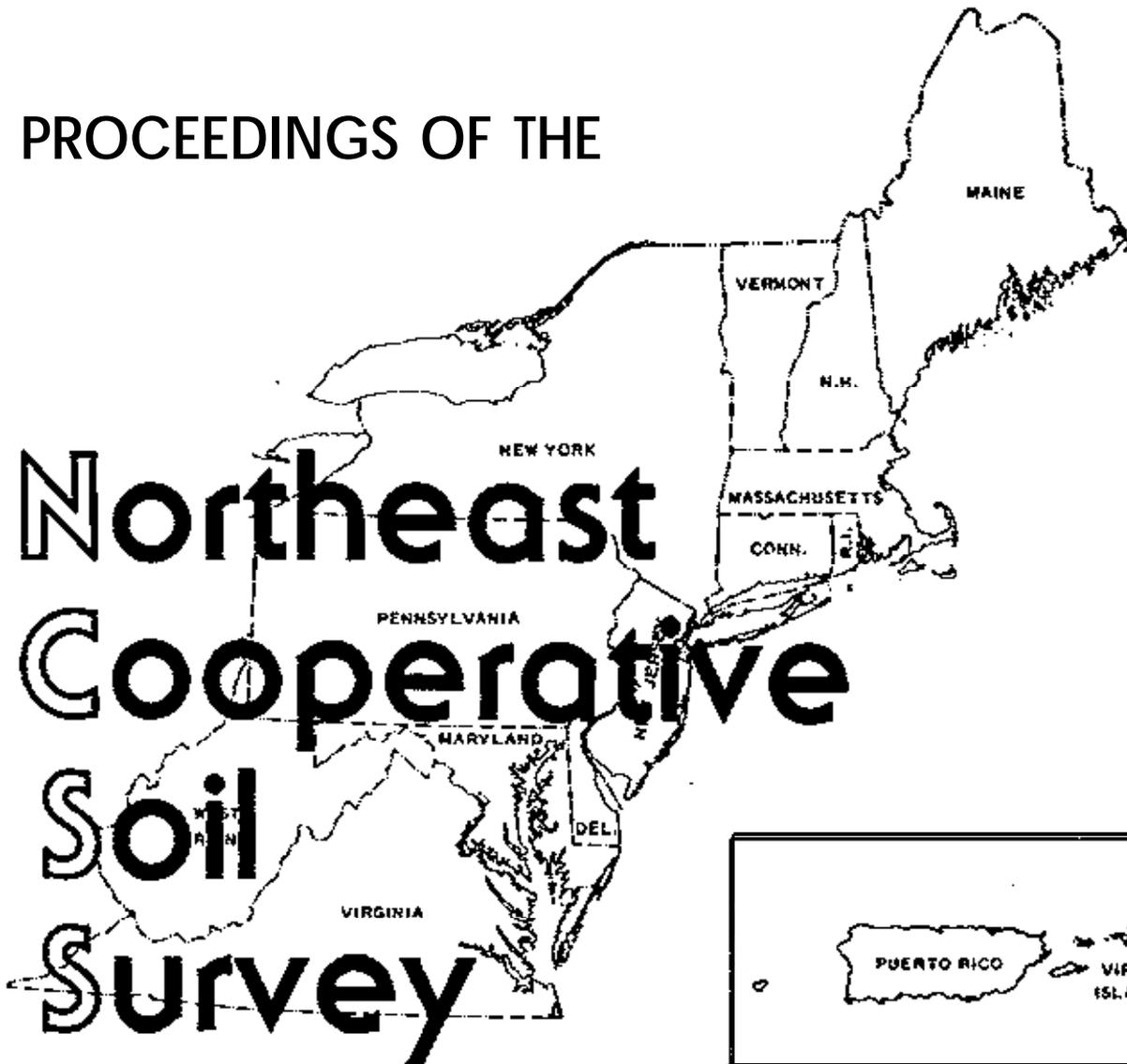
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PROCEEDINGS OF THE

**Northeast  
Cooperative  
Soil  
Survey**



**Conference**

Storrs, Connecticut  
July 17-22, 1978



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Remarks:

Soil Conservation Service Representatives

John W. Pippie . . . . . State Conservationist, Storrs, Connecticut  
Arthur B. Holland . . . . . Assistant Director, Northeast Technical  
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Klaus W. Flach . . . . . Assistant Administrator for Soil Survey,  
Washington, DC  
John E. McClelland . . . . . Director, Soil Survey Classification and  
Correlation Division, Washington, DC

Experiment Station Representative

David E. Hill . . . . . Associate Soil Scientist, New Haven,  
Connecticut

State of Connecticut Representative

Hugo Thomas . . . . . Director, Natural Resources Center,  
Department of Environmental Protection,  
Hartford, Connecticut

Forest Service Representative

Walter E. Russell . . . . . Regional Soil Scientist, Milwaukee,  
Wisconsin

Committee Reports:

1. Legal Aspects of the Use and Interpretations of Soil Survey
2. Use of Soils for Waste Management
3. Inventory and Use of Soils in Forested Regions
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THE NORTHEAST COOPERATIVE SOIL SURVEY CONFERENCE

PURPOSE, POLICIES AND PROCEDURES

I. **Purpose** of Conference

The purpose of the NECSS conference is to bring together representatives of the National Cooperative Soil Survey in the northeastern states for discussion of technical and scientific questions. Through the actions of committees and conference discussions, experience is summarized and clarified for the benefit of all; new areas **are** explored; procedures are synthesized; and ideas are exchanged and disseminated. The conference also functions as a clearing house for recommendations and **proposals** received from individual members and state conferences for transmittal to the National Soil Survey Conference.

II. Participants

Permanent participants of the conference are the following:

The **SCS** state soil scientist responsible for each of the 13 northeastern states, District of Columbia and staff soil **scientiest** of the Caribbean area; Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Puerto Rico, Rhode Island, Virginia, Vermont and West Virginia.

The experiment station or university soil survey **leader(s)** of each of the 13 northeastern states and Puerto Rico.

Head, **soil Correlation** Unit, Northeast Technical Service Center, Soil Conservation Service

National **Soil Survey Laboratory Liaison** to the Northeast.

Cartographic Staff Liaison to the Northeast.

One representative **from** each of the Eastern and southern Regions of the U.S. Forest Service.

On the recommendation of **the** Steering Committee, the Chairman of the conference may extend invitations to a number of other individuals to participate in committee work and in the conference. Any soil scientists or other technical specialists of any state or federal agency whose participation is helpful for particular objectives or **projects of the conference may be invited to attend.**

### III. Officers

#### A. Chairman and Vice-Chairman

An experiment station representative and an SCS state soil scientist or staff soil scientist of the Caribbean area alternate as chairman and vice-chairman. The vice-chairman elected at the biennial meeting **serves** as program leader for one conference and becomes conference chairman for the next one. The chairman functions as chairman of the biennial conference and his responsibilities include the following:

1. Planning and management of the biennial conference.
2. Function as a **member** of the Steering Committee.
3. Issue announcements and invitations to the conference.
4. Contact proposed committee chairman and vice-chairman to serve in those positions.
5. Provide for appropriate publicity for the conference.
6. Preside at the business meeting of the conference.
7. Maintain conference mailing list and turn it **over to** incoming chairman.

The vice-chairman functions as Program Chairman of the biennial conference and his responsibilities include the following:

1. Serve as a member of the Steering Committee.
2. Act for the chairman in the chairman's absence Or disability.
3. Organize the program of the conference.
4. Make necessary arrangements for lodging accommodations **for** conference members, for food functions, for meeting **rooms,** including committee rooms, and for local transport on official functions.
5. Assemble and distribute the proceedings of the **conference.**

#### B. Steering Committee

##### 1. Membership

A Steering Committee assists in the planning and management of biennial meetings, including the formulation of committee memberships and selection of committee chairman and vice-chairman. The steering Committee consists of the following four members:

Head. **Soil** Correlation Unit, **NETSC,** SCS (chairman).  
 The conference chairman.  
 The conference vice-chairman.  
 The conference past chairman.

The Steering Committee chairman functions mainly to call a meeting of this committee to handle its business and to **ensure** full committee membership.

The Steering Committee may designate a conference chairman and vice-chairman if the elected persons are unable to fulfill their obligations.

## 2. Meetings and Communications

At least one meeting is held at each regional conference. Additional meetings may be scheduled by the chairman if the need arises.

Most of the committees communications will be in writing. Copies of all correspondence between members of the committee shall be sent to the chairman.

## 3. Authority and Responsibilities

### a. Conference Participants

The Steering Committee formulates policy on conference participants, but final approval or disapproval of changes in policy is by consensus of the participants.

The Steering Committee makes recommendations to the conference for extra and **special** participants in specific **conferences**.

### b. Conference Committees and Committee Chairman

**The Steering Committee formulates** the conference **committee** membership and selects committee chairmen and vice-chairmen.

The **Steering Committee** is responsible for the formulation and transmittal to committee chairman of committee charges.

### c. Conference Policies

The Steering Committee is responsible for the formulation of statements of **conference** policy. Final approval of such statements is by consensus of the conference participants.

d. Liaison

The Steering Committee is responsible for maintaining liaison between the regional conference and (a) the Northeastern Experiment Station Directors, (b) the Northeastern State Conservationists, SCS, (c) Deputy Administrator for Soil Survey of the Soil Conservation Service, (d) regional and national offices of the U.S. Forest Service and other cooperating and participating agencies, (e) the Northeast Soil Research Committee, and (f) the National Soil Survey Conference of the Cooperative Soil Survey.

C. Administrative Advisors

Administrative advisors to the conference consist of the Technical Service Center Director, SCS, and the chairman of the N.E. Agricultural Experiment Station Directors or their designated representatives.

D. Committee Chairman and Vice-Chairman

Each conference committee has a chairman and vice-chairman who are selected by the Steering Committee.

IV. Meetings

A. Time and Place of Meetings

The conference convenes every two years, in **even-numbered years**. The date and location will be determined by the Steering Committee.

V. Conference Committees

A. **Most** of the work of the conference is accomplished by duly constituted **committees**.

B. Each committee has a chairman and vice-chairman. A secretary **or** recorder may be selected by the chairman, if necessary. Committee chairmen and vice-chairmen are selected by the Steering Committee.

C. The kinds of committees and their members are determined by the steering Committee. In making their selections the Steering Committee makes use of expressions of interest filed by the conference participants.

D. Each committee shall make an official report at the designated time at each biennial conference. Chairmen of committees are responsible for submitting the required number of committee reports promptly to the vice-chairman of the conference. The conference vice-chairman is responsible for assembling and distributing the conference proceedings. Suggested distribution is:

One copy to each participant on the mailing list.

One copy to each state conservationist, **SCS**, and Experiment Station Director in the Northeast.

Twenty-five copies to the Director, Soil Survey Operations Division, SCS, for distribution to other regional conferences and their committees.

E. Much of the work of committees will of necessity be conducted by **correspondence** between the times of biennial conferences. Committee chairmen are charged with the responsibility for initiating and carrying forward this work.

#### VI. Representatives to the National Soil Survey Conference

The elected Experiment Station vice-chairman or chairman will attend the national conference. A second Experiment Station representative also will attend the conference. He is to be selected by the Experiment Station representatives at the regional conference.

The SCS representatives are usually selected by the Deputy Administrator, SCS in consultation with the TSC Director and state conservationists.

#### VII. Northeast Soil Taxonomy Committee

Membership of the standing committee is as follows:

**Head**, Soil Correlation Unit, NETSC. SCS (**permanent chairman**, non-voting).  
 Three Federal representatives.  
 Three State representatives.

The term of membership is usually three years, with **one-third** being replaced each year. The elected Experiment Station conference chairman or **vice-chairman** is responsible for overseeing the selection of state representatives.

VIII. **Amendments**

Any part of this statement for purposes, policy and procedures may be amended at any time by agreement of the conference participants.

By-Laws Adopted January 16, 1976.

## HIGHLIGHTS OF THE 1978 NORTHEAST COOPERATIVE SOIL SURVEY CONFERENCE

E. H. Soltner, Vice-Chairman for 1978 Conference

This was the first conference held outside of New York City. Headquarters was at the Kestelo L. Bishop Center for Continuing Education, on the University of Connecticut campus. The conference just preceded the 1978 Northeast American Society of Agronomy Meetings at the University.

Representation of agency and institution administration was most welcome and encouraging. In addition, new participants and guests added greatly to our effectiveness.

The agenda, format, and location of the 1978 summer conference, were well received. All committee activities were completed and reports compiled beforehand. Committee reports were reviewed by four discussion groups during the conference.

The conference addressed major items confronting the Cooperative Soil Survey in the Northeast today and in the years to come. These are:

- Completing the field mapping of all lands, including both private and public lands.
- Updating those published soil surveys that are inadequate, for one reason or another, for present day needs in resource conservation planning.

The activities, discussions, and presentations of the twelve committees were the operational heart of our conference. Charges were designed so that most could be completed within the time frame of the conference.

Committees 1, 5, 9, 10, and 12 were designated as "ad hoc" committees. They were charged with surveying present knowledge of the "state of the art" or with preparing proposals for consideration. The following notations on the committee reports indicate the scope of our 1978 conference:

### 1. Legal Aspects of the Use and Interpretation of Soil Survey.

Soil survey and related data are being used more extensively as a legal basis for regulating use of land. The report is a summary, by states, of new legislation, ordinances, and regulations at various levels of government.

### 2. Use of Soils for Waste Management.

Disposal of the many kinds of wastes is a major concern in maintaining a quality environment. The committee assessed the use of present guides for waste treatment on named kinds of soils, and developed new ratings for benchmark soils in the Northeast. Additional research needs include safe rates of application, heavy metal studies, use of poorly drained soils, and others.

3. Inventory and Use of Soils in Forested Regions.

Forests are extensive in the Northeast and there are concerns about detail and efficiency of soil inventories on these lands. Deliberations centered on the intensity levels of mapping and interpretations needed for planning and overall management. Limitation ratings for road and skid trails need to be developed. It is recommended that state committee be established for testing and refining criteria used for making woodland interpretations.

4. Soil Potential Ratings for Selected Uses.

The soil potential concept has added a new dimension to soil surveys. Guideline and procedure sources for rating soils for selected uses are identified. Soil potential ratings should be developed where there is interest and need. There needs to be substantial participation by "local" specialists. Cost-benefit studies of corrective measures are among the research needs identified.

5. Soil Moisture Regimes

**Information on soil moisture** regimes is needed throughout the Northeast to assist with taxonomic concepts and interpretations. **Kinds of data** needed and how it should be obtained are **discussed**. A system of **collecting data** at selected observation posts in **major soil physiographic regions** is proposed.

6. Soil Survey and Related Data Needed for Conservation Planning of Surface Mined Areas.

Surface mining in parts of the Northeast is rather extensive. More land will be disturbed by mining. The committee has identified soil, geologic, and other information needed for conservation planning in these areas. Additional research is needed to determine the validity of current state laws, quality of spoil, and adaptation of plant species.

7. Interpretations of Soil Association Units on Soil Survey Maps.

Presentation and use of soil association interpretations in detailed soil surveys have been troublesome. Ways of forming interpretations were explored; Three-dimensional block diagrams are valuable in demonstrating the interrelationships of component soils. Color is effective in display systems. A national study is recommended for testing user reaction to and comprehension of interpretations of multi-taxon map units.

8. Presentation of Soil Survey Data for Use by Planners.

Natural soil group maps and meso-intensity general soil maps are used in the Northeast to provide soil survey data at an intermediate level of specificity. Both systems are recommended for meeting the needs of users. The general use of ADP in presenting data, specifically the SP17 program, needs further consideration.

9. Soil Survey Research Needs and Priorities.

Agricultural Experiment Station scientists are encouraged to design research projects in the areas of land disposal of waste materials, woodland interpretations, soil potential for crop yields, moisture regimes, crop yields on mine soil, and mapping unit composition. Studies on soil moisture regimes is recommended as a funded regional project.

10. Remote Sensing in Soil Survey and the Northeast In Particular.

Ten states in the Northeast have used or anticipate using remotely sensed data, other than black and white photographs. Color infrared photography is valuable in delineating wet soils, floodplains, and tidal marshes. Several states outside the Northeast are successfully using remotely sensed data in their soil survey programs. Considerable potential exists in helping increase the speed and accuracy of soil surveys.

11. Planning and Meeting Future Needs of the National Cooperative Soil Survey in the Northeast.

A system of evaluating map unit composition and documenting soil survey quality by soil survey area is needed. For maximum utility, the committee recommends that future soil surveys be published on base maps with planimetric base quality.

12. General Soils Map of the Northeast.

A broad plan for developing and the Northeast was prepared. It guide this project. A draft of ready for review by the time of

The steering committee wishes to thank all committee chairmen, vice-chairmen, and conference participants and contributors for a job well done. Ed Cielkosz, AUS, and Ed Sautter, SCS, are Vice-Chairman and Chairman respectively for the 1980 conference. The 1980 conference will be at The Pennsylvania State University in the summer.

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TUESDAY, JULY 18, 1978 - continued

1:00-1:10 p. m            Announcements

1:10-1:30 p. m            Remarks

~~1:30-0:50~~

WEDNESDAY, JULY 19, 1978

8:00-12:00 noon      **Discussion of Committee Reports by the four Discussion groups**

**Group A - PEQUOTI, Shippee Hall**

**Group B - PEQUOT 2, Shippee Hall**

**Group C - ROOM 10, Bishop Center**

**Group D - ROOM 11, Bishop Center**

**(See pages 6, 7, 8, 9, 10, and 11)**

12:00-1:00 p. m      **LUNCH**

1:00-4:00 p. m      **Continuation of discussion of Committee Reports**

4:00-5:00 p. m      **Chairman of Committees 2, 3, 4, and 5 prepare draft of final reports**

THURSDAY, JULY 20, 1978

8:00-8:30 p. m      **Remarks**      **E. J. Kersting, Dean,  
College of Agriculture and  
Natural Resources,  
University of Connecticut**

8:30-12:00 noon      **Continuation of discussion of Committee Reports**

12:00-1:00 p. m      **LUNCH**

1:00-5:00 p. m      **Tour (bus)  
Connecticut Valley Tobacco  
Production**

FRIDAY, JULY 21, 1978

8:00-12:00 noon      **Committee Reports  
(12 committees; 45 minutes maximum per report)**

**FRIDAY, JULY 21, 1978 - continued**

8:00-12:00 noon

Committee #2  
**Use of Soils for Waste  
Management**

**J. E. Witty,  
Chairman**

Committee #3  
**Inventory and Use of Soils  
in Forested Regions**

**W. F. Hatfield,  
Chairman**

Committee #4  
**Soil Potential Ratings for  
Selected Uses**

**O. W. Rice, Jr.,  
Chairman**

Committee #5  
**Soil Moisture Regimes**

**D. S. Fanning,  
Chairman**

Committee #6  
**Soil Survey and Related Data  
Needed for Conservation  
Planning of Surfaced Mined  
Areas**

**R. M. Smith,  
Chairman**

Committee #7  
**Interpretations of Soil  
Association Units on Soil  
Survey Maps**

**R. L. Shields,  
Chairman**

Committee #8  
**Data for Use by Planners**

**S. A. L. Pilgrim,  
Chairman**

Committee #9  
**Soil Survey Research Needs  
and Priorities**

**W. R. Wright,  
Chairman**

Committee #11  
**Planning and Meeting Future  
Needs of the National Co-  
operative Soil Survey in  
the Northeast**

**F. L. Gilbert,  
Chairman**

Committee #12  
**General Soils Map of the  
Northeast**

**E. J. Ciolkosz,  
Chairman**

**FRIDAY, JULY 21, 1978 - continued**

12:00-1:00 p. m	LUNCH	
1:00-4:00 p. m	Continuation of Reports	
4:00-4:30 p. m	Report on National Soil Survey Laboratory	R. D. Yeck
8:00-8:30 p. m	Use of Transect Methods in Quality Control of Soil Surveys	R. W. Arnold

**SATURDAY, JULY 22, 1978**

8:00-9:00 a. m	Business Meeting - Election of Vice-Chairman Plans for next conference Proceedings of 1978 Conference Miscellaneous items	R. W. Arnold
9:00-9:30 a. m	Summary	J. D. Rourke
9:30 a. m	ADJOURN	

### Instructions for Discussion Groups

With some exceptions all participants at the conference have been assigned to one of four discussion groups. (See pages 7, 8, 9, and 10.)

In the pages that follow, you will find Information Sheets for each of the four discussion groups. This information gives the name of the meeting room, the chairmen, vice-chairmen, the members of the discussion groups, the designation of recorders, suggested time guidelines for discussion of the committee reports, and some additional notes.

Each discussion group will discuss each of the nine committee reports. (Committees 2, 3, 4, 5, 6, 7, 8, 11, and 12.) You will note opposite the names of members of the group, the designation of R2, R3, etc. These people will serve as recorders during the discussion of the committee reports. R2 will record for the discussion of the Committee 2 Report, R3 for the discussion of the Committee 3 Report, etc. The R2s, R3s, etc. from each of the four discussion groups will meet later on during the conference with the chairmen of Committees 2, 3, etc. to develop another draft of the committee reports to be given to the entire conference on Friday, July 21, 1978.

You will have approximately one hour to discuss each of the technical committee reports. The technical committee chairmen will be present when their report is being discussed. (See schedule on page 11.)

For this reason you should follow fairly closely the suggested time guidelines shown on the information sheet for your group, and the sequence of committee reports. This will permit the committee chairmen to move from one discussion group to the next and be present when your group is discussing their report.

The discussion group chairman may want to ask the vice-chairman to lead the discussion of some of the committee reports rather than carrying the entire load alone.

Information Sheet

DISCUSSION GROUP

A

PLUQUOT 1, SHIPPEE HALL

Chairman           D. G. Watson

Vice-Chairman    W. R. Wright

(R2, etc. indicates reorder for discussion of report of  
Committee 2, etc.)

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J. T. Ackard (R2)

K. C. Bracy (R3)

D. Carlisle (R4)

F. W. Heinenberg (R5)

W. E. Hanna (R6)

J. S. Patterson (R7)

R. D. Yeck (R8)

D. M. Wells (R11)

J. C. Sencindiver

K. Olson (R12)

D. F. Childs

Suggested time guidelines **for** discussion of committee reports

<u>Wednesday</u>	<u>Committee Rpt. No.</u>	<u>Thursday</u>	<u>Committee Rpt. No.</u>
8:00- 9:00	2	8:30- 9:30	8
9:00-10:00	3	9:30-10:00	7
10:30-11:30	4	10:30-11:00	7
11:30-12:00	5	11:00-12:00	12
1:00- 1:30	5		
1:30- 2:30	6		
3:00- 4:00	11		

Note:

Coffeebreaks: Wednesday- 10:00-10:30 a.m.; 2:30-3:00  
                  -10:00-10:30 a . m .

Lunch: 12:00 - 1:00 p.m each day.

**Information Sheet**

DISCUSSION GROUP

B

PEQUOT 2, SHIPPEE HALL

**Chairman** R. L. Cunningham

**Vice-Chairman** D. G. St-ice

(R2, etc. indicates recorders for discussion of report of Committee 2, etc.)

T. E. Calhoun (R2)

D. L. Yost (R6)

C. F. Eby (R4)

C. H. J. Breeding (R3)

R. E. Hartung

D. E. Hill (R5)

K. J. LaFlamme (R12)

M. O. Wilson (R11)

F. J. Vieira (R8)

**Suggested time guidelines for discussion of committee reports**

<u>Wednesday</u>	<u>Committee Rpt. No.</u>	<u>Thursday</u>	<u>Committee Rpt. No.</u>
8:00- 9:00	3	8:30- 9:30	12
9:00-10:00	2	9:30-10:00	11
10:30-11:30	5	10:30-11:00	11
11:30-12:00	4	11:00-12:00	8
1:00- 1:30	4		
1:30- 2:30	7		
3:00- 4:00	6		

**Note:**

Coffeebreaks: Wednesday - 10:00-10:30 a. m ; 2:30-3:00 p.m.  
Thursday - 10:00-10:30 a. m

Lunch: 12:00-1:00 p. m each day.

**Information Sheet**

**DISCUSSION GROUP**

**C**

**ROOM 10, Bishop Center**

**Chairman**            **J. A. Ferwerda**

**Vice-Chairman**    **W A. van Eck**

**(R2, etc. indicates recorders for discussion of report of  
Committee 2, etc.)**

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Information Sheet

DISCUSSION GROUP

D

ROOM 11, Bishop Center

Chairman H. D. Luce

Vice-Chairman W. C. Kirkham

(R2, etc. indicates recorders for discussion of report of Committee 2, etc.)

R. L. Googins (R2)

J. E. McClelland

L. H. Rivera (R12)

D. A. Lietzke (R5)

H. E. Winkley (R8)

R. F. Shipp (R7)

D. G. Van Houten (R6)

J. R. Vann (R11)

K. Wheeler (R3)

Suggested time guidelines for discussion of committee reports

<u>Wednesday</u>	<u>Committee Rpt. No.</u>	<u>Thursday</u>	<u>Committee Rept. No.</u>
8:00- 9:00	5	8:30- 9:30	11
9:00-10:00	4	9:30-10:00	8
10:30-11:30	6	10:30-11:00	8
11:30-12:00	2	11:00-12:00	7
1:00-1:30	2		
1:30-2:30	3		
3:00- 4:00	12		

Note:

Coffeebreaks: Wednesday - 10:00-10:30 a. m ; 2:30-3:00 p. m  
Thursday - 10:00-10:30 a. m

Lunch: 12:00 - 1:00 each day.

Committee Chairman Schedule

Discussion Groups

	A	B	C	D
<b>Committee Chairman:</b>	<b>PEQUOT 1</b>	<b>PEQUOT 2</b>	<b>ROOM 10</b>	<b>ROOM 10</b>
	: Shippee Hall	: Shippee Hall	: Bishop Center	: Bishop Center
2. J. E. Witty	: Wed. : 8:00-9:00	: Wed. : 9:00-10:00	: Wed. : 10:30-11:30	: Wed. : 11:30-12:00 : 1:00- 1:30
3. W F. Hatfield	: Wed. : 9:00-10:00	: Wed. : 8:00-9:00	: Wed. : 11:30-12:00 : 1:00- 1:30	: Wed. : 1:30-2:30
4. O. W. Rice, Jr.	: Wed. : 10:30-11:30	: Wed. : 11:30-12:00 : 1:00- 1:30	: Wed. : 8:00- 9:00	: Wed. : 9:00-10:00
5. D. S. Fanning	: Wed. : 11:30-12:00 : 1:00-1:30	: Wed. : 10:30-11:30	: Wed. : 9:00-10:00	: Wed. : 8:00-9:00
6. R. M. Smith	: Wed. : 1:30- 2:30	: Wed. : 3:00- 4:00	: Thurs. : 8:30- 9:30	: Wed. : 10:30-11:30
7. R. L. Shields	: Thurs. : 9:30-10:00	: Wed. : 1:30- 2:30	: Wed. : 3:00- 4:00	: Thurs. : 11:00-12:00
8. S. A. L. Pilgrim	: Thurs. : 8:30- 9:30	: Thurs.	: Wed.	: Thurs.

# 1978 NORTHEAST COOPERATIVE SOIL SURVEY CONFERENCE

## OPENING REMARKS

Richard W. Arnold, Chairman

Participants, Visitors and Guests: I now declare the 1978 Northeast Cooperative Soil Survey Conference open and ready to plan work. **Several important things are happening at this conference.** It is the first time that I am aware of that the Northeast Conference has met outside of New York City, and not in the month of January. We have more representation from the Forest Service in the Northeast this time and this gives us a greater sense of solidarity as a Cooperative Soil Survey. We are very fortunate to have people on the program who are willing to share their thoughts and concepts with us. We look forward to their comments and suggestions and are grateful for their participation in our conference.

Whether you are an old-timer or a newcomer to these conferences, I want to take a moment to point out our purpose. In the by-laws adopted January 16, 1976, we have said and I quote, "The purpose of the Northeast Cooperative Soil Survey Conference is to bring together representatives of the National Cooperative Soil Survey in the northeastern states for discussion of technical and scientific questions. Through the actions of committees and conference discussions, experience is summarized and clarified for the benefit of all; new areas are explored; procedures are synthesized; and ideas are exchanged and disseminated. The conference also functions as a clearing house for recommendations and proposals received from individual members and state conferences for transmittal to the National Cooperative Soil Survey Conference."

The objective of this 1978 conference as suggested by your executive committee is to address several major items that we feel confront the Cooperative Soil Survey in the Northeast now and in the near future. These items are: (1) to complete the field mapping of all private and non-federal land and, in cooperation with the U. S. Forest Service, that of federal lands, and (2) to update previously published soil surveys that are inadequate for one reason or another for present day needs in resource conservation planning.

Can we really make this a conference to assist ourselves to plan work for preparing adequate soil surveys in the Northeast? What do you think? I think that experts in pedology are truly exceptional people. You are not possessive of your ideas and concepts. You are dedicated to understanding the environment. You are humanitarians with a genuine concern for the world community. You are unselfish with your time and talents, and you certainly are not afraid of hard work.

We are here together as specialists in pedology and related disciplines. We do not have to impress each other with the significance of our work; we already know this. Consequently, I charge each of us to give our best effort during these several days to evaluate what needs to be known and to developing approaches for obtaining this information. Our sincere thanks to each of you for playing a role in this conference's strategy for providing efficient and effective soil surveys that are reasonable for the needs as they are foreseen.

## CONNECTICUT'S RESOURCES

Dick Arnold, Kenneth Wilson, and members of the Northeast Cooperative Soil Survey Conference. It's a pleasure for me to be here this morning to help open this conference. Ken Wilson has given you a gracious welcome to Storrs, and the University of Connecticut. I want to share with you some of the facts about Connecticut's resources, their use, and a few highlights related to the management and protection of our resources.

First I'll give you an overview of the state. Connecticut, as you know, is one of the original 13 states. It was settled in 1633. Although we are the third smallest state, with an area of only 5,009 square miles, we rank fourth in population density.

Dairy farming is the leading enterprise. In 1977 there were about 870 dairy farms, with a return of \$67 million. Milk produced on these farms supplies nearly 40 percent of the milk consumed in the state.

Poultry farming consists of both broiler and egg production. There are over 4.5 million laying hens. These birds furnish Connecticut residents with 90 percent of their eggs, and the broilers furnish 95 percent of the poultry. Poultry provides \$61 million gross income to Connecticut farmers.

Tobacco production is concentrated in the Connecticut River Valley (extending into Massachusetts). Those of you who have not seen this area will have an opportunity on the field trip, and by the way, in that general area there is a farm that was originally settled in 1633 and is still being farmed today. Shade tobacco is grown under netting and is produced in only a few areas in the United States. Approximately 3,400 acres of shade tobacco and 1,250 acres of broadleaf tobacco were produced in 1977. Tobacco is a \$30 million industry.

Other crops include nursery stock, potatoes, sweet corn, and fruit. The entire gross of the agricultural industry is about \$230 million. One other interesting fact about Connecticut's agriculture is that little or no grain is harvested, corn is used for silage and small grains are not grown.

Physically, Connecticut can be divided into four broad areas or regions.

- The western highlands are the most rugged section of the state, with several hills over 2,000 feet high. The highest point is 2,335 feet above sea level. The area is heavily forested and very scenic, dotted with many colonial villages and dairy farms.

- The flat central lowlands of the Connecticut River Valley has productive soils with few limitations. Major crops are vegetables and tobacco. Here is where much of the urban development is taking place also.

- The eastern highlands, also wooded, are not as rugged as the western highlands. The area is very scenic, with many historic sites and tourist attractions. Agriculture consists primarily of poultry and dairy farming.

- The coastal area is an important natural resource. The jagged and irregular shoreline has a variety of small bays, inlets, estuaries, harbors, and bays. The many beaches and shallow off shore areas are important sources of seafood. Located on the Thames River, near Long Island Sound, are the submarine base in Groton and the Coast Guard Academy in New London. A very popular tourist attraction on the Sound is the Mystic Seaport, which some of you may want to visit.

I will now briefly highlight some of our program activities. The Soil Conservation Service has eight field offices in Connecticut, which furnish assistance to Connecticut's eight soil and water conservation districts.

We are providing you a copy of the "Connecticut Resource Conservation Report" which outlines our major activities, including technical help to landowners, water resource programs, resource conservation and development areas, and the soil survey.

In the interest of time, I'll talk about the Cooperative Soil Survey Program, and highlight some of the items in the Connecticut soil survey. It should be noted that the 1960 survey of the

Priorities for soil surveys in the early days were based primarily on the farming areas of the state. As a result, the highly urbanizing areas, such as Fairfield County, did not receive the benefits of a modern survey until only recently. In fact we have just completed mapping in Fairfield County.

Currently over 90 percent of the state is mapped, with three of the eight counties having published surveys. Two more will have published surveys in a very few months. All field work in the state will be completed by 1960.

Local and state funding to accelerate soil surveys has been exceptional in Connecticut. We are proud of the local interest. During the last five years, about one third of the soil survey budget has come from local or state funds, with a high of about 40 percent, one year.

There is strong interest in soil surveys by a wide variety of

Connecticut has two major pieces of legislation that affect the resource use, and the use of soil surveys. In 1972, the "Inland Wetlands and Water Courses Act," required the regulation of the use of inland wetlands, floodplains, and watercourses.

The Act requires the use of the soil survey to identify and delineate the wetland areas. All poorly and very poorly drained soils, and all floodplain soils are considered wetlands under this legislation.

Naturally, there has been considerable involvement of our personnel in helping make the Act work. I believe it is fair to say, however, that overall it is working well. It has certainly put the spotlight on the soil survey and its potential.

The second act passed by the state legislature this year is one to preserve farmland. The act provides a \$5 million pilot program to purchase development rights on farmland. This is a voluntary program and when the farmer offers land to the state for purchase, an evaluation will be made; The soil survey will be used to help determine which farms are to be purchased.

In addition to these two Acts, several towns have included soil survey information in their town regulations.

I want you to know about the cooperative working relationship that we have between numerous agencies and organizations. One of the unique features of the Cooperative Soil Survey in Connecticut is that we work with two experiment stations. The Connecticut Agricultural Experiment Station in New Haven and the Storrs Agricultural Experiment Station. Our partnership with these two stations has been outstanding and we are producing, I feel, a product which will be useful for the residents of Connecticut for many years to come.

Another area of cooperation has been the student intern program with the Geography Department here at UCONN. This arrangement is especially helpful in preparing soil maps for publication. The students work a minimum of 16 hours per week in our office on compilation and map finishing activities. This provides on-the-job experience for which they receive 6 hours credit. SCS provides training and in turn receives soil survey publication assistance. Three students worked with us during the spring semester.

Other student internship programs have also been used. For example, students majoring in natural resources have done field soil mapping. We also use soil conservationists in various district programs. We have two this summer. We've had a biology intern program for biology students and for the last two summers we have had a UCONN student from the Ivory Coast who has been with us for about a month each summer.

In closing I want to use this opportunity to pay special tribute to Dr. Hugo Thomas, Director of the Natural Resources Center, of the Connecticut Department of Environmental Protection. We especially recognize Hugo's help in obtaining state funds the past six years to speed up the completion of the survey and for his many efforts in promoting the use of the soil survey.

I also want to express my appreciation to Ed Sautter for his leadership in our soil survey program during the past six years. He has done an exceptional job.

Thank you for your attention and if we can be of help during the week, please let us know and feel free to stop by our office on Route 44A in Mansfield. Have a good conference.

Thank: you.

Northeast Cooperative Soil Survey Conference  
University of Connecticut  
Storrs, Connecticut  
July 11, 1978

Current Items of Interest From the TSC

I welcome the opportunity to wet with the Northeast Cooperative Soil Survey Conference this week in Connecticut. I am one of approximately seven speakers giving talks entitled "Remarks." Fortunately for me, I am the first speaker on this subject and I have the freedom of covering a vast area, which may be infringing on some of the other speakers. However, I do have six or seven points I would like to cover.

1. There are some funds available for additional aerial photography or imagery for the Northeast States. The state soil scientists should let John Rourke, Head of the Soils Staff at the TSC, know their priority for additional imagery as soon as possible, in order that these priorities can be given to Washington and contracts for additional aerial photography can be let by Cartographic before the end of the fiscal year.

Theoretically, we should be able to obtain this priority from the CASPUSS scheduling; however, the Cartographic schedule for CASPUSS has a column headed "New Base - Imagery" which does not have any projected dates for ordering imagery setup for the Northeast States. The CASPUSS schedule reflects only those dates on which imagery was ordered. The states, when updating their CASPUSS schedule, should indicate their proposed ordering dates for imagery. This would facilitate the scheduling of imagery when additional funds become available, as happened this year.

2. My second item has to do with the MAG card reader/writer, or the "black box."

The Soil Survey Editorial Staff at Glenn Dale, Maryland, recently released a MAG card reader/writer, which can "read" soil survey manuscripts typed on IBM MAG cards in SCS state and field offices and "write" them on the discettes used by word processors.

Pat MacPherson, Chief of the SSES, reports that so far conversions have been smooth and that word processing time in her shop has been reduced. Use of this equipment should help increase the

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Presented by Arthur



number of soil survey manuscripts that can be processed annually. It has been estimated that use of this system saves about one-third of the time used in keyboarding manuscripts into the Linolex.

The States of Maine, West Virginia, Pennsylvania, Connecticut and Vermont have IBM typewriters that can type MAG cards for this reader/writer. Virginia is in the process of going to a word processing unit, and we have encouraged them to consider the IBM system. States using the IBM word processing system can greatly facilitate and expedite their publications.

States having this equipment and wishing to incorporate it into their procedures should contact Jim **Giuliano** at the Northeast TSC for details on formatting the material in order to minimize keyboarding into the Linolex. If your clerical staff should encounter any problems in keying a manuscript on the cards, or if you have any questions regarding the MAG cards and conversions of the cards to the Linolex disc, contact Jim.

3. My next item has to do with "Rating Soil Limitations for Off-Road Vehicle Trails."

Our Washington office has been working with the Corps of Engineers, at their request, in developing guides for rating soil limitations for off-road vehicle trails. There has been considerable public pressure to utilize government military reservations for off-road vehicle trails. The military are interested in providing this recreation facility, but are also concerned about potential erosion problems.

The Washington office has informed the Corps that if they have questions, they should contact the SCS state soil scientist. If a military reservation or the Corps contacts you, please get in touch with John Rourke. He will give you guidance on rating soils for off-road vehicle trails.

4. My fourth item concerns prime farmland legends.

Northeast TSC Advisory LIM-6, dated July 10, covers this subject pretty thoroughly. We requested the states to prepare a listing of all their prime farmland legends and submit them to the TSC. We encourage you to send this to the TSC as soon as possible. Several states have already submitted them. Using the definition of prime farmland, we have been reviewing the lists for adequacy and completeness.

In the TSC review of these lists, we [REDACTED] found that in some instances mapping units are listed that fall [REDACTED] the limits of [REDACTED]



the criteria for prime farmland. We fully understand why, in some situations, this is possible. It can be due to one of several reasons; included among these would be: (1) the dominant condition on the landscape is narrower than that indicated by the name of the mapping unit; and (2) a particular soil characteristic, significant to the definition of prime farmland, is outside the range given on the latest approved series description and/or coordinated Form-5. (The latter is an indication of a need to update the description and the Form-5.)

If any of the mapping units on your legends do not fit a strict application of the definition for prime farmland, you should state on the legend that some parts of the mapping units listed may fall outside the range of the prime farmland criteria, but that the dominant conditions on the landscape are within the limits given for prime farmland. Document these mapping units by stating which part of the mapping unit falls outside the limit and the proportions of this for mapping units as a whole.

5. My next item concerns the cadmium-lead study which the SCS is undertaking in cooperation with the Food and Drug Administration and EPA.

Assistant Secretary Cutler has given SCS the task of sampling approximately 6,000 sites across the United States, where vegetables and food are being grown, for the purpose of determining cadmium-lead levels. The cooperative SCS, SEA-FR, EPA and FDA study was authorized by Dr. Cutler on May 26, 1978. EPA and FDA need the background levels of cadmium-lead and other metals to set maximum limits of these metals in edible crops and in soils to which sludge is applied.

The study is to start in fiscal year 1979 and continue through fiscal year 1982. All analytical and most equipment costs are to be paid by FDA and EPA. The SCS is to pay for all permanent employees' salaries and travel expenses. Areas of responsibility have been assigned to the following individuals:

- R. B. Daniels - study planning and coordination
- M. W. Meyer - training sessions and sampling quality control
- C. S. Holzhey - soil analysis and interpretation
- J. Kubota - interpretation of plant analytical data

An advisory signed by Mr. Davis describing the cadmium-lead study is going to each state conservationist whose state is involved in the study. The six participating states in the Northeast are Maine, Maryland, New Jersey, New York, Pennsylvania and Virginia. Specific soils and crops have been determined and assignments are being made

to designated sites in these states for the sampling process. Details for sampling and the equipment to be used will be sent to each state prior to the sampling date. It is very important that the crops be harvested as they are maturing to get the best information from this study.

6. My next item has to do with the Advance Mapping System or AMS. The final acceptance tests of the AMS hardware and software were completed June 26. The system meets SCS contract specifications and processes 24 soil survey map sheets in eight hours.

The automatic mapping system was moved to the Glenn Dale office to provide facilities for proper temperature control, since the facilities at Hyattsville could not control the temperature at less than 80 degrees. The move was completed on June 8 and production plans for AMS are as follows:

- a. Complete Pennsylvania watershed work
- b. Complete preparation of press-ready negatives for Rhode Island
- c. Complete important farmland maps for eight counties for I&M Division
- d. Full production in entering soil data and preparation of interpretive maps by October 1, 1978, after AMS is fully staffed

7. My last item concerns long-range planning and multiyear plans. It is imperative that you work with your state conservationist in developing the long-range plan for soil surveys in your state. The budgeting process now covers a five-year period, which includes the past year (as history), the fiscal year we are currently in, the upcoming budget year, and two years for planning in the future.

Your annual soil survey plan of operation and long-range soil survey plan need to be kept up to date to facilitate this long-range planning. The budget will be prepared based on work analysis and the information you submit to Washington in the future.

It is important that all areas to be surveyed are reflected in your plan and that there be a plan for completing the surveying in your state, fully recognizing that there will be adjustments as time goes by. However, each soil survey area should be scheduled for completion and so reflected in your long-range plan. This will be a major basis for the CO-02 budget in your state.

Again, I appreciate having the opportunity to be with you this week. Thank you.

The soil survey of the United States has reached a critical phase. We have mapped about 65% of the land area of the Nation and probably 75 to 80% of the important farmland, and important urban growth areas. For the first time we can start to make plans for completing the once-over mapping of the Nation.

We are under great pressure to get the job done. This is reflected in nothing more than the large non SCS contributions to soil survey. In N 1978 about 20% of the total funds for the National Cooperative Soil Survey came from sources other than SCS. Among the Federal agencies, the Bureau of Land Management is committed to obtain soil surveys for **130,000,000** acres of public lands in the West during the next **10** years. The Forest **Service**, through RPA, is committed to **an adequate resource** inventory by 1985. In addition, many states and local governments are contributing to soil survey. In a number of states, SCS has formal agreements with state governments to complete the soil survey of the state within a relative short and prescribed period.

Our challenge now is to deliver soil survey information in quantity and of continuing exceptional quality.

A Plan to Complete the Soil Survey of the Nation.

We are working on a coordinated plan to complete the soil survey of the **Nation**. We are planning to decrease gradually our resources in soil survey in those states in which mapping is nearing completion. We expect to move funds and manpower from these states to those that have yet a large amount of work left to do. We have to set priorities and weigh the needs for remapping in intensively used areas against first mapping in other, perhaps economically not so important, areas. At the same time we have to retain staffs that will assist SCS and other agencies in the application of soil survey information.

Increasing Soil Survey Production.

There are great opportunities for increasing the number of acres mapped per staff year. **Much** of the lands that remain to be mapped are less intensively used and requires less detailed soil survey information than many of the lands for which mapping is completed. Our challenge is to design soil surveys that meet foreseeable needs but that **are** completed more rapidly than some of the soil surveys in the past. We have to turn around some of our soil scientists who have made very detailed soil surveys during most of their career and to teach them techniques that are appropriate for less intensively used areas. Traditionally, there have been large differences in productivity among soil survey areas and among states. Some of these differences can be explained in complexity

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1/ Remarks by Dr. Klaus W. **Flach**, Assistant Administrator for Soil Survey, SCS, Washington, DC, at the Northeast Cooperative Soil Survey Conference, Storrs, Connecticut, July 1978.

of the soil pattern and differences in mapping intensity. But some must be attributed to differences in efficiency in management and skill of mapping. Our goal now must be to bring all soil scientists to the highest possible competence. In most cases, no great changes can be effected in ongoing soil surveys. But there are great opportunities in new soil surveys. For example, a 3rd order soil survey of the unincorporated towns in Maine progresses at the rate of about 100,000 acres per **staff**-year in spite of the very short mapping season.

In the Western United States we are planning on soil surveys of extensively used range land where a five-man soil survey party will map about **1,000,000** acres per year. We can also take advantage of new technology. The use of helicopters can decrease access time and can increase the efficiency of mapping. Helicopters can be cost effective in spite of very high hourly operating costs. We are also increasing our use of infrared and color imagery and we have made some progress in using digitally scanned material such as is provided by **LANDSAT**. There is, however, no single tool and no single management technique that promises a major break through in productivity. Rather, progress primarily has to come from professional soil scientists working in well managed soil survey parties that successfully employ the right mix of skills and technology.

It cannot be stressed enough that all **soil** surveys we make have to meet the operational needs of our primary users. A 3rd order soil survey mapped at the rate of 100,000 acres a year must be as adequate for its intended uses as a very highly detailed 2nd order soil survey that is produced at a rate of 20,000 acres per year. However, much more than in the past, users of soil surveys must realize that not all soil survey data can be reflected in delineations on a soil map. They have to learn to use the map in conjunction with descriptive material. This need is most obvious for 3rd order soil surveys but a case can be made that it is equally strong for detailed interpretations of 2nd order soil surveys.

#### Soil Survey Publications.

In order to assure full use of all soil survey information, we have to strive continuously to improve the quality of our publications. Soil surveys, like any other resource inventory, have to generalize the complexity of the real world. We have to do a better job in telling our users just how we generalize and how this affects the uses that can be made of soil surveys.

Soil surveys contain three kinds of data: descriptions and data on pedons, descriptions and data on **taxonomic** units, and descriptions and data on mapping units. In addition, they contain interpretive information for each of these kinds of units. But I don't believe, that in our present reports, we are making enough of a distinction between these three kinds of data.

A good soil survey is one that provides good documentation of pedon data, taxonomic data, and mapping unit data. In such a soil survey the typical mapping delineation and the maximum contrasting mapping inclusion that is not shown in the map has a **meaningful** relationship to the typical management unit for important uses. Dr. Fred Miller recently published a" excellent paper on the use of soil surveys in the Journal of Soil and Water Conservation, Soil Survey Under Pressure: The **Maryland** Experience, May-June 1978. My only disagreement with this paper lies in the fact that he equates quality of a soil survey with purity of mapping units. A high quality soil survey is one that gives useful information at a" appropriate level of generalization. The detail that would be necessary to have pure mapping units in very highly complex areas would be confusing to most users. Indeed, the soil survey with the least utility might be one that is completely correct.

#### Quality Control.

For the purposes of this paper I am defining quality control as making sure that every soil survey meets its purpose. The responsibility for quality control rest primarily with the soil scientist in the field and much less so with state offices, technical service centers, and the Washington office.

These offices can assist and coordinate, but they can do relatively little to improve on a" inadequate basic survey. In order to have useful soil surveys and meet our production goals we have to delegate as much authority and responsibility as close to the field as possible. We have to be certain, however, that each member of the soil survey staff at all levels fully accepts this responsibility. And I am concerned that we still see too much evidence that responsibility is not being assumed at the proper level. There are still too many party leaders in the field and staffs at state offices that assume that the TSC or the Washington office will find the mistakes and correct them.

I" particular, too many people assume that quality control in soil survey is the responsibility of the technical service centers. As we have increased the number of soil surveys completed per year, from perhaps 30 or 40 ten years ago to nearly 100 today, we have not expanded the soils staffs at- the technical service centers accordingly. Rather, we expect the state offices and field offices to assume the main responsibility for quality control. Technical service centers should check, they should coordinate, they should coach and perhaps they should threaten but they cannot do quality control for states.

The increased responsibility will provide these states with more opportunities for trying out new things and for developing new ideas in presenting soil survey information. Obviously, with our current workload and our limitations on staffing in our editorial staff, we have to continue to standardize our reports and expand the use of prewritten material. At the same time we must not stifle new ideas and we must not stop the gradual evolution of a product that meets new and changing conditions. We cannot make each soil **survey an** original piece of art but we also cannot afford to have a production line that produces only black Model "T" s."

## A Glimse at the Future.

As we approach completion of once-over mapping, we have to reevaluate and restate the goals of soil survey. Eventually, the soil survey must be a comprehensive source of information for all aspects of the Nation's soil resources. In many ways we have, so far, only done a bare minimum of defining and describing what is within the areas around which we have drawn lines. As we use our soil resources more intensively, and as our concern for the environment increases, our knowledge of soils and **our** skills in using soils wisely has to increase accordingly. At the Federal level we have started some of these refinements of soil survey. In the inventory phase we have started a heavy metal survey to provide a base level against which heavy metal pollution from waste disposal and other sources may be judged. We have started a soil moisture project to increase our skill in predicting the likely effect of drought on agricultural production. In the area of soil survey interpretations we are moving ahead with developing soil potential ratings and we are conducting a comprehensive study to assess the potential of **our** soils to serve as a depository for organic waste.

These efforts are just a beginning. More sophisticated soil **resource** inventories and soil survey interpretations will require the close cooperation of many disciplines. The State **Experiment** Stations are ideally suited for this interdisciplinary work. Hence, they play a key role in advancing the art and science of soil survey. Close cooperation among those responsible for making and using soil surveys is essential. The work planning conferences of the National Cooperative Soil Survey are the key to the effectiveness of this cooperation. I wish you a successful conference this year and in the years ahead.

Remarks: John E. McClelland, Director, Soil Survey Classification  
and Correlation, SCS

NE Cooperative Soil Survey Conference  
History of soil Survey Work Planning Conference

Work planning conferences of the national soil survey have been held at least since the early 1940's. Prior to 1948 annual meetings of the soil survey inspection staff were held to plan soil survey activities and to discuss soil survey procedures. Most of the participants were soil scientists from the Bureau of Plant Industry, Soils, and Agricultural Engineering and collaborators from agricultural experiment stations. From 1948 through 1952 the conference was named Soil Survey Work Planning Conference, but the participants were predominantly from the USDA. In 1953 the conference was renamed "Technical Work Planning Conference of the National Cooperative Soil Survey". This name is used today although sometimes it is referred to as The National Soil Survey Conference. Regional conferences have been meeting at least since 1955. Through 1965 the national meetings were held annually and thereafter biennially.

Prior to 1951 when the current Soil Survey Manual was published, much of the work of the national committees was devoted to modernizing the 1937 Soil Survey Manual. After that time national committees discussed criteria for describing, classifying, and mapping soils and needs for additional criteria. In general each regional conference had counterpart committees where pertinent. While the recommendations of the national conference have not always been incorporated in national guidelines, they are the basis for many changes that have been made.

There are no specific rules governing the relationship between regional and national work-planning conferences. Actually the name is really not appropriate because most "planning" is done at State work-planning conference?.. Some committees of the regional and national conferences discuss the same subjects, but most regional committees have topics of regional interest. For example, only 2 of the 11 committees of this conference have charges similar to those of national committees. This is to be expected because all States including major cooperators participate in regional planning conferences whereas national offices of various cooperators and regional, state, and international representatives participate in the national conference.

Updated Procedures  
for  
Soil Taxonomy

Soil Taxonomy was not published until the end of 1975, but copies of the galley proofs were distributed in October 1973, and a few changes have been made since that time. Procedures for amendments were attached to Advisory SOILS-26, 11/5/74. Because of organizational changes and experience we are now in the process of amending the procedures.

At the present time there is a quick procedure for making minor amendments to the system. Then there is a lengthy review process for those amendments that change the classification of known soils or modify existing definitions. The procedures that will be amended cover those proposals for additions to Soil Taxonomy that amplify incomplete definitions or provide subdivisions of classes for which little information was available at the time Soil Taxonomy was written.

The amended procedures provide for a less time-consuming review process for proposals for more complete definitions or for classifying soils not previously known to the authors of Soil Taxonomy. These proposals can originate anywhere but must be supported by descriptions of the soils and definitions.

Remarks About Soil Survey Manual, John E. McClelland  
Director, Soil Survey Classification and Correlation

Jack McClelland discussed the revision of the Soil Survey Manual. As chapters are revised and edited they will be distributed and tested in the field before the book is republished. The current Manual still is a very useful book and most changes are to take care of the new technology.

Because nearly half of the country is covered by modern soil surveys, either published or in the process of publication, the question was raised whether changes such as revised horizon designations should be introduced. These would follow the international horizon designations, although not exactly. By a show of hands most delegates indicated that they would prefer to change even though our current designations can be equated easily to the revised designations. It was pointed out that examination of the horizon designations will indicate whether the revised horizon designations or the current designations are used unless **no** change in meaning results.

THE COOPERATIVE SOIL SURVEY IN CONNECTICUT  
PAST DEEDS ADD FUTURE HOPES

David E. Hill

The soil survey has been a part of the Connecticut scene for 80 years. One of the first surveys by the U.S.D.A. Division of Soils **was** completed and published in 1899 by **Dorsey** and Bonsteel. The objective of the survey was to **investigate** and map different kinds of soil for **growing** tobacco in the Connecticut Valley. The survey took only **3-1/2** months to complete. The soils **recognized** were only 10 in number and most of the names, **Windsor, Enfield, Hartford, Podunk, Elmwood, Holyoke**, remain **today** in our state **legend**.

The early surveyors were, of **course**, **geologists** so that **mapping** had a **strong geological** bias but their observations of soils and their properties were very astute and **the beginnings**

interpretations were crude by today's standards but they were a **start**. Soon we rated all mapping units **according** to their **slight**, moderate, or severe limitations. These interpretations identified specific problems that were associated with specific **mapping** units and were intended to impart a word of caution to the users of soil. Today our interpretations are **shifting** from a defensive **to an** offensive position. We are now thinking in terms of soil potential, end soils are rated **according** to the effect that **management** practices can be used to improve the soil to allow a specific use. Thus, we now stand at the threshold of a more useful way to provide soil survey information.

This brings us to where we are today in the soil survey. In Connecticut **mapping** is nearly complete. Three surveys have been published, three others have been completed and under various **phases** of the publication mill and in the **remaining** two, the field work is **90-95%** complete. Although mapping will soon be done, the work of interpretation **goes on and** with it the research to improve our interpretations or make new ones. Our new thrust into the realm of soil potentials is timely for it allows **us** to better evaluate alternative uses of land and alternative management practices to achieve a particular use of land. Some are skeptical about **identifying** specific engineering practices that can overcome specific soil limitations. They say that such information will only lead to greater pressures on the use of land for development. Of course, they may be **right** but under the present mood of **environ-**mental awareness this

maps to **segregate** different mapping units. For example, our inland wetland laws for Connecticut are based on lines drawn on soils maps by the National Cooperative Soil Survey. So also, new **sanitary** codes are being developed in Connecticut which identify "**areas** of concern" that are based on soils which have severe limitations for septic tanks. The new codes place restrictions on the timing of percolation tests and deep hole observations used for septic tank design and require special design of systems to be **placed** in those soils. The use of soil survey information in environmental law requires soil scientists to be as precise as they can and be constantly on **guard** against misuse of soil survey information. Continued acceptance will depend upon **today's** performance.

**But** what of the **future**?

The need for soil mapping will not terminate after the Current survey has been completed. There will be a continual need for special surveys in areas that are environmentally sensitive, **especially** where complexes are currently mapped at the present scale. Improved accuracy of soil boundaries **will** undoubtedly be required in some **areas** where environmental laws are brought to bear on **development** activities.

Advocacy of the soil potentials in the interpretative scheme requires that research

as needed. Those who seek soil survey Information should receive it promptly and by staff members who are highly competent and know the soils they are dealing with.

In summary, we have come a long way in 80 years in our understanding of soils, and the ability to classify and interpret them for others who use them. Research must continue to improve our interpretations and to meet the demands of new unforeseen uses for they surely shall arise and challenge us.

THE USE OF SOIL SURVEY IN CONNECTICUT  
Hugo F. Thomas

(Presented at the Northeast Cooperative Soil Survey Conference)  
(Storrs, Connecticut, July 18, 1978)

Thank you for the opportunity to share some thoughts with you on the use of the Soil Survey in Connecticut.

Allow me to preface my remarks with a brief identification of who I am and what the Connecticut Natural Resources Center is about. I do this to establish a sense of creditability as to some knowledge of the field as well as a Perspective of the Connecticut user.

I taught at the University of Connecticut for nine years in the Geology Department before joining the Department of Environmental Protection and forming the Natural Resources Center. My area of concentration at that time was sedimentation and stratigraphy, although in my last years at the University I broadened my course offerings and research into the application of my field and the related earth sciences - to land use problems. This move from the more traditional academic position of the day was largely a result of my personal involvement as Chairman of a town conservation commission, member of the Eastern Connecticut Resource Conservation and Development project, and town Councilman.

In 1968 I joined with our colleagues from other disciplines to form the Connecticut Geology-Soil Task Force, an ad-hoc group of natural resource scientists and planners organized to encourage greater collaboration and understanding among the specialists who were responsible for the collection, interpretation, and use of information on natural resources in Connecticut. The activities of the Geology-Soil Task Force culminated in the 1972 publication "Use of Natural Resource Data in Land and Water Planning" by the Connecticut Agricultural Experiment Station and edited by David Hill and myself. (I assume that many of you here today are familiar with this publication through past presentations made by Dave at your New York meetings.)

That publication coincided with the reorganization of some 15 units of state government into the Department of Environmental Protection and was essentially the impetus for the formation of the Natural Resources Center. The first Commissioner of Connecticut's Department of Environmental Protection, Dan Lufkin, considered the work of this ad-hoc group and concluded that the state needed a single unit responsible for establishing an integrated resource data base and a delivery system to appropriate land use decision makers.

Based on this charge, we formed the Natural Resources Center to provide for the state assemblance of basic data inventories from the various elements of the natural resources system (i.e. topography, soils, geology, hydrology, biology, and atmospheric). The Center also serves to coordinate the Connecticut activities of the appropriate federal agencies (i.e. SCS, USGS, Fish and Wildlife, Bureau of Mines, etc.).

A companion effort to the data collection unit is the data dissemination and technical assistance unit. The effort of this unit is multi-faceted and includes natural resource directories, user workshops, participation in the Connecticut environmental review teams, and a map-report library service which serves as a central depository for all published and open-filed natural resource information.

For us, **our association with the soil scientists is working in Connecticut has been a first-class experience and I hope the feeling has been mutual.** Since 1973 we have **added \$60,000 a year of state money to the detailed mapping program in Connecticut in order to accelerate the completion of this valuable tool.** **And as you have heard, Connecticut is now about 95% of this goal.** **As a matter of fact, Connecticut is indeed fortunate to have completed or nearly completed all basic resource map inventories.** **No other state has the same completeness of natural resource inventories to as large a scale as Connecticut (1:15,000 to 1:25,000).**

The state's perception of **the value of the National Cooperative Soil Survey is evident in not only its willingness to fund the acceleration of the inventory, but in its adoption of enabling legislation and regulations specifically identifying the use of the survey.**

**For example, Section 8-2b of the Connecticut General**

revisions to

Under a section entitled Disposal of Sewage in Areas of Special Concern, it reads in part - "Areas with a minimum soil percolation rate faster than one inch per minute or slower than one inch in thirty minutes, or maximum ground water less than three feet below ground surface, or ledge rock less than five feet below ground surface or soils with slopes exceeding twenty-five percent, or consisting of soil types interpreted as having severe or very severe limitations for on-site sewage disposal by the National Cooperative Soil Survey of the Soil Conservation Service, or designated as wetland (which is also a soil definition) shall require special concern in the investigation and design for subsurface sewage disposal. It then goes on to describe what must be done if in such an area.

In the same document, the section on Procedures for Issuance of Permits of Subsurface Sewage Disposal Systems in part states: "For this purpose, information shall be available at the local health department or town offices relative to public water supplies and watershed areas, designated wetlands, soil classification maps, and projected schedules for public sewer extensions."

**In addition, the proposed application form attached to this draft code revision includes a line to be filled in entitled: SCS Soil Classification.**

**In Connecticut, municipalities use and our statewide workshops teach the use of the soil survey and its interpretation for the development of Master plans, the identification of concerns in plot plan submissions, and in the preparation for on-site reviews.**

**Now with the breast beating and back patting over - let me aim my remarks at several problem areas that might stimulate discussion in your work sessions this week. These problems center around the availability of the soil survey; its format; the question of statewide consistency and standardization; and a method for update, and the evolution of interpretative use of the soil survey.**

**Again I reiterate that I have the utmost respect for you and the job being done, These are problems inherent in any program of this nature. I recognize that to various degrees they are being addressed and that we must shoulder the responsibility for some of the solutions as much as you. But you are the experts and must advise us as to what can be done to make the survey most useful.**

**On the subject of availability, I have already documented the heavy regulatory and land use decision too! commitment this state has made to the National Cooperative Soil Survey.**

**In Connecticut, every municipality, every developer, every consultant must have access to the basic inventory of the soil survey if they are to be in compliance with the regulations just cited. However, what is the status of the availability of the survey in Connecticut? True, 95% has been field mapped. But as recently as 1973, only five years ago, less than 80% was field mapped, yet some of these statutes were**

majority of the books (1953), only 3 of 8 counties are published. All three are out of print and the oldest, Hartford County, was mapped when the field orientation and classification was more reflective of an ag-cultural use mission than the modern broad land use mission. In other words, mapping and classification has evolved but the published survey for this county reflects only the thinking of the time of publication.

Of the 169 town composite photomosaics for the entire town may exist for about 70 towns with often questionable content and replication of the field sheets or published survey map sheets by sources outside the Soil Conservation Service. Where one must rely on field sheets only, they are essentially available out in three or four locations: the SCS district field office, the state SCS office, the Experiment Station, and the Connecticut Department of Environmental Protection. Reprints are time consuming to obtain, costly, and contain field symbology often unfamiliar to the non-soil scientist user. In fact, field symbology can differ from county survey to county survey.

In Connecticut we have sold the user on the need for the soil survey as a tool that he should routinely use, state and local government has even mandated that it be used, but we are falling short in getting it to him in a timely, effective, and efficient manner.

We must have rapid publication of soil survey and make composite maps available to users as soon as possible. I realize that the Soil Conservation Service has accelerated its effort for county survey publication, but perhaps an open-file of interim documentation of the maps can be made available immediately following county correlations and compilations so as not to rely solely on field sheets until the formal published survey is available.

On the issue of form - the soil survey when used alone as a sole source, natural resource tool for such things as farm conservation plans and site reviews by the district conservationists was suitable to the traditional soil survey scale, base, or boundary.

However, today it is not one ingredient in an attempt to describe and understand the total natural resource system, processes, and functions at and surrounding the site of a proposed or existing land use activity. Attempts are routinely being made to integrate the soil inventory with topographic, geologic, hydrologic, biologic, and existing land use inventories.

This is particularly true in Connecticut where these other inventories are as available as the soil survey.

Scale and boundary can be adjusted within the limits of accuracy of the respective map standards. (Although the issue of scale and boundary change itself is a constant battle with users who want to change any and all inventories to plot plan size.)

However, proper reformatting of scale and boundary for integration with other inventories are not possible unless the soil inventory is converted over to a planimetric base. The problem of the soil survey of Connecticut being on field photographs or a photomosaic base is the biggest hindrance to multiple resource inventory integration and is becoming increasingly more serious.

Not only does this limit the use of the integration with other inventories, but through ignorance of the problem or a disregard for the problem, there are more and more incidents of misuse by the soil science



For example, at least one of the 15 regional planning agencies (and likely more) recently computerized by cells a land use inventory with a wetland inventory (as well as other data). Remarkably, the wetland information is derived from the soils maps in Connecticut. We questioned them on how the problems of base adjustment were overcome. The response was that the maps were photographically changed and this was not a problem. With continued questioning it was admitted that in many cases areas designated as wetlands overlaid with urban structures and other conditions known not to be wetland but it was just assumed that a mistake was made in the field mapping by the soil scientist and the wetland was erased.

Another regional planning agency with a similar project indicated that they used their own planning personnel to convert the soils maps to a planimetric base. In a third case the response was that we know its not accurate but is good enough for our purposes. It may be good enough for their purposes but believe me, it soon gets in the hands of other users without qualifying statements and it doesn't take long for a challenge as to the creditability of the entire soil survey.

Even beyond these examples, the entire natural resource field is moving toward interactive computer systems with computer graphics. Without accurate coordinates on a planimetric base the soil survey cannot be integrated with these systems. We at the Natural Resource Center are right now on the verge of taking that step into computer graphics of available resource inventories.

The Connecticut state office of SCS has tried soil science personnel through a small contract with our state Coastal Area Management Unit to manually reformat 23 complete and partial coastal quadrangles to photo-rectified planimetric, 1:24,000, 7 1/2 minute quadrangle maps. In January of this year in response to our request the Connecticut state office of SCS sent a cartographic requisition to the Hyattsville, Maryland SCS Cartographic Unit to digitize published soil survey map sheets to match 3 selected demonstration 7 1/2' quadrangles (Danbury, Hartford County; South Coventry, Tolland County; and Litchfield, Litchfield County). They were also requested to rectify the digitized map sheets to fit the 7 1/2' quadrangle base, and prepare a film positive and print of each quadrangle combining the digitized soil maps fitted to the quadrangle base scale of 1:24,000.

The State of Connecticut is prepared to provide financial support for a statewide conversion if the response to this request proves satisfactory.

Finally, I have a few remarks on the subject of statewide consistency and standardization.

In any widespread mapping inventory which takes place over a long period of time, involving a large number of field personnel who incur transfer in and out of the state, a problem is bound to occur in the form of continuity of effort and consistency of product. In Connecticut this occurred with the bedrock and surficial geology mapping which is concluding after 25 years of effort, the same is true with the water resource basin inventories which took 18 years. The detailed soil survey of Connecticut will also have covered a span of about 20 years when completed.

So I ask you, as the experts, to investigate these questions yourselves. Can we do more to make the soil survey available to all users? Can we keep the completed and published survey updated? Can we accurately with automated means transfer the survey to a photo-ratified planimetric base? Is there standardization and consistency in effort statewide and regionwide? Do we now have several levels in degrees of accuracy from one published survey to the next? Is there confusion in symbology? Are we confusing the user by various approaches to interpretation? And most important, are any of these turning him away from using the soil survey?

After all, you have spent the last 20 years on this survey - we must now be sure that your professional findings are in a form so that all who need to use it can get maximum benefit from it.

I hope this has not offended anyone, but instead raised some points of user interest that you may wish to consider during this meeting and afterwards. I am sure that some points may prove not to be valid, while others perhaps need your attention.

Thank you again for inviting me to address you.

## SOIL SURVEYS AND NATIONAL FORESTS 1/

### I. National Forests' Regims - NCSS Regions

National Forests' Regions and the Regions of the Natimal Cooperative Soil Survey do not share common boundaries. There are nine regions in the National Forest System. Seven of these regions are located in the western half of the country with only two in the eastern half. This is because of the much higher concentration of National Forest land in the West. In National Forest Region 9, the Eastern

the Nation's renewable resources that will assure an adequate supply of forest and range resources while maintaining the integrity and quality of the environment.

The National Forest Management Act of 1976 reinforced the Multiple Use Sustained Yield Act, and amends and further reinforces the Resources Planning Act. Both RPA and NFMA emphasize land management planning using a systematic and interdisciplinary approach.

### III. Soil Surveys and National Forest

Implicit in all of the significant legislation governing management of National Forest lands is the need to get a handle on land capability. This, of course, is a prerequisite to any project or activity dealing with land or land based resource management.

In order to do the job of National Forest Land and Resource Management required of us, we need to first be able to define, describe, map and interpret units of the landscape in terms of their capabilities and responses to management activities--to the specific management activities and systems applied to the land.

What is the best way to accomplish this?--To get at this handle on land capability? Is it soil survey? Frankly, there are many in forestry and related professions who doubt that it is.

In the Resources Planning Act great emphasis is placed on the interdisciplinary approach to land management planning. This was reemphasized in the National Forest management Act. We will be required, as I understand it, to have a land management plan made of each National Forest by the fall of 1983. These plans are to be revised and updated periodically. The word INTERDISCIPLINARY is emphasized in both acts, and in the draft regulations being written to implement the National Forest Management Act. Interdisciplinary input is emphasized at all phases of the planning process including the inventory phase. We will be directed by the regulations to develop inventories of the soil and water resources, and of other resources as well, (geologic, climatic, vegetative, wildlife habitat, etc.).

Many feel we should have one integrated inventory of all the resources including soils. Many of you have no doubt heard of the term, "Land Systems Inventory" and "Ecological Classification System." when I first came to this Region and assumed my present job about 6 months ago, I learned that a considerable amount of initial effort had gone into the development of an "Ecological Classification System." This concept seems to be very popular



intent will be to build on rather than disregard the less intensive survey. The hierarchical aspect of the Land Systems approach provides a convenient way to disaggregate downward toward more intensive or aggregate upward toward less intensive mapping units. There are sane relationships between the various levels in the hierarchy and the "kinds of soil survey," which I view as soil survey orders of intensity.

<u>Land Systems</u>	<u>Soil Survey</u>
province	Order 5
Section	Order 5
Subsection	Order 5
Land Type Association	Order 4
Ecological Land Type	Order 3
ELT phase	Order 2
Site	Order 1

with regard to participation in cooperative soil surveys, the Forest Service will support it wherever it is mutually beneficial to do so. I think it is extremely important to keep the lines of communication open between the Forest Service, SCS, and any other interested agencies at all levels. I must repeat here that our line officers will not support soil surveys that are not designed to meet National Forest management needs. Inputs from other disciplines in designing soil survey mapping units will become increasingly important.

I said earlier that many Foresters doubt that soil survey is the best way to get a handle on land capability. The reason for this is that the National Cooperative Soil Survey has not always given us mapping units that relate to our management needs. Map unit design is crucial to the usefulness of the soil survey. Claus Flach stated awhile ago that the new memorandum between SCS, the Forest Service, and other agencies states that soil surveys are not to be called soil surveys unless they are made "by the rules." For a time it was felt in the Forest Service that we could not make soil surveys "by the rules" and still meet National Forest management needs. This is why we deviated for a period of time from the National Cooperative Soil Survey. There are those in the Forest Service who still feel we cannot make soil surveys "by the rules" and meet National Forest management needs. I believe we can.

Another point that I would make is that we do not have as much manpower available to devote to soil survey as it may appear from the number of soil scientists we have. This is because our soil

scientists spend a relatively small amount of their time in soil survey. They spend large proportions of their time in other activities, such as providing soil management support services, on-site investigations, interdisciplinary team participation of various kinds, reviewing environmental impact statements and environmental analysis and so forth.

In summary, I believe we have a task of coordinating or resolving the various approaches to inventorying forest soils. I see the various terms such as "Soil Survey," "Soil Resource Inventory," "Land Systems Inventory," and "Ecological Classification System" as differences in terminology more than in substance. I see the Land Systems or ~~Forest~~

COMMITTEE 1

LEGAL ASPECTS OF THE USE AND INTERPRETATIONS OF SOIL SURVEYS  
F. W. CLEVELAND, Chairman

SUMMARY OF LEGISLATION, ORDINANCES, AND REGULATIONS

This summary does not include the items summarized in Appendix A of the 1974 Proceedings of the Northeast Cooperative Soil **Survey** Work Planning Conference. There may be other legislation pertaining to use of soil surveys that is not included in this summary. I could only summarize the information that was sent to me.

CARIBBEAN AREA

There is no new legislation enacted or proposed that will have an effect on soil surveys or pertain to registration of soil scientists in Puerto Rico or the U.S. Virgin Islands.

CONNECTICUT

The Connecticut State Department of Health proposed broad changes in the **septic** tank codes of the state. The new codes were submitted to public hearings in May 1978. At the time this summary was prepared, we were unable to find out the outcome of the hearings.

The proposed changes involved (1) definitions that apply to three sections of the codes, (2) minimum requirements for subsurface sewage disposal systems, and (3) issuance of permits for subsurface sewage disposal systems. One of the proposed changes that was of most interest to me pertained to Disposal of Sewage in Areas of Special Concern which is part of the section concerning "Minimum Requirements for Subsurface Sewage Disposal Systems." The following three paragraphs state the proposal.

(1) Areas with a minimum soil percolation rate faster than one inch per minute or slower than one Inch in thirty minutes, or maximum ground water less than four and one-half feet below ground surface, or ledge rock less than seven feet below ground surface, or soils with slopes exceeding fifteen percent, or consisting of soil types interpreted as having severe or very severe limitations for on-site sewage disposal by National Cooperative Soil Survey of the Soil Conservation Service, or designated as wetland under the provisions of Sections 22a-36 through 22a-45 of the General Statutes as amended shall require special concern in the investigation and design for subsurface sewage disposal. Wherever fill is added, the percolation test shall be made in natural soil and percolation rate shall be faster than one inch in sixty minutes. If more than twelve inches of cut or fill is required in a plan, this constitutes an area of special concern.

(2) In such areas of special concern, investigation for maximum ground water level and minimum soil percolation rate shall be observed by the local director of health between February 1 and May 31, or such other times when the ground water level is determined by the commissioner of health to be near its maximum level. Two or more percolation tests and two or more observation pits shall be made on each proposed lot in the area of the proposed leaching system and the location of all tests shown on the site plan. Special plans shall be prepared by a qualified professional engineer registered in the state of Connecticut in accordance with design guidelines established by the commissioner of health and the specific recommendations of the local director of health. Such plans shall be submitted for approval to the commissioner of health. Such plans shall include all pertinent information as to the basis of design, soil conditions, test pit locations, maximum ground water and ledge rock elevations, both original and finished surface contours and elevations, sewer invert elevations, bench mark, property lines, building locations, open watercourses, ground and surface water drains, nearby wells and water service lines. Each sewage disposal system located in the area of special concern shall be constructed under the supervision of a qualified professional engineer who shall make a final inspection and certify that it has been installed in accordance with the approved plans. Such certification shall be submitted to the local director of health prior to his final approval.

(3) No sewage disposal system shall be installed on an area designated as wetland under Section 22a-46 through Section 22a-47 of the General Statutes as amended unless approval has been obtained from the wetlands agency.

An organizational meeting for the Society of Soil Scientists of Southern New England was held May 30, 1974. Soil Scientists of Connecticut, Massachusetts, and Rhode Island voted unanimously to organize for the purpose of:

1. Advancement of soil science as it relates to soil classification mapping, and interpretations.
2. The promotion of the professional interest of soil scientists in Connecticut, Rhode Island, and Massachusetts.

Present membership of the Society is 50 Full Members and 21 Associate Members.

#### DELAWARE

At the time this summary was prepared, we had received no information concerning new legislation in Delaware.

## MAINE

There has not been a great deal of activity in Maine legislature since **1973 concerning land** use laws. There has been some refinement in the laws and more enforcement of the laws, but no major changes.

The certification program for soil scientists in Maine is alive and active. At present, there are about 50 active certified soil scientists in Maine. To date, two people who took the certification examination failed the test. It was necessary to go to court once to remove the certification from an individual whose practice of soil science was deemed unprofessional.

## MARYLAND

At the time this summary was prepared, no information had been received from Maryland concerning new legislation.

## MASSACHUSETTS

At the time this summary was prepared, no information had been received from Massachusetts concerning new legislation. No efforts have been made to propose legislation which will regulate the registration of soil scientists (classifiers). The main reason is because of the very small number of soil scientists which might be affected by such legislation.

## NEW HAMPSHIRE

The **1974** "Proceedings" mentioned an "Act Establishing a Critical Lands Commission" and "Providing for the Classification of Certain Land Areas

2. Town of Hampstead - A soil map and manual entitled "Soils and Their Interpretations for Various Land Uses" prepared for the Town of Hampstead by SCS and Southern Rockingham Regional Planning District Commission is used as the basis for minimum lot sizes. This manual contains the soil survey field sheets showing the soils as mapped by SCS soil scientists. Any person having evidence of incorrect mapping can appeal to the Planning Board. Adequate evidence shall mean an onsite investigation by a qualified SCS soil scientist. Minimum lot sizes are determined by kinds of soil as discussed for the Town of Atkinson.
  
3. Town of Sandown - Soil lot size and frontage are based on the following chart. The soil groups are defined in New Hampshire Water Supply and Pollution Control Commission publication "Guide for the Successful Design of Small Sewage Disposal Systems" published December, 1974. When a lot for a single family residence has more than one soil type, the lot size is calculated on the basis of the predominant soil type.

TABLE OF MINIMUM LOT SIZES (IN SQUARE FEET)  
AND LOT FRONT AGES (IN FEET)

SOIL GROUP	SLOPE CLASSIFICATION	LOT SIZE	LOT FRONTAGE
1	A-C 0-8%	40,000	160
	C 8-15%	44,000	160
	D 15-25%	48,000	160
2	A-B 0-8%	52,000	235
	C 8-15%	57,200	235
	D 15-25%	62,400	235
3	A-R 0-8%	64,000	295
	C 8-15%	70,400	295
	D 15-25%	76,800	295
4	A-B 0-8%	58,000	265
	c 8-15%	63,800	265
	D 15-25%	69,600	265
5	A-C 0-8%	90,000	500

NOTE: May not be suitable for subsurface sewage disposal.

4. Town of Milford - Established a Wetland Conservation District as areas identified and delineated as poorly drained, or very poorly drained soils and as bodies of water by the National Cooperative Soil Survey through field mapping surveys completed in 1972 and shown on its field mapping photographic sheets. The Wetland Conservation District is shown on a map or maps designated as the Town of Milford Wetland Conservation District Map. The Wetland Conservation District shall be considered as overlaying any other districts established. Permitted Uses in the Wetland Conservation District, if they do not result in the erection of any structure, include forestry, agriculture, water impoundments and well supplies, drainageways, wildlife refuge, parks and recreation areas, conservation areas and nature trails, and open space.

An act providing for certification of individuals as qualified soil scientists was introduced in the House of Representatives but did not make it out of the Environment and Agriculture Committee.

The first meeting of the Society of Soil Scientists of Northern New

NEW JERSEY

Since passage of the State Act, townships in several counties have passed similar ordinances. These include four townships in Morris County and nine townships in Somerset County (three of these require an Environmental Impact Statement).

Clinton Township, Hunterdon County passed a flood plain ordinance which restricts erection of structures in areas delineated on maps as having a flood hazard. The ordinance refers to the "Soil Survey of Clinton Township, Hunterdon County, New Jersey" in which flood plain soils and terrace soils are defined and delineated.

Allamuchy Township, Warren County amended their ordinance entitled "An Ordinance Establishing a Code To Regulate and Control the Location, Construction, Use, Maintenance, and Method of Emptying or Cleaning Individual Sewage Disposal Systems, or Other Places Used for the Reception or Storage of Human Excrement, the Issuance of Permits and Providing Penalties for the Violation Thereof." The amendment groups the soils into several groups as to whether or not they can be used for soil absorption sewage disposal facilities. Some of the groups may be used if the limitations are overcome by special design of the systems or other means.

The New Jersey Association of Professional Soil Scientists has a bill in Committee for licensing of professional soil scientists. It is Assembly Bill No. **486**. There is a problem with some of the wording in the bill which the Association is attempting to resolve.

#### NEW YORK

In New York, no changes have occurred in the last four years in the status of laws that require soil surveys in regulations. It is anticipated, however, that legislation or rules are going to come about that will require soil productivity indices in the land appraisal process. Dr. Arnold and Fred Gilbert have proposed that soil productivity indices be used in appraising all agricultural land. They have prepared a short paper that describes this process.

#### PENNSYLVANIA

The Solid Waste Management Act of **1968**, which was discussed in the **1974** Proceedings, was amended in **1977**. We received a copy of the amended act and a copy of "Interim Guidelines for Sewage, Septic Tank, and Holding Tank Waste on Agricultural Lands." In order to prevent overloading or over-application of sludges, the guidelines were formulated to provide for environmentally sound yet reasonable sludge application rates and methods for agricultural land. Agricultural lands selected for application of sludge are to meet the following conditions:

1. Suitable soils are those that fall within the USDA textural classes of sandy loam, loam, sandy clay loam, silty clay loam, and silt loam.
2. Soils are to have a well developed solum with a minimum depth of 20 inches to bedrock and/or to seasonal high water tables.
3. Existing slopes at the site are not to exceed 12 percent except for certain no-till or cover crop applications as stated in the section that discusses "Agricultural Use of Sewage Sludge." In addition, no closed depression shall exist on the proposed site.
4. Land areas subject to active flooding are not acceptable for sludge application.
5. Soil pH is to be 6.5 or greater. The soil pH may be adjusted by the addition of lime or other suitable material and maintenance of the soil pH at 6.5 or greater is required during the operational life of the site and for two years following the end of sludge application.
6. Depth to the permanent groundwater table at the site is to be a minimum of four feet.

There is a similar guideline for use of sewage sludge for the reclamation of disturbed lands. The important feature of these new solid waste management regulations is that sewage sludges are now addressed as a concern and theoretically are and will be subject to control. These regulations require chemical analyses of the sludge, site evaluations for soil, geologic and hydrologic suitability, etc.

We also received a copy of the amended Pennsylvania regulations concerning subsurface sewage disposal. Soils are an integral part of these regulations. The soil series of Pennsylvania have been placed in fifteen groups based on their limitations for subsurface disposal of effluent and the most probable percolation rates of those which are not eliminated from consideration by flooding, seasonal water table, shallowness, or special pollution hazards.

The Pennsylvania Association of Professional Soil Scientists (PAPSS) was organized March 22, 1975. Present membership is about 55 full members and 8 associate members. The Legislative Committee has formulated draft legislation for the registration of soil scientists. The membership of PAPSS have indicated a willingness to contribute funds in addition to using PAPSS funds to acquire the services of a lawyer to provide legal and lobbying services to get the legislation introduced and advanced. Whether the introduction of the bill will be effected this legislative year or next is now uncertain.

### RHODE ISLAND

At the time this summary was prepared, we had not heard of any new legislation affecting use of soil surveys in Rhode Island.

### VERMONT

At the time this summary was prepared, we had not heard of any new legislation affecting the use of soil surveys in Vermont.

### VIRGINIA

The soil and Water Conservation Districts Law of Virginia reprinted in 1975 states "It is to be the policy of the General Assembly to accelerate the inventory of Virginia's soil resource and set a goal of completing the soil survey and mapping by 1990, and to appropriate funds to the Virginia Soil and Water Conservation Commission to expedite the program so that the goal may be reached and to provide an incentive for participation of local units of government. (1972, c.557)

In addition to the other duties and responsibilities conferred by this chapter, the Virginia Soil and Water Conservation Commission shall have the duty and responsibility to take the leadership in the program for accelerating the Virginia portion of the National Cooperative Soil Survey, to complete the inventory of Virginia's soil resource by 1990, and to make necessary coordination therefor. (1973, c.557)

No criminal action for trespass shall lie against the Virginia Soil and Water Commission. or

Article 1.1 of the Taxation Code provides for special assessments for agricultural, horticultural, forest, or open space real estate in a manner that will promote the preservation of it ultimately for the public benefit.

State Health Department Regulations Concerning Land Disposal of Waste (Septic tank systems and land applications) and Solid Waste Disposal Sites (Sanitary land fills). -- I did not have copies of these regulations to summarize.

House Bill 403 concerning Coal Surface Mining -- This bill was enacted by the **1978** session of the General Assembly to bring Virginia in compliance with the Federal Surface Mining Control and Reclamation Act of **1977** (P.L. 95-87). The federal law relates to prime farm land which would be identified by a soil survey.

Agricultural and Forestal Districts Act (House Bill 949) was passed by the **1977** Virginia General Assembly. -- The act provides a means by which agricultural and forestal land may be protected and enhanced. Any owner or owners of land may submit an application to the local governing body for the creation of an agricultural or agricultural and forestal district within such locality, provided that the owner or owners own at least 500 acres or more than 50 percent of the land proposed to be included in the district, whichever is greater. Provided, however, that no owner shall own more than 3,500 acres of land proposed to be included within the boundaries of all districts in the state. Land used in agricultural and forestal production within such a district shall qualify for an agricultural or forestal value assessment.

The organizational meeting of the Virginia Association of Professional Soil Scientists was held in Charlottesville, Virginia the weekend of September 11 and 12, 1976. The Constitution and Bylaws for the Association were adopted by 50 soil scientists from 34 locations in Virginia. The Association has elected not to pursue state registration at the present time, but does encourage its members to seek registration with ARCPACS.

#### WEST VIRGINIA

At the present time, we are unaware of any legislation or ordinances that have been passed or proposed in West Virginia that would affect soil surveys.

The soil scientists in West Virginia are currently making an effort to secure certification. At this time this effort is still in the organizational stage. Various committees have been formed but no formalized action has occurred.

COMMITTEE 2

USE OF SOILS FOR WASTE MANAGEMENT

Charges:

The Committee was given three charges as follows:

1. Review and **comment** on report of Committee 3, Waste Treatment on Named Kinds of Soils, 1977 National Technical Work Planning Conference of the Cooperative Soil Survey.
2. Using the best guides available, rate the soil series in the Northeast for receiving (nontoxic) **biodegradable** liquid and solid wastes.
3. Identify additional research **or** study that is needed **to assure** that the criteria used for rating soils is adequate.

Committee Members:

Dale E. Baker  
James J. Burke  
Lowell A. Douglas, Vice Chairman  
Carl F. Eby  
Darrell G. **Grice**  
David E. Hill

**James N. Krider**  
Raymond F. Shipp  
Leonard W. Tritt  
Peter L. M. **Veneman**  
John E. Witty, Chairman

Committee Report:

Charge 1 - Review and Comment on Report of Committee A, Waste Treatment  
on Named Kinds of Soils, 1977 National Technical Work  
Planning Conference of the Cooperative Soil Survey.

The basic charge to the national committee on waste management was to "improve national guidelines for waste treatment on named kinds of soils." Because of time limitations it was decided that new guides could not be developed but a review and assessment be made of how guides were being used and what the regional differences concerning land application of sewage sludge and manure might be.

Three work groups were set up to make the reviews and assessment. The following is a summary of the 3 work group reports.

Work Group I. Assess National Application of Guides to Soil Limitations.

A canvass was made of state and TSC Soil Conservation Service offices to determine the kinds of guidelines used in various states for rating soils for land application of wastes and the uniformity of rating individual soil series. About one-half of the responding states had not rated any of their soils, however,, a few of these states indicated they had evaluated the soils at a few sites on an individual request basis but they apparently did not use any

application) ~~these~~ were many more discrepancies in the ratings of soil series between these states as compared to Michigan and Wisconsin. The major reason for the \*discrepancies were that these states developed their own guidelines and did not use the same soil properties or limits in the guidelines.

Guidelines were used uniformly within states and use of national guidelines resulted in more uniformity in rating the same soil series between states than when a state developed their own guidelines.

#### Work Group II. Animal Manure.

Waste production can be divided into climatic regions:

1. Moisture sufficient regions (percolation is dominant). Dairy, poultry and swine operations are common in this region.
2. Moisture tension regions (percolation and evaporation are about balanced). Feedlots for beef cattle finishing are common in this region.
3. Moisture deficit regions (evaporation is dominant). Feedlots for beef and dairy cattle and poultry operations are common in this region, also grazing with low animal density.

In moisture deficit regions irrigation is an essential component of crop production. Applying feedlot waste on irrigated land in places has resulted in high  $\text{NO}_3\text{-N}$  levels in ground water. Presence of substratum  $\text{NO}_3\text{-N}$  of geologic origin in some places has accentuated hazards of excess  $\text{NO}_3\text{-N}$  in ground water. Leaching salts from manure with irrigation water is essential to seedling establishment and minimization of salt damage of soils.

In moisture sufficient regions soluble salts from manure normally do not accumulate in the soil, however, salt concentration of the ground water may increase.

Work Group II recommended that cation exchange capacity and soil texture be added to the national guidelines as additional criteria to rate soils. The cation exchange capacity would be

---

A review of the literature was made with special attention given to assessing concentrations of Cd, Zn, and Zn/Cd ratio in plants grown on sludgetreated soils under field conditions. Attention was directed primary to results from Alabama, Illinois, Maryland, Minnesota, and Wisconsin because data were available on a common plant - corn.

The principal findings were:

1. Cadmium concentration in corn tended to increase with Cd loading rate. The Cd concentration ranged from about 0.2 ppm to more than 22 ppm. Corn grown on soils with the highest rate of sludge applied had the most Cd. Effects of soil differences were most evident between Cd loading rates of 1 to 10 kg/ha.
2. Zinc concentration in corn also increased with Zn loading rates. The Zn concentration ranged from about 70 ppm to nearly 400 ppm. Soil differences were reflected in plant Zn concentrations at comparable Zn loading rates.
3. Zinc/Cd ratios tended to be lower in corn grown in Maryland and Alabama than in corn grown in Minnesota and Wisconsin. Higher concentrations of Cd in corn grown on Ultisols than in Argiboralls of Wisconsin appeared to influence how Zn/Cd ratios changed.
4. General observations indicate that soil systems tend to be overloaded with high sludge applications so that the specific role of CEC becomes masked out. Critical Cd levels have not been defined but corn will have more than 5 ppm of Cd if Cd loading rates exceed 10 kg/ha.

Presence of calcareous subsoils and substratum appeared to be as effective as increasing CEC to minimize Cd movement from sludge-treated soils through a food and feed chain.

5. Total analysis (carbonate fusion or HF treatment), acid extraction (0.1 N HCl) and chelates have been used to assess heavy metal concentrations in sludges and sludge-treated soils, No one analytical approach has been found to meet all needs for making assessments of sludge loading rates on soils and their impact on environmental quality and quality of foods and feeds.

#### Recommendations:

1. The work group recommends that soil pH and presence of calcareous horizons be considered as additional criteria for use when soils

are rated for sludge disposal. High soil pH and carbonate levels inter-related, probably will decrease levels of Cd in plants grown on sludge-treated soils.

Lime application rates to enhance plant growth may not coincide exactly with rates that would decrease plant cadmium concentrations. Presence of naturally occurring carbonate horizons should be beneficial, especially where trenching techniques are employed.

2. Conclusions based on short-term studies should be confirmed from a few long-term studies to assess the role of mineralization with time.

The role of CEC probably will increase as sludge undergoes mineralization with time.

Charge 2 - Using The Best Guides Available, Rate The Soil Series In The Northeast for Receiving (Nontoxic) Biodegradable Liquid And Solid Wastes.

The Chairman and Vice Chairman of Committee 2 decided that Charge 2 should be modified, basically because of the inadequacy of the current guides. new guides were being prepared, and time and money were not available to rate all the soil series in the Northeast.

This spring the Chairman of Committee 2 was asked to take leadership (SCS) in preparing initial drafts of needed new guides. It was thought that as many as seven guides may be needed depending upon the type of waste and whether or not the objective is utilization or disposal. These guides would replace the two guides that were attached to SCS Advisory SOILS-14, dated May 8, 1973.

The modified charge to the committee was to: "Review and Comment on the New Guides and Test Them by Rating the Northeast Benchmark Soil Series." Drafts of the guides were prepared in conjunction with Committee 2 work. The most recent draft, entitled "Guides for Rating Soils For Waste Management" is attached as Appendix I.

All the benchmark soil series in the Northeast were rated. The ratings given the Benchmark Soil Series

For the nearly level phases of benchmark soils, the following table shows the number of series rated as having slight, moderate, or severe limitations for receiving the indicated kinds of waste or using the indicated method of disposal. The first number is for benchmark soils in the New England states and New York; the second number is for those in Maryland, New Jersey, Pennsylvania, Virginia, and West Virginia.

	Slight	Moderate	Severe
Manure & food Proc. Wastes	11 , 15	23 , 22	33 , 10
Munic. Sludge & Ind. Org. Waste	0 , 1	32 , 39	35 , 10
waste H <sub>2</sub> O Used for Irrig.	0 , 1	32 , 39	35 , 10
Slow Rate	0 , 1	25 , 35	42 , 14
Overland Flow	2 , 4	21 , 33	44 , 13
Rapid Infilt.			



RECOMMENDATIONS

1. The committee be continued.
2. The state soil scientists in the Northeast review the ratings given the benchmark soils used in their state and report back to Committee 2 any changes needed in the guides to better reflect how the soil should be rated. Reports due from the state soils scientists by December 1, 1978.
3. The committee prepare general guidelines, by July 15, 1979, for Management of Soils for Land Application of Waste Materials.

## APPENDIX 1

### GUIDES FOR RATING SOILS FOR WASTE MANAGEMENT

#### 6. waste Management.

Soils can be a medium for surface application of organic wastes and waste waters as a crop production resource as well as a medium for treatment and disposal. Successful systems require favorable soil properties to prevent environmental damage. These guides are based upon defined classes of organic wastes and waste waters and whether the objective is (1) utilization as a crop production resource, (2) disposal on land in excess of the crop needs, or (3) land reclamation. Kinds of organic wastes considered are: 1. manure and food processing wastes; 2. municipal sewage sludge and industrial organic wastes; and 3. logging, wood processing, and separated and shredded municipal organic waste. Waste water includes municipal and food processing waste water and lagoon effluent.

The nitrogen content of organic waste ranges from low to high. The availability of nitrogen for crop utilization generally depends on the nitrogen content of the waste. Organic waste high in nitrogen, (>1.8 percent, dry weight; C:N ratio <20:1), upon decomposition in soil, immediately increases the soil nitrogen in a form that is available to crops. Organic waste with a medium level of nitrogen (1.2 to 1.8 percent, dry weight; C:N ratio of 20 to 30:1), upon decomposition in soil, results in an initial period in which much of the released nitrogen is immobilized by the soil microflora. This initial period is then followed by an increase in soil nitrogen in a form that is available to crops. Organic waste low in nitrogen (<1.2 percent, dry weight; C:N ratio >30:1), upon decomposition in soil, may result in a tie-up of soil nitrogen in a form unavailable to crops for several months. This is caused by the competition of the soil microflora with the crop for available nitrogen. If crops are to be grown, then additional nitrogen needs to be added to raise the apparent nitrogen content of the organic material up to 1.2 to 1.5 percent on a dry weight basis just to satisfy the needs of the microflora.

Based on their capabilities and limitations, soils are rated slight, moderate, or severe for the utilization of organic waste as a crop production resource for plant nutrients and use of waste water for irrigation. Liquids that are relatively high in nitrogen in which the application rate is controlled more by the nitrogen content rather than amount of water the soil can safely absorb are considered as a crop production resource for plant nutrients and not a resource for irrigation water. Soils are also rated as slight, moderate or severe

for the disposal of waste water on land using the following processes:  
1. slow rate, 2. overland flow, and 3. rapid infiltration

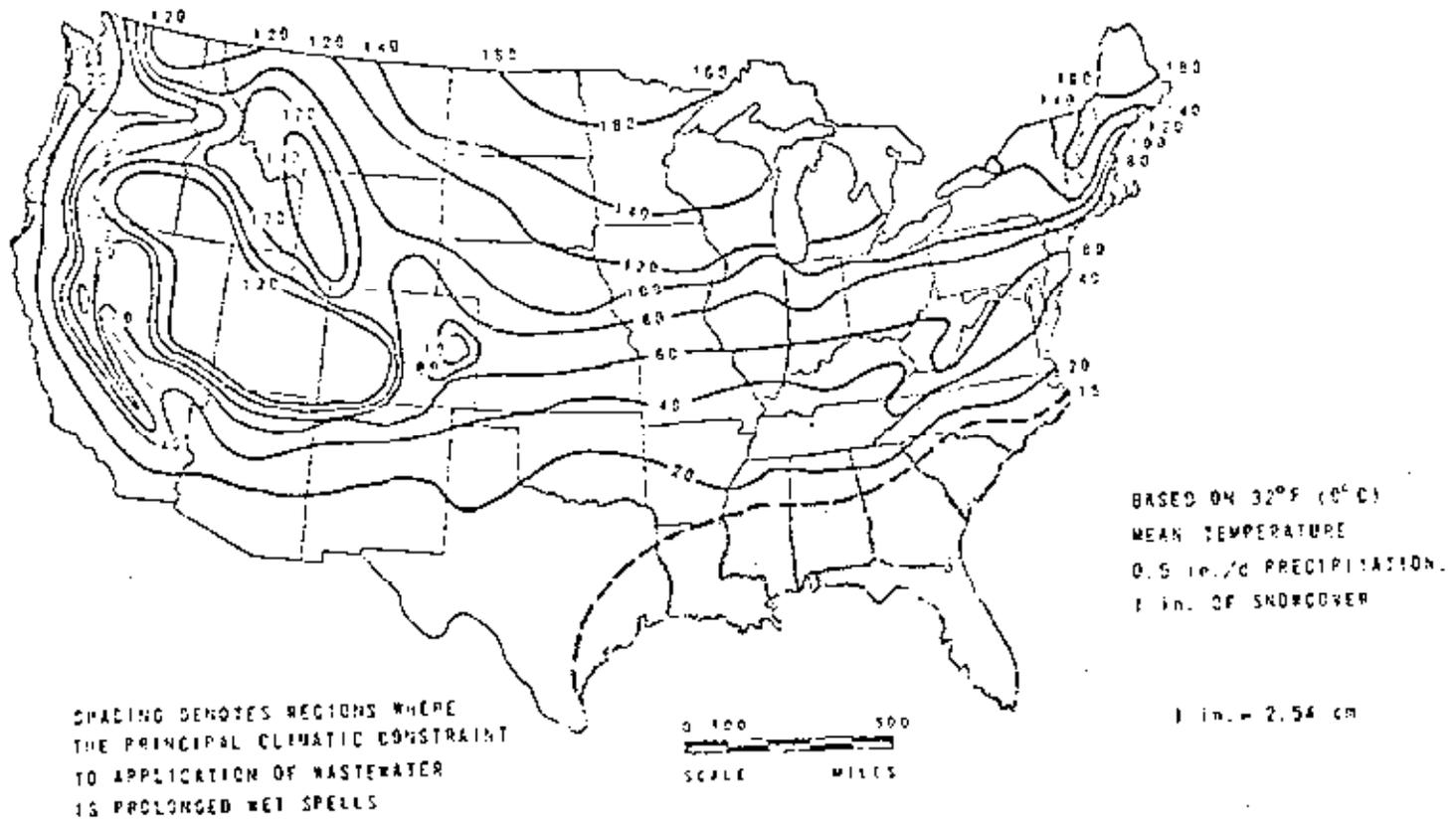
Limitations as a result of periods of soil freezing or excess precipitation, which cause unfavorable soil conditions for receiving **wastes, are** not considered in these **guides**. Storage facilities need to be available during these periods. Figure 1 can be used for estimating storage days based on climatic factors.

(a) Manure and Food Processing Waste.

Manure is the waste excreted by livestock and poultry. It

FIGURE 1

ESTIMATED STORAGE DAYS BASED  
ONLY ON CLIMATIC FACTORS (2)



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2-11

(a) MANURE AND FOOD PROCESSING WASTE

PROPERTY	LIMITS			RESTRICTIVE FEATURE
	SLIGHT	MODERATE	SEVERE	
Permeability (In/Hr) (6 (0-60"))	:	6-20	>20	Poor Filter
Depth to High Water Table (Ft)	x .5	0.5-1.5	<0.5	Wetness Ponding Trafficability
Slope	0-8	8-25	>25	Slope
Erosion Factor (K)(Surface Layer)	<.35	.35-.45	>.45 <sup>1/</sup>	Erodes Easily
Available Water Capacity (In) (0-60")	>6	3-6	<3	Low Absorption
Depth to Bedrock (In)	>20	10-20	<10	Depth to Rock
Fraction >3" (Wt Pct) (Wt Ave to 40")	<25	25-50	>50	Large stones
Sodium Adsorption Ratio (Great Group)	:	---	>12 (Natric, Halic)	Excess Sodium
Salinity(mmhos/cm)	<4	4-a	>8	Excess Salt
Wind Erodibility Group	3,4,4L,5,6,7,8	1.2	---	Soil Blowing
Flooding <sup>2/</sup>	None Rare Occasional Protected	Frequent	:	Floods
Soil Reaction(pH) (Surface Layer)	>3.6 <sup>3/</sup>	<3.6	----	Too Acid

<sup>1/</sup> Rate moderate if slope is <8 percent,

<sup>2/</sup> Wastes should not be applied prior to an anticipated flood occurrence (e.g., spring thaw and rains).

<sup>3/</sup> Soil should be limed to meet crop requirements before the wastes are applied.

7.3

(b) Municipal Sewage Sludge and Industrial Organic Waste.

Municipal sewage sludge as referred to here is the residual product remaining from the treatment of municipal sewage. It is composed mainly of **cellmass**, bacteria cells primarily which have developed during secondary treatment and which **have** incorporated soluble **organics** into their own bodies. Sludge also contains small amounts of sand, silt, and other solid debris. Industrial organic waste (a description is needed). Also included is septic tank waste.

Municipal sewage sludges and industrial organic wastes have low to high nitrogen content. Some may contain constituents toxic to plant growth **or** hazardous to the food chain (heavy metals **or** exotic organic compounds) and should be chemically analyzed prior to use. Some may also have hazardous numbers of pathogens if not treated to reduce their numbers. These wastes are either solid **or** slurry. Depending upon solids content they can be moved by auger, conveyor, **or** pump.

The soil properties and features considered are those that affect absorption, plant growth, susceptibility to wind **or** water erosion, potential for ground water pollution and application. Properties that affect absorption are permeability, depth to high water table, soil reaction (this property also affects plant growth), cation exchange capacity, depth to porous bedrock, and available water capacity. Soil reaction, sodium adsorption ratio, and salinity are soil properties that affect plant growth. Wind erodibility group, erosion factor, slope, and susceptibility to flooding are used to measure the potential for wind and water erosion. Permeability and depth to high water table affect the potential for ground water pollution. Depth to high water table can interfere with application of the wastes.

The soil rating guideline (Table **b**) is based on utilizing the nutrients in the waste for crop production and are not directed toward reclaiming **or** restoring critical areas.

(c) Carbonaceous Material Used as Soil Conditioner and Stabilizer.

These materials include wood processing wastes, leaves, straw, **stover**, some paper products, manure, and municipal sewage sludge. Except for manure and sewage sludge they are generally very low in nitrogen. These wastes are solid and some can be spread by using blowers.

## (b) MUNICIPAL SLUDGE AND INDUSTRIAL ORGANIC WASTE

PROPERTY	LIMITS			RESTRICTIVE FEATURE
	: SLIGHT :	MODERATE :	SEVERE :	
Permeability (in/hr) (0-60")	: <6	6-20	>20	: Poor Filter
Depth to High Water Table (ft)	: >1.5	: 0.5-1.5	: <0.5	: Wetness : Ponding : Trafficability : Low Adsorption
Cation Exchange Capacity (meq/100g)(wt ave to 20"):	: >15	5-1.5	: <5	: Low Adsorption
Slope (pct)	: 0-8	8-15	: >15	: Slope
Erosion Factor (K) (Surface Layer)	: <.35	: .35-.45	: >.45	: Erodes Easily
Available Water Capacity (in)(0-60")	: >6	3-6	: <3	: Low Absorption
Depth to Bedrock (in)	: >40	: 20-40	: <20	: Depth to Rock
Fraction >3 in (wt pct)(wt ave to 40")	: <25	: 25-50	: >50	: Large Stones
Sodium Adsorption Ratio (Great Group)	: ---	: ---	: >12	: Excess Sodium : (Natric, Halic)
Salinity (mmhos/cm)	: <4	4-8	: >8	: Excess Salt
Wind Erodibility Group	: 3,4,4L, : 5,6,7,8 :	: 1,2	: ---	: Soil Blowing
Flooding <sup>1/</sup>	: None : Rare : Protected	: Occasional:	Frequent	: Floods
Soil Reaction (pH)(Surface Layer)	: >6.4	: 3.6-6.4	: <3.6	: Too Acid

<sup>1/</sup>Wastes should not be applied prior to an anticipated flood occurrence (e.g., spring thaw and rains).

A specific guideline table has not been prepared for rating soils concerning the utilization of these materials when used as a soil conditioner or stabilizer. They can be used as a mulch or soil conditioner for stabilizing critical areas, in land reclamation, or in landscaping. Necessary precaution is needed to prevent removal of the material from the site by wind or water erosion. Also if municipal sewage sludge is used on land which will, in the future, be used for the production of food chain crops, it is important that maximum lifetime site application of **sludge-borne** metals does not exceed that specified in Municipal Sludge Management: Environmental Factors, October 1977, MCD-28, EPA 430/9-77-044, pages 18-22, or not exceed regulatory guidelines adopted by the individual state(s) if the state regulation is less.

(d) Waste Water Used For Irrigation.

The waste water considered is from municipal waste water and food processing plants and lagoons.

Municipal waste water is the waste stream from a municipality containing domestic waste and possibly industrial waste (if there are industries emptying into the collection system.) It may be raw sewage (untreated), although this is rare, or it may be waste water which has received either primary or secondary treatment. Food processing waste water is the waste water resulting from the preparation for public consumption of fruits, vegetables, milk, cheese, and meats. They can be high in sodium and chloride content. Lagoon effluent as discussed here refers to the effluent from a lagoon used to treat either domestic wastes or animal wastes. Domestic wastes are very dilute and the effluent from a lagoon treating them will be very low in carbonaceous and nitrogenous matter. Nitrogen content ranges from 10 to 30 mg/1. Lagoons treating animal wastes may have an effluent much higher in concentration of these materials, mainly because the manure has not been diluted as much as domestic wastes. Nitrogen content varies considerably but will be from low to moderate (10 to 1000 mg/1).

Nitrogen content is low in most waste waters but some may have limited use for irrigation without dilution with other water because of relatively high nitrogen content. Some waste waters may cause sodium or salinity increase in the soils in arid and semi-arid regions, but this is generally

not a problem in humid regions. The heavy metal content of effluents are usually low, however, chemical analyses should be made prior to use.

Soil properties and features are listed that need consideration in the design, construction, management, and performance of a waste water irrigation system. Those properties important in design and management are: high water table, available water capacity, permeability, USDA texture, wind erodibility, erosion factor, slope, and flooding. Soil properties or features that influence construction are stones and depth to bedrock or **cemented pan**. The properties that affect performance of the system are depth to bedrock or cemented pan, presence or absence of a fragipan, bulk density, sodium adsorption ratio, salinity, and soil reaction. Cation exchange capacity also affects performance and it is used here as an estimate of the capacity of a soil to absorb heavy metals.

The soil rating guideline (Table **d**) is based on utilizing the water for moisture for crop production and not directed toward the disposal of the waste water. If disposal is the primary objective, use either Table e, f, or g.

- (e) Slow Rate is the process by which waste water is applied to the land at rates normally between 0.5 and 4.0 inches per week. The primary purpose is waste water treatment or disposal rather than irrigation of crops. The applied waste water is treated as it flows through the soil, with most of the treated water percolating to the groundwater and **some** entering the atmosphere by evapotranspiration. Surface runoff of the applied water is generally not allowed.

The waste water considered is from municipal waste water and food processing plants and lagoons. Municipal waste water is the waste stream from a municipality containing domestic waste and possibly industrial waste (if there are industries emptying into the collection system.) It may be raw sewage (untreated), although this is rare, or may be waste water which has received either primary or secondary treatment. Food processing waste water is the waste water resulting from the preparation for public consumption of fruits, vegetables, milk, cheese, and meats. They can be high in sodium and chloride content. Lagoon effluent as discussed here refers to the effluent from a lagoon used to treat either domestic wastes or animal wastes. Domestic wastes are very dilute and the effluent from a lagoon treating them will be very low in carbonaceous and nitrogenous matter.

(d) WASTE WATER USED FOR IRRIGATION

PROPERTY	LIMITS			RESTRICTIVE FEATURE
	: SLIGHT	: MODERATE	: SEVERE	
Fraction >3in (Wt Pct)(0-40'') :	<25	25-50	>50	: Large Stones
Depth to High Water Table (Ft) :	>3	0.5-3	<0.5	: Wetness : Ponding
Available Water Capacity (In) (0-40" ) :	>4	2-4	<2	: Droughty
USDA Texture (Surface Layer) :	: COSL, SL, : FSL, VFSL, : L, SIL, SI, : SCL, CL., : SICL	: LVFS   : SC	: COS, FS, VFS : LS, LFS : : SIC, c	: Fast Intake : : : Slow Intake
Wind Erodibility Group :	: 4, 4L, 5, 6, : 7, 8	: 3	: 1, 2	: Soil Blowing
Permeability (In/Hr)(0-60'') :	>0.2	0.06-0.2	<0.06	: Percs Slowly
Depth to Bedrock (In) :	>40	20-40	<20	: Depth to Rock
Depth to Cemented Pan (In) :	>40	20-40	<20	: Cemented Pan
Fragipan (Great Group) :	: ----	: All Fragi.	: ----	: Rooting Depth
Bulk Density (g/cc)(0-40'') :	<1.7	> 1.7	: —	: Rooting Depth
Slope :	< 3	3-8	> 8	: Slope
Erosion Factor(K) (Surface Layer) :	<.35	.35-.45	>.45	: Erodes Easily
Flooding :	: None Rare Protected	: Occasional	: Frequent	: Floods

Con't.: WASTE WATER FOR IRRIGATION

PROPERTY	LIMITS			RESTRICTIVE FEATURE
	: SLTGH	: MODERATE	: SEVERE	
Sodium Adsorption Ratio (Great Group)	----	----	>12	Excess Sodium
Salinity(mmhos/cm)	<4	4-8	>8	Excess Salt
Soil Reaction(pH) (Surface Layer):	>6.4	3.6-6.4	(3.6	Too Acid
Cation Exchange Capacity (meg/100g)(Wt Ave to 20') <u>1</u> :	715	5-15	<5	Low Adsorption

1/Disregard CEC if heavy metal content is low in the applied water.

Nitrogen content ranges from 10 to 30 mg/l. Lagoons treating animal wastes may have an effluent much higher in concentration of these materials, mainly because the waste has not been diluted as much as domestic wastes. Nitrogen content varies considerably but will be from low to moderate (10 to 1000 mg/l).

Nitrogen content is normally low. Heavy metal content is usually low, however, chemical analyses should be made prior to use.

The soil properties and features considered are those that affect absorption, plant growth, susceptibility to wind or water erosion, and application of wastes. Properties that affect absorption are depth to high water table, available water capacity, permeability, depth to porous bedrock, soil reaction, and cation exchange capacity. Soil reaction, sodium adsorption ratio, and salinity are soil properties that affect plant growth. Wind erodibility group, erosion factor, slope, and susceptibility to flooding are used to measure the potential for wind and water erosion. stones can interfere with the application of the wastes.

The soil rating guideline (Table e) is based on land treatment of waste water and not directed toward using the water as a source of moisture for crop production, however, crops are usually grown as a part of the soil-plant treatment process.

- (f) Overland Flow is the process by which waste water is applied to the upper reaches of sloped land and allowed to flow across a vegetated surface to runoff collection ditches, sometimes called terraces. Length of run is generally 150 to 300 feet. The waste water loses solids and nutrients to plant and soil surfaces as it flows in a thin film down the relatively impermeable slope. Most of the water reaches the collection ditch; some is lost by evapotranspiration and a small part percolates to the groundwater.

The waste water considered is from municipal waste water and food processing plants and lagoons. Municipal waste water is the waste stream from a municipality containing domestic waste and possibly industrial waste (if there are industries emptying into the collection system). It may be raw sewage (untreated), although this is rare, or it may be waste water which has received either primary or secondary treatment. Food processing waste water is the waste water resulting from the preparation for public

## (e) SLOW RATE

PROPERTY	LIMITS			RESTRICTIVE FEATURE
	SLIGHT	MODERATE	SEVERE	
Fraction 3 in (Wt Pct) (Wt Ave to 40"):	(25	25-50	> 50	: Large stones
Depth To High Water Table (Ft) <u>1</u> /	> 3	1.5-3	( 1.5	: Wetness : Ponding
Cation Exchange Capacity (meg/100g) <u>2</u> / (Wt Ave to 20")	> 15	5-15	< 5	: Low Adsorption
Slope (Pct)	< 6	6-12	> 12	: Slope
Available Water Capacity (In)(0-60")	> 6	3-6	< 3	: Low Absorption
Permeability (In/Hr) (0-60")	0.6-6.0	6.0-20	> 20	: Percs Fast
		0.06-0.6	< 0.06	: Percs Slowly
Depth To Bedrock (In)	> 60	40-60	< 40	Depth to Rock
Erosion Factor (K) (Surface Layer)	< .35	.35-.45	> .45	:
Flooding	None Protected Rare	Occasional	:	:
Sodium Adsorption Ratio (Great Group)	----	----	:	:
Salinity (mmhos/cm)	< 4	:	:	:
Soil Reaction (pH) (Surface Layer)	> 6.4	:	:	:
Wind Erodibility Group	3, 4, 4L, 5, 6, 7, :	:	:	8

consumption of fruits, vegetables, milk, cheese, and meats. Nitrogen content is variable. They can be high in sodium and chloride content. Lagoon effluent as discussed here refers to the effluent from a lagoon used to treat either domestic wastes **or** animal wastes. Domestic wastes are very dilute and the effluent from a lagoon **treating them** will be very low **in** carbonaceous and nitrogenous matter. Nitrogen content ranges from 10 to 30 **mg/l**. Lagoons treating animal wastes may have an effluent much higher in concentration of these materials, mainly because the manure has not been diluted as much as domestic wastes. Nitrogen content varies considerably but will be from low to moderate (10 to 1000 **mg/l**).

Nitrogen content is normally low. Heavy metal content is usually low, however, chemical analyses should be made prior to use.

The soil properties considered are those that affect absorption, plant growth, and design and construction of site. Properties that affect absorption are depth to cavernous bedrock, soil reaction, and cation exchange capacity. Soil reaction, permeability of the surface layer, salinity and sodium adsorption ratio are soil properties that **affect** plant growth. Slope, permeability within 6 to 20 inches, depth to high water table, flooding, depth to bedrock, and stones are soil properties that influence design and construction.

The soil rating guideline (Table f) is based on treating the waste water and not directed toward using the water as a source of moisture for crop production, however, the area is vegetated because plants are a necessary part of the soil-plant treatment process.

(g) Rapid Infiltration.

In rapid infiltration the waste water is applied in a level basin and it percolates through the soil and the **treated water** eventually reaches the ground water. Application rates range from 4 to 120 inches per week.

Because thickness of material needed for proper renovation of the waste water is **more** than 72 inches, geologic and hydrologic investigations during the early planning stages are needed to determine the potential for pollution of ground water.

## (f) OVERLAND FLOW

PROPERTY	LIMITS			RESTRICTIVE FEATURE
	: SLIGHT	: MODERATE	: SEVERE	
Slope (Pct)	2-8	: 0-2, 8-12 : >20	: >12	: Slope
Permeability (in.hr) : <0.2 (within 6-20"):		: 0.2-2.0	: 72.0	: Seepage
Depth To High Water Table (Ft.) :	>1	: 0.5-1	: <0.5	: <b>Wetness</b> : Ponding
Flooding	None Protected : Rare	: Occasional	: Frequent	: Floods
Depth to Bedrock (In):	>60	: 40-60	<40	: Depth to <b>Rock</b>
Salinity (mmhos/cm):	<8	: 8-36	: >16	: Excess Salt
Sodium Adsorption Ratio (Great Group):	—	: ---	: >12 : (Natric, Halic):	: <b>Excess Sodium</b>
Soil Reaction (pH) (Surface Layer) :	>3.6	<3.6		: Too acid
Fraction >3 in (Wt Pct)	<25	: 25-50	: >50	: <b>Large Stones</b>
Cation Exchange Capacity (meq/100g) <sup>1/</sup> : (Wt Aver to 20") :	>15	5-15	: <5	: Low Adsorption

<sup>1/</sup>Disregard CEC if heavy metal content is low in the applied water.

The waste water considered is generally from municipal waste water treatment plants. Nitrogen content is generally low. Normally, heavy metal content is low, however, chemical analyses should be made prior to use.

The soil properties that influence risk of pollution, design and construction, and performance are major considerations. Depth to high water table, flooding, and depth to bedrock present a potential pollution hazard and influences design and construction. Slope and stones are also an important consideration in design and construction. Properties that influence performance are permeability and soil reaction.

The soil water table (Table 9) is based on treating the waste water and is directed toward using the water as a source of moisture for crop production. Vegetation is not a necessary part of the treatment process, however, sealing is slower and basin recovery is improved after draining if vegetated.

RESTRICTIVE LIMITS

RESTRICTIVE FEATURE	LIMITS			
	SLIGHT	MODERATE	SEVERE	
Slope (ft)	<3	3-6	>6	Slope
Permeability (Darcy) (20-72")	>5	2-6	<2	Percol Slightly
Depth to High Water Table (ft)	---	---	<72 <sup>1/2</sup>	Shallow to Intermediate
Floods	None Protected Rare	Occasional	Frequent	Floods
Depth to Bedrock			1/2	
[REDACTED SECTION]				
Soil Reaction (pH)	>3.6	<3.6		Too Acid

<sup>1/2</sup>Minimum depth of 10 feet to water table or bedrock is desirable.

APPENDIX II

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. SERIES RATED FOR WASTE MANAGEMENT

ARENIA: Coarse-loamy, mixed, mesic  
Aquic Eutrochrepts

ARMOY: Loamy-skeletal, mixed, mesic  
Lithic Dystrachrepts

ALLERTON: Fine-loamy, mixed, nonacid,  
mesic Aeric Haplaquepts

ARVINGTON: (assuming CEC is 5-15)  
Coarse-loamy, mixed, frigid  
Typic Haplochrepts

MANURE & FOOD PROC. WASTES	0-8%:Mod-wetness 9-25%:Mod-slope, wetness >25%:Sev-slope	0-25%:Sev-low adsorp. 25%:Sev-slope, low adsorp.	0-3%:Sev-wetness	0-8%:Sl. 8-25%:Mod-slope 25%+:Sev-slope
MUNC. SLUDGE & IND. ORG.	0-8%:Mod-too acid, low adsorp. 8-15%:Mod-	0-15%:Sev- depth to		0-8%:Mod-low adsorp., too acid 8-15%:Mod-slope, low adsorp., too acid 15%+:Sev -slope
SEW. SLUDGE	0-6%:Mod-wetness, low adsorp., too acid	0-12%:Sev-low adsorp.	0-3%:Sev-wetness	0-6%:Mod-low adsorp., too acid 6%+:Sev-slope
OVERLAND FLOW	2-8%:Mod-seepage, 0-2, 8-15%:Mod-slope, seepage, too acid, low adsorp. 15-25%:Sev-slope	0-12%:Sev-depth to rock 12%+:Sev-slope, depth to rock	0-3%:Sev-wetness	0-12%:Sev-seepage 12%+:Sev-slope, seepage
RAPID INFILT.	0-6%:Sev-percs slowly, shallow to water 6-25%:Sev-slope, percs slowly, shallow to water	0-6%:Sev-depth to rock 6%+:Sev-slope, depth to rock	0-3%:Sev-wetness	

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	<u>ANALY:</u> Sandy, mixed, fragil Type: Haplorthods	<u>ACTON:</u> Sandy, skeletal Aquic Udocthen	<u>ANALY:</u> Coarse, loamy over sandy or sandy, skeletal, mixed waste Type: Dystrachrepts	<u>ALLI:</u> Fine, silty, acid, waste Acric Haplachrepts
WASTE & FOOD PROC. WASTES	0-25%: Sew-low absorp., 25%: Sew-slope, low absorp.	0-8%: Mod-poor filter 8-25%: Mod-slope, poor absorp. 25%: Sew-slope	0-6%: Mod-poor filter, low absorp. 8-25%: Mod-slope, poor filter, low absorp. 25%: Sew-slope	0-8%: Mod-wetness, 8%: Mod-slope, wetness
MING. SLUDGE & IND. GCG, WASTE	0-15%: Sew-slope, low absorp., low absorp. 15%: Sew-slope, low absorp., low absorp.	0-8%: Mod-poor filter, absorp. 8-15%: Mod-slope, poor absorp. & absorp. 15%: Sew-slope	0-8%: Mod-poor filter, low absorp., low absorp. & acid 8-15%: Mod-slope, poor filter, low absorp. & acid 15%: Sew-slope	0-8%: Mod-wetness, tends wetly, low absorp., depth to rock, long 8-15%: Mod-slope, wetness, tends acid usually, low absorp., depth to rock, too acid
WASTE H <sub>2</sub> O USED FOR IRRIGATION	0-8%: Sew-fast intake, low absorp., 4%: Sew-slope, fast intake, low absorp.	0-3%: Mod-wetness, too 3-8%: Mod-slope, wetness, absorp. 8%: Sew-slope	0-3%: Mod-coo acid 3-8%: Mod-slope, too acid 8%: Sew-slope	0-8%: Sew-petes slowly 8-15%: Sew-slope, petes slowly
SLOW RATE	0-12%: Sew-low absorp., low absorp., petes fast 12%: Sew-slope, low absorp., low absorp., petes fast	0-6%: Mod-wetness, low acid, low absorp. 6-12%: Mod-slope, wetness, too acid, low absorp. 12%: Sew-slope	0-6%: Mod-top acid 6-12%: Mod-slope, too acid 12%: Sew-slope	0-12%: Sew-wetness, petes slowly depth to rock 12-15%: Sew-slope, wetness, petes slowly, depth to rock
OVERLAND	0-12%: Sew-petes fast, low absorp.	0-12%: Sew-petes fast	0-12%: Sew-seepage	0-8%: Mod-wetness, depth to rock
FLOW	12%: Sew-slope, petes fast, low absorp.	12%: Sew-slope, petes f	12%: Sew-slope, seepage	0-2, 8-12%: Mod-slope, wetness, depth to rock 12-15%: Sew-slope
RAPID INFILT.	0-3%: Sl. 3-6%: Mod-slope 6-4%: Sew-slope	0-6%: Sew-shallow to wa 6-4%: Sew-slope, shallow	0-6%: Sew-shallow to water 6-4%: Sew-slope, shallow to water	0-6%: Sew-petes slowly, shallow to water, depth to rock 6-15%: Sew-slope, petes slowly, shallow to water, depth to rock



SEALING WATER FOR WASTE MATERIAL

CHARLTON: Coarse-loamy, mixed mesic  
Typic Dystrachrepts

CHERRAND: Loamy-skeletal, mixed, mesic  
Typic Dystrachrepts

CLIFIELD: Coarse-loamy, mixed, mesic  
Typic Dystrachrepts

COLLIER: (assuming GEC is >15)  
Fine-silty, mixed, mesic  
Entic Dystrachrepts

MANURE & FOOD PRODC. WASTES	0-8%:s1 8-13%:Mod-slope	0-8%:Mod-poor filler, erodes easily, low adsorp. 8-12%:Mod-slope, poor filler, erodes easily, low adsorp.	0-8% 8-22% 25-31%	Mod-slope Mod-slope v-slope	0-27%:Sew-erodes easily 25%:Sew-slope, erodes easily 0-15%:Sew-erodes easily
MINC. SLODGE & IND. ORG. WASTE	25%:Sew-slope 0-8%:Mod-low adsorp., too acid 8-15%:Mod-low adsorp., slope, too acid	25%:Sew-slope 0-8%:Mod-poor filler, low adsorp., erodes easily, low adsorp. 8-15%:Mod-slope, poor filler, low adsorp., erodes easily, low adsorp.	0-8% 0-8% 0-8%	v-slope Mod-low adsorp., too acid Mod-low adsorp., too acid	0-15%:Sew-erodes easily 15-21%:Sew-slope 0-8%:Sew-erodes easily
WASTE H2O USED FOR IRRIGATION	15%:Sew-slope 0-7%:Mod-too acid, low adsorp. 3-8%:Mod-slope, too acid, low adsorp. 9%:Sew-slope	0-5%:Sew slope 0-12%:Mod-droughty, erodes easily, too acid, low adsorp. 0-8%:Mod-slope, droughty, erodes easily, too acid, low adsorp. 9%:Sew-slope	15-21% 0-32% 3-8% 9%	Sew-slope Mod-too acid, low adsorp. Mod-slope, too acid, low adsorp. v-slope	15-21%:Sew-slope 0-8%:Sew-erodes easily 9%:Sew-slope, erodes easily
SLODGE BAIT	0-6%:Mod-low adsorp., too acid 6-12%:Mod-low adsorp., slope, too acid 12%:Sew-slope	0-12%:Sew-percs fast 0-12%:Sew-percs fast	0-6% 6-12% 12%	Mod-low adsorp., too acid Mod-low adsorp., slope, too acid Sew-slope	0-12%:Sew-erodes easily 12%:Sew-slope, erodes easily
OVERLAND FLOW	0-12%:Sew-percs fast 12%:Sew-slope, percs fast	0-12%:Sew-seepage 12%:Sew-slope, seepage	0-2% 2-6% 8-11% 12%	Mod-slope, percs fast, low adsorp. Mod-percs fast, low adsorp. Mod-slope, percs fast, adsorp. Sew-slope	2-8%:Mod-seepage 0-2, 8 12%:Mod-slope, seepage 12%:Sew-slope
RAPID INFILT.	0-6%:Sew-percs slowly 6%:Sew-slope, percs slowly	0-6%:s1 6%:Sew-slope	0-6% 6-2%	Mod-percs slowly v-slope, percs slowly	0-6%:Sew-percs slowly 6%:Sew-slope, percs slowly

PERCENT RAINFALL FOR WASTE MANAGEMENT

	COLUMN: (Assuming CEC is <3) Sandy-skeletal, mixed, fine Typic Haplochreps	COVERING	PERCENT RAINFALL FOR WASTE MANAGEMENT	DENSITY: (Assuming CEC is >15) Fine, loamy, mixed, weak Classeaquic Haplochreps	PERCENT RAINFALL FOR WASTE MANAGEMENT
EXPOSURE A FOOD PROC. WASTES	0-25%:Sev-low absorp.	0-8%:Sev-low absorp.	slowly, shallow to water	0-9%:SI 8-25%:Mod-slope	0-6%:Mod-wetness, too easily 8-25%:Mod-slope, too easily
NONC. SLUDGE & IND. ORG. WASTE	0-15%:Sev-low absorp.	0-8%:Sev-low absorp.	slowly, shallow to water	0-8%:Mod-wetness, too acid 6-15%:Mod-slope, wetness, too acid	0-8%:Mod-wetness, too easily, too acid 6-15%:Mod-slope, wetness, too acid
WASTE H2O USED FOR IRRIGATION	0-8%:Sev-drougthy, fast intake, low adsorp.	0-8%:Sev-drougthy, fast intake, low adsorp.	slowly, shallow to water	0-3%:Mod-wetness, percs slowly, too acid 3-8%:Mod-slope, wetness, percs slowly, too acid	0-3%:Mod-wetness, percs slowly, too acid 3-8%:Mod-slope, wetness, percs slowly, too acid
SLOW RATE	0-12%:Sev-low absorp., percs fast	0-8%:Sev-low absorp., percs fast	slowly, shallow to water	0-6%:Mod-wetness, percs slowly, too acid 6-12%:Mod-slope, wetness, percs slowly, too acid	0-6%:Mod-wetness, percs slowly, too acid 6-12%:Mod-slope, wetness, percs slowly, too acid
OVERLAND	0-12%:Sev-seepage, low adsorp.	2-9%:SI	slowly, shallow to water	2-8%:SI	2-8%:SI
RAPID INFILT.	0-6%:Mod-large stones 6-6%:Sev-slope	0-6%:Sev-slope, see page, low adsorp.	slowly, shallow to water	0-2, 8-12%:Mod-slope, 12-6%:Sev-slope	0-2, 8-12%:Mod-slope, 12-6%:Sev-slope



SOUTH BAY/D FOR WASTE CHARACTERISTICS

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<u>CRESENT: Fine-to-very-mixed acid, mesic Acidic liquid, mesic (assuming CEC is 5-15)</u>	<u>CHICKEN STERN: Sandy-skeletal mixed, mesic Type dystrochreptic</u>	<u>ISSUED: Heavy-skeletal mixed, transit type hypochreptic</u>
<p><u>GROUP A AND PNOG CASTLES</u></p> <p>0-8%:Mod-wetness 6-25%:Non-slope,wetness 25%:Sev-slope</p>	<p>0-8%:Mod-poor filter, low absorp., large stones 0-25%:Mod-poor filter, slope, low absorp., large stones 25%:Sev-slope</p>	<p>0-8%:Mod-poor filter, low absorp., large stones 8-25%:Mod-slope, poor filter, low absorp., large stones 25%:Sev-slope</p>
<p><u>SHO-SLUDGE 4.1SR, CRG, WASTE</u></p> <p>0-8%:Mod-wetness, low absorp., too acid 8-15%:Mod-slope, wetness, low absorp., too acid 15%:Sev-slope</p>	<p>0-8%:Mod-poor filter, low absorp., low absorp., large stones, too acid 8-15%:Mod-poor filter, low absorp., slope, low absorp., dk. stones, too acid 15%:Sev-slope</p>	<p>0-8%:Mod-poor filter, low absorp., low ab. exp., large stones, too acid 8-15%:Mod-slope, poor filter, low absorp., low absorp., large stone, too acid 15%:Sev-slope</p>
<p><u>WASTE 110 WLF 20X MEXICALFIN</u></p> <p>0-3%:Mod-wetness, pores slowly, too acid, low absorp. 3-8%:Mod-slope, wetness, pores slowly too acid, low absorp. 8%:Sev-slope</p>	<p>0-3%:Mod-large stones, droughty, too acid, low absorp. 3-8%:Mod-large stones, droughty, slope too acid, low absorp. 8%:Sev-slope</p>	<p>0-3%:Mod-large stones, too acid, low absorp. 3-8%:Mod-slope, large stones, too acid, low absorp. 8%:Sev-slope</p>
<p><u>SLUR BATE</u></p> <p>0-0%:Mod-wetness, low absorp., pores slowly, too acid 6-12%:Mod-slope, wetness, low absorp., pores slowly, too acid 12%:Sev-slope</p>	<p>0-6%:Mod-large stones, low absorp., low absorp., pores fast, too acid 6-12%:Mod-large stones, low absorp., slope, low absorp., pores fast, too acid 12%:Sev-slope</p>	<p>0-6%:Mod-large stones, low absorp. low absorp., pores fast, too acid 6-12%:Mod-slope, large stones, low absorp., low absorp., pores fast, too acid 12%:Sev-slope</p>
<p><u>OVERLAND FLDN</u></p> <p>2-6%:Mod-wetness, seepage, low absorp. 0-2%:Mod-slope, wetness, seepage, low absorp. 12%:Sev-slope</p>	<p>0-12%:Sev-pores fast 12%:Sev-slope, pores fast</p>	<p>0-12%:Sev-seepage 12%:Sev-slope, seepage</p>
<p><u>RAVINE TRILLI</u></p> <p>0-6%:Sev-pores slowly, shallow to water 6%:Sev-slope, pores slowly, shallow to water</p>	<p>0-3%:Mod-large stones 3-8%:Mod-slope, large stones 6%:Sev-slope</p>	<p>0-3%:Sev-pores slowly, shallow to water, floods 3-8%:Mod-slope, large stones 6%:Sev-</p>

SERIES: RAFTED TON WATER MANAGEMENT

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2-32

HYDROLOGY (CWC < 5% )      WELLIS: Loamy-sand, mesic      TOPSOIL: Fine, silty, calcareous, mesic      UNDERL: Loamy-skeletal, mesic, gneiss  
Sandy-skeletal, mixed, mesic      Litic, Dystrachric,      Aeric, Dupl. gypses      G10s0b0r0c    Hapludalfs  
Typic Uorthents           (assuming CWC in 5-15)

<u>STRURE &amp; FOOD PROG. WASTES</u>	0-25%:Sev-poor filter	0-25%:Sev-low absorp.	0-8%:Mod-ermin., erodes easily, low absorp.	0-8%:Mod-poor filter
	25%:Sev-slope, poor filter	25%:Sev-slope, low absorp.	8-25%:Mod-slope, richness, erodes easily, low absorp.	8-25%:Mod-slope, poor filter
<u>NRG. SLUDGE &amp; GUN. OILS, WASTE</u>	0-15%:Mod-low absorp., poor filter	0-15%:Sev-low absorp.	0-8%:Mod-low min., low absorp., erodes easily, low absorp., too acid, depth to rock	0-8%:Mod-poor filter, low absorp., too acid
	15%:Sev-low absorp., slope, poor filter	15%:Sev-slope, low absorp.	8-15%:Mod-slope, richness, low absorp., erodes easily, low absorp., too acid, depth to rock	8-15%:Mod-slope, poor filter, low absorp., too acid
<u>WASTE (NO IRRIGATION)</u>	0-8%:Sev-low absorp.	0-8%:Sev-depth to rock	0-8%:Mod-ermin., poor slowly, depth to rock, erodes easily, low absorp.	0-8%:Mod-ermin., poor slowly, depth to rock, erodes easily, low absorp.
	8%:Sev-face intake, slope, low absorp.	8%:Sev-depth to rock, slope	8-12%:Mod-slope, richness, erodes easily, low absorp., depth to rock, erodes easily, too acid, low absorp.	8-12%:Mod-slope, richness, erodes easily, low absorp., depth to rock, erodes easily, too acid, low absorp.
<u>SLOW RATE</u>	0-12%:Sev-low absorp., poor filter	0-12%:Sev-low absorp., depth to rock	0-6%:Sev-poor filter	0-12%:Sev-poor filter
	12%:Sev-low absorp., slope, poor filter	12%:Sev-slope, low absorp., depth to rock	6-12%:Sev-slope, poor filter	12%:Sev-slope, poor filter
<u>OVERLAND FLOW</u>	0-12%:Sev-poor face, low absorp.	0-12%:Sev-poor face, depth to rock	2-8%:Mod-ermin., low absorp.	0-12%:Sev-slope
	12%:Sev-slope, poor face, low absorp.	12%:Sev-slope, poor face, depth to rock	2-8-12%:Mod-slope, richness, low absorp.	12%:Sev-slope, poor face
<u>RAPID INFILT.</u>	0-3%:Mod-large stones	0-6%:Sev-depth to rock	0-6%:Sev-poor slowly, shallow to water, depth to rock	0-3%:Mod-slope
	3-6%:Mod-slope, large stones	6%:Sev-slope, depth to rock	6%:Sev-slope, poor slowly, shallow to water, depth to rock	3-6%:Mod-slope, 6%:Sev-slope

SIZES RATED FOR WASTE MANAGEMENT

	ILLUSTRATION: COVERED-LONGYARDS reside Agric. landscapes	ILLUSTRATION: JUNGLE/PAVED/PAVED Classroom/landfills	ILLUSTRATION: COVERED/PAVED/PAVED reside Typic. landscapes	ILLUSTRATION: VARY-FINE/PAVED reside/PAVED/PAVED/PAVED
POURTE & FOOD PRODUCE WASTES	U-87:Sev-wetness	0-87:st 8-15%:Mod-slope	0-37:Sev-floods	0-37:Sev-wetness
FRIG-SLUDGE & IND. ORG. WASTE	0-87:Sev-wetness	0-87:Mod-low adsorp, too acid 8-15%:Mod-slope, low adsorp, too acid	0-37:Sev-floods	0-37:Sev-wetness
WASTE (1/2) USED FOR IRRIGATION	0-87:Sev-wetness	0-37:Mod-percs slowly, too acid, low adsorp 3-8%:Mod-slope, percs slowly, too acid, low adsorp 8-12%:Sev-slope	0-37:Sev-floods	0-37:Sev-wetness, slow inflow, percs slowly
SLOW RATE	0-87:Sev-wetness	0-87:Mod-wetness, low adsorp, percs slowly, too acid 6-12%:Mod-slope, wetness, low adsorp, percs slowly, too acid 12%:Sev-slope	0-1%:Sev-wetness, floods	0-37:Sev-pending, percs slowly
OVERLAND FLOW	0-87:Sev-percs fast, wetness	2-6%:Mod-sweep, low adsorp 0-2%:R-12%:Mod-slope, sweep, low adsorp 12%:Sev-slope	0-37:Sev-floods	0-37:Sev-wetness
RAPID INFILT.	D-67:Sev-shallow to water 6-87:Sev-slope, shallow to water	0-0%:Sev-percs slowly 6%:Sev-slope, percs slowly	0-3%:Sev-percs slowly, shallow to water, floods	0-3%:Sev-percs slowly, shallow to water

SERIES RATED FOR WASTE MANAGEMENT

	<u>LYONS:</u> Lowly mixed, rigid Lithic Dyplocroites	<u>NEBRASKA:</u> Sandy mixed, porous Type Dyplocroites	<u>ALBUQUERQUE:</u> Coarse to very mixed, fine Fluorapatite, butrochroites (assemblage: 100% by 210)	<u>SABERT:</u> Lowly, stibitofactoid, mixed, rare lithic Dyplocroites
<u>MAJORITY &amp; TROPIC:</u>	0-25%:Sev-low absorp	0-8%:Mod-poor filter, low absorp	0-3%:Mod-sevness, floods	0-25%:Sev-low absorp
<u>WASTE H<sub>2</sub>O UNLID FOR TRICATION:</u>	25%:Sev-slope, low absorp	8-25%:Mod-poor filter, slope, low absorp	12%:Sev-slope, floods	25%:Sev-slope, low absorp
<u>MAJORITY &amp; TROPIC:</u>	0-15%:Sev-low absorp	0-8%:Mod-poor filter, low absorp, low absorp, too acid	0-3%:Sev-floods	0-15%:Sev-low absorp
<u>WASTE H<sub>2</sub>O UNLID FOR TRICATION:</u>	15%:Sev-slope, low absorp	8-15%:Mod-poor filter, low absorp, slope, low absorp, too acid	0-3%:Mod-sevness, floods, too acid	15%:Sev-slope, low absorp
<u>WASTE H<sub>2</sub>O UNLID FOR TRICATION:</u>	0-8%:Sev-depth to rock	0-7%:Mod-low adsorp, low absorp, percs	0-3%:Mod-sevness, floods, too acid	0-8%:Sev-depth, depth to rock
<u>WASTE H<sub>2</sub>O UNLID FOR TRICATION:</u>	8-7%:Sev-depth to rock, slope	3-8%:Mod-slope, too acid, low absorp	0-3%:Mod-sevness, floods, too acid	8-7%:Sev-depth, depth to rock, slope
<u>WASTE H<sub>2</sub>O UNLID FOR TRICATION:</u>	0-12%:Sev-low absorp, depth to rock	6-12%:Mod-low adsorp, slope, low absorp, percs, fast, too acid	0-3%:Sev-sevness	0-12%:Sev-low absorp, depth to rock
<u>WASTE H<sub>2</sub>O UNLID FOR TRICATION:</u>	12-2%:Sev-slope, low absorp, depth to rock	12-2%:Sev-slope	0-3%:Sev-sevness, floods	12-2%:Sev-slope, low absorp, depth to rock
<u>WASTE H<sub>2</sub>O UNLID FOR TRICATION:</u>	0-17%:Sev-percs fast, depth to rock	0-17%:Sev-percs fast	0-3%:Mod-sevness, floods	0-17%:Sev-depth to rock
<u>WASTE H<sub>2</sub>O UNLID FOR TRICATION:</u>	12-7%:Sev-percs fast, depth to rock	12-7%:Sev-slope, percs fast	0-3%:Sev-sevness, floods	12-7%:Sev-depth, depth to rock
<u>WASTE H<sub>2</sub>O UNLID FOR TRICATION:</u>	0-6%:Sev-depth to rock	0-3%:Mod-slope	0-3%:Sev-sevness, floods, shallow to water	0-6%:Sev-percs, slowly, depth to rock
<u>WASTE H<sub>2</sub>O UNLID FOR TRICATION:</u>	6-7%:Sev-slope, depth to rock	6-7%:Sev-slope	0-3%:Sev-sevness, floods, shallow to water	6-7%:Sev-slope, percs, slowly, depth to rock



SERIES RATED FOR WASTE MANAGEMENT

	<u>PAVTON:</u> Very fine, silty, micaceous Typic Ochraqualfs (guessed at This one, No. desc. or interf. available)	<u>PAVTON:</u> Coarse, loamy, mixed, micaceous Typic Fragiochreptis	<u>PERBU:</u> Coarse, loamy, mixed, fragid Aquic Fragiochreptis	<u>PHILPS:</u> Fine, loamy over sandy or sandy-skeletal, fragid, micaceous Glossaqueic Hapludalfs
<u>MANURE &amp; FOOD PROC. WASTES</u>	0-3%:Sev-wetness	0-8%:S1 8-25%:Mod+slope 25%:Sev-slope	0-8%:S1 8-25%:Mod-slope 25%:Sev-slope	0-8%:Mod-poor tiller, erodes easily, low absorb
<u>MING. SLUDGE &amp; IND. ORG. WASTE</u>	0-3%:Sev-wetness	0-8%:Mod-low adsorp, too acid 8-15%:Mod-low adsorp, slope, too acid 15%:Sev-slope	0-8%:Mod-low adsorp, too acid 8-15%:Mod-low adsorp, slope, too acid 15%:Sev+slope	0-8%:Mod-poor tiller, erodes easily, low absorb, low adsorp
<u>WASTE HYD USED FOR IRRIGATION</u>	0-3%:Sev-wetness, percs slowly	0-3%:Mod-percs slowly, rooting depth, too acid, low adsorp 3-8%:Mod-percs slowly, rooting depth, slope, too acid, low adsorp 8%:Sev-slope	0-3%:Mod-percs slowly, rooting depth, too acid, low adsorp 3-8%:Mod-percs slowly, rooting depth, slope, too acid, low adsorp 8%:Sev-slope	0-3%:Mod-wetness, droughty, erodes easily, low adsorp 3-8%:Mod-wetness, droughty, erodes easily, slope, low adsorp
<u>SLOW RATE</u>	0-3%:Sev-pending, percs slowly	0-6%:Mod-low adsorp, percs slowly, too acid 6-12%:Mod-low adsorp, slope, percs slowly, too acid 12%:Sev-slope	0-6%:Mod-wetness, low adsorp, percs slowly, too acid 6-12%:Mod-wetness, low adsorp, slope, percs slowly, too acid 12%:Sev-slope	0-6%:Mod-wetness, low adsorp, low absorb, percs fast, erodes easily 6-12%:Mod-wetness, low adsorp, slope, low absorb, percs fast, erodes easily 12%:Sev-slope
<u>OVERLAND FLOW</u>	0-3%:Sev-wetness	0-12%:Sev-percs fast 12%:Sev-slope, percs fast	0-2%:Mod-slope, percs fast 2-8%:Mod-percs fast, low adsorp 8-12%:Mod-slope, percs fast, low adsorp 12%:Sev-slope	0-2%:Mod-slope, seepage, low adsorp 2-6%:Mod-seepage, low adsorp
<u>RAPID INFILT.</u>	0-3%:Sev-percs slowly, shallow to water	0-6%:Sev-percs slowly 6%:Sev-slope, percs slowly	0-6%:Sev-percs slowly, shallow to water 6%:Sev-slope, percs slowly, shallow to water	0-6%:Sev-shallow to water 6-8%:Sev-slope, shallow to water

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SERIES RATED FOR WASTE MANAGEMENT

	<u>PITTINGS:</u> Course-loamy, mixed, mesic Typic Fragiochreptic	<u>RFD BLOOM:</u> Course-loamy, mixed, nonacid Mesic Aeric Hapludqueps (assuming CEC is 5-15)	<u>RIKCHWERY:</u> Course-loamy, mixed, mesic Aeric Fragiochreptic	<u>SARDI:</u> Course-silty, fixed, nonacid Mesic Fluvisollic Hapludquep
<u>MANURE &amp; FOOD PROC. WASTES</u>	0-8%:Sl 8-23%:Mod-slope 23-37%:Sev-slope	0-8%:Mod-wetness, low absorp	0-25%:Sev-wetness,	0-2%:Sev-wetness, erodes easily, floods
<u>MINC. SLUDGE &amp; IND. ORG. WASTE</u>	0-6%:Mod-low adsorp, too acid 8-15%:Mod-low adsorp, slope, too acid 15-21%:Sev-slope	0-8%:Mod-wetness, low adsorp, low absorp, too acid	0-15%:Sev-wetness, low absorp	0-2%:Sev-wetness, erodes easily, floods
<u>WASTE H<sub>2</sub>O USED FOR IRRIGATION</u>	0-3%:Mod-wetness, percs slowly, rooting depth, too acid, low adsorp 3-8%:Mod-wetness, percs slowly, rooting depth, slope, too acid, low adsorp. 8-15%:Sev-slope	0-3%:Mod-wetness, too acid, low adsorp 3-8%:Mod-slope, wetness, low adsorp, low absorp, too acid	0-8%:Sev-wetness, rooting depth 8-15%:Sev-wetness, rooting depth, slope	0-2%:Sev-wetness, ponding, erodes easily, floods
<u>SLOW RATE</u>	0-6%:Mod-wetness, low adsorp, percs slowly, too acid 6-12%:Mod-wetness, low adsorp, slope percs slowly, too acid 12-17%:Sev-slope	0-6%:Mod-wetness, low adsorp, low absorp, percs slowly, too acid 6-8%:Mod-slope, wetness, low adsorp, low absorp, percs slowly, too acid	0-12%:Sev-wetness, low absorp 12-17%:Sev-wetness, slope, low absorp.	0-2%:Sev-wetness, ponding, erodes easily, floods
<u>OVERLAND FLOW</u>	0-2%:Mod-slope, percs fast, low adsorp. 2-8%:Mod-percs fast, low adsorp. 8-12%:Mod-slope, percs fast, low adsorp. 12-17%:Sev-slope	0-2%:Mod-slope, seepage, wetness, low adsorp. 2-8%:Mod-seepage, wetness, low adsorp.	0-12%:Sev-percs fast, wetness 12-17%:Sev-slope, percs fast, wetness	0-2%:Sev-wetness, floods
<u>RAPID INFILT.</u>	0-6%:Sev-percs slowly, shallow to water 6-12%:Sev-slope, percs slowly, shallow to water	0-6%:Sev-percs slowly, shallow to water 6-8%:Sev-slope, percs slowly, shallow to water	0-6%:Sev-percs slowly, shallow to water 6-12%:Sev-slope, percs slowly, shallow to water	0-2%:Sev-percs slowly, shallow to water, floods

SERIES RATED FOR WASTE MANAGEMENT

SCANTIC: Fine, illitic, nonacid, mesic  
Typic Haplaquepts

SCARNORD: Sandy, mixed, mesic  
Histic Humaquepts

SCIO: Coarse-silty, mixed, mesic  
Aquic Dystrachrepts

SUDBURY: Sandy, mixed, mesic  
Aquic Dystrachrepts

MANURE & FOOD PROC. WASTES	0-8%:Sev-wetness	0-3%:Sev-wetness	0-8%:Mod-poor filter, erodes easily 8-25%:Mod-poor filter, slope, erodes easily	0-8%:Mod-poor filter, wetness, low adsorp. 8-15%:Mod-poor filter, wetness, slope, low adsorp.
MUNC. SLUDGE & IND. ORG. WASTE	0-8%:Sev-wetness	0-3%:Sev-wetness	0-8%:Mod-poor filter, low adsorp., too acid 8-15%:Mod-poor filter, low adsorp., slope, too acid	0-8%:Mod-poor filter, wetness, low adsorp., too acid 8-15%:Mod-poor filter, wetness, low adsorp., slope, low adsorp., too acid
WASTE H <sub>2</sub> O USED FOR IRRIGATION	0-8%:Sev-wetness	0-3%:Sev-wetness, ponding, fast intake	0-8%:Sev-erodes easily 8-15%:Sev-slope, erodes easily	0-3%:Mod-wetness, too acid, low adsorp. 3-8%:Mod-wetness, slope, too acid, low adsorp. 8-15%:Sev-slope
SLOW RATE	0-8%:Sev-wetness	0-3%:Sev-wetness, percs fast	0-12%:Sev-erodes easily 12-15%:Sev-slope, erodes easily	0-12%:Sev-wetness 12-15%:Sev-wetness, slope
OVERLAND FLOW	0-8%:Sev-wetness	0-3%:Sev-percs fast, wetness	0-2%:Mod-slope, percs fast, low adsorp. 2-8%:Mod-percs fast, low adsorp. 8-12%:Mod-slope, percs fast, low adsorp.	0-12%:Sev-percs fast 12-15%:Sev-slope, percs fast
RAPID INFILT.	0-6%:Sev-percs slowly, shallow to water	0-3%:Sev-shallow to water	0-6%:Sev-percs slowly, shallow to water 6-15%:Sev-slope, percs slowly, shallow to water	0-6%:Sev-shallow to water 6-15%:Sev-slope, shallow to water

SUFFIELD: Coarse-silty over clayey, mixed, med. Dyseric, kurochrepts

SUTTON: Coarse-silty over clayey, mixed, med. Dyseric, kurochrepts

WASTE MANAGEMENT

TIGGA: Coarse-loamy, mixed, med. Dyseric, fluvoaquic, kurochrepts. (assuming CEC is >10)

UNDALEA: Coarse-silty, mixed, typical Dyseric, kurochrepts. (assuming CEC is 5-10)

MANURE & ROAD PROC. WASTES	3-8%:Mod-slope 4-25%:Mod-slope 25%:Sev-slope	0-8%:Mod-slope 8-25%:Mod-slope 25%:Sev-slope		0-3%:Mod-poor filter, too acid	25%:Sev-slope, erodes easily 0-15%:Sev-erodes easily
MUNIC. SLUDGE & IND. ORG. WASTE	3-8%:Mod-low adsorp, too acid 8-15%:Mod-low adsorp, slope, too acid 15%:Sev-slope	0-8%:Mod-slope 8-15%:Mod-slope 15%:Sev-slope			15%:Sev-slope, erodes easily 0-8%:Sev-erodes easily
WASTE H2O USED FOR IRRIGATION	3-8%:Mod-percs slowly, slope, too acid, low adsorp. 8%:Sev-slope	0-3%:Mod-slope 3-8%:Mod-slope 8%:Sev-slope		0-3%:Mod-floods, too acid	8%:Sev-slope, erodes easily 0-12%:Sev-erodes easily
SLOW RATE	3-8%:Mod-low adsorp, percs slowly, too acid 6-12%:Mod-low adsorp, slope, percs slowly, too acid 15%:Sev-slope	0-6%:Mod-slope 6-12%:Mod-slope 15%:Sev-slope		0-3%:Mod-percs fast, floods, too acid	0-12%:Sev-erodes easily 12%:Sev-slope, erodes easily
OVERLAND FLOW	3-8%:Mod-percs fast, low adsorp. 8-12%:Mod-slope, percs fast, low adsorp. 12%:Sev-slope	0-12%:Sev-percs fast 12%:Sev-slope, percs fast		0-3%:Sev-slope	0-3%:Sev-slope
RAPID INFILT.	3-6%:Sev-percs slowly 6%:Sev-slope, percs slowly	0-6%:Sev-percs slowly, shallow to water 6%:Sev-slope, percs slowly, shallow to water		0-3%:Sev-slope, shallow to water	6%:Sev-slope, percs slowly

SERIES RATED FOR WASTE MANAGEMENT

WALPOLE: Sandy, mixed, mesic  
Aeric haplaquepts

WAREHAM: Mixed, mesic Humaqueptic  
Psammaquepts

WARNERS: Fine-silty, carbonatic,  
Mesic Fluvaqueptic haplaquepts

WILTMAN: Coarse-loamy, mixed,  
Mesic Humic Fragiaquepts

MANURE & FOOD PROC. WASTES	3-8%: Sev-wetness	0-8%: Sev-wetness	0-3%: Sev-wetness	0-8%: Sev-wetness
MUNC. SLUDGE & IND. ORG. WASTE	3-8%: Sev-wetness	0-8%: Sev-wetness	0-3%: Sev-wetness	0-8%: Sev-wetness
WASTE H <sub>2</sub> O USED FOR IRRIGATION	3-8%: Sev-wetness	0-8%: Sev-wetness	0-3%: Sev-wetness	0-8%: Sev-wetness
SLOW RATE	3-8%: Sev-ponding	0-8%: Sev-wetness	0-3%: Sev-wetness	0-6%: Sev-wetness 6-8%: Sev-slope, wetness
OVERLAND FLOW	3-8%: Sev-seepage, wetness	0-8%: Sev-wetness, seepage	0-3%: Sev-wetness	0-8%: Sev-wetness, seepage
RAPID INFILT.	3-6%: Sev-shallow to water 3-8%: Sev-slope, shallow to water	0-8%: Sev-shallow to water	0-3%: Sev-percs slowly, shallow to water	0-6%: Sev-percs slowly, shallow to water 6-8%: Sev-slope, percs slowly, shallow to water

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SERIES RATED FOR WASTE MANAGEMENT

WINDSOR: Mixed, mesic  
Typic Udipsamments

WINDOSET: Coarse-silty, mixed, nonacid,  
mesic Aquic Udifluvents

WOODBRIDGE: Coarse-loamy, mixed, basic  
Typic Fragiochrepts

MANURE & FOOD PROC. WASTES	0-8%:Mod-poor filter, low adsorp. 8-25%:Mod-poor filter, slope, low adsorp. 25+%:Sev-slope	0-3%:Sev-erodes easily, floods	0-8%:S1 8-25%:Mod-slope 25+%:Sev-slope
MUNC. SLUDGE & IND. ORG. WASTE	0-15%:Sev-low adsorp. 15+%:Sev-low adsorp., slope	0-3%:Sev-erodes easily, floods	0-8%:Mod-low adsorp., too acid 8-15%:Mod-low adsorp., slope, too acid 15+%:Sev-slope
WASTE H <sub>2</sub> O USED FOR IRRIGATION	0-8%:Sev-fast intake, low adsorp. 8+%:Sev-fast intake, slope, low adsorp.	0-3%:Sev-erodes easily, floods	0-3%:Mod-wetness, percs slowly, rooting depth, too acid, low adsorp. 3-8%:Mod-wetness, percs slowly, rooting depth, slope, too acid, low adsorp. 8+%:Sev-slope
SLOW RATE	0-12%:Sev-low adsorp., low adsorp.	0-3%:Sev-wetness, erodes	
RAPID INFILT.	0-3%: S1 3-6%:Mod-slope 6+%:Sev-slope	0-3%:Sev-percs slowly, shallow to water, floods	0-6%:Sev-percs slowly, shallow to water 6+%:Sev-slope, percs slowly, shallow to water

APPENDIX III

SERIES RATED FOR WASTE MANAGEMENT

ADLEHIA: Fine-loamy, mixed, mesic  
Aquic Inceptisols

BELTSVILLE: Fine-loamy, mixed, mesic  
Typic Frigidic Gleys

BURNS: loamy-skeletal, mixed,  
hectic Typic Dystricceptisols

DRINKERMAN: Fine-silty, mixed,  
mesic Typic Frigidic Gleys

MANURE & FOOD PROC. WASTES	Slight	Moderate-wetness, erodes easily	Moderate - low adsorp.	Severe-wetness
GENC. SLUDGE & IND. ORG. WASTE	Moderate - low adsorp., too acid	Moderate - too acid	Moderate - low adsorp., depth to rock, too acid	Severe-wetness
WASTE H <sub>2</sub> O USED FOR IRRIGATION	Moderate-wetness, soil blowing, too acid, low adsorp.	Moderate-wetness, erodes easily, percs slowly, cemented pan, too acid	Moderate-drouthy, depth to rock, too acid, low adsorp.	Severe-wetness
SLOW BATE	Moderate-wetness, too acid, low adsorp.	Moderate-wetness, too acid, percs slowly	Severe-depth to rock	Severe-wetness
OVERLAND FLOW	Moderate-weepage, low adsorp.	Slight	Severe-depth to rock	Severe-wetness
RAPID INFILT.	Severe-percs slowly, shallow to water	Severe-percs slowly, shallow to water	Severe-depth to rock	Severe-percs slowly, shallow to water

SERIES RATED FOR WASTE MANAGEMENT

CAKNO: Very-fine, mixed in waste  
Type Haplidults

CAWODE: Clayey, mixed, mesic  
Aeric Ochraqutels

CHRISTEN: Fine-loamy, mixed,  
cutanic, typic Haplidults

CHRISTIANA: Clayey, Kandiinter  
mesic, typic Kandiutels

FAVURE & FOOD PROC. WASTES	Severe-erodes easily	Moderate-wetness, erodes easily	Moderate-large stones	Moderate-erodes easily
MANU. SLUDGE & IND. ORG. WASTE	Moderate-low absorp., depth to rock	Moderate-wetness, erodes easily, too acid	Moderate-low absorp.	Moderate-low absorp., erodes easily, too acid
WASTE H <sub>2</sub> O USED FOR IRRIGATION	Moderate-droughy, percs slow, too acid	Moderate-wetness, erodes easily, percs slowly, too acid	Moderate-low absorp., too acid	Moderate-erodes easily, percs slowly, low absorp., too acid
SLOW RATE	Moderate-low absorp., percs slowly	Moderate-wetness, percs slowly, erodes easily, too acid	Moderate-low absorp., too acid	Moderate-low absorp., percs slowly, erodes easily, too acid
OVERLAND FLOW	Severe-depth to rock	Moderate-wetness	Moderate-seepage	Moderate-low absorp., seepage
RAPID INFILT.	Severe-percs slowly	Severe-percs slowly, depth to rock	Severe-percs slowly	Severe-percs slowly

SERIES RATED FOR WASTE MANAGEMENT

COLLINGTON: Fine-loamy, mixed,  
mesic Typic Hapudults

COOKPORT: Fine-loamy, mixed,  
mesic Aquic Fragnudults

GRANTON: Fine-silty, mixed, mesic  
Typic Fragnudults

SKALIA: Loamy-skeletal,  
mixed, mesic Typic  
system hapods

MANURE & FOOD PROC. WASTES	Slight	Moderate-erodes easily	Severe-wetness	Moderate-poor filter, low absorp.
MUDIC. SLUDGE & IND. ORG. WASTE	Moderate-erod acid	Moderate-low absorp., erodes easily erod acid	Severe-wetness	Moderate-poor filter, low absorp., depth to rock, low absorp.
WASTE LIQ USED FOR IRRIGATION:	Moderate-erod acid	Moderate-wetness, erodes easily, centered pan, erod acid, low absorp.	Severe-wetness	Moderate-erod depth, erod acid, low absorp.
SLOW RATE	Moderate-erod acid	Moderate-wetness, percs slowly, low absorp., erodes easily, erod acid	Severe-wetness	Severe-depth to rock
OVERLAND FLOW	Moderate-seepage	Moderate-seepage	Moderate-depth to rock	Severe-seepage, depth to rock
RAPID INFILT.	Severe-percs slowly	Severe-percs slowly, shallow to water, depth to rock	Severe-percs slowly, shallow to water, depth to rock	Severe-depth to rock

SURFESS RATED FOR WASTE MANAGEMENT

GRAVELLO Fine to very silty, acid, low  
 UIC in interstitial

GRAVELLO Fine to coarse, silty, low  
 Type: high UIC in

CLAY Clay, silty, low  
 Type: low UIC in

CLAY Fine to very silty,  
 acid, low  
 Type: low UIC in

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GRAVEL A  
 FOOD PROC.  
 WASTES

slight

Moderate-low absorp.

Severe-slow

moderate-low absorp.

MORG. SLUDGE  
 & TSP. ORG.  
 WASTE

Moderate-low absorp., low acid

Moderate-low absorp., low absorp.  
 low acid

Severe-slow

Moderate-low absorp., low  
 absorp., low acid

WASTE II, III  
 USED FOR  
 IRRIGATION

Moderate-low acid, low absorp.

Moderate-drawling, low acid, low  
 absorp.

Severe-low

Moderate-low absorp., low  
 low absorp.

SLUDG RATE

in dilute-depth to rock, low  
 absorp., low acid

Moderate-low absorp., low absorp.,  
 low acid

Severe-slow

Moderate-low and low  
 absorp., low acid

OVERLAYS  
 FLOW

Moderate-slow, depth to rock

Moderate-low absorp., depth to rock

Moderate-slow

Moderate-slow

RAPID  
 INFILT.

Severe-pores slowly, shallow to  
 water, depth to rock

Severe-shallow to water

Severe-pores slowly, shallow to  
 water

Moderate-pores slowly  
 depth to rock

SOILS RATED FOR WATER PENETRATION

LINE 1: Fine-grained, mixed, non-  
Aque. Frag. (clay)

LINE 2: Non-compact type  
Soil structure

LINE 3: Fine-grained, silty, clayey,  
non-compact type (clayey)

LINE 4: Fine-grained,  
non-compact type  
Soil structure

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	<u>LINE 1:</u> Fine-grained, mixed, non- Aque. Frag. (clay)	<u>LINE 2:</u> Non-compact type Soil structure	<u>LINE 3:</u> Fine-grained, silty, clayey, non-compact type (clayey)	<u>LINE 4:</u> Fine-grained, non-compact type Soil structure
MODERATE & HIGH INTRUSION WASTES	Moderate-rates easily	Severe-low filter	Severe-rates	slight
MOD. SLUDGE & INO. ORG. WASTE	Moderate-low adsorp.; rates easily	Severe-low filtration to clogs	Severe-rates	Mod. filtration adsorp.
WASTE NOT USED FOR IRRIGATION	Moderate-rates; rates easily; low adsorp.	Severe-fast infiltration; low adsorp.	Severe-rates	Moderate-low adsorp.
SLOW RATE	Moderate-rates; rates slowly; low adsorp.; rates easily; low acid	Severe-low adsorp.	Severe-rates	Moderate-low adsorp.; depth to rock
OVERLAND FLOW	Moderate-rates	Severe-rates; low adsorp.	Moderate-rates; low adsorp.	Moderate-low adsorp.; depth to rock
RAPID INFILT.	Severe-rates slowly; shallow to water	Moderate-depth to rock	Severe-shallow to water	Severe-rates slowly; depth to rock

SOILS DATA FOR WASTE MANAGEMENT

FERRISON: Clayey, mixed, mesic  
Typic Hapludolls

GILPIN: Fine-loamy, mixed, mesic,  
Typic Hapludolls

GLENNVILLE: Fine-loamy, mixed, mesic  
Aeric Fragluudolls

HAGERSTOWN: Fine, mixed,  
Aeric Typic Hapludolls

MANURE & FOOD PRODC. WASTES	Moderate-erosion easily	Moderate-low absorp.	Moderate-low absorp.	Slight
MFG. SLUDGE & IND. OPG. WASTE	Moderate-too acid	Moderate-low absorp., depth to rock, too acid	Moderate-wetness, too acid	Slight
WASTE H2O USED FOR IRRIGATION	Moderate-too acid	Moderate-too acid, droughty, depth to rock	Moderate-too acid, wetness low absorp., rooting depth	Slight
SLOW RATE	Moderate-too acid	Severe-depth to rock	Moderate-wetness, too acid low absorp., low absorp. percs slowly	Slight
OVERLAND FLOW	Moderate-seepage	Severe-depth to rock	Moderate-seepage, wetness, low absorp.	Moderate-seepage
RAPID INFILT.	Severe-percs slowly	Severe-percs slowly, depth to rock	Severe-percs slowly, shallow to water	Severe-percs slowly, depth to rock

SERIES RATED FOR WASTE MANAGEMENT

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MINTINGTON: Fine-silty, mixed, mesic  
Fluventic Hapludolls

KEYHONT: Clayey, mixed, mesic  
Aquic Hapludults

LAIDIG: Fine-loamy, mixed, mesic  
Typic Fragiuudults

LEGORE: Fine-loamy, mixed,  
mesic Udic Hapludalfs

MANURE & FOOD PROC. WASTES	Slight		Slight	Slight
MUNC. SLUDGE & IND. ORG. WASTE	Moderate-low adsorp., floods	Moderate-erodes easily, too acid	Moderate-low adsorp., too acid	Moderate-too acid
WASTE H <sub>2</sub> O USED FOR IRRIGATION	Moderate-floods, low adsorp.	Moderate-wetness, percs slowly, soil blowing, too acid	Moderate-too acid, low adsorp., rooting depth	Moderate-too acid
SLOW RATE	Moderate-low adsorp., floods	Moderate-wetness, too acid, percs slowly	Moderate-wetness, low adsorp., too acid, percs slowly	Moderate-too acid
OVERLAND FLOW	Moderate-seepage, floods, low adsorp.	Slight	Moderate-seepage, low adsorp.	Moderate-seepage
RAPID INFILT.	Severe-percs slowly, shallow to water	Severe-percs slowly, shallow to water	Severe-percs slowly, shallow to water	Severe-percs slowly

SERIES RATED FOR WASTE MANAGEMENT

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	<u>LOW ACTIVITY: Fine-silica, mixed, acidic Type Fragments</u>	<u>MEDIUM: Fine-silica, mixed, acidic Fluogranitic Enrichments</u>	<u>HIGH: Coarse-grained, miscellaneous Type Hyperorthopyres</u>	<u>HIGH ACTIVITY: Fine-silica, mixed, acidic Type Hyperorthopyres</u>
HAZARDOUS & FOOD HAZARDOUS WASTES	Severe-wetness	Slight	Moderate-wetness easily	Slight
MISC. SLUDGE & IND. ORG. WASTE	Severe-wetness	Moderate-low adsorp., floods	Moderate-low adsorp., wetness easily, too acid	Moderate-low adsorp., too acid
WASTE LIQUID USED FOR IRRIGATION	Severe-wetness	Moderate-wetness, floods, low adsorp.	Moderate-wetness easily, too acid, low adsorp.	Moderate-low adsorp., too acid
SLOPE RATE	Severe-wetness	Moderate-wetness, low adsorp., floods	Moderate-low adsorp., too acid	Moderate-low adsorp., too acid
OVERLAND FLOW	Severe-wetness	Moderate-seepage, floods	Moderate-seepage, low adsorp.	Moderate-seepage, low adsorp.
RAPID INFILT.	Severe-shallow to water, percs slowly	Severe-percs slowly, shallow to water	Severe-percs slowly	Severe-percs slowly

STATUS RATED FOR WATER MANAGEMENT

NAIVE/EX: Fine-heavy, mixed, mesic Type: High/low  
HIRONQUELA: Fine-loamy, mixed, mesic Type: Intermediate  
NOITALTO: Fine, mixed, mesic Type: High/low  
MURILLA: Fine-loamy, mixed, mesic Type: Intermediate

LOW ONE & HIGH RANGE, 4-5 STPS	Moderate-erodes easily	Moderate-erodes easily	Slight	Slight
POOR, SHALLOW & FWD. DRCS	Moderate-low adsorp.; erodes easily, too acid	Moderate-low adsorp.; erodes easily, too acid	Moderate-too acid	Moderate-too acid
WASH EROD. USED FOR IRRIGATION	Moderate-too acid, wetness, low adsorp.; erodes easily	Moderate-wetness, erodes, rooting depth, too acid, low adsorp.	Moderate-too acid	Moderate-too acid
SLOW RATE	Moderate-wetness, low adsorp., too acid	Moderate-wetness, low adsorp., pores slowly, erodes easily, too acid	Moderate-pores slowly, too acid	Moderate-too acid
OVERLAND FLOW	Moderate-seepage, low adsorp.	Moderate-seepage, low adsorp.	Moderate-seepage	Moderate-seepage
PAID INFILT.	Severe-pores slowly, shallow to water	Severe-shallow to water	Severe-pores slowly	Severe-pores slowly, shallow to water

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SERIES RATED FOR WASTE MANAGEMENT

MSKINGUN: Fine-loamy, mixed, mesic  
Typic Dystrachrepts

OTHELLO: Fine-silty, mixed, mesic  
Typic Ochraquults

PENN: Fine-loamy, mixed, mesic  
Ultic Hapludalfs

POCONOKE: Coarse-loamy,  
siliceous, thermic  
Typic Ubraquults

MANURE & FOOD PROC. WASTES	Moderate-low absorp.	Severe-wetness	Moderate-low absorp.	Severe-wetness
MUNC. SLUDGE & IND. ORG. WASTE	Moderate-low adsorp., low absorp., Depth to rock, too acid	Severe-wetness	Moderate-low adsorp., low absorp., depth to rock, too acid	Severe-wetness
WASTE H <sub>2</sub> O USED FOR IRRIGATION	Moderate-too acid, droughty, depth to rock, low adsorp.	Severe-wetness	Moderate-too acid, droughty, low adsorp., depth to rock	Severe-wetness
SLOW RATE	Severe-depth to rock	Severe-wetness	Severe-depth to rock	Severe-wetness
OVERLAND FLOW	Severe-depth to rock	Severe-wetness	Severe-depth to rock	Severe-wetness
RAPID INFILT.	Severe-percs slowly	Severe-percs slowly, shallow to water	Severe-shallow to water	Severe-shallow to water

SERIES RATED FOR WASTE MANAGEMENT

	<u>REACTIVITY:</u> Fine-loamy, mixed, mesic Typic Fragindulis	<u>SASSAFRAS:</u> Fine-loamy, siliceous, mesic Typic Hapludulis	<u>TATUM:</u> Clayey, mixed, thermic Typic Hapludulis	<u>UPSWIR:</u> Fine, mixed, mesic Typic Hapludulis
<u>HAYIRE &amp; POOD PROC. WASTES</u>	Moderate-erodes easily, low absorp.	Slight	Moderate-erodes easily	Moderate-erodes easily
<u>MINC. SLUDGE &amp; IND. ORG. WASTE</u>	Moderate-low adsorp., erodes easily, too acid	Moderate-low adsorp., too acid	Moderate-erodes easily, too acid	Moderate-erodes easily, too acid
<u>WASTE H<sub>2</sub>O USED FOR IRRIGATION</u>	Moderate-wetness, rooting depth, erodes easily, too acid, low adsorp.	Moderate-low adsorp., too acid	Moderate-erodes easily, too acid	Moderate-erodes easily, percs slow, too acid
<u>SLOW RATE</u>	Moderate-wetness, low adsorp., low absorp., percs slowly, too acid	Moderate-too acid, low adsorp.	Moderate-erodes easily, depth to rock	Moderate-percs slow, erodes easily, too acid
<u>OVERLAND FLOW</u>	Moderate-seepage, depth to rock, low adsorp.	Moderate-seepage, low adsorp.	Moderate-seepage	Slight
<u>RAPID INFILT.</u>	Severe-percs slowly, shallow to water	Severe-percs slowly	Severe-percs slowly, depth to rock	Severe-percs slowly

SERIES RATED FOR WASTE MANAGEMENT

WEIKERT: Loamy-skeletal, mixed, mesic Lithic Dystrachrepts

WESTMORELAND: Fine-loamy, mixed, mesic Udic Hapludalfs

WESTPHALIA: Coarse-loamy, siliceous, mesic Ochreptic Hapludults

WHARTON: Fine-loamy, mixed, mesic, Aquic Hapludults

MANURE & FOOD PROC. WASTES	Severe-low absorp.	Moderate-erodes easily		Slight
MUN. SLUDGE & IND. ORG. WASTE	Severe-low adsorp., low absorp., depth to rock	Moderate-low adsorp., erodes easily, too acid	Severe-low adsorp., erodes easily	Moderate-low adsorp., too acid
WASTE H <sub>2</sub> O USED FOR IRRIGATION	Severe-low adsorp., droughty, depth to rock	Moderate-erodes easily, too acid, low adsorp.	Severe-erodes easily, low adsorp.	Moderate-wetness, percs slow, too acid, low adsorp.
SLOW RATE	Severe-low absorp., low adsorp.	Moderate-low adsorp., erodes easily, too acid	Severe-low adsorp.	Moderate-low adsorp., wetness, percs slowly, too acid
OVERLAND FLOW	Severe-seepage, depth to rock, low adsorp.	Moderate-seepage	Severe-low adsorp.	Slight
RAPID INFILT.	Severe-depth to rock	Severe-percs slowly, shallow to water	Severe-percs slowly	Severe-percs slowly, shallow to water

SERIES RATED FOR WASTE MANAGEMENT

MODIUM: Fine-loamy, siliceous,  
mesic, Aquic Inceptisols

WHEELING: Fine-loamy, mixed, mesic  
Udic Inceptisols

MANURE & FOOD PROC. WASTES		Slight	
MENC, SLUDGE & YSD, ORG. WASTE	Moderate-low adsorp., too acid	Moderate-low adsorp., too acid	
WASTE H-Q USED FOR TURFCATION	Moderate-vecness, soil blowing, too acid, low adsorp.	Moderate-ccc acid, low adsorp.	
SLOW RATE	Moderate-vecness, low adsorp.	Moderate-low adsorp., too acid	
OVERLAND FLOW	Moderate-seepage, low adsorp.	Moderate-seepage	
RAPID INFILT.	Severe-percs slowly, shallow to water	Severe-percs slowly, shallow to water	

NORTHEASTERN COOPERATIVE SOIL SURVEY CONFERENCE

JULY 17-22, 1978

REPORT OF COMMITTEE 3, INVENTORY AND USE OF SOILS IN FORESTED REGIONS

Members of the Committee were:

Chairman- William F. Hatfield

Vice Chairman - Robert V. Rourke

Richard Alvis  
Peter E. Avers  
Kenneth C. Bracy  
Charles Breeding  
Jean Fisher

F. William Hahnenberg  
Walter E. Russell  
Earl L.

based upon the integration of the soil series involved as described in the mapping unit. [An example of an estimation of slope and aspect through computer compilation at V.P.I., Blacksburg, Vn. is amended to this report.]

D. It is recommended that we continue to determine the intensity of the soil survey required in forested areas by considering:

1. minimum size of ~~management~~

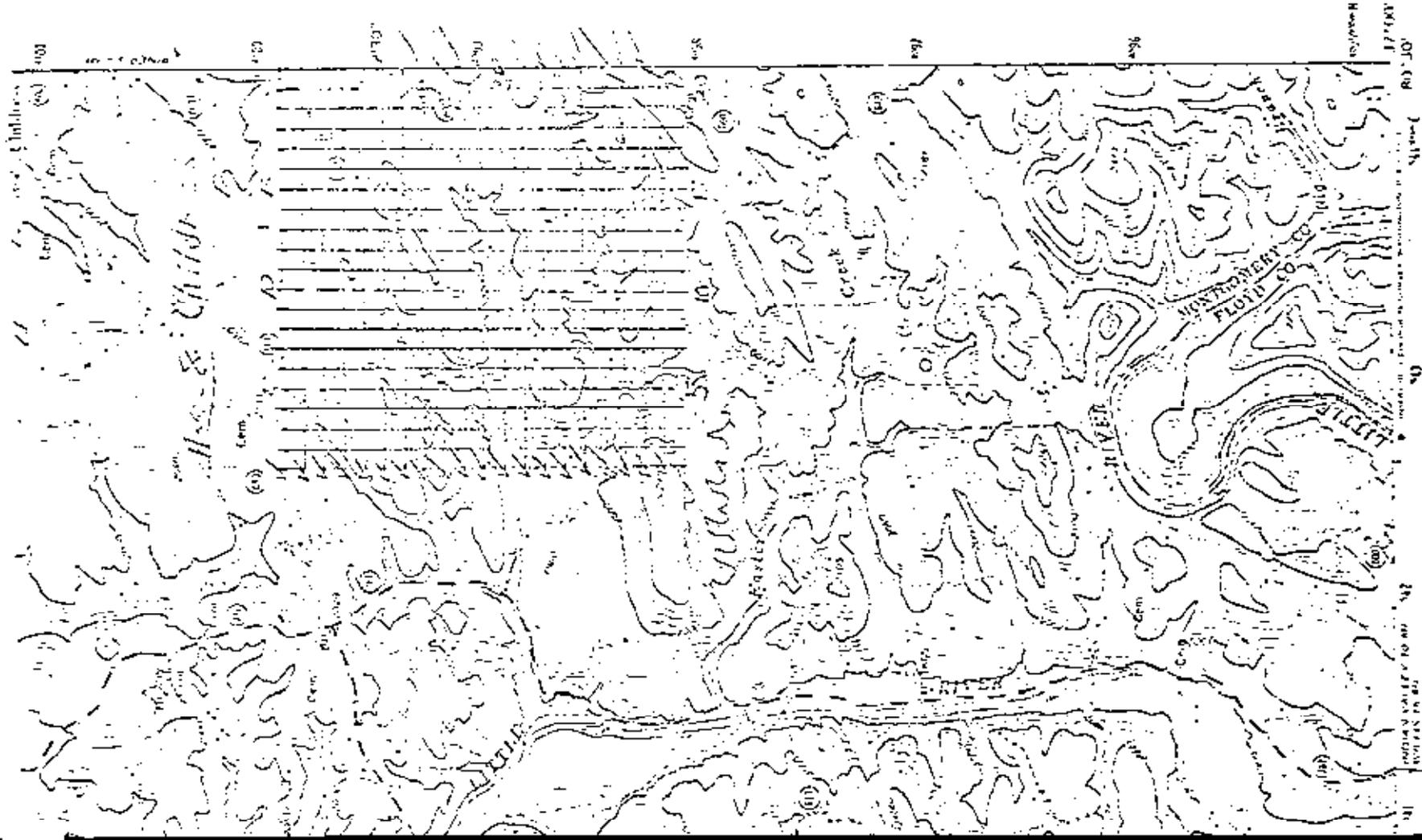
Charge 2.

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5. Gather existing data from all possible sources, public and private, concerning soil-site factors affecting productivity as an aid in design of mapping units for forested areas.

General recommendation:

The Committee recommends that the forest soils committee be continued so that it may move ahead in assessing the adequacy of recommendations previously made.



1. BENKS-+EIKERT-CHILMONT VARIANT ASSOCIATION

NUMBER OF POINTS PER SAMPLE TYPE: MINUM = 300 FEET. 8 FEET.  
 THE MINIMUM SIGNIFICANT DIFFERENCE IN ELEVATION IS 8 FEET.

POINTS	PERCENT
PLACES	37.1
ROADS	11.7
WATERS	0
SINKS	0.0
STRADES	0.0
TOTAL	561

(Sinks have been combined with valleys.)

KENT-CHILHOWIE VARIANT ASSOCIATION

A S P E C T

AGE	45	90	135	180	225	270	315	350	TOTAL POINTS	PERCENT	CUM.
0-5	0 0.0	0 0.0	2 0.6	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	2	0.6	0.6
5-10	5 2.2	14 5.9	17 4.7	19 5.3	5 1.7	9 2.5	14 3.9	24 7.2	113	31.3	31.9
10-15	10 2.6	25 6.4	10 2.6	27 7.5	12 3.3	28 7.8	11 3.0	18 5.0	159	36.5	70.4
15-20	16 1.7	21 5.8	1 0.3	23 6.4	3 0.8	15 4.2	3 0.8	26 7.2	98	27.1	97.5
20-25	0 0.0	6 1.1	0 0.0	0 0.0	0 0.0	2 0.6	0 0.0	3 0.8	9	2.5	100.0
25-30	0 0.0	0	0.0	100.0							
TOTAL	24	62	30	69	21	54	29	73	361		
TOTAL	6.6	17.2	8.3	19.1	5.8	15.0	7.6	20.2		100.0	

1. GERAS-HEIKERT-CHILLOWIE VARIANT ASSOCIATION

MINIMUM ELEVATION = 590 FEET  
 MAXIMUM ELEVATION = 675 FEET  
 MEAN ELEVATION = 616 FEET

DISTRIBUTION OF ELEVATIONS

RANGE	COUNT	PERCENT	CUM. %
590-599	1	1.0	1.0
600-609	1	1.0	2.0
610-619	1	1.0	3.0
620-629	1	1.0	4.0
630-639	1	1.0	5.0
640-649	1	1.0	6.0
650-659	1	1.0	7.0
660-669	1	1.0	8.0
670-679	1	1.0	9.0
680-689	1	1.0	10.0
690-699	1	1.0	11.0
700-709	1	1.0	12.0
710-719	1	1.0	13.0
720-729	1	1.0	14.0
730-739	1	1.0	15.0
740-749	1	1.0	16.0
750-759	1	1.0	17.0
760-769	1	1.0	18.0
770-779	1	1.0	19.0
780-789	1	1.0	20.0
790-799	1	1.0	21.0
800-809	1	1.0	22.0
810-819	1	1.0	23.0
820-829	1	1.0	24.0
830-839	1	1.0	25.0
840-849	1	1.0	26.0
850-859	1	1.0	27.0
860-869	1	1.0	28.0
870-879	1	1.0	29.0
880-889	1	1.0	30.0
890-899	1	1.0	31.0
900-909	1	1.0	32.0
910-919	1	1.0	33.0
920-929	1	1.0	34.0
930-939	1	1.0	35.0
940-949	1	1.0	36.0
950-959	1	1.0	37.0
960-969	1	1.0	38.0
970-979	1	1.0	39.0
980-989	1	1.0	40.0
990-999	1	1.0	41.0
1000-1009	1	1.0	42.0
1010-1019	1	1.0	43.0
1020-1029	1	1.0	44.0
1030-1039	1	1.0	45.0
1040-1049	1	1.0	46.0
1050-1059	1	1.0	47.0
1060-1069	1	1.0	48.0
1070-1079	1	1.0	49.0
1080-1089	1	1.0	50.0



2. CAMBO-OAKLEY-OPE ASSOCIAT

A S P E C T

SLOPE. SLOPE	A S P E C T										TOTAL POINTS PERCENT CURVE
	17	14	35	45	17	270	315	57.5	47.1	47.1	
A 0.09 - 0.03	4.7	3.9	8.7	12.5	4.7	3.0	1.9	5.5	...	47.1	47.1
B 0.04 -	10.2	26.2	39	67	14	17	11	3.0	19	52.5	99.7
			10.8	12.6	3.9	5.3					
C 0.09 - 0.15	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0	0.0	100.0
D 0.16 - 0.25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	100.0
E 0.25 - 0.25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	100.0
F 0.50 -	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	100.0
TOTAL POINTS	27	40	74	113	31	30	11	35	361		
PERCENT	7.5	11.1	20.9	31.3	8.6	8.3	3.0	9.7		100.0	



11. CATHOLIC-WYERSVILLE-LEM ASSOCIATION

MINIMUM ELEVATION = 946 FEET  
 MAXIMUM ELEVATION = 1770 FEET  
 MEAN ELEVATION = 1447 FEET

DISTRIBUTION OF ELEVATIONS

RANGE	COUNT	PERCENT
946-1000	1	0.1
1000-1050	1	0.1
1050-1100	1	0.1
1100-1150	1	0.1
1150-1200	1	0.1
1200-1250	1	0.1
1250-1300	1	0.1
1300-1350	1	0.1
1350-1400	1	0.1
1400-1450	1	0.1
1450-1500	1	0.1
1500-1550	1	0.1
1550-1600	1	0.1
1600-1650	1	0.1
1650-1700	1	0.1
1700-1770	1	0.1

	TOTAL POINTS PERCENT CUM.
0	0.0
1	0.6
2	0.6
3	23.5
4	44.6
5	65.1
6	80.9
7	83.9
8	100.0
9	100.0



1978 NORTHEAST COOPERATIVE SOIL SURVEY CONFERENCE

Storrs, **Connecticut** July 18-22, 1978

Report of **Committee 4**

Soil Potential Ratings for Selected Uses

Charges:

- a. Develop a list of those soil and site related criteria significant to the preparation of soil potential ratings for the use of soils as cropland, pastureland, woodland, wildlife habitat, and recreation.
- b. Based on the above lists, develop a procedure for preparing soil potential ratings for the **use** of soils in the Northeast as cropland, pastureland, woodland, wildlife habitat, and recreation.
- c. Identify additional research or study that is needed to adequately develop soil potential ratings for the above listed uses of soils.

Committee Members:

R. E. Francis	N. A. McLoda	H. G. Uhlig
R. E. Hartung	A. L. Oleson	Dr. W.A. vanEck,
V. M. Hicks	O. W. Rice, Jr., Chairman	Vice Chairman
W. C. Kirkham	L. H. Rivera	F. J. Vieira
		H. W. Winkley
		I. G. Wolfe

Recommendations of the Committee:

1. That the soil and site limitations used in developing soil potentials be identified from the limitations guides listed below:
  - a. Recreation **uses** - The guides in National Soils Handbook Section 403.
  - b. Woodland - The guides in Woodland Interpretations for Soils in Land Resource Areas of the Northeast.
  - c. **Cropland** and Pasture - The draft guides contained in this report.
  - d. Wildlife habitat - See **recommendation** No. 3.
2. That soil limitation guides prepared by the TSC or National office for use in preparing soil potential ratings be reviewed by states and cooperating agencies before **they are** issued.

3. That soil interpretations for Wildlife Habitat be continued to be provided as they have in the past (see Soils Memorandum-74). Soil potential ratings should be developed where there is necessary interest and need is exhibited.
4. That, as a supplement to the basic procedures for preparing soil potential ratings as presented in National Soils Handbook Section 404, the examples included in Appendixes 1 and 2 and the discussion of change be used in preparing soil potential ratings.
5. That greater emphasis than contained in NSH Section 404 be given to obtaining substantial participation by local subject matter specialists outside SCS when developing, for a specific area, soil potential ratings and the criteria for them.
6. That states who develop materials on soil potentials share it with the other states and the TSC.
7. That the committee be dissolved.

The following problems were raised about which the committee came to no conclusion:

1. In situations where there is more than one possible corrective measure to a problem of a soil, which measure should be used in determining the soil potential rating? Possibly we should first debit the Index of Costs of corrective measures for controlling soil deterioration (erosion). Then, debit the Index of Performance with the Index of Costs of corrective measures not related to soil deterioration. For a particular mapping unit, we could use the corrective measure that produces the highest Soil Potential Index. From an array of acceptable alternatives the least costly and most effective one would be evident.
2. When we rate rotation cropland, how much is the Soil Potential Index reduced, if any, because it cannot be cropped each year?

A possibility would be to group and compare against each other those soils that could be row cropped with the same frequency.

Another possibility would be to reduce the Soil Potential Index by the product of the fraction of time it is not row cropped times the estimated yield when row cropped. As an example, if the estimated yield of a soil were 120 bu/ac, it could be row cropped .25 of the time, the SPI would be reduced by 90 (120 x .75).

Another possibility would be to reduce the yield for the entire crop sequence to **common** units such as dollars or TDN.

It is clear that the definition of soil use that is to accompany each set of **cropland** soil potential ratings must clearly state the objectives of the ratings and the assumptions used. The rating system developed must be consistent with these objectives.

#### Introduction:

The concept of soil potential ratings has been under consideration and development since at least 1973. At the 1975 National Soil Survey Conference and the 1974 and 1976 Northeast Soil Survey Conferences, certain aspects of soil potentials were discussed. One of the comments was that the Washington office should issue general guidelines for preparing soil potential ratings. In June 1975, each SCS **state** office was asked to review the draft Guides for Preparing Soil Potential Ratings and to secure a review by cooperating agencies. As a result of that review, National Soils Handbook Subsection 404, Soil Potentials Ratings, will be issued in the very near future.

The handbook section will broadly outline the use of soil potential ratings within the soil survey and SCS. Our committee report may or may not be consistent with the contents of the handbook subsection. The report should, however, be useful in developing the guides for the application of Subsection 404 in the Northeast and as a source of ideas for suggested future changes in the Subsection.

We do not as yet have a good indication of how much interest among users of soil surveys there will be for soil potentials for the uses discussed in this report. In thinking of interest, we probably should recognize **two** aspects: need and interest - application. Although the charges to the **Committee** did not mention need and interest, the chairman would like to gain from the conference an estimate of the interest and, if possible, the need for soil potential ratings for the uses covered in this report.

#### Committee Report:

##### Charge a.

The committee perceived this charge to be to "develop or specify the soil limitation guides that are suitable for identifying soil problems to be considered in assessing the soil potential ratings for the use of soils as cropland, pastureland, woodland, wildlife habitat, and recreation."

## Cropland and Pastureland

Appendix 1 is a draft guide for identifying soil limitations for cropland to be used in preparing soil potential ratings, examples of corrective measures and their cost, examples of completed worksheets for three soils, and a cost index sheet. The term **cropland** includes land used for the **common row** crops in the northeast (excluding the Caribbean Area): corn for grain and silage, small grain soybeans, potatoes and peanuts. The crops are managed for high average yearly production assuming adequate treatment to protect or improve the soil, to hold erosion to safe limits and to hold off-site pollution to acceptable levels. There is no SCS approved soil **limitation** guide for cropland. The guide in Appendix 1 attempts to account for soil properties and characteristics that strongly influence productivity levels and that relate soil properties to soil related management problems. An attempt was made to keep duplicating "soil factors" to a minimum.

Appendix 2 is a draft guide for identifying soil limitations for pastureland and a list of effects, corrective measures and continuing limitations to be used in preparing soil potential ratings. The term pastureland includes the following pasture types in the Northeast (excluding the Caribbean Area):

### Specific Pasture Types

Grass - clover	Tall fescue
Bromegrass - alfalfa	Trefoil - grass
Kentucky bluegrass	? Timothy
Orchardgrass	? Smooth Bromegrass
Orchardgrass - alfalfa	? Ked top

### General

Additional criteria, not contained in the soil limitation guides discussed below, may need to be added to the guides to accommodate local conditions. In the examples contained in Appendix 1, these are shown as "Possible Mapping Unit Criteria."

### General Pasture Types

Pasture (this term is used in the northeast on SCS-SOILS-5 for adapted grass pastures, volunteer or sowed, regardless of species).

The pastures are managed for high annual production and assume adequate treatment, to protect or improve the soil, to hold erosion to safe limits, and to minimize off-site pollution.

There is no SCS approved soil limitation guide for pastureland. There is a draft of a Pasture and Hayland Soil Suitability Guide that accounts for soil factors that influence productivity levels and which are related to management problems, and it was used as a reference for identifying soil factors affecting pasture management.

## woodland

In the Northeast the term woodland includes land used for the common forest types such as: sugar maple - beech - yellow birch and white spruce - balsam fir \* paper birch.

Although there is no SCS approved national soil limitation guide for woodland, there is a rating guide which relates soil properties to management implications contained in the Draft National Handbook for Woodland Conservation, dated July 1975. This guide is based on and is very similar to the interpretations guides in the Woodland Interpretations for Soils in Land Resource Areas used in the Northeast to coordinate woodland interpretations.

At this stage of development of the soil potential ratings procedures, we see no imperative for developing an additional soil limitation rating guide for woodland. Either of these guides is suitable to be used as a starting point in preparing tables of Effects on Use, Corrective Measures, and Continuing Limitations to be used in soil potential ratings for woodland, however, the guide in Appendix 3 is more widely available.

## Wildlife Habitat

Guides for identifying soil limitations for improvement, maintenance, and creation of specific wildlife habitat elements are contained in SOILS MEMORANDUM-74. There is a Proposed Revision of Guides for Making Wildlife Interpretations dated April 6, 1978. Its status is too uncertain at this time to be of consideration in this meeting.

Because suitability for producing habitat elements is more directly related to kinds of soils than wildlife species or habitats for a kind of wildlife are related to kinds of soil, we believe it would be more meaningful to prepare potential ratings for habitat elements than for general kinds of wildlife habitat.

Because wildlife habitat in most management systems is a by-product of management for other land uses, it appears there may be few requests for soil potential ratings for wildlife habitat elements. **However**, should there be a request for such ratings, and the cost of changes in management are to be attributed to the wildlife being managed, the Criteria for Rating Soils for Grain and Seed Crops, for Domestic Grasses and Legumes, for Wetland Plants, and for Shallow Water Areas contained in SOILS MEMORANDUM-74 can be used to identify soil limitations. If ratings for kinds of wildlife habitat are needed, the products of the numerical soil potential index for the applicable habitat elements and the weighting factors in SOILS MEMORANDUM-74 can be **summed** to obtain a soil potential index for wildlife habitat. This requires development of lists of measures to overcome soil limitations, measure cost indexes and continuing limitations cost indexes.

Wildlife habitat ratings for mapping units of order 1 or order 2 soil surveys have limited applicability because an interspersion or complex of the different habitat elements are needed for good wildlife habitat. This complex is not usually found on one soil. A soil association is a better unit for rating potential for wildlife habitat.

### Recreation

Guides for identifying soil limitations for Camp Areas, Picnic Areas, Playgrounds and Golf Fairways are contained in National Soils Handbook Subsection 404.

Should guides for other recreation uses be needed, they can be developed as needed. See Appendix 4.

### Charge b.

"Based on the above lists, develop a procedure for preparing soil potential ratings for the use of soils in the Northeast as cropland, pastureland, woodland, wildlife habitat, and recreation."

In carrying out this charge, we have tried to provide more specific guidance on some aspects than there is in Subsection 404 of the National Soils Handbook. We believe it is important that all states in the Northeast observe the following procedures for preparing soil potential ratings in order to maintain **some** degree of consistency in the ratings:

1. Basic guides of soil limitations for the uses covered in this report. This item is Charge a to the committee and has already been discussed.
2. Composition of the groups of technical specialists to be involved in preparing soil potential ratings. Key members of the group (for each use) should be a soil scientist familiar with the soils being rated; for **cropland** and pastureland, an SCS agronomist; for woodland, an SCS woodland conservationist; for wildlife habitat, an SCS biologist; and for recreation, an SCS recreation specialist. An SCS economist should be available as needed. In addition, State Experiment Station and Extension Service technical specialist should be invited to participate as technical advisors. A representative (a specialist in the use being rated, if possible) of the expected dominant users of the ratings should be closely involved with the group during the development and testing of the criteria and procedures and final review. Other technical specialists, in local, state or federal agencies or private enterprise, who are interested, should be invited to participate and called upon as needed.

### 3. Measures of Performance Suitable For Use In Evaluating Soil Potentials.

#### Cropland

For the broad land use "cropland", a suitable measure of performance is the estimated yields from the technical guide for each mapping unit of the dominant row-crop for the area. Frequently this will be corn for grain or corn for silage.

If soil potentials are needed for a specific crop whose soil requirements are significantly different to those of corn, the soil potential rating for that particular crop should be worked out using the estimated yield of a particular crop as a measure of performance. An example of a suitable measure of performance is bushels per acre.

#### Pastureland

For the broad land use "pastureland", a suitable measure of performance is the estimated yield from the technical guide for each mapping unit of the dominant pasture mixture of the area. For specific pasture crops, estimated yields for that particular crop can be used as a measure of performance. An example of a suitable measure of performance is animal unit months per acre or animal unit weeks per acre. The purpose of converting AUMs to AUWs is to have a unit of suitable size for use in calculating the soil potential index.

#### Woodland

For the broad land use "woodland", a suitable measure of performance is cubic feet of wood produced per acre per year, based on the most common woodland type in the area. The yield performance of the woodland type should be based on the index species for the woodland type. The units in which the measure of performance is expressed is cubic feet/acre/year. This unit can be obtained by using Site Index to Volume conversion tables.

#### Recreation

We do not recommend rating soil potential for the broad land use "recreation." For specific recreation uses the measure of performance might be the recreation visits. A visit by one person to a recreational or fish and wildlife site during a day, regardless of how long he stays, or in what kind of activity he may participate.

## Wildlife Habitat

At this stage of development, it appears that expected performance of soils for wildlife habitat may be best expressed in arbitrary units.

### Charge C.

"Identify additional research or study that is needed to adequately develop soil potential ratings for the above listed **uses** of soils."

### Research Needs

1. Cost benefit studies of corrective treatments on **cropland** and **pastureland**. The costs and benefits should be in units of crop yield increase or decrease attributable to soil deterioration because of withheld conservation treatments, or **due** to unfavorable soil properties for which treatments are not available.
2. Cost-benefit studies of woodland management practices and techniques that can be used to overcome soil limitations.
3. Studies to determine how many individuals of all species of wildlife each soil can produce (songbirds, small mammals, reptiles, amphibians, etc., as well as game animals), and how the mixture of soil properties (or soils) affect the variety and number of individuals produced.

Research is needed on how to develop habitat (treatments needed) for all species. (How do you change a soil to develop humming bird habitat?)

Qualitative and quantitative effects of the mixture of habitat elements, within a soil association or among two or more soil associations, on wildlife habitat.

GUIDE OF SOIL LIMITATIONS FOR CROPLAND <sup>1/</sup>  
AND ROTATION CROPLAND

Rating Criteria	Degree of Soil Limitation		
	Slight	Moderate	Severe
Rooting Depth	>100 cm (40 in deep) ;	50-100 cm (20-40 in) (moderately deep)	<50 cm (20 in) (shallow & very shallow)
Surface Texture	Loam Silt loam <b>Silt</b> Sandy clay loam <b>Silty clay</b> loam	Loamy coarse sand Loamy sand Loamy fine sand Loamy very fine sand  Coarse sandy loam Sandy loam Fine sandy loam Very fine sandy loam Clay loam Sandy clay Silty clay	<b>Gravel</b> Sandy gravel Sand Coarse sand  Fine sand Very fine sand Clay Organic
Slope	0-3%	3-15%	>15%
Average Moisture Capacity to 75 cm (30 in) or rooting depth	>10 cm (4 in)	5-10 cm (2-4 in)	(5 cm (2 in)
Permeability (per hour)	Moderately rapid and moderate 1.5-15 cm (0.6 - 6.0 in)	Rapid and moderately <b>slow</b> 15-50 and 0.5-1.5 cm (6-20 and 0.2-0.6 in)	Very rapid and very slow >50 and <0.5 cm >20 and <0.2 in)
Drainage	Well drained and moderately well drained	Somewhat excessively drained and somewhat poorly drained and artificially drained poorly and v. poorly drained	Excessively drained, poorly drained and very poorly drained

<sup>1/</sup>Includes continuous and rotation cropland

Cropland (cont'd.)

Rating Criteria

Degree of Soil Limitation

Rating Criteria	Degree of Soil Limitation		
	Slight	Moderate	Severe
Flooding	None or rare during growing season	Occasional flooding during growing season (less than once in 2 yrs.)	Frequent flooding during growing season (more than once in 2 yrs.)
K Factor	<.37	.37 - .49	>.49
Surface Stoniness > 254 mm (10 in) % coverage	0 - 0.1	0.1 - 3	> 3
Surface Stoniness 2 - 254 mm (2mm-10 in)	Channery, cherty, gravelly shaly, slaty	V. channery, v. cherty, v. gravelly, v. shaly, v. slaty cobbly. flaggy	Very cobbly. very flaggy
Soil reaction at 20 inches	> 6.0	4.5 - 6.0	(4.5

Possible Mapping Unit Criteria

Surface Rockiness	0 (no rockiness)	<0.1 (slightly rocky)	>0.1 - 10 (rocky or v. rocky)
Size of delineation contiguous to contrasting soils	> 25 ac	10 - 25 ac	<10
Soil reaction at surface	> 6.0	4.5 - 6.0	

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EXAMPLES OF CONTINUING LIMITATIONS AND THEIR COST

- CROPLAND -

<u>Continuing Limitations</u>	<u>Annual Index</u>
Moderate yield (15% to 30% below standard)	Reduce SPI by amount of yield reduction.
Low yield (more than 30% below standard)	" "
Drainage - yield reduction due to late planting, seedling mortality, etc.	Reduce SPI by amount of yield reduction
Flooding - Yield reduction due to flood damage, averaged over return period.	Reduce SPI by amount of yield reduction and cost of replanting, etc.

DRAFT  
 EXAMPLES OF CORRECTIVE MEASURES AND THEIR COST

- CROPLAND -

Corrective Measure	Cost	Annual Index
Terraces (20 year life)	\$250/A	2
Continuing limitation for terraces - (operation & maintenance)	\$11/A	2
Grassed waterways (10 year life)	\$150/A	2
Continuing limitation for waterways - (operation & maintenance)	\$8/A	1
Contour farming	\$5/A	1
Tile drain (25 year life) (60 spacing, 60¢/ft, 725 ft/A)	\$435/A	
Continuing limitation for tile drainage - (operation & maintenance)	\$4/A	1
No-till	No additional cost	

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Numerical Cost Index for Treatments and Continuing Limitations

Based on Average Annual Installation Costs and Annual  
Operation and Maintenance Costs

---

<u>Cost Per Acre (dollars)</u>	Index
0-10	1
10-20	2
20-30	3
30-40	4
40-50	5
50-60	6
60-70	7
70-80	8
80-90	9
90-100	10

# EXAMPLE

Definition: Soils are managed for maximum average yearly production of the crop to be grown assuming adequate treatment to protect or improve the soil, to reduce erosion to safe limits and to minimize pollution. Experienced yields taken based on average annual costs.

Exhibit 404.1(c)

## WORKSHEET FOR DEVELOPING SOIL POTENTIAL RATINGS

- Drayland  
West Slope Hills

Mapping Unit: Dunsmuir very fine sandy loam

Rating Factors	Soil Facts	Effects On Use	Treatments	Continuing Limitations (CL)	
				Kind	Index
Soil Erosion	2-100 mm	slight			
Texture	VF SL	moderate			
Structure	E-89a	moderate	terraces	0.4 m	2
Stoniness	>10cm	slight		0.4 m	1
Permeability	10-15cm	slight			
Drainage	well drained	slight			
Acidity	5.0-6.0	slight			
Salinity	0.02	slight	irrigation		
Soil Temperature	-	-			
				5	Total

Crop Yield Standard \_\_\_\_\_  
Crop Yield Estimate 110 bu/acre

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$$\frac{110}{250/bu; CL = 1.0} \times \frac{100}{100/bu; CL = 2} = 13.425$$

$$CL = 5\% \text{ of } 13.425 = 0.671$$

$$2.5 \times 0.671 = 1.6775 \text{ (Terrace) } \times 10 = 16.775$$

SPT  
5/20/77

EXAMPLE

Definition: Soils are managed for maximum average yearly production of the crop to be grown assuming adequate treatment to protect or improve the soil, to reduce erosion to safe limits and to minimize pollution. Experienced

Exhibit 10 (a)

Mapping Unit: *11-10000-0000*

*Use: 9000 Series*

Rating Factors	Soil Facts	Degree of Limitation	Effects On Use	Treatment Kinds	Index	Continuing Limitation Kind	(CL) Index
Rooting Depth	>100 cm	Slight					
Texture	SLC	Slight					
Slope	0-3	Slight					
AWC	6-10 cm	moderate					
Permeability	1.5-25 cm	Slight					
Drainage	Poorly drained	Severe	Stagnant water	Tile Drain	2	CLM	1
Frosting	1000 mm water eq. depth	moderate	Late planting				
K Factor	.99	moderate	Erosion	Contour farming			
Surface Stagnancy							
Crop Yield Standard _____					Total	Total	1
Crop Yield Estimate <i>11500000</i>							

\* Returned to ground  
 60 \$/ft; 725'/100' =  
 48000', CL = 19% of  
 installation cost  
 life expectancy = 25 yrs.

$$\frac{11500000}{48000} = \frac{2}{1} = \frac{1}{1} = \frac{111}{111}$$

Performance Standard Index yield      Treatment Cost Index      Continuing Limitation Cost Index      Soil Potential Index

SPT 5/20/77

EXAMPLE

Definition: Soils are managed for maximum average yearly production of the crop to be grown assuming adequate treatment to protect or improve the soil, to reduce erosion to safe limits and to minimize pollution. Experienced yields taken from SCS SOILS-S. Treatment and continuing limitation costs are based on average annual costs.

Exhibit 401.6(c)

WORKSHEET FOR DEVELOPING SOIL POTENTIAL RATINGS - Cropland

Mapping Unit: Barks cobbly silt loam

Use: Row crops

Rating Factors	Soil Facts	Degree of Limitation	Effects On Use	Treatments	Index	Continuing Limitations (C.I.)			
				Kinds		(ind)	Index		
Rooting Depth	50-100cm	moderate	Erosion	No-Till-RL contour farming	1				
Texture									
Slope	0-8	moderate							
Air C	<5cm	severe							
Permeability	1.5-15cm	slight							
Drainage	well drained	slight							
Flooding	none	slight							
k-Factor	.24	slight							
Surface Stoniness 2-254mm	cobbly	moderate							
				Total	1	Total			

Crop Yield Standard

Crop Yield Estimate 70 bu corn

$$\frac{70}{\text{Performance Standard Exp. Index yield}} - \frac{1}{\text{Treatment Cost Index}} - \frac{-}{\text{Continuing Limitation Cost Index}} = \frac{69}{\text{Soil Potential Index}}$$

SPTF  
5/20/77

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## GUIDE OF SOIL LIMITATIONS FOR PASTURELAND

Rating Criteria	Degree of Soil Limitation		
	Slight	Moderate	Severe
Slope - K Factor	0-15% <.49	15-25% 7.49	725% —
Surface stoniness (% coverage) 254mm (10in) 2mm-254mm	0.1 Channery, cherty, gravelly shaly, slaty	0.1-3 V. channery, v. cherty, v. gravelly, v. shaly, v. slaty, cobbly, flaggy	>3 V. cobbly, v. flaggy
Available moisture capacity to 75cm (30in) or rooting depth	>10cm (4in)	5-10cm (2-4in)	(5cm (2in)
Drainage  or (depth to high water table)	Well drained, moderately well drained  >24in	Somewhat excessively drained, somewhat poorly drained and artificially drained poorly and v. poorly drained  12-24in	Excessively drained, poorly drained, v. poorly drained  0-12in
Texture	Loam, silt loam, silt, sandy clay loam, silty clay loam	Loamy coarse sand, loamy sand, loamy fine sand, loamy v. fine sand, coarse sandy loam, sandy loam, fine sandy loam, v. fine sandy loam, clay loam, sandy clay, silty clay	Fine sand, v. fine sand, clay, organic
Rooting depth Depth to rock	>40in	20-40in	<20in
Depth to fragipan	>40in	20-40in	<20in
Permeability (lowest within 20 in)	Moderately rapid and moderate 1.5-15cm (0.6-6.0in)	Rapid, and moderately rapid 15-50 and 0.5-1.5cm 6-20 and 0.2-0.6cm)	V. rapid, and v. slow 750 and <0.5cm (>20 and <0.2in)
Flooding	None, rare	Occasional if brief, frequent if v. brief	Frequent if long or v. long
Soil reaction at 20in	>5.5	4.5-5.5	<4.5 151 4-17

DRAFT  
 SELECTED EFFECTS ON USE, CORRECTIVE  
 MEASURES AND CONTINUING LIMITATIONS  
 FOR USE IN PREPARING SOIL POTENTIAL

RATINGS FOR PASTURELAND

Rating Criteria	Effect on Use	Corrective Measures	Continuing Limitations
Slope-K Factor	Erosion, management & machinery limitations		
Surface stoniness	" "		
Available moisture capacity	Lower yield	Supplemental irrigation	
Drainage	Limits grazing periods, equipment use restrictions, renovation frequency, choice of plants		
Texture	Limits grazing periods * trafficability, erosion-reduced plant cover, compaction-reduced plant cover		
Depth to rock	Lower yield		
Depth to fragipan	Lower yield		
Permeability	Reseeding frequency, Renovation		

APPENDIX 3

FROM: WOODLAND INTERPRETATIONS FOR SOILS IN LAND RESOURCE AREAS  
IN THE NORTHEAST

Guide to  
POTENTIAL EROSION HAZARD RATINGS  
of Soils in Woodland Use

K		

Guide to  
PLANT COMPETITION RATINGS  
of Soils in Woodland Use

Drainage	Ordination Class	Acidity	Ratings	
			Hardwoods	Conifers
Excessive and somewhat excessive	1, 2		Moderate *	Severe
	3		Slight *	Moderate *
	4, 5, 6		Slight	Slight
Well and moderately well	1, 2		Moderate	Severe
	3, 4		Slight	Moderate
	5, 6, 7		Slight	Slight
Somewhat poorly	1, 2		Severe	Severe
	3,4,5,6,7		Moderate	Severe
Poorly, very poorly		Acid pH 5.6 or less	Moderate	Moderate
		Not acid pH over 5.6+	Severe	Severe

\* Ratings one class more severe on high fertility soils.

Guide to  
EQUIPMENT LIMITATION RATINGS  
of Soils for Woodland Use

Soil Family & Texture Class	1/ Slope %	2/ Wetness	Class of 3/ Rockiness Stoniness		Rating
			Rockiness	Stoniness	
Members of clayey families except those with thick loamy or sandy surfaces	0-15%	A,B	0, 1, 2	0,1,2,3	Moderate
			3, 4, 5	4, 5	Severe
	15%+	C			Severe
					Severe
All soils not described in the category above	0-15%	A	0, 1	0, 1, 2	Slight
			2	3	Moderate
			3, 4, 5	4, 5	Severe
		B	0, 1, 2	0,1,2,3	Moderate
	3, 4, 5		4, 5	Severe	
	15-35%	C			Severe
					Severe
	35%		0, 1, 2	0,1,2,3	Moderate
3, 4, 5			4, 5	Severe	

1/ Slope ranges are approximate. Adjust by soil survey areas.

2/ Wetness: "A" means water table not within 15" more than 2 months per year. Generally includes moderately well-drained to excessively drained soils. "B" means water table within 15" two to six months per year (most aquic subgroups) generally includes somewhat poorly drained soils. "C" means water table within 15" more than six months per year (most aqu suborders) generally includes poorly and very poorly drained soils.

3/ See Soil Survey Manual, page 222.

Stoniness: (example)

- Class 1 Gloucester stony loam
- 2 Gloucester very stony loam
- 3 Gloucester ext. stony loam stonyland (Gloucester soil material)
- 4 Stonyland, very stonyland
- 5 Rubble land

Rockiness:

- Class 1 Hagerstown rocky loam
- 2 Hagerstown very rocky loam
- 3 Hagerstown ext. rocky loam rockland (Hagerstown material)
- 4 Rockland
- 5 Rock outcrop

Guide to  
SEEDLING MORTALITY RATINGS  
of Soils in Woodland Use

Drainage	Effective Rooting Depth	Surface Texture	Exposure 1/	Soil Temp. Zone	Rating
Excessive				Frigid	Moderate
				Mesic	Severe
Somewhat excessive	Not Limiting (20" or deeper)		Not Exposed		Moderate
			Exposed		Severe
	Limiting (less than 20")			Severe	
Well, moderately well, and somewhat poorly drained	Not Limiting (20" or deeper)	sl, fsl, vsl, l, sil, si			Slight *
		ls, cl, scl, sicl	Not Exposed		Slight *
			Exposed		Moderate *
		sands, sic, sc, c	Not Exposed		Moderate *
	Exposed			Severe	
	Limiting (less than 20")	sands, sic, sc, c			Severe
		ALL OTHER TEXTURES	Not Exposed		Moderate *
		Exposed		Severe	
Poorly and very poorly drained					Severe

1/ Exposed means south or west facing slopes of more than 15% gradient.

\* Soils with high frost heaving rated one class more severe.

Guide to  
WINDTHROW HAZARD RATINGS  
of Soils in Woodland Use

Anchor rooting more than 20" deep<sup>1/</sup> - Slight

Anchor rooting limited to 10-20" - Moderate

Anchor rooting less than 10" - Severe

<sup>1/</sup>Limitation to anchor root development may be a fragipan, claypan, bedrock, or a water table of considerable duration.

APPENDIX 4

SUGGESTED PROCEDURE FOR RATING SOILS POTENTIALS FOR RECREATION USE

1. Rate soils for an area only when specific requests for assistance have been received. Preliminary planning, objectives, and assumptions as well as suitable practices to overcome limitations are to be worked out with the cooperator.
2. Rate soils for specific recreational activities. Avoid rating potentials of soils for longitudinal activities (trails) or for areas covering a number of activities. Criteria for some activities are too varied for broad recreational development interpretations. Rate for the activities such as golf fairways, camp areas, picnic areas, and playgrounds.
3. Consider or develop desirable site conditions for various recreation uses. See attached table #1 for examples. Review U.S. Forest Service research work on subject and adapt to needs of the cooperator.

Refer to "Guide For Rating Soils For Selected Uses."

4. Consider conservation or other practices required to overcome soil limitations and provide a weight factor for the appropriate soil properties and the limits as given in the guide. (See the attached sheets for suggested weights.)
5. Determine the relative value for the soil Potential interpretations by rating several bench mark soils. Soils with high sums of weighted limits should be considered as having a low potential for the recreation activity.

Indicate that soils potentials are only one of a dozen elements used in determining the overall potential of an area. See Recreation Ready Reference for list of key elements for specific activities. Stress that soil potentials for recreation should be used for preliminary planning only. Rating of the soils based on limitations for sanitary facilities, building site development, septic fields, roads, and other items combined with rating for recreation activities is needed for anything higher than preliminary planning. In other words, never use soil potential interpretations for project or design planning especially without information pertaining to the reason for the soil limitations.

Example Table No. 1 (WORK SHEET)

DESIRABLE SITE CONDITIONS FOR VARIOUS RECREATION USES

(Natural condition or condition which must be created by conservation measures or other treatment.)

Recreation Use	Desirable Site Conditions						
	Moistness	Slope	Depth	Texture	Obstructions	Permeability	Flooding
Intense play area	Well drained	0-3% (ideally 1%)	24"	Sandy loams to silt loams	Non-stony	Moderate to rapid	Occasional
Picnic and campsite areas	Well drained & mod. w. dr.	0-15%, 1% at actual tent or table area	24"	Loamy sands to silt loams	Stone free at each tent & table site	Moderate to rapid	Occasional
Extensive Play areas	Mod. well dr. & drier	0-15%	18"	Loamy sands to silt loams	Non-stony	---	---
Golf courses	Well drained. Mod. well drained.	0-15%	24"	Sandy loam to silt loams	Non-stony	Moderate to rapid	None
Ski areas	Dr. to mod. w. dr. & drier. No seeps.	3-80%	12"	Sandy loams to silt loams	Non-stony	---	---

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## 403.5(a) CAMP AREAS

PROPERTY	LIMITS			RESTRICTIVE "FEATURE"
	SLIGHT	MODERATE	SEVERE	
1. FLOODING	None, (0) PROTECTED	--- (3)	RARE, (5) COMMON	FLOODS
2. SLOPE (PCT)	0-3(0)	3-15 (4)	15+(5)	SLOPE
3. FRACTION < 3 IN. (PCT) (SURFACE LAYER)	<25(0)	25-50(2)	>50(3)	LARGE STONES
4. $\frac{4}{4}$ /COARSE FRAGMENTS (PCT) (SURFACE LAYER)	<30(0)	30-65(1)	>65(2)	SMALL STONES
5. HIGH WATER TABLE (FT)	>2.5(0)	1.5-2.5 (2)	<1.5(4)	WETNESS
6. $\frac{19}{19}$ /PERMEABILITY (IN/HR) (0-40")	>0.6(0)	0.06-0.6 (1)	<0.06 (3)	PERCS SLOWLY
7. $\frac{12}{12}$ /USDA TEXTURE (SURFACE LAYER)	---	SCL, CL, SICL (1)	SC, SIC, c (2)	TOO CLAYEY
8. UNIFIED (SURFACE LAYER)	---	---	OL, OH, PT (1)	EXCESS HUMUS
9. USDA TEXTURE (SURFACE LAYER)	---	LCOS, LS, LFS, VES (1)	COS, S, FS (2)	TOO SANDY
10. BEDROCK (IN)	---	---	<10(1)	DEPTH TO ROCK
11. $\frac{42}{42}$ /USDA TEXTURE (SURFACE LAYER)	---	SIL, SI, VFSL (1)	---	DUSTY

$\frac{4}{4}$ /100- $\frac{1}{2}$  passing No. 10 sieve.

$\frac{19}{19}$ /Soils in LIST, TOR, ARID, or XER suborders, great groups or subgroups rate one class better.

$\frac{42}{42}$ /Disregard unless soil is in TOR, ARID or XER suborders, great groups or subgroups.

## Possible Soil Potential Classes

<10 = High Potential

10-19 = Mod. Potential

>20 = Low Potential

NSH Notice \_\_\_\_\_

## 403.5(b) PICNIC AREAS

PROPERTY	LIMITS			RESTRICTIVE FEATURE
	SLIGHT	MODERATE	SEVERE	
1. SLOPE (PCT)	0-8	(4) 8-15	(5) 15+	SLOPE
2. FLOODING	NONE, RARE, OCCAS. PROTECTED	FREQ 4	---	FLOODS
3. HIGH WATER TABLE (FT)	>2.5	1.0-2.5 (2)	<1.0 (4)	WETNESS
4. FRACTION >3 IN. (PCT) (SURFACE LAYER)	<25	25-50 (2)	>50 (3)	LARGE STONES
5. <sup>19</sup> /USDA TEXTURE (SURFACE LAYER)		SCL, CL, SICL (1)	SC, SIC, C (2)	TOO CLAYEY
6. USDA TEXTURE (SURFACE LAYER)		LCOS, LS, LFS, VFS (1)	COS, S, FS (2)	TOO SANDY
7. USDA TEXTURE (SURFACE LAYER)		---	FIB, HM, MPT, (1) MUCK, PEAT, SP	EXCESS HUMUS
8. %I/COARSE FRAGMENTS (PCT) (SURFACE LAYER)	<30	30-65 (2)	>65 (3)	SMALL STONES
9. SOIL REACTION (pH) (SURFACE LAYER)		---	<3.5 (3)	TOO ACID
10. <sup>19</sup> /PERMEABILITY (IN/HR) (0-40")	>0.6	0.06-0.6 (1)	<0.06 (3)	PERCS SLOWLY
11. <sup>42</sup> /USDA TEXTURE (SURFACE LAYER)		SIL, SI, VFSL (1)	---	DUSTY

<sup>4</sup>/100- $\frac{1}{2}$  passing No. 10 sieve.

<sup>19</sup>/Soils in UST, TOR, ARID, or XER suborders, great groups or subgroups rate one class better.

<sup>42</sup>/Disregard unless soil is in TOR, ARID, OR XER suborders, great groups, or subgroups.

Possible Soil Potential Classes

NSH Notice - - \_\_\_\_\_

<10 = High Potential  
10-19 = Mod. Potential  
>20 = Low Potential

## 403.5(c) PLAYGROUNDS

PROPERTY	L I M I T S			RESTRICTIVE FEATURE
	SLIGHT	MODERATE	SEVERE	
1. FRACTION >3 IN. (PCT) (SURFACE LAYER)	<10 (0)	10-30 (3)	>30 (4)	LARGE STONES
2. SLOPE (PCT)	0-2(0)	2-6(3)	6+(5)	SLOPE
3. <sup>4/</sup> COARSE FRAGMENTS (PCT) (SURFACE LAYER)	<10 0	10-30 (1)	>30 (2)	SMALL STONES
4. USDA TEXTURE (SURFACE LAYER)	---	SCL, CL, SICL (1)	SC, SIC, C (2)	TOO CLAYEY
5. USDA TEXTURE (SURFACE LAYER)	---	LCOS, LS, LFS; VFS (1)	COS, S, FS (2)	TOO SANDY
6. USDA TEXTURE (SURFACE LAYER)	---	---	IFB, HM, MPT, (2) MUCK PEAT: SP	EXCESS HUMUS
7. HIGH WATER TABLE (FT)	>2.5 0	1.5-2.5 (2)	<1.5 (5)	WETNESS
8. FLOODING	NONE, RARE, PROTECTED; 0	OCCAS (1)	FREQ (3)	FLOODS
9. BEDROCK (IN)	>40 0	20-40 (1)	<20 (2)	DEPTH TO ROCK
10. CEMENTED PAN (IN)	>40 (0)	<sup>20/</sup> 20-40 (2)	<20 (4)	CEMENTED PAN
11. <sup>19/</sup> PERMEABILITY (IN/HR) (0-40")	>0.6 (0)	0.06-0.6 (2)	<0.06 (4)	PERCS SLOWLY
12. <sup>42/</sup> USDA TEXTURE (SURFACE LAYER)	---	SIL, SI, VFSL (2)	---	DUSTY
13. SOIL REACTION (pH) (SURFACE LAYER)	---	---	<3.6 (2)	TOO ACID

<sup>4/</sup>100-% passing No. 10 sieve.

<sup>19/</sup>Soils in UST, TOR, ARID or XER suborders, great groups, or subgroups rate one class better.

<sup>20/</sup>Rate slight on 0-2% slopes.

<sup>42/</sup>Disregard unless soil is in TOR, ARID or XER suborders, great groups, or subgroups.

## Possible soil Potential Classes

NSH Notice - -

<14 = High Potential  
15-27 = Mod. Potential  
>28 = Low Potential

4-28/62

403.2(f) LAWNS, LANDSCAPING AND GOLF FAIRWAYS

PROPERTY	LIMITS			RESTRICTIVE FEATURE
	SLIGHT	MODERATE I-	SEVERE	
1. SALINITY (MMHOS/CM) (SURFACE LAYER)	<4	4-a (1)	>8 (3)	EXCESS SALT
2. SODIUM ADSORPTION RATIO (GREAT GROUP:)	---	---	>12 (HALIC, (3) NATRIC)	EXCESS SODIUM
3. SOIL REACTION (pH) (SURFACE LAYER)	---	---	<3.5(2)	TOO ACID
4. SULFIDIC MATERIALS (GREAT GROUP)	---	---	SULFA- QUENTS, SULFI-(2) HEMIST	EXCESS SULFUR
5. <sup>4</sup> /COARSE FRAGMENTS (PCT) (SURFACE LAYER)	<10	10-30 (2)	>30(4)	SMALL STONES
6. FRACTION >3 IN. (PCT) (SURFACE LAYER)	<25	25-50 (2)	>50(4)	LARGE STONES
7. HIGH WATER TABLE (FT)	>2	1-2 (3)	<1 (4)	WETNESS
8. FLOODING	NONE, RARE, PROTECTED	OCCAS (1)	FREQ (3)	FLOODS
9. SLOPE (PCT)	0-8	8-15 (3)	15+(4)	SLOPE
10. BEDROCK (IN)	>40	20-40 (2)	<20 (3)	THIN LAYER
11. CEMENTED PAN (IN)	>40	20-40 (1)	<20 (3)	THIN LAYER
12. <sup>7</sup> /USDA TEXTURE (SURFACE LAYER)	---	SC (1)	SIC, C (2)	TOO CLAYEY
13. USDA TEXTURE (SURFACE LAYER)	---	---	FB, HM,(2) SP, MPT, MUCK, PEAT	EXCESS HUMUS
14. USDA TEXTURE (SURFACE LAYER)	---	LCOS, LS, FS, VFS (1)	COS, S (2)	TOO SANDY

Possible Soil Potential Classes

<sup>4</sup>/100-~~1~~ passing No. 10 sieve.

<sup>7</sup>/If in kaolinitic family, rate one class better.

NSH Notice - \_\_\_\_\_

<14 = High Potential  
15-27 = Mod. Potential  
>28 = Low Potential

DISCUSSION OF COMMITTEE #4 REPORT 7/21/78

RE: Discussion of Woodland Soil Limitation Guide.

**ANONYMOUS:** How were the guidelines contained in the Woodland Interpretations for Soils in Land Resource Areas of the Northeast developed?

Cleveland: The guides were developed at the Technical **Service** Center and extensively discussed during 1967-1969 in workshops by all interested agencies. Other regions were doing similarly and there was inter-region coordination.

J. Rourke: B. Hartung (absent during **committee** report) questioned **some** of the woodland guides.

RE: Discussion of Possible exclusion of Soil Limitation Adjective Rating in Soil Potential Ratings.

H. Luce: Would prefer both "present condition" as well as "potential", once restriction is removed, be included in the tables.

R. Shields: Would prefer the inclusion of soil limitation rating be left optional.

J. Rourke: We can respond to local people and list the potential and/or the limitation rating as they wish.

H. Luce: In all reports there is a need to carefully define "limitation" and "potential" and carefully label the tables. Some published reports are confusing.

D. Childs: West Virginia would like to drop the soil limitation rating from soil potential tables.

D. Hill: For Connecticut, I would like to continue to list soil limitations rating at present, but be prepared to do without it in the future when soil potentials have been **proven**.

RE: Discussion of Soil Potentials for Wildlife.

H. Luce: There are 200 beagle clubs in the Northeast managed intensively for rabbit. There appears to be a place for using soil surveys and soil potentials for wildlife habitat.

REPORT OF COMMITTEE 5  
SOIL MOISTURE REGIMES

D. S. Fanning  
University of Maryland

The charge to this Ad Hoc Committee was to develop a comprehensive proposal for obtaining water regime data on soils of the Northeast.

In response to this charge the committee was polled by letter to find out: 1. What kinds of data are considered to be needed, and 2. How the data should be obtained?

The remainder of this report consists of a summary of the responses to these two questions and a rough draft of the proposal called for in the committee charge.

The following responses (given in the form of questions to which answers are needed) were received with regard to what kinds of data are needed:

1. Which soils in the Northeast have perched water tables and which have ground water tables within the soil?
2. What is the depth and duration of these water tables in the soils?
3. How do these water tables relate to drainage classes and soil morphological features, especially to soil color patterns?
4. Where and how is the perched and ground water moving? (Relates to 7).
5. Are there areas in the Northeast that may need supplemental irrigation?
6. What is the unsaturated hydraulic conductivity of benchmark soils of the Northeast?
7. How does water move through soils of the Northeast? How much of the movement is through macrochannels (e.g. along root channels, animal burrows, prism faces; etc. for particular soils)?

8. Do any of the soils of the Northeast (particularly excessively drained ones) belong in Soil Taxonomy moisture regime classes that are drier than udic?
9. What is the moisture regime of the unsaturated part of the soils and its relation to the saturated part?
10. What is the depth to fluctuating water tables and what is their relationship to seasonal moisture patterns and to precipitation patterns *and snow melt*?
11. *How to* recognize apparent vs perched water tables?
12. What is the moisture regime during the unfrozen period or during the growing season?
13. What is the oxygen content of the free water in the soil, especially as related to gleying phenomena?
14. What is the duration of the water table at various depths?

A number of the questions (1, 2, 3, 4, 10, ii, 13, 14) relate to water tables and there is continuing concern with perched water tables. The previous NESSC soil moisture committee did stress perched water tables and recommended a coordinated water table study to characterize perched water tables and their relationship to apparent water tables and their significance to soil survey interpretations. That presumably was the thrust that generated the present committee's charge.

Other concerns are with water movement in soils and geologic columns (questions 4, 6, 7, 9), water quality (13, others indirectly from standpoint of movement of pollutants, etc. in the moving water) and moisture of the unsaturated part of the soil as it relates to crop production, etc. (5, 8, 9, 12). All of these things seem to be legitimate concerns of this committee. The concerns in both of these latter areas reflect general concerns throughout the region. The Northeast Soil Research Committee spent much of its time in New York last January talking about hydrology, particularly from the viewpoint of the possible effects of EPA water standards upon agriculture in the region. This area will also be considered at a symposium on land use and water quality at the Northeast Branch Meeting of the American Society of Agronomy next week. Interest in irrigation in the region develops when droughts strike.

The next section of the report deals with how should the moisture regime data be accumulated?

It was felt that the mechanics for accomplishing the goals in most of the areas of concern are known, but that agreements among agencies and institutions must be made to accomplish the required tasks:

In regard to water tables it was felt that soils would have to be studied in each of the major physiographic provinces of the region. This will require identifying the specific regions and soils, adopting methods; and getting individuals to do the installations and monitoring. "Piezometer" type installations would be required. Methods for making these installations have generally been worked out, but problems still remain for stony soils which are common in the region. One or more perforated wells to observe apparent water tables should also probably be installed at each site.

Exact procedures for monitoring also require further attention. Probably the water should be removed from the piezometers each time they are read.

A major need here seems to be to have a single individual who is well versed in the water table problem to be in charge and for him to have plenty of time to do the work. Suggestions are that this could be an individual given this assignment at the SCSTSC in Broomall, or a (newly hired?) hydrologist at an agricultural experiment station or a graduate student. Graduate students working with interested soil physics and soil survey, people could make valuable contributions. The individual in charge presumably would have many helpers in the various regions to actually do the monitoring. These could be soil scientists in individual survey areas, farm managers at experiment station farms, park managers, etc.

It is felt that if such a major effort was to be initiated that other environmental parameters such as soil temperatures should be measured at the same sites. Also to adequately interpret the water table data it would be very important to collect rainfall data at the sites. A smaller number of well documented and carefully monitored sites would be preferable to a large number of sites without the corollary data. A logical solution would be to tie the water table observation sites to weather stations at experiment station farms.

With regard to the moisture content of the unsaturated part of the soil. It would seem to be possible to monitor the moisture content of this part of the roll by neutron probe in the same piezometer pipes that are used to observe the perched water tables, however, this has apparently never been attempted and would require some pilot studies before it could be tried on a routine basis. Alternatively gravimetric measurements could be made of the upper part of the soils during the growing season. This would probably lend itself more to monitoring by field soil scientists. It was suggested that bulk density and moisture curves should be determined when measurements are initiated as these would be useful in computer modeling.

It was also suggested that predicting moisture regimes from weather records based on procedures worked out by Franklin Newhall, SCS, Washington, D.C. be investigated. A problem here may be to account for water from runoff and run on. However, various soil moisture prediction methods should probably be investigated and data compared to field measurements.

To see if all soils in the Northeast have moisture regimes of udic or wetter it was suggested that the moisture regime of excessively drained soils such as Evesboro (mesic, coated, Typic Quartzipsamments) and Schaffenaker (mesic, coated Typic Quartzipsamments) should be investigated.

Water movement in rolls and geologic columns is a large topic and probably beyond the realm of this committee. ~~Since~~

## Proposal

**Objective:** To obtain soil moisture regime data for soils of the Northeast.

**Procedure:** Organize a closely knit team of field soil scientists, experimental farm operators, weather observers, etc., to install and monitor soil moisture observation posts in major soil physiographic regions throughout the Northeast. These installations would monitor water tables, both perched and apparent, and also measure the moisture of the unsaturated part of the soil by neutron probe and/or by gravimetric methods. Soils on important different relief positions (e.g. convex vs concave or well vs poorly drained sites) should be examined at each site in each soil-physiographic region. Other pertinent environmental parameters (soil temperature, rainfall, etc.) would also be monitored. The data would be analyzed by the organizing individual or individuals to get answers to the questions posed in the first part of this report.

### Recommendations

1. That a regional effort be initiated to collect data and to develop models of soil moisture regimes of soils of the Northeast. This would be a joint effort between the SCS and the Experiment Stations, and other interested parties.
2. That a dual approach to accumulate the moisture regime data on a regional basis be made. Initially installations should be made to collect moisture regime data generally according to the proposal given in this report. Directions for making these measurements should come from the TSC. In developing these directions the TSC will consult with Dr. Ray Daniels, Director of Soil Survey Investigations, with NSSL and with the continuing soil moisture regimes committee.

The second approach should be to develop a regional project on moisture regimes to be supported by and administered through the state agricultural experiment stations. This project should include special studies to support and go beyond the studies described above, such as looking at the chemistry of soil and ground water, and at models of water movement in landscapes, etc.

3. That the committee be continued on an ad hoc basis with committee composition and charges to be assigned by the conference steering committee.

Committee Members

R. Arnold  
T. C. Calhoun, Vice Chairman  
D. Fanning, Chairman  
D. McCandless  
J. C. Patterson  
R. Rourke  
J. Witty  
R. Yeck

In addition:

F. W. Hahnenberg  
D. E. Hill  
D. A. Lietzke  
F. P. Miller

served as recorders in the various discussion groups at the Conference and contributed to the report.

## COMMITTEE NUMBER 6

SOIL SURVEY AND RELATED DATA NEEDED FOR CONSERVATION PLANNING  
OF SURFACE MINED AREASCharges

- A. Identify soil and geologic data that are needed for conservation planning in the reclamation of orphan (abandoned) mine spoil soils.
- B. Identify soil and geologic data that are needed for **conservation** planning of areas that are to be surface mined.
- C. Identify additional research or study that is needed to assure that soil data are adequate for conservation planning of areas surface mined for coal.

Committee Members

- J. Ackard  
 D. Childs  
 E. Ciolkosz  
 R. Francis  
 R. Googins  
 J. Kabota  
 A. Kuhl (Vice Chairman)  
 J. Sencindiver\*  
 D. Smith (Chairman)

Charge A. Identify soil and geologic data that are needed for conservation planning in the reclamation of orphan (abandoned) mine spoil soils.

Basic soils data are needed prior to any step in the reclamation process. Similar data are also needed for cut and filled areas after grading and prior to any liming, fertilization, planting or seeding.

The following soil properties could be determined or estimated: texture, percent and kind of coarse fragments, slope, permeability, bulk-density, structure, pH, total acid-base balance, available water capacity, erodibility, and depth to bedrock as well as whether underlying rock is fractured, solid, or rippable. Selective chemical and physical analyses of rock strata in high walls may be useful in understanding the properties of the minesoils.

The present land use in the area around the orphan minesoil should be considered in planning the use of the newly reclaimed area. The planned use of land being reclaimed should be compatible with that of surrounding land.

\* Represented Smith at the committee meeting.

Charge B. Identify soil and geologic data that are needed for conservation planning of areas that are to be surface mined.

soil survey the area if not already soil mapped. **Determine** if the soils qualify for prime farmland. (See LIM Memorandum-3, dated March 23, 1978, and pages 62694 and 62695 of the Federal Register, Volume 42, Number 239, dated December 13, 1977). If the land does not qualify as prime farmland, then mining operations should consider the post mined use of the land as sited in Section 715.20 "**Revegetation**" from the above rules, paragraphs **(f)** (2) and **(f)** (2) (iii) on page 62691.

It is extremely important that all available geologic data be considered such as the numerous core **drillings** routinely done in areas to be stripped before the surface material over the coal or other minerals is disturbed. Materials rich in pyrite and other toxic materials should be blended or sandwiched with sufficient neutralizing material to prevent toxic minesoils or toxic water. Material that weathers slowly should be placed in the lower part of the spoil to help assure physical stability on slopes.

Under anticipated regulations, undifferentiated or **selectively-**placed spoil will be graded to the proper slope, then **the stockpiled** favorable material for surface placement will be spread over the area. At this time, the deposit will fit our modern definition of soil and should be soil surveyed. The scale of the soil map may vary from 1:20,000 to 1:7,920 depending on the complexity of the material. If there is an ample amount of favorable soil material available, the smaller scale soil map should be adequate. If there is little soil material available and/or highly variable rocks and earthy materials, then a more detailed map may be needed for conservation planning due to the complexity of the newly-created minesoil.

Some characteristics to consider are the thickness of the replaced soil material and the soil texture, percent and kind of coarse fragments, stoniness, slope, permeability, structure, bulk density, **pH**, total acid-base balance and erodibility of the **minesoil** profile from the surface to a depth of 60 inches or to bedrock. (In soil surveys, profile observations for mapping and **classification** may be limited to a depth of 100 cm. due to the difficulty of digging with hand tools in the stony material.)

Land use of surrounding areas should be considered when planning the use of reclaimed areas. If the area mined had been in **cropland** and surrounding areas are still in cropland, the reclaimed area should be reclaimed for **cropland** or other fully compatible use. The same is true for forest land, etc.

Charge C. Identify additional research or study that is needed to assure that soil data are adequate for conservation planning of areas surface mined for coal.

1. Research is needed to determine if it is necessary to take as many precautions in reclaiming mine spoil as currently recommended by state and federal laws. As an example, is it always desirable to mix or to segregate the soil horizons or other selected favorable materials for stockpiling?

2. Research is needed on the backfill slopes for steep land. The "original contour," as is often cited in current mine laws, often renders land useless for nearly every kind of use. Perhaps it would be better to construct bench type terraces when reclaiming steep land. This should make it more useful.

3. Additional research is needed to determine the relationship between certain coal seams or other geologic strata and the quality of the spoil and resulting minesoils.

4. Additional research is needed to determine what physical and chemical analyses of **the premining** borings would provide maximum benefits in planning the reclamation process and how it would benefit us in the reclamation process.

5. Research is needed to determine how acid mine drainage may be reduced by proper **placement** of potentially toxic materials.

6. More data are needed on crop yield (including forest crops) of reclaimed areas versus crop yields of undisturbed areas, with special **attention** to methods adapted to the kinds of soils involved.

7. More specific information is needed about plant species and varieties adapted to soil properties of reclaimed areas.

8. Data is needed on predicting slope stability, erodibility, and sediment production of minesoils.

6-4

**Recommendations:**

1. That the findings of the committee on the three charges be accepted - Approved by **the** conference.

2. That the committee has fulfilled its obligations and should be disbanded - Approved by **the** conference.

REFERENCES  
(Committee 6)

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Soil Conservation Service. 1975. Guide for **revegetation** of surface mine spoil (minesoil). West Virginia Technical Guide, Sections II-H-1 and III-B.

REPORT OF COMMITTEE 7

INTERPRETATION OF SOIL ASSOCIATION MAPPING  
UNITS ON SOIL SURVEY MAPS

Chairman - R. L. Shields

Vice Chairman - J. Foss

Members

W. Ellyson  
J. Ferwerda

K. Langlois  
J. Warner

Storrs, Connecticut

July 18-22, '1978

CHARGES

- A. Develop methods for the display of interpretations of soil association mapping units on soil survey maps for such uses as cropland, woodland, and community development. (Emphasis is on display of interpretations in published soil surveys.)
- B. Identify additional research or study that is needed for the adequate interpretations of soil association mapping units.

COMMITTEE ACTION AND BACKGROUND

The committee chairman developed a questionnaire consisting of eight questions related to the charges. The questionnaire was sent to all of the committee members. and all of the members responded to this questionnaire. The questionnaire and the individual committee members' responses are shown on Appendix A. (Please note: the committee chairman reduced the individual replies to fit the questionnaire. Hopefully, he made correct interpretations of the responses and retained the essential thoughts of the members. The unabridged committee member responses are retained and available for reference.1

After the individual questionnaire responses were tallied the **chairman**, determined consensus opinion on each question and reported this as committee response to the charges.

Background material of reference sent to the committee **members** along with the questionnaire were as follows:

1. National Soil Handbook Definition and Explanation of Soil Associations.
2. Examples of how the **Hollis-Charlton** Association and Hollis-Rock Outcrop Association are handled as correlated soil survey mapping units in a community uses interpretations table.
3. A portion of the soil interpretations table that accompanies the general soil maps of Onondoga County, New York.
4. Soil interpretations table and general soil map for southern Maryland **RC&D** Project.
5. Soil interpretations table and **general** soil map for state of Delaware.

(Note: The above five items are not included as Appendices to this report because of the awkwardness of trying to reproduce the materials in volume sufficient for multiple discussion groups. The **committee** chairman will prepare these reference materials in other form for the use of the 'discussion groups.)

The Committee 7 Report follows.

NOTES FROM DISCUSSION OF THE TENTATIVE  
COMMITTEE 7 REPORT AT THE NORTHEAST  
COOPERATIVE SOIL SURVEY CONFERENCE

CHARGE A. (Reference questions 1, 2, and 3 in Appendix A)

During our discussions at the conference we learned that some of our original concerns expressed in questions 1, 2, and 3 of Appendix A were no longer **valid**. We learned that the automated system for generating tables of soil interpretations for published soil surveys now prints the names of **multi-taxon** components at a single location in the table and provides interpretations for each component at that location, rather than scattering the interpretations alphabetically. This, then, eliminates the problem of awkwardness and confusion for the user.

(Reference question 4 in Appendix A)

Most of the discussion time was spent on this issue - whether interpretations for so called "broadly defined" map units of 3rd order soil surveys should be included in the same interpretations tables with more narrowly defined units of 2nd order surveys.

Arguments for having them in the same table were:

1. Two sets of tables would likely confuse the users rather than enlighten them.
2. Separate tables would add substantially to the volume and cost of the publication.
3. Actually, some map units of 3rd order soil surveys have fewer percentages of inclusions and can be interpreted more accurately than some narrowly defined units of 2nd order soil surveys - so why try to separate them on tabular presentations.
4. Mapping units of 3rd order soil surveys may be **thought** to be inferior if in tables separate from 2nd order soil surveys.

5. Footnotes can be used to indicate that interpretations for map units of 3rd order soil surveys, such as soil associations, **are** less precise if such is the case.

Arguments against having them in the same table were:

1. Interpretations for map units in 3rd order soil surveys, such as soil associations, generally are for large tracts and are broader in scope than for 2nd order soil surveys. For example, the former may carry column headings such as "community uses" or "waste disposal" whereas the latter will be **more** specific with columns on "septic tanks", "dwellings with **basements**", "**trench-type** sanitary landfills". Therefore, it is very difficult to format interpretations for the two in one table.
2. Interpretations for **multa-taxa** units of 3rd order soil surveys should be kept to themselves where it can be noted that specific, on-site investigations are needed for intensive, small-parcel use.

Discussion was long and involved on this issue and quite divided. There were good arguments in both directions.

(Reference question 5 in Appendix A)

There was good **agreement** as to the value of **three-dimensional** block diagrams to demonstrate the inter-relationship of components of soil associations. There has been generally good cooperation on the part of the editorial staff in utilizing well prepared diagrams. There were expressions of dissatisfaction with these diagrams being isolated in a separate section of the report remote from the mapping unit descriptions.

(Reference question 6 in Appendix **A**)

Response seemed to indicate that just one interpretation for a soil association should be an option where each component has similar interpretations; where the intended uses are of low intensity; and where 3rd order soil surveys are to be followed by high intensity surveys or on-site investigations.

(Reference question 7 in Appendix A)

Liberal use of color in the interpretations tables would open up many possibilities for improving display systems of **multi-taxon** units. For instance, tri-color "pies" could be used effectively to provide summary interpretations for entire soil associations. Otherwise, **our** present techniques for display in tables are about as imaginative as they can be.

(Reference question 8 in Appendix A)

Items a, b, **c**, and d were felt **to** be needed but rather **more** related to design of mapping units rather than display systems. Item **e** was retained as a final committee recommendation.

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COMMITTEE 7 RECOMMENDATIONS  
APPROVED BY THE CONFERENCE

CHARGE A

1. That interpretations for soil associations of 3rd order soil surveys appear in the **same** tables with interpretations of map units of 2nd order soil surveys. (This recommendation was accepted by a narrow margin - **60%** of the conference participants in favor and 40% against.)

That the format for expressing these interpretation's for the individual members (components) of an association within these tables be the same as that commonly used in interpretations tables that accompany general soil maps. (This may present some problems in combining "broad-use" column headings and "narrow-use" column headings in a single table.)

That the percentage of the entire association occupied by each member of an association be displayed beside the name of the member to provide the user a reasonable picture of the probability of encountering the kinds of limitations, suitabilities or potentials stated for each member.

2. That our soil survey publications policy will encourage liberal use of 3 **dimensional** block diagrams to portray the interrelationships of **individual** soils within soil associations, and that these diagrams will be located near or adjacent to the mapping **unit** descriptions of these soil associations.

That those who direct and manage our soil survey publications **remain aware** that use of color in published soil **surveys will** open up many ~~opportunities~~

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COMMITTEE 7 QUESTIONNAIRE AND RESPONSE FORM

1. Are you satisfied with the presently used format for providing interpretations of soil associations in "detailed" soil surveys, as in the Hollis-Charlton and Hollis-Rock outcrop associations tabular interpretations? Why or why not?

Consensus - No. The committee is not satisfied with the present format for the following reasons:

- a.) Awkward and confusing to most users.
  - b.) Users get impatient and use the first encountered interpretation.
2. If you are satisfied in 1 (above) do you have suggestions for improving the usefulness of the approach.

*Some committee members who gave conditional satisfaction with the present system said we should list the interpretations for each member of the association at the same place in a table, rather than scatter them alphabetically.*

3. Should we format the interpretations of soil associations of "detailed" soil surveys the same as we do for general soil maps (as in the Honeoye-Lima association of the New York example)? Please give reasoning.

Consensus - Yes. The reasons given were:

- a.) Need information in just one place.
  - b.) Much easier to compare the interpretations for individual members and weigh their significance for the whole association.
  - c.) The percentage figures are needed as well.
  - d.) Provides landscape information as well as soil limitations at one place.
  - e.) We should not squeeze broadly defined units into tables with mono-taxon units that are narrowly defined.
4. If you answer "yes" in 3 (above), would you propose that interpretations for soil associations, complexes and un-differentiated units be displayed in tables separate from single taxa units?

No consensus here: Feelings are divided. However, the chairman feels that John Warner's proposal and rationalization be given considerable thought in discussion groups.

Warner proposes that soil associations as used in order 3, should be displayed in the kinds of interpretive tables we are now using with general soil maps, as in the Onondaga County, New York example. However, interpretations for complexes and indifferenciated units, as in order 2 surveys, should be displayed in the same tables as single taxon units.

He emphasizes that we should not squeeze broadly defined units into tables with mono-taxon narrowly defined units because users too easily conclude that interpretations of the two kinds of units can be applied with equal validity. Basically, the level of interpretation should be matched with the level of mapping intensity. The level of interpretations for soil associations can be broad, especially if detailed soil surveys of specific parcels within order 3 surveys are to follow for high intensity uses.

5. Do you believe that 3-dimensional block diagrams should be included with either the interpretive tables or with the mapping unit descriptions to enhance understanding of the relationship of the component soils in the association? Do you believe such diagrams should be consolidated in a separate section of the published soil survey?

Consensus - Yes by all members that 3 dimensional block diagrams are needed to enhance understanding of the relationship of component soils in soil associations. Opinion was divided as to where these should be located in a published soil survey, but most felt with the mapping unit descriptions.

6. The National Soils Handbook states that the major components "are individually large enough to be delineated separately at the scale of mapping." Since we do not separate them but, instead, combine these as soil associations, some suggest that we should go ahead and give just one interpretation for the association. Do you believe this would be feasible? Why or why not?

No Consensus - Opinions divided. Those who thought just one interpretation for an association would be feasible gave the following reasoning:

a.) *It could work where slopes or stones are over-  
hiding*

*To provide guidelines for integrating interpretations  
of different soils in multi-taxa units into a single  
interpretation.*

*On better guidelines for separating areas of order 2  
and order 3 surveys within a survey area.*

## REPORT OF COMMITTEE 8

### Presentation of Soil Survey Data for Use by Planners

Storrs, Connecticut

July 18-22, 1978

#### Background

Presently there are two approaches being used in the Northeast to provide soil survey data to planners that are intermediate in specificity between that shown on detailed soil survey maps and that shown on the small scale general soil maps included in published soil surveys. These are Natural Soil Groups and Meso-Intensity General Soil Map.

#### Charges

- A. Evaluate the two procedures and provide an answer to the following questions:
  1. What are the strong points of each?
  2. **What** are the weak points of each?
  3. Is one approach more useful than the other?
  4. Would you recommend one approach over the other?
- B. Identify additional research or study that is needed to improve the presentation of soil survey data for use by planners.

#### Committee Members:

S.A.L. Pilgrim, Chairman  
D. Lietzke, Vice-Chairman  
F.W. Cleveland  
W.E. Hanna - added 4/19  
G. Petersen  
F. Putnam  
**E. Sautter**  
**D. Van Houten**  
F. Vieira  
B. Watson  
D. Wells  
G. Wood

Recommendations of the Committee

1. Endorse both the Natural Soil Group and **Meso-Intensity** procedures as a means of presenting soil survey information. The committee believes this flexibility is essential to meet the needs of users.
2. The alternatives of each system should be presented to **more** planners and users. Feedback on

3.

4.

5.

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permeability, depth to bedrock, depth to water table, and stability.

In general, the Natural Soil Groups are arranged in order of increasing limitations or problems for most uses. Drainage class of wetness characteristics is one of the prime considerations. Thus, the better drained soils are the first groups. Groups are divided on the basis of drainage class, depth, permeability, flooding stoniness and rockiness. Subgroups are divided only on the basis of slope steepness, where this is an important feature affecting use."

It is important to note that detailed soil surveys provides the base data and has to be available.

### General Soil Maps (Meso)<sup>2/</sup>

"Soils Memorandum SCS-33 (Rev.) gives the policy and procedure for General Soil Maps and Land-Resource Haps of counties and states. It does not cover general soil maps (meso) at a scale of 1:62,500 which are being prepared for many New York counties. They are intermediate between detailed soil maps and small scale general soil maps described in Soils Memo SCS-33. Although general soil maps (meso) allow for more map detail than small scale general soil maps, the legend is stratified to permit generalization at the highest level. At this level the map can be used as a small scale general soil map which gives a bird's-eye view of the county. The lowest level in the legend is the map unit which is commonly a phase of a soil association. The units are used to separate areas for use in broad planning at the county level."

It is important to note that these interpretive maps can be developed from available detailed soil maps or, where detailed maps are not available, from field work.

### Natural Soil Groups for Connecticut

Although not specifically outlined in the charges to this committee, it may be useful to briefly look at the Connecticut system. The following is excerpted from the introductory paragraphs of the publication describing the system:

"The Natural Soil Groups system is designed to help people use soil surveys. The availability of material to interpret soil surveys for many uses has generated much interest and demand. This has led to many kinds of ratings, maps, tables, and other means of

<sup>2/</sup>From "Technical Note - Soils NY-3" dated September 17, 1974.

presenting **information** about soil. Because the number of specific land use interpretations is large when considering a tract of land containing many different soils, some means of summarizing the mass of **detail** to a more **comprehensible** level is desirable. This kind of summarization is one function of the Natural Soil Groups system. In addition, the adaptability of **this** system to interpretations for many uses reduces the need for numerous single-purpose interpretive maps.

State, regional, and town planners as well as owners or planners for individual tracts will find Natural Soil Groups an eminently useful system for analyzing soil survey information. Planners can make a variety of soil interpretations and select suitable alternatives from one map rather than compiling the pertinent interrelationships from a variety of maps.

The Natural Soil Groups system is especially useful in providing a framework for summarizing statistical data from a soil survey. This is more important when state, regional, or town planning involves large areas and uses computer data processing of soil information.

The system leads users of soil survey information to think and base decisions on soil characteristics and how these characteristics affect uses, rather than on the degree of limitations or suitability **ratings** alone. With this one system and map, users can determine the limitations as well as the potentials for a variety of purposes and land uses."

It should be noted that the approaches used in developing the Maryland and Connecticut systems are somewhat different. The Maryland system **deemphasizes** soil parent materials, landscape position, and geomorphic characteristics.

#### Some Characteristics of the **Two** Procedures

1. Strong **Points** - Natural Soil Groups
  - a. Converts many map units of detailed soil maps to few natural soil groups on most landscapes.
  - b. Intermediate detail and scale between general soil map (county) and detailed soil map.
  - c. Groups soils that have like characteristics, use, and management together and splits out contrasting soils, all of which **lends** itself to specific interpretive statements for Cropland, Urban, Recreation, Wildlife, **or** Woodland uses.

- d. Permits broad planning on Natural Soil Groups and more detailed planning on detailed soil information that shows on the map.
- e. Can be used at State, regional, county, or local (community) level.
- f. Can be used to designate Prime Farmland, Wetlands, Flood Plains, etc.
- g. Exposes geomorphic patterns of soils in some situations.
- h. Keeps the soils that are similar in characteristics, use and management together on landscapes that are adaptable to Natural Soil Groups.
- i. Provides a higher degree of interpretation reliability than Meso-Intensity General Soil Map. (For kinds of interpretations used in NSG system.)
- j. This kind of map and interpretations begins to overcome problems with utility of the soil information for the user. Although not specifically listed as such, several objectives for the inventory are listed at the bottom of page 9 and in Table 2. ("Natural Soil Groups of Maryland", Maryland Department of State Planning, December 1973.) Stating the purpose for the report in this manner will minimize incorrect usage. By developing a focus on particular characteristics, the natural soil group concept reduces unnecessary complexity and thus improves its utility. The inventory in general appears to have been tailored with a specific purpose in mind. The descriptions of each of the mapping units are easy to understand since there are very few technical terms included.
- k. Soil series names are not used--soil properties are the basis.
  - 1. Detailed mapping unit boundaries and symbols are visible on the map.
- m. Map scale can be easily adjusted for proposed use.

Strong Points - Meso-Intensity General Soil Map

- a. Converts many map units of detailed soil survey to few map units on meso maps.
- b. Intermediate between detailed soil maps and small scale general soil maps.

- c. Legend provides for two levels of generalization.
- d. Uses rated are unique for the general soil map (**meso**) and do not duplicate uses rated for the detailed soil map.
- e. This soil map would be more convenient to compile and would double as general soil map and mesa-intensity map.
- f. A mew-intensity general soil map is primarily based on physiographic or geomorphic areas and has a primary purpose of combining soils in characteristic and repeating patterns.
- g. This inventory helps to reduce complexity of the detail of the soil map by combining soils into soil associations.
- h. Can be individually tailored to each county.
- i. Geomorphic pattern of soils and geographic setting of major soil areas are identified.
- j. Introduces people (the users) to soil survey and soils.

2. Weak Points - Natural Soil Groups

- a. Interpretations are more generalized for some groups than for a specific soil within the group.
- b. Natural Soil Groups contain interpretations that imply **more** precision than intended for broad area planning. There is a **considerable chance** of error or of misuse of natural soil groups if they are interpreted for specific land uses such as septic tank filter fields,
- c. The system may not adapt as well to counties with contrasting terrain features.
- d. The characteristics chosen to make the groupings may not satisfy the requirements to interpret for all uses.
- e. Mixing of soils from different physiographic provinces, i.e., depth to hard rock vs. deep coastal plain soils.
- f. A limited **number** of soil characteristics used to make groupings.
- g. The major weaknesses of this inventory are related to quantification of the outputs and to definitions of interpretive classes,

For **planners**, if phrases such as "hardly any economic return" or "produce. . .insufficient abundance" can be quantified in terms of actual productivity, the planner can then more accurately determine trade-offs between alternative land uses. Additionally, by including mitigating measures required to overcome limitations, he can better assess development requirements for each of the soil groups.

- h. Must have a detailed soil survey available.

**Weak Points - Meso-Intensity General Soil Maps**

- a. Map units are named primarily as phases of soil associations and as such contain limiting dissimilar soils.
- b. Level of generalization is such that it is generally useful for county or wider areas of planning, but can be used on smaller areas.
- c. Interpretation of each map unit is based on the dominant soil condition (not necessarily the dominant soil) in the association which makes interpretive value of delineations considerably less than those of detailed soil survey.
- d. Interpretations to be meaningful are for the association as a whole.
- e. Contrasting soils are allowed in the same group which causes a lower purity of interpretation. (It should be noted that New York people attempt to minimize this through legend design.)
- f. This map, if used mainly because of its adaptation to the soil survey publication, would add considerable expense to the publication. (Local users can underwrite the cost.)
- g. The major weaknesses of this kind of map and interpretations are related to quantification of the outputs and to definitions of interpretive classes. Additionally, by including mitigating measures required to overcome limitations, he can better assess development requirements for each of the soil groups.
- h. The **meso-intensity** General Soil Map provides very little information on the purpose of the report, i.e., the objectives. There is no description of the interpretive columns nor of the interpretive classes themselves. Very

general statements such as "can be overcome under good management and careful design" are the rule and provide only the most general guidance. Similarly, the map is just as general. Utilizing the proper techniques, we can provide more specificity in a meso-intensity inventory.

- I. Soil series names used for the units.
  - j. Base map lacks air photo imagery.
  - k. Washington County example map is comprised of two sheets (consider smaller scale).
3. Is one approach more useful than the other?
- a. The **Meso-Intensity** General Soil Map would be the best map, in my opinion, in most counties since we have published all of our counties with the small scale general soil map. I do feel, however, that if the user foots the bill and prefers the Natural Soil Groups and the county terrain features are adaptable to a meaningful map, that we should be flexible enough to accommodate his preference.
  - b. One committee member **commented** that the Natural Soil Group approach is more useful for community, county, or state planning than **Meso** General Soil Map because soils are grouped by those **factors important** to planning most **nonfarm** uses.
  - c. With some modification and quantification, the Natural Soil Groups approach can **provide** substantially more specific information for the planner than can the **meso-intensity** General Soil Map concept.
4. Would you recommend one approach over the other?
- a. **Committee** members endorsed the continued use of both procedures.
  - b. Connecticut advised **the committee**, "The Natural Soil Group concept has been well received and used in Connecticut. It can be used on the town level for operational planning at the same scale as the detailed soil survey, too".

Charge B: Identify additional research or study that is needed to improve the presentation of soil survey data for use by planners.

- a. I think we need to move ahead on the soil potential approach because it is a more meaningful way of presenting soil survey data. However, in order to use this approach, we need to accurately document map unit composition and study the interactions of the different soils within a map unit on the various uses,
- b. We need to continue to modify our techniques such as has been done with the Natural Soil Groups Inventory to more **specifically** meet the needs of planners/users. Continued implementation and experimentation with these different techniques is needed.
- c. We need to establish goals and objectives relating to user needs for each inventory. This requires close coordination between users and the resource people in the pre-field stages. From this coordination, resource people should be able to tailor an inventory to meet the goals and objectives, and at the same time, relate the physical requirements to complete it, i.e., dollars, manpower, and time. If outlined in the final report, these goals and objectives will identify the purpose of this inventory and the types of use for which it is particularly well suited,
- d. We need to be flexible in establishing the mapping scale and the type of inventory to accomplish the objectives. This flexibility is necessary so that we may best meet the needs of planners/users. (O.K., but not for each planner per se.)
- e. All descriptive and **interpretive** classes need to be defined in **terms** that the non-mapper can relate to, i.e., what does "moderately limit" mean?
- f. We need to quantify outputs on different soils for various activities to meet many planning needs. In addition, we need to tailor our interpretations to the needs of the planner/user. In some cases, very general suitabilities, such as in the **meso-**intensity general soil map could be satisfactory. However, specific, quantitative, functional interpretations are often needed. Phrases such as "hardly any economic return" have little value to the planner who is trying to determine an optimum mix of activities based on land capability and demand for the activities. A corollary benefit to quantifying outputs is the ability to determine trade-offs resulting from emphasizing specific activities.

- g. Through interpretive tables, we need to define constraints and then mitigating measures for each of the soil mapping units. This will require an interdisciplinary approach and will enable the planner to define resource and economic consequences.

APPENDIX

USE OF MESO-INTENSITY GENERAL SOIL MAPS (Scale 1:62,500)

SURVEY OF USERS

- |                           |  |
|---------------------------|--|
| Walker Banning (Planner)  | • <b>Central New York Regional Board</b><br>(5 counties) |
| Mary Harnan (Planner)     | • Broome County Planning Board                           |
| Jim Hill (IPA - Engineer) | • Adirondack Park Agency (APA)                           |
| Pat Smith (Planner)       | • Black River-St. Lawrence Regional<br>Planning Board    |
| Richard Zimmerman (D.C.)  | • Wayne County   |

I. "ARE THE MESO INTENSITY GENERAL SOIL MAPS BEING USED?"

Banning: When meso report supplied in 1969 it was initially used intensively for regional planning but used less now as detailed surveys for area become available.

Harnan: Used intensively initially to develop a set of natural resource inventory maps but used less as moved into second phase (1:24,000) of **plannings**. Still used some **for individual** town planning.

Hill: Quote "The maps are used almost daily for various aspects of planning and review of soil conditions in areas of site appraisals."

Smith: Currently being used to develop interpretive maps for Regional Land Use Plan,

Zimmerman: Used considerably by planning board to develop a set of maps of environmentally sensitive soils. Also used **in** working with other public and private groups.

II. "HOW ARE THE MESO MAPS BEING USED?"

Banning: As overlays in developing a regional plan • series of interpretive maps, such as depth to bedrock, drainage groups, permeability classes, etc.  
• copies of report frequently supplied to consultants, realtors, etc.

Harnan: **Developed** a series of overlay interpretive resource maps based on meso map, including slope, flood hazard, **permeability**, depth to bedrock, etc. • used with other

resource data such as woodland and vegetation maps. Used mostly for county-wide **planning** and to a lesser extent, town planning.

- hand out report to groups and individuals.
- use in meetings and presentations, excellent for small groups to view overall soil problem areas.

**Hill:** Use as overlays with other resource overlays for broad regional planning - one of the basic maps for developing land use maps for Adirondack Park (AP) area.

- map always reviewed before looking at specific site problems.
- used by APA to back discussion at public hearings for proposed land use zoning - map has not been challenged.
- provided to some towns for planning.
- used to develop a regional prime farmland map.

Zimmerman: Supplied to utility companies to locate routes.

- identify principal prime farmland areas.
- locate **principal** gravel resources in the county.
- supplied to consulting firms looking for nuclear power plant sites along Lake Ontario.
- used in a meeting as a base to help convince County Board of Supervisors to fund \$150,000 drainage project.
- locate **muckland areas** 50 acres or more in **size**.
- supplied to County Planner to develop maps of environmentally sensitive soils including stability, slope, depth to bedrock, etc.

### III. "IS SCALE OF 1:62,500 SATISFACTORY?"

Banning: Okay, but would prefer 1:63,630 (Actual 1" to 1-mile scale) - some maps were reduced to 1" = 2 miles for multi-county Regional Planning Reports.

Harnan: Scale is excellent because it coincides with State supplied planning maps.

**Hill:** Scale is perfect for regional plans, but have enlarged to 1:24,000 for development of town size interpretive maps including on-site sewage disposal, slope groups, community development, etc.

Smith: Scale is okay for some planning, but have reduced in some instances to 1:125,000 to develop a set of overlay interpretive maps at regional plan level.

Zimmerman: Scale is good for meetings to display soil resources and problems on a county basis - ideal for utility companies use.

IV. "HOW COULD MESO MAPS AND ACCOMPANYING REPORTS BE IMPROVED?"

Banning: If meso maps are not based on detailed soil surveys this creates problems as detailed surveys become available (5-county meso maps not based on detailed survey).

- interpretation table could be more specific, rather than "community development" indicate limitations for "dwellings", "septic effluent fields", "roads and streets", etc.
- text material is adequate.

Harnan: Make meso maps more detailed - 1937 planimetric base maps at same scale are better because had more detail, this map is used some by Planning Board.

- text material is satisfactory.

Hill: General terms in table are sometimes too broad - specific interpretations for on-site sewage disposal, dwellings, and a layman type engineering table would be helpful, particularly for town planning.

Smith: Tables provided were not detailed enough - used data and interpretations from SCS-Soils-5's.

Zimmerman: Map and text satisfactory as provided (SWCD is charging \$6.00/copy for a report centered around meso-map.)

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ADDITIONAL NOTES

1. - Overall rating of usefulness of meso-intensity maps:

Banning: High during initial planning stage, medium to low as planning has evolved to more detailed town and site planning.

**Harnan**: Medium.  
Hill: Very high.  
Smith: Medium, would prefer detail soil survey.  
**Zimmerman**: High.

2. - All of the planning agencies tend to use the maps for more specific purposes than the map was intended or should be used - particularly **APA**.
3. - Broome County, Central New York-Regional Planning Board, Black River-St. Lawrence Regional Planning Board, and **APA** funded or partially funded cost of producing the **meso** maps.
4. - Interpretation maps developed from **meso** map were mainly based on dominant soil in each association, not necessarily most limiting soil. Some planning agencies screened colors to give a percent of each dominant soil.

Natural Soil Groups of Maryland  
Prepared by: Robert L. Shields

The following are some of the major uses made of the system thus far:

1. Maryland State Land Use **Plan**.
2. County and regional land use plans.
3. Generalized maps of prime farmland.
4. River basin and watershed studies of soil and land use conditions.
5. Coastal zone management studies.
6. Delineations of wetlands.
7. Locate large areas for liquid and solid waste disposal.
8. Locate potential critical **areas** in the 208 **nonpoint** pollution planning.
9. Base reference for preparing environmental impact statements.
10. Overlay with geological maps to generate areas suitable for uses dependent upon both soil and geological considerations.
11. Provides a generalized soil map for many uses where detail intermediate between soil association maps and detailed soil maps are needed.

Among the above, Item 3 has been extremely useful for filling the void until the detailed **Important** Farmlands Inventory maps are available.

Report of Committee 9

SOIL SURVEY RESEARCH NEEDS AND PRIORITIES

Northeast Cooperative Soil Survey Conference  
Storrs, CT, July 17-22, 1978

Committee Members:

W. Wright, Chairman	D. Fanning
J. Kubota, Vice Chairman	R. Smith
J. Witty	R. Shields
W. Hatfield	S. Pilgrim
O. Rice	F. Gilbert

Charges:

1. To serve as a clearing house of ideas and to identify research needs and priorities.
2. To solicit, evaluate, and select one research proposal for submission to the Northeast Soil Research Committee for support as a funded regional project.

Recommendations:

1. That Agricultural Experiment Station scientists be encouraged to design research project in one or more of the following areas as they relate to their specific needs, priorities, and resources.
  - a) Initiate studies related to the development of guidelines for establishing limitations and management practices for land disposal of waste materials on named kinds of soils.
  - b) Develop research projects designed to increase the accuracy of interpretations to the users concerning woodland production and soil erosion on harvested woodland sites.
  - c) Develop research projects on "Soil Potential", particularly cost benefit studies and soil
  - d)

- e) Develop studies concerned with crop yield data on reclaimed minespoil areas vs. undisturbed soils.
  - f) Develop studies related to the evaluation of mapping unit composition, character, and quality.
2. That the soil moisture regime committee be charged with developing a research proposal on water regimes for consideration as a regional project and that the proposal be presented to the Northeast Soil Research Committee for support as a funded regional project.
  3. That Committee 9 be continued as a permanent committee rather than an Ad Hoc Committee to serve as a clearing house of ideas concerned with soil survey research needs and priorities in the Northeast.

# REMOTE SENSING IN SOIL SURVEYS

Report of Committee 10

by  
Horace Smith

Remote sensing is the science of acquiring information about distinct objects from measurements made without coming into contact with the objects. Remotely sensed data, in the form of black and white aerial photography, have been used by soil scientists since the early 1900's. This report is an update on current Soil Conservation Service (SCS) policy regarding remote sensing technology. It is also a brief progress summary on the status of remote sensing in soil survey with special emphasis on what is happening in the Northeast.

In 1973 the SCS established a Remote Sensing Specialist position in the Washington office on the staff of the Land Inventory and Monitoring Division. The primary responsibility of this position is to coordinate remote sensing activities within SCS. Shortly after 1973 an interdisciplinary team, headed by a soil scientist, was placed in Reston, Virginia to look at developing remote sensing applications in their fields. The SCS has recently assigned, **for** the second time, a soil scientist with the Laboratory for Applications of Remote Sensing (LARS), Purdue University. Recently, the SCS has drafted a policy memorandum which is about ready for release that assigns responsibility at the Washington office, TSC, and state level for coordinating remote sensing activities. I have been assigned responsibility for coordinating remote sensing activities within the Northeast Technical Service Center area.

In the Northeast, ten states have used or anticipate using remotely sensed data, other than black and white photographs, in their soil survey and related programs. These states are:

Connecticut and Rhode Island: Researchers at the Universities of Connecticut and Rhode Island are using color infrared photography to study wetlands. They report this photography is an excellent aid in delineating areas that classify as wetlands.

Maine: The SCS is using U-2 transparencies for interpreting forest conditions. The SCS is also conducting a low budget, low altitude remote sensing project with the University of Maine on forested land using color infrared. The project is being used in forested areas to see if tonal patterns or stress conditions shown in the trees can be correlated to soil types. So positive results from this study to date, but data does show promise.

## Remote Sensing in Soil Surveys

Maryland and Delaware: The SCS and the University of Maryland are using infrared photographs and transparencies to <sup>IMP</sup> the tidal marshes of Kent County. They are finding that reflectance of naturally occurring vegetation is a key to determining the soil mapping units. They are also using infrared photographs to locate depressions and wet photholes in the eastern part of Kent County before actually making the detailed soil map. They also report that infrared photographs are particularly useful in planning transects through wooded areas in locating floodplains in large wooded tracts of the county.

In other related activities in Maryland and Delaware, the SCS has tried to use Landsat data for land use but found it unreliable. They have had good success using National Aeronautics and Space Agency (NASA) infrared photography flown from 65,000 feet and using a map scale of 1:32,000 in identifying both land use and wetlands. In the Upper Chester Watershed, for example, they used the soil survey (Johnston soils) to indicate general wetland potential, then used NASA photography to identify wetland boundary. They were able to type wetland with limited field checking.

New Jersey: The SCS is using black and white infrared photographs, rectified to fit the 1:24,000 USGS topographic sheets, in two progressive soil surveys. They have found these photographs to be very valuable in delineating wet spots, floodplains, and tidal marshes. Color infrared photographs are available at the Department of Environmental Protection - Environmental Analysis for use when needed. Recently the Department of Community Affairs, Division of State and Regional Planning has acquired Landsat data for the state for use in developing crop maps for sample areas. The acquired tape is July 18, 1976. The SCS may assist with one sample area in Monmouth and will record crop information for the 1978 crop season. Although these are summer tapes, some information may be obtained that will aid in mapping soils.

New York: The SCS soil survey party leader in Warren County has borrowed infrared photographs from the New York State Geological Survey for use in the soil survey of Warren County. Warren County is largely wooded and the infrared photography has been extremely useful in delineating somewhat poorly drained and wetter soils. Also, it has been very helpful in identifying and assessing the extent of rock outcrops in various mapping units. The wetter soils and rock outcrops have a distinct tonal pattern that contrasts sharply with the overall photo tone.

## Remote Sensing in Soil Surveys

Virginia: The SCS used infrared photography a few years ago when they mapped the Barrier Islands. This photography worked extremely well in a practically virgin vegetative community. The soil scientists were able to extent many soil lines based on plant community interpretations from the infrared photography.

West Virginia: The SCS has discussed the possibility of borrowing infrared photography from the West Virginia Geological Survey for use in the soil survey of southern West Virginia. It is anticipated that the soil survey in this part of the state will be composed primarily of broadly defined units - Order 3.

Several states outside the Northeast are successfully using computer-aided or other types of remotely sensed data in their soil survey programs. Indiana and Alaska are two states worth mentioning.

In Clinton County, Indiana, the SCS in cooperation with Purdue University and LARS used digital analysis of Landsat multispectral scanner data collected June 9, 1973 to prepare a spectral map of a 430 hectare area. The soil map delineations produced using these data were compared to a conventionally prepared soil map. Results indicate that soil drainage characteristics can be identified. Correlation of drainage characteristics with soil series allows for more accurate determination of the kinds and extent of inclusions in mapping units.

In 1976, the SCS in Alaska used Landsat imagery in a range and soil survey of a tundra area in northwestern Alaska. Results indicate the map produced is much more accurate than if it had been made entirely by conventional field procedures. This project is expected to be expanded to the entire Seward Peninsula in 1979. During the summer of 1978, the SCS in Alaska will attempt to use Landsat data in several forested areas of interior Alaska to refine the information in the exploratory survey.

On the national scene, the SCS is cooperating with LARS at Purdue University and NASA in a program to develop procedures to assist with soil survey mapping. LARS is studying the relationship between the physical and chemical properties of soils and their multispectral signatures. LARS has asked the SCS to provide them with surface samples of 225 benchmark soils from 42 states they have selected for the study. This study has considerable potential to help increase the speed and accuracy of our soil surveys and to help us determine the kinds and extent of inclusions in our mapping units.



## Remote Sensing in Soil Surveys

In summary, remotely sensed data in the form of black and white aerial photographs, have been used in soil surveys since the early 1900's. Currently, the majority of the Northeast states are successfully using remotely sensed data along with regular black and white aerial photographs in their soil survey programs. With greater emphasis on the use of Order 3 surveys, and greater demands for locating and delineating wetlands, it would appear that the future looks bright for the use of satellite imagery and other forms of remotely sensed data in the Northeast.

1978 NORTHEAST SOIL SURVEY CONFERENCE

Committee 11

Planning and Meeting Future Needs  
of the National Cooperative Soil  
Survey in the Northeast

COMMITTEE MEMBERS:

Frederick L. Gilbert - Chairman  
Fred P. Miller - Vice-Chairman  
Dennis Darling  
William J. Edmonds  
Kenneth J. LaFlamme  
Charles A. Reynolds  
Horace Smith  
Richard W. Arnold

Charges:

1. Review, evaluate, and comment on the recommendations made by Committee 1, (Modernizing Soil Surveys), 1977 National Technical Work Planning Conference.
2. Develop procedures for evaluating a published soil survey as to up-grading needs and make these part of the National Soils Handbook.
3. Consider upgrading needs along with original field work when setting annual priorities at state and national levels.

Recommendations:

The committee and the discussion groups attempted to focus on some specific areas of concern which relate to the charges given.

1. Map Unit Composition.

Map unit composition needs to be better expressed in soil surveys. Members of the discussion groups noted that much of the information about the units that were delineated in a soil survey area is not recorded but leaves the area with the soil scientists. Some quantitative system of evaluating map unit composition needs to be adopted. It is recommended that state and TSC reviews check evaluation of map unit composition as a routine part of soil survey field reviews. Knowledge of the composition of map units should be applied to interpretations so that at least a subjective ~~reference can be~~

2. Documentation of Soil Survey Quality.

Soil surveys exist in the region that fall into many classes of dependability when judged as to their adequacy for specific utilitarian purposes. The reasons for the variations of dependability are many. Some deficiencies are the result of an inadequate map unit design (inadequate when judged by a contemporary planning need), some are because the base map is of poor quality, some are because of poor mapping techniques, and some are because of a combination of these.

Members of the discussion groups recommend that a system be adopted to give an "in-house grade" to each existing soil survey as to its adequacy for contemporary uses. Future plans should include a budget for this activity. Judgments should be made about the acceptability of soil surveys based upon this objective evaluation.

Guidelines for developing an "in-house grade" for soil surveys should be developed before 11/79.

3. Base Maps.

The committee recommends that future soils surveys be published on base maps with planimetric base quality. This means that future soil surveys be published on ortho-photography or an equivalent alternative.

4. Multi-Resource Maps.

The committee recommends that we (the committee) investigate the possibility of developing and publishing multi-resource maps and that we report the results to the conference by June, 1979.

5. That regional committees be established by the steering committee for developing guidelines for evaluating (1) map unit composition and for (2) developing guidelines for assigning an "in-house grade" for soil surveys. This committee should consist of representatives of pertinent disciplines.

6. Recommend that this committee

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**Committee Number 12**  
General Soils Map of the Northeast

Charge

- a) Prepare a plan for the preparation and publication of a General Soils Map of the Northeast with an accompanying bulletin.

Committee Members

E. Ciolkosz (Chairman)  
J. Rourke

Recommendations

1. A map and bulletin of the Soils of the Northeast should be drafted and published.
2. A steering committee of five people should be selected to guide the drafting and publication
  - a) Two from the **SCS (TSC** - Head of Soils Staff and a State Soil Scientist)
  - b) Three from the Experiment Stations (one will be the chairman of the steering committee)
  - c) The selection of the steering committee will be made by this committee (Comm. 12)
  - d) The steering committee will be selected by August 15, 1978
3. The steering committee will form a committee of two people from each state (one **SCS** and one Experiment Station) for this project. This committee should be subdivided into the following subcommittees:
  - a) Map Subcommittee - will recommend map type, scale, base, etc., and also follow through with the preparation of the map. The chairman will be from the SCS.
  - b) Bulletin Subcommittee - will recommend format and content of the bulletin and also follow through with the preparation of the bulletin. The chairman will be from an Experiment Station.These subcommittees should consult the report "Soils of the Southern States and Puerto Rico" for guidance.
4. A publisher should be selected early in the project. The bulletin will probably be published by an Experiment Station and the map by the SCS.
5. The work committee should have a draft of the bulletin and map ready for review by the 1980 Northeast Soil Survey Conference.
6. Committee 12 should be disbanded on August 15, 1978.

Action Taken

All recommendations were approved by the conference.

REPORT OF THE CONNECTICUT AGRICULTURAL EXPERIMENT STATION

David E. Hill



silt and clay. Thus Charlton and related soils have moderate limitations for septic tanks rather than slight limitations. Our studies of longevity have shown that their long term performance is less than average. We have also identified our sandy soils as having severe limitations because of their below average filtration capacity. Earlier they were assigned a slight limitation but a footnote alerted the reader that they might permit pollution of the underlying water table. This change in rating emphasizes the need for special design of such systems or regulatory action to control density of systems on the landscape.

In order to make more useful predictions about the movement of nitrate and phosphate in soils we are monitoring the soil surrounding a septic tank leaching field and observing movement in a 3-dimensional pattern. In another experiment in Windsor, it became apparent that pollutants move in finger patterns in sandy soils overlain by finer textured topsoils. Fingering is mitigated by an instability developing at the interface of the textural discontinuity and requires 3-dimensional monitoring to insure that sampling intercepts the fingers that serve as pathways for pollutants. We are also studying phosphorus and nitrate movement in a 6 x 10' field cell in which the soil is aerobic from May to October and anaerobic from November through April. Based upon sorption characteristics of phosphorus determined in the laboratory we were able to predict its breakthrough at an 18-inch depth in the test cell with a high degree of accuracy. We have also confirmed that phosphorus sorption sites in the soil rejuvenate after a short resting period and allows long term sorption.

REPORT OF THE STORRS AGRICULTURAL EXPERIMENT STATION  
TO THE  
1978 NORTHEAST COOPERATIVE SOIL SURVEY CONFERENCE.

At least four funded research projects of the Storrs Agricultural Experiment Station have relevance to the Soil Survey Program in Connecticut.

A project entitled "Characterization of Connecticut Soils having Marginal Value for Agriculture" has been funded under the "batch" program as of June of this year. Mr. Cliff Bienko has been hired as a graduate research assistant as a part of this project. This project is just underway. Harvey Luce is the principal investigator for this project.

A project entitled "Soil Properties Affecting the Performance of Septic Systems in Selected Connecticut Soils" has been funded by the Connecticut Research Foundation. This research is presently underway under the direction of Harvey Luce.

A project entitled "Potential Groundwater Pollution from Sewage Sludge Application on Agricultural Land" is in its second year under the direction of Drs. R. W. Wengel and G. P. Griffin. This project is sponsored by the Connecticut Institute of Water Resources. This study is being carried out in the town of Enfield on an Agawam soil. A noteworthy preliminary finding is that the content of heavy metals in corn tissue generally did not increase with increased application of sewage sludge. This differs from the findings of certain other workers.

A fourth project funded by McIntyre Stennis monies is being carried out under the direction of Dr. Henry Haalck of the Department of Natural Resources. This project is entitled "Sedimentation from Logging Roads and Skid Trails in Eastern Connecticut."

We now have three graduate students in the area of soil genesis and classification. There appears to be considerable student interest in this area.

The undergraduate enrollment in soils has possibly reached a peak. However, this peak towers above our teaching resources. A total of 453 students took graduate and undergraduate courses in soils last year. The students were taught by the equivalent of 1.35 teaching positions in soils.

The University of Connecticut soils judging team placed 4th in the Northeastern Regional Contest in Maine last October. This was the first time the University of Connecticut participated in this event.

REPORT TO THE NORTHEAST SOIL SURVEY  
WORK PLANNING CONFERENCE - 1978

R.V. Rourke  
Department of Plant and Soil Sciences  
University of Maine  
Orono, Maine 04473

Research activities by those interested in the soil area continue at the University of Maine and include investigations leading toward interpretations of this resource for agricultural, urban and forest uses.

Projects of interest to agriculturists are: potato waste application at varying rates upon the soil surface; nitrate levels of the soil solution at 2 depths beneath potatoes fertilized at 3 levels of N; pesticide levels in the soil solution surrounding a pesticide container landfill; and phosphorus fixation and availability in selected agricultural soils in the state.

Research concerning urban uses of soils has centered in the area of arraying soil potentials in a manner that a community may find its major problems limiting good development or growth. The identification of the limiting soil factor to use allows the community to assign its own schedule of desires in overcoming the limitation.

Soils in forested areas are being studied to determine the effects of fertilizer upon tree growth and also the destiny of fertilizer materials applied to the soil. A study has recently been completed in which the properties of mountain soils have been compiled.

Soil characterization studies have continued to be based upon soil series. This is the result of a cooperative effort between the Maine Agricultural Experiment Station and the S.C.S. in which the soil moisture, texture, stone volume, cation level, and organic carbon content are measured in each of 5 pedons in the state.

A general soils map of the state has recently been completed.

Experiment Station Report - Maryland  
D. S. Fanning, J. E. Foss, and F. P. Miller  
Department of Agronomy  
University of Maryland

The following **projects** have been completed **since** the last Northeast **Cooperative Soil** Survey Conference.

1. Study of soils developed on serpentinite: M. Rabenhorst, M.S. thesis.

A study was made on 4 profiles developed on serpentinite and 3 profiles on associated mafic rocks. The morphological, chemical, and mineralogical characteristics of these soils were studied. Some of the soils mapped as derived from serpentinite were actually formed from other basic rocks.

2. Soils developed on Cretaceous red clays: D. Wagner, M.S. thesis.

The purpose of this study was to characterize the Cretaceous clay soils, study the landscape relationships, and the variability of the associated undifferentiated soil mapping units. Cat clays were also studied.

3. Inventory of soil mapping units in Maryland and land use changes in Southern Maryland: J. Phillips, M.S. thesis.

A complete listing of soil mapping units with acreages of soil series, capability subclasses, slope, tax groups, and parent material has been prepared with a EOBOL computer program. The second part of the study showed that, in urbanizing areas in southern Maryland, approximately 70% of the land developed was in capability classes I and II.

4. Development of method for determination of heavy metals (Cu, Zn, Ni) in sewage sludge-soil plant systems by X-ray spectroscopy V. Z. Keramidas, M.S. thesis.

Tube contribution background was reported as a problem in elemental analysis by X-ray spectroscopy and a method for overcoming it was developed.

5. The effect of kind of soil (chemistry, mineralogy) and soil pH upon heavy metal reversion: R. F. Korcak, Ph.D. thesis.

This was studied by growing corn on A and B horizons of various Maryland soils to which heavy metals were added in the greenhouse. B horizons were better at reverting the metals to unavailable forms than A horizons and more reactive soils (e.g. Myersville, Manor) were better "reverters" than more inert soils (Evesboro). No good correlation for ability to revert metals to any single soil property was found.

6. Techniques of mapping and variability of urban rolls in river dredgings and in miscellaneous fill have been studied in Washington, D.C.: C. E. Stein, M.S. thesis (near completion).

Studies u n d e r w a y :

1. Soils of Old landscapes in the Piedmont-Schist Derived (Elloak Series and related rolls).
2. Composting Project in Rock Creek Park. (With National Park Service Cooperative).
3. Study of Colts Neck Soils - Eastern Shore of Maryland. Paleosols developed in glauconite (variable % of glauconite). Cooperative with SCS.
4. Archeological Studies
  - a. El Mirador - Guatemala - Vertisols
  - b. Volcanic Soils - Pompeii
5. Evaluation of composted sludge as an amendment to sand and gravel spoils common to the Baltimore-Washington area. Also characterization of these spoils with respect to their physical and chemical properties.
6. Continuing studies of soil properties affecting heavy metal reversion looking particularly

Report by Dr. Nobel K. Peterson, Representative of the New  
Hampshire Agricultural Experiment Station, at the  
Northeast Soil Survey Work Planning Conference  
Storrs,

New Jersey **Agricultural** Experiment Station - Activities

Lowell A. Douglas

The **Northeast Soil Survey Conference** is most likely interested in two types of investigations now in progress at the New Jersey Agricultural Experiment Station. A considerable amount of effort is being **expended** in New Jersey on the **utilization** of various wastes in soils. A second effort relates to soil characterization and soil properties. These will be discussed separately.

A considerable effort is being extended within several groups of **the Experiment Station** to follow the fate **of various wastes in** soils. ~~These~~ studies include many projects and many departments. For example, a study of the sewage sludge **from** Camden, New Jersey, encompasses studies **that** include all steps in the sludge management process from the **sewage-**treatment plant through **composting**, to transportation to the fields, to utilization by agriculture or dumping in sanitary landfills. Both environmental and economic constraints are being evaluated. Included in this study is an evaluation of the suitability of all the soil series **mapped in New Jersey** for accepting sewage sludge.

An extensive study is under way to define the ideal lot **size** compatible with acceptable groundwater qualities, where housing is built utilizing septic systems for disposal of the household wastes. This study includes monitoring of **individual** septic systems on approximately twenty-five sites in the outer **coastal** plain of New Jersey.

Soil **characterization** work in New Jersey has long *been dedicated to* the **definition of** processes important in the formation of soils. At the

present time, eight graduate students are working on thesis in these studies. As part of the backup work to this type of investigation, a soil micromorphology laboratory has been outfitted at Rutgers. Students at both the pre- and post-doctoral level are now engaged in soil micromorphology studies.

REPORT OF THE CORNELL UNIVERSITY AGRICULTURAL EXPERIMENT STATION

Richard W. Arnold

The most significant part of our program in the past two years has been our expansion. We have a modest start with a Soil Characterization Laboratory under the supervision of Keith Wheeler. During the past year, we have held both laboratory and field sampling training sessions and hope to continue this effort next year. We now have an assistant project leader at the Cornell University Agricultural Experiment Station. He is Ken Olson who came from Ohio. I hope most of you have an opportunity to meet him during the conference.

I would like to mention some of our research projects to highlight our progress for the last several years.

- (1) Soil productivity interpretations. In an effort to determine soil productivity we have selected a dairy farm operation which combines corn silage and hay yield estimates for calculating total digestible nutrients. Soil productivity is defined or calculated by taking the percent of the crop in an acceptable rotation times the crop yield, times the TDN factor obtained from Morrison's FEEDS AND FEEDING. This provides TDN's per acre per year. Assume a certain map unit in a CCHHH rotation as determined by the universal soil loss equations. TDN factors are 20% per silage and 50% per hay. The percent of corn, in this case 33%, times the estimated yield times 20%, plus 50% for hay times the hay yield times 50% TDN provides us the estimated TDN per acre per year for that particular map unit. An index of all map units in a survey is then developed by dividing all the TDN values by the highest one calculated in that soil survey. The TDNs may be calculated for tax parcels, or farms, just the same as you would for a resource conservation plan, and the soil index for the tax parcel or farm recorded. At the present time we are attempting to relate the TDN indices of productivity to farm values assessments.
- (2) During the past year a new soil association map has been developed for New York State by Marlin Cline and Ray Marshall. It was originally developed as a working map at a scale of 1:500,000 and is published at a scale of 1:750,000. This soil association map has also been used to produce maps of prime farm land, unique lands and lands of statewide importance for the State of New York.
- (3) We are still plagued by inadequate data to pin down our frigid soil zones in the State of New York. Several years ago, we predicted areas that would require additional testing, and even though we have about two years data it appears that in some marginal areas we will need other types of information such as frost-free days, solar radiation, heat units or some other measure in addition to just soil temperature. Our goal is twofold: one, to test the taxonomic limits, and second, and perhaps more important, to improve the interpretations that we make for soils in different regions of the State.

- (4) We have a working model for soil development along our major stream for the past nine or ten thousand years based on a study in Chenango county. The river channel, once it became stabilized at a given elevation, tended to move laterally across the valley in spurts or something that approximates cycles. The lateral accretion deposits are capped by overflow deposits. This vertical accretion is also cyclic in nature and may eventually be related to sun spot activity cycles. The second bottom, or first ten-ace for some people, has numerous buried A and B horizons marking former periods of stability, and such soils are fluventic or cumulic subgroups of Inceptisols. The first bottom, or actual flood plain varies but the soils generally have high amounts of organic matter in the profile and they also qualify as fluventic subgroups. We believe that the landscape position is very important in understanding the development and mapping of flood plains in New York State.
- (5) Our Soil Resource Inventory group, which is funded by a U.S.A.I.D. grant, has developed guidelines for evaluating soil maps. One step is to determine the average size of map delineations. This is then related to map intensity, scales of reduction, size of planning areas, and so forth. These guidelines include concepts of base map accuracy, map unit composition, ground truthing, and so forth. We are attempting to develop guidelines that will permit an evaluation of the adequacy of a given soil survey for a particular planning purpose.
- (6) We have also been concerned about quality control during soil mapping. We are currently using a model that says that as we increase the number

Report of the Pennsylvania State  
University Experiment Station **Representative**

Edward J. **Ciolkosz**

- A. Dr. Roy **Matelski** retired Sept. 1976. Roy is living in State College and drops into the Department to visit occasionally.
- B. Dr. Jerry Nielsen from **Montana** State University is spending a 1 year **sabatical** leave at the Agronomy Dept. During this year Jerry will be working on soil potentials particularly with respect to disturbed lands.
- C. The progress report "Soils of Pennsylvania" has finally been published. It is available for distribution on request.
- D. Soil Genesis and Classification Research
  - a. A study of soil temperature regimes has been underway in Pennsylvania and West Virginia. Soil temperatures are being measured at 50 cm depths at 4 sites, 60 miles apart from Northern Pennsylvania to Northern West Virginia. At each site 4 elevations are being studied and measurements are being made 4 times during the year with the exception of one site at which monthly measurements are being taken. The first two years data indicates that the **Mesic-Frigid** soil temperature boundary is at an elevation of about 1750' in Northern Pennsylvania and at about 2800' in Southern Pennsylvania. This study will be continued for one more year. This will give a total of 3 years data to base a prediction equation of soil temperature vs latitude and altitude.
  - b. Spodosols are being studied in Pennsylvania. They are being studied to determine if they meet the present Soil Taxonomy criteria and if there is a relationship between spodosols and soil temperature regimes.
  - c. A study is being started to investigate the genesis of fragipans with depth and with time. This study will investigate fragipans developed in **Wisconsinan** and Pre-Wisconsinan glacial till. The sampling will be to a depth of 10-14 feet.
  - d. A toposequence of soils developed in loess in SE Pennsylvania was studied. This study produced a mathematical method to separate loess parent material from other kinds of parent materials. It also provided more evidence for a filling and packing mechanism for fragipan formation.
- E. Environmental Soil Science Research
  - a. A floodplain soil was irrigated with acid mine water at two rates (5 and **10"/week**) for 5 months. This study indicates that if the soil is kept limed it can renovate acid water without any adverse effect on the groundwater or vegetation.

b. Characterization of mine soils indicates that many mine soils have moderate salt

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REPORT OF THE RHODE ISLAND AGRICULTURAL

EXPERIMENT STATION REPRESENTATIVE

William R. Wright

This report summarizes the progress on various research activities in support of the National Cooperative Soil Survey Program from 1976 to 1978.

1. Soil Characterization Studies

Morphological, chemical, and physical analyses were completed on 13 soil profiles.

2. Engineering Properties

Twenty-six soil samples were analyzed and

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6. Soils of Rhode Island

A publication on the Soils of Rhode Island is currently being written to go along with a new general soils map of the state.

7. Sanitary Landfills

A new project dealing with the construction of mini-landfills on different soils to monitor potential

Virginia Polytechnic Institute and State University  
Report on Soil Survey Related Activities

presented to The Northeast Cooperative Soil Survey Conference  
Storrs, Connecticut: July 18-22, 1978

1. Virginia Tech currently has seven progressive soil surveys underway. Eight additional **VPI** Soil Scientist Trainees are located with SCS progressive surveys. The Virginia General Assembly is currently allocating about \$450,000 per year for the soil survey.

2. Laboratory facilities at Blacksburg are utilized for routine soil characterization for all **VPI and SCS** Soil surveys. Last **year** the following analyses were made:

Chemical analysis	477 <b>samples</b> for CEC
Physical analysis	612 samples for PSA
Mineralogy analysis	130 samples for sand plus silt mineralogy,
	54 samples for clay mineralogy

3. Research activities are underway in the following areas:

(a) Water table depth and duration study, (**VPI** and **SCS**)

The State Health Department needs this information. Most data is being collected in progressive soil survey operations.

(b) Hapludult - Paleudult study (**SCS** and **VPI**)

Hapludults with **palic** clay curves and Paleudults (?) that formed in thick clayey sediments.

(c) **Cullen - Georgeville** series concepts (**VPI** and **SCS**)

This is one of a number of series concept studies underway for which Virginia has responsibility.

(d) Piedmont Saprolite Characterization Study (**VPI** and **SCS**)

(e) Aluminum in **Soils** study

Its role in base saturation determinations.

**(f) Soil Mineralogy Investigations (VPI)**

- (1) Mixed mineralogy should be separated into
  - mixed - active
  - mixed - inactive

(2) Clay mineralogy of fine-loamy soils as series criteria

(3) Whole soil mineralogy

**(g) Soil variability studies (VPI)**

(1) Nested statistical sampling design vs. grid **vs.** random linear transects.

(2) Predictability of mapping unit properties.

**(h) Updating of old surveys (VPI and SCS)**

(1) How far can an old survey (1940 vintage) be updated

(2) Updating of old series concepts

(3) Updating of base maps

(4) Addition of mapping unit interpretations

The intent of this study is what can be done, and how to do it, so that old surveys can be made more useful for today's needs.

**(i) Soil formation on strip mine spoil study (VPI)**

**(j) Drainfield effluent movement study (VPI)**

**(k) Soil mineralogy changes in septic tank drainfield soils (VPI)**

**(l) Soil - geomorphology study (VPI and SCS)**

Most of these projects are designed to gather data that will relate directly to soil survey activities and to provide useful information to the users of soil surveys.

PRESENT STATUS AND THE FUTURE OF THE  
SOIL SURVEY PROGRAM IN THE NORTHEAST

John D. Rourke  
Head, Soils Staff  
NETSC

First, let us examine the present status of the soil survey program in the Northeast.

Of the approximately 155-1/2 million acres (including both private and publically owned lands) in the Northeast, field mapping has been completed on 96-3/4 million acres. This means that field mapping has been completed on 65 percent of total land area in the Northeast. Field mapping has been completed in the Caribbean Area, Delaware, Maryland, and Rhode Island. It is nearing completion in Connecticut, New Jersey, and Pennsylvania-(some 90 to 95 percent). As of this date, the remaining six states do not have scheduled dates for the completion of field mapping.

There are 370 soil survey areas in the Northeast; 145 of these have published soil surveys that are considered to be adequate for present-day resource conservation planning. Field mapping has been completed in 52 survey areas but as of this date the surveys have not been completed. Included among these 52 areas are (1) 45 with approved final correlations, (2) 38 with soil survey text manuscripts completed by the state, and (3) 22 with atlas sheets completed by the state. Field mapping, with scheduled completion dates, is presently underway in 82 soil survey areas. In the remaining 91 areas, completion of field mapping on a progressive basis is not presently scheduled.

Now, let us examine the work remaining to complete the field mapping and publication of all soil survey areas in the Northeast.

1. Complete the field mapping of approximately 58-3/4 million acres (both private and public lands).
2. Of the 96-3/4 million acres presently reported as being mapped, I feel that some 9 million acres are suspect. This is not to say that they are not adequate for present-day resource conservation planning, but they should be re-examined before field mapping is reported as being completed and the soil survey published.
3. Complete all of the necessary work on the correlations! text manuscripts, and atlas sheets of the 52 survey areas with field mapping completed.
4. Prepare field correlations, final correlations, text manuscripts and atlas sheets for the remaining 173 soil survey areas in the Northeast. (I mention again that 91 of these do not presently have scheduled completion dates for the completion of field mapping.)

5. Revise, as necessary, the descriptions of the soil series that will be recommended for correlation.
6. Implement the new Rating Guide for the interpretation of soils for selected uses. Mr. Rice is preparing our proposal for this implementation and it will be sent to you in the near future.

Lastly, I will address the development of long-range plans to complete the field mapping in your respective states and the determination of your staffing needs after field mapping has been completed and the soil surveys published.

The Administrator has charged the Assistant Administrator for Soil Survey to develop a long-range plan to complete the field mapping of the United States. To be meaningful and workable, a national plan should be developed from plans of the individual states.

I mentioned previously that six of our states presently do not have scheduled completion dates for the completion of field mapping. I maintain they should have! A good manager should always have a plan for getting the job done, even though there may be a lot of unknowns, as far as the resources that will be available to him in order to get the job done are concerned. Also, the "02-dollar" is in short supply. I feel that, in the future, the allocation of 02 funds will be based on long-range plans to complete the job.

I have been asked by several of you as to how one can develop a long-range plan when there are so many unknowns as far as resources, both funds and personnel, are concerned. My answer has been that you should have at least three alternative plans. One would be on the conservative end -- how long would it take me to complete field mapping with the resources, both money and people, presently available to me? The second would be at the other end of the spectrum -- what resources would I need **to** complete field mapping within the time frame designated by Mr. Davis? The third one would be between the first two - based on **assumptions** of possible resources that could be made available to me from local sources (town, township, county, or state), when could I get the job done?

Staffing needs after field mapping has been completed and the soil surveys published cannot be determined until you have the answers to three questions. First, what kinds of soil information will be needed? Second, where (in terms of locations within your state) will it be needed. Third, what is the total adequacy of the soils data base that will be available.

After you have the answers to these questions, a work load analysis and a projection on a fiscal year basis will determine the staffing needs for soil scientists. With this information, your state conservationist will have a basis for determining the use of the resources available to him.

Responding to these charges, development of long-range plans to complete the field mapping in your respective states and the determination of staffing needs, will not be easy. Your state is a part of the Northeast, and the Northeast is a part of the United States. With the charge given to us by the Administrator of the Soil Conservation Service, they must and will be answered.



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## ROLE OF NSSL IN THE NATIONAL COOPERATIVE SOIL SURVEY PROGRAM

R. D. Yeck, USDA, SCS, Lincoln, NE

The National Soil Survey Laboratory (NSSL) of the Soil Conservation Service (SCS) is located in Lincoln, Nebraska. The facility was completed in 1975. The national laboratory consolidates the functions of preexisting laboratories that were located in Beltsville, Maryland; Lincoln, Nebraska; and Riverside, California. The function of the laboratory is to provide federal support to the National Cooperative Soil Survey Program. The laboratories were consolidated to increase efficiency through greater staffing specialization and equipment modernization. Modernization would have been fiscally prohibitive for three separate laboratories. I want to spend some time discussing NSSL's organization and operations before talking about its role.

At NSSL, resource staff and analytical staff functions combine to maximize laboratory efficiency. One resource soil scientist serves as a liaison to each of the four SCS Technical Service Centers (TSC's). I serve as liaison to the NETSC. Each liaison assists a TSC in program planning, maintains a purview of pertinent research by other agencies, and is SCS contact person for the states covered by his TSC. Research soil scientists with advanced training in pedology, soil chemistry, soil physics, soil mineralogy, data handling, and geology conduct research and investigate specific soil survey problems as they arise. The analytical staff is dedicated to efficient sample analysis and is divided into sample processing, particle size, chemical, physical, and mineralogical sections. The entire analytical staff is smaller than the combined staffs of the preexisting labs, but it provides more data by using a number of labor-saving devices. In fact, the new lab produces about twice the analyses per man-year that the three previous labs averaged. The total number of soil scientists has decreased, but the time available to them for problem-solving has actually increased. The analytical staff uses considerable part-time assistance from university students.

Several labor-saving innovations have contributed to analytical efficiency. An automatic extractor permits overnight extraction and cut operator time in half. It uses mechanically operated syringes (SSSAJ 41:1207) to control leaching rate. The automatic extractor provides more consistent results than manual extractions because leaching rates are the same regardless of texture. The extractor is used primarily for CEC and extractable iron, but it has been adapted to obtain saturation extracts. Automatic titrators

with automatic sample changers further streamline CEC, extractable acidity, organic carbon, and other analyses requiring titration. A microprocessor has been added to one titrator to properly sequence the stirring needed for pH determinations. Automatic sample changers increase the efficiency of atomic absorption and x-ray analysis. An ion-exchange chromatograph allows more rapid analysis for anions. In bulk density determinations, a technique of clod submersion by raising the water container under the clod has reduced operator time. In the past, the clods were moved after weight determination to obtain clod volume. Other techniques for clod volume measurement are being investigated.

Although some samples require hand preparation, an automatic sieving machine has been fabricated that speeds preparation of many samples. Electronic balances throughout the lab have decreased weighing time and are particularly advantageous in particle size analyses that require at least 12 weighings per sample. In the particle size section, the balance is interfaced with a programmable calculator that can be used to calculate and format particle size data for immediate use.

Most of the analytical instruments at NSSL have attached data capture units. Cassette tapes, on which data are recorded, are transferred to a compatible terminal unit. This unit transmits the data to the University of Nebraska Computer Center, where results are calculated and stored and where data are formatted for distribution. Data from large projects are available within 12 months and from smaller ones within 3 months.

Sampling equipment containers are lighter weight than in the past. This reduces costs of shipping equipment and samples. Since most of our field studies now require flying of people and equipment, a new set of gear has been adapted for air travel. Equipment is sent to the field in aluminum trunks. Bulk samples are shipped to the lab in canvas bags as before, but clod samples are shipped in partitioned boxes that are packed in aluminum cases. Mark-sense pedon description forms are being widely field tested this year. We intend to produce narrative pedon descriptions through software interpretation of the marks, thus eliminating the time-consuming typing translation from field descriptions to narrative descriptions. Mark-sense description information will be entered into the Pedon Data Subsystem along with laboratory data. The Pedon Data Subsystem is now located at the National Soil Survey Laboratory. Data in the Pedon Data Subsystem will be available to cooperators. We encourage universities to include their data in the system. The more complete the data

are from any one part of the country, the more useful they will be.

I've discussed the lab organization, operations, and equipment. With that background, we can discuss the role of the NSSL in the National Cooperative Soil Survey Program.

In some states, NSSL is a primary source of laboratory support for the soil survey program. In others it is an additional source. There are several university soil survey laboratories in the Northeast. NSSL works with the state laboratories by sharing analytical loads on joint projects and by providing **interlab** checks to insure data uniformity.

Regardless of the specific role participation of university labs or the distribution of the analytical workload, we need to remain well coordinated to know what each other is doing and share ideas on the major soils questions. We need to keep good interstate and interlaboratory communications. We work very closely with the university soil survey representative and the soil staff at the Northeast TSC, John Rourke's group at Broomall, Pennsylvania, which is the hub of the Northeast program coordination. Their staff investigations specialist, Thomas Calhoun, coordinates with our laboratory and is particularly concerned with the relationship of soils to landscapes.

The vitality of the Northeast soil survey investigations program is a consequence of strong coordinated efforts among National Cooperative Soil Survey cooperators, and we are pleased to have been included during planning stages of state and regional programs despite our Midwest location. Many of us worried that distance would diminish the SCS soil survey lab role when the Beltsville soil lab was discontinued. Distance prevents holding many of the seminars, lectures, and other niceties that we enjoyed trading with Northeast people. But on the plus side, general coordination and the quality, quantity, and timeliness of support on investigations projects have improved markedly.

An example of our participation includes the NE-96 technical committee study on soil waste products. Experiment station scientists in the Northeast are conducting research as part of this project and NSSL is characterizing each soil. Results will be related to standard chemical, mineralogical, and physical soil properties that will extend the usefulness of the research.

Some long-standing soil taxonomy questions are getting much of our attention. Both SCS and universities, for example, are

[REDACTED] part in the latest phases of Spodosol studies in the  
[REDACTED] st. Since some parallel work is being conducted in  
[REDACTED] parts of the United States, the Spodosol questions may  
[REDACTED] considered on a national level. A Northeast regional  
[REDACTED] study is also getting off the ground this summer.  
[REDACTED] of the states in the Northeast are participating yet,  
[REDACTED] but we expect them all to be eventually.

Along with the advantages of laboratory consolidation come  
some disadvantages. One is the loss of the ~~checks-and-~~  
balances system that existed when there were three SCS  
laboratories. The friendly competition among labs kept us  
all on our toes. With consolidation, that checks and balances  
function must continue to operate, but now we must look to  
laboratories at universities to help through **interlab** checks,  
[REDACTED] of procedures, and the [REDACTED]

[REDACTED] Director of Soil Survey [REDACTED] in Washington,  
[REDACTED] Daniels, helps us focus [REDACTED] problems. For  
[REDACTED] our laboratory is cooperating [REDACTED] A, EPA, and the  
[REDACTED] Science and Education Administration [REDACTED] Federal Research  
[REDACTED] to determine basic levels [REDACTED] cadmium, lead,  
[REDACTED] and other minor elements [REDACTED] and soils  
[REDACTED] de. The SEA-FR Plant [REDACTED] Laboratory at Ithaca,  
[REDACTED] ark, and the SCS soil [REDACTED] there, Joe  
[REDACTED] will also be major contributors.

[REDACTED] can contribute to the [REDACTED] of ideas and  
[REDACTED] s from one part of the [REDACTED] region to another.  
[REDACTED] st in relating soils qu [REDACTED] s the country,  
[REDACTED] ses its soil sample bank [REDACTED] sents soils from  
[REDACTED] he United States and a [REDACTED] gn samples. The  
[REDACTED] are useful in testing [REDACTED] a proposal made  
[REDACTED] part of the country on [REDACTED] efore we make a  
[REDACTED] hange in, for example [REDACTED] al criteria for  
[REDACTED] s based on what we le [REDACTED] rtheast, we will  
[REDACTED] 94 6 T 3 T [REDACTED] 55

C B A . . . . A B C  
CLEAN BRUSH APPROACH ACHIEVES BETTER CONCEPTS  
R. W. Arnold <sup>1/</sup>

Soil surveyors learn many of **the** cliches about mapping soils and become familiar with a "windshield survey", a "cloudy day traverse", a "640 day", and "landscapes painted with a broad brush". "Lumpers" are often thought to use wide brushes to show boundaries, whereas the "splitters" are thought to use the finest of camel hair tip brushes to separate the numerous segments on their maps.

But aside from these ideas about delineating a few or many parts of the landscape is another facet of mapping that has created problems over the years. This is the continuation of mapping units having the same reference name but the concept of the reference has changed with time. In many earlier surveys the field party was reasonably sure of the concepts it used to recognize and delineate soil units in their survey. A lot of these concepts it used to recognize and delineate soil units in their survey. A lot of these concepts, however, were never recorded, or were not adequately described to enable others to readily use the ideas. Often the concepts were passed on by word of mouth and were subject to the well known distortions associated with story telling.

The earlier mappers used their own paints and brushes to achieve the purpose of the surveys at that **time**. **As** the years passed the paint hardened and various thinners were added, sometimes old and new paints were blended to try to get the job done. All too often the results were streaked and uneven from one survey party to another or from field sheet to field sheet.

The time has come for us to stand back, admire the craftsmanship of previous landscape surveys, and re-assess the objectives of modern

<sup>1/</sup> Professor of Soil Science, Cornell University

soil surveys and how we can best meet the challenging requirements of a new era. The old imprecise concepts must be cleaned from our brushes and we'll open fresh buckets and dip into up-to-date concepts needed to meet the increased desires and standards of today's soil surveys.

Rather than relying on memories and opinions of what was included in delineations of mapping units, we want to be able to guarantee our products based on valid measures of accuracy and precision. Statistical sampling and interpretations based on such sampling will help us to achieve the new look in designing, defining, and describing map units. The data will assist us in discussing the precision of our mapping, the accuracy of our mapping, and the nature of the variability that is, and must be, included in our mapping. A user's judgment about the reliability of our landscape painting will in great measure depend on our ability to present the concepts that permit him to make wise decisions.

### Soil Transects

We commonly use transects as lines along which we make soil observations in order to estimate the amounts of soils observed in delineated areas. The transects usually are randomly selected straight lines that tend to cross drainage ways or other landscape features such as ridgetops and valley slopes at approximately right angles. This helps assure that more of the points or small areas that give rise to variability have an opportunity to be observed.

Once the transects have been selected observations at fixed intervals are made. The intervals should be less than those associated with cyclic or recurrent soil patterns, if such distances are known or expected. When boundaries between adjacent soils are plotted, the result is called a line-transect instead of a point-transect.

Pilot areas may also be selected as samples of delineations and the same statistical treatment of the information may be made. We will be concerned here mainly with point-transects.

For most of us, transects are commonly used in three ways:

1. To estimate the composition of map unit delineations in order 2 soil surveys. This is our biggest task--- to find out what we have been including in our mapping.
2. To estimate the composition and name areas delineated by remote sensing (usually *airphoto* interpretation) in order 3 surveys. This would also apply to the so-called low intensity units in mixed surveys.
3. To estimate the extent, kind, and nature of potential mapping units in areas where little is known, or as confirmation for a progressive survey. *This use* has received very little attention in a quantitative way, although it is likely one of the most widely used qualitative procedures in establishing and checking map legends.

#### Estimating Map Unit Composition

It is assumed that soil scientists are able to recognize differences among soil properties and thereby indicate whether an observation belongs to one class of soil or another. When making transects it is usual to record the class or *taxon* of each observation but in the analysis it is necessary only to know if it is soil A or not soil A. After evaluating the average amount of *soil* A and how variable or dispersed are the estimates of the amount of soil A, then the same is done for soil B, soil C, and so forth.

Often there is a mixture of length of transects, some short, some long, and usually a lot of moderate length. Some way to weight these distances seems desirable--that is, the estimate of the amount of soil on a long transect should be more important than the estimate from a very short one because we are interested in land area more than number of delineations.

A cluster of analysis for weighting the transects was selected because it readily handles different soils, varying lengths of transects, varying number of transects, and is concerned with the decision of soils A or not soil A.

By obtaining estimates of the variability of the amount of a soil it is possible for us to say that with 90% assurance in map unit X, soil A makes up 60-80% of the area. You may prefer to say that at the 90% probability level, soil A is  $70\% \pm 10\%$  of map unit X. The use of probability is simply a way of letting people know that if we continued to sample the area again and again, we believe we would obtain an interval that includes the true percentage of soil A. Our answers are subject to error, of course, but we want to provide the best information we can that is consistent with the purpose of the survey and the effort that can be given.

#### Procedure

Intervals along transects vary with complexity of soil patterns, distances to be covered, amount of detail desired, and effort available for estimating composition. For checking order 2 delineations it is common to observe soil about every SO-55 steps (approximately 50 meters).

For each transect there are two numbers needed for the evaluation:  
 $m_i$  = total number of observations made in the transect (borings or

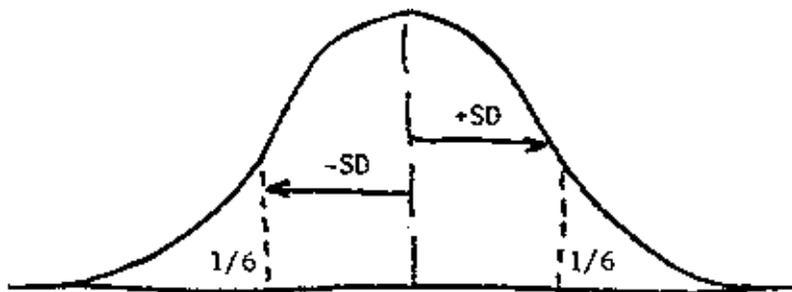
small holes usually).

$a_i$  = number of observations in the transect that belong to soil A (usually a series).

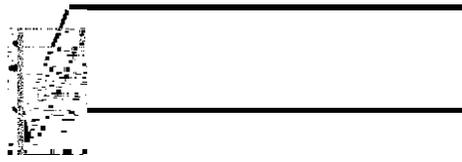
The proportion of soil A in transect  $i$  is:

$P_i = a_i / m_i$ , which is  $\frac{\text{number of observations of soil A}}{\text{number of total observations}}$

**The**  $a_i$ ,  $m_i$ , and  $p_i$  are recorded for each transect. As more



The equation is:  $SD = S =$



The standard error, SE, and the standard deviation, SD, are used to estimate the confidence intervals within which we believe the true proportion occur, and also to estimate the number of transects needed to obtain a specific level of accuracy.

### Confidence Interval

The confidence interval is determined as follows:

$$CI = p \pm t SE$$

where the proportion  $p$  and standard error SE are based on the sample transects.

The  $t$  value used depends on two things: the number of transects used, and the level of probability you wish to select. Sometimes the  $t$  value is shown as:  $t_{.95,6}$  which means that the  $t$  value shown is for the 95% probability level and 6 degrees of freedom. The degree of freedom is one less than the number of transects because one parameter,  $p$ , of the distribution has been used to calculate the error term. Thus, if seven transects were used, the degree of freedom would be 6. A limited distribution of  $t$  values is given in table 1.

Table 1. Limited distribution of "t"

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For example, if for 9 transects,  $p$  is found to be .6568  
 SE is .0647 and we select a 90% probability then  $t_{.90,8} = 1.860$ .  
 The confidence interval will be:

$$CI = p \pm t SE = .6568 + (1.86)(.0647) = .6568 \pm .1203$$

This may also be expressed by saying that there is 90% assurance that soil A comprises 53.6 to 77.7% of map unit X. You may select different levels of probability that appear to be consistent with the objectives for a specific map unit or type of survey.

### Estimating the Number of Transects Needed

When one has some prior knowledge of the variability of map unit composition it is possible to estimate the approximate number of transects needed to achieve a desired level of accuracy.

The equation is:

$$n = t^2 SD^2 / L^2$$

where  $t$  is the  $t$  value for infinite degrees of freedom but varies according to probability levels;  $SD$  is the standard deviation; and  $L$  is the allowable error, or difference between the estimated proportion and the true population proportion.

It is common to want to estimate a proportion that will be within 10% of the real value. One must use the same units for  $SD$  and  $L$ , such as the proportion or percent. Sometimes 5% or 20% are selected for  $L$ . There are two ways to think of an allowable error that is within 10% of the true value. The difference can be thought of as  $|p_i - p|$  which is the difference between two proportions, and if they were .6568 and .7568, respectively, the difference would be .1000 which is 10%. The other way is to think of  $|p_i - p| = 10\%p$



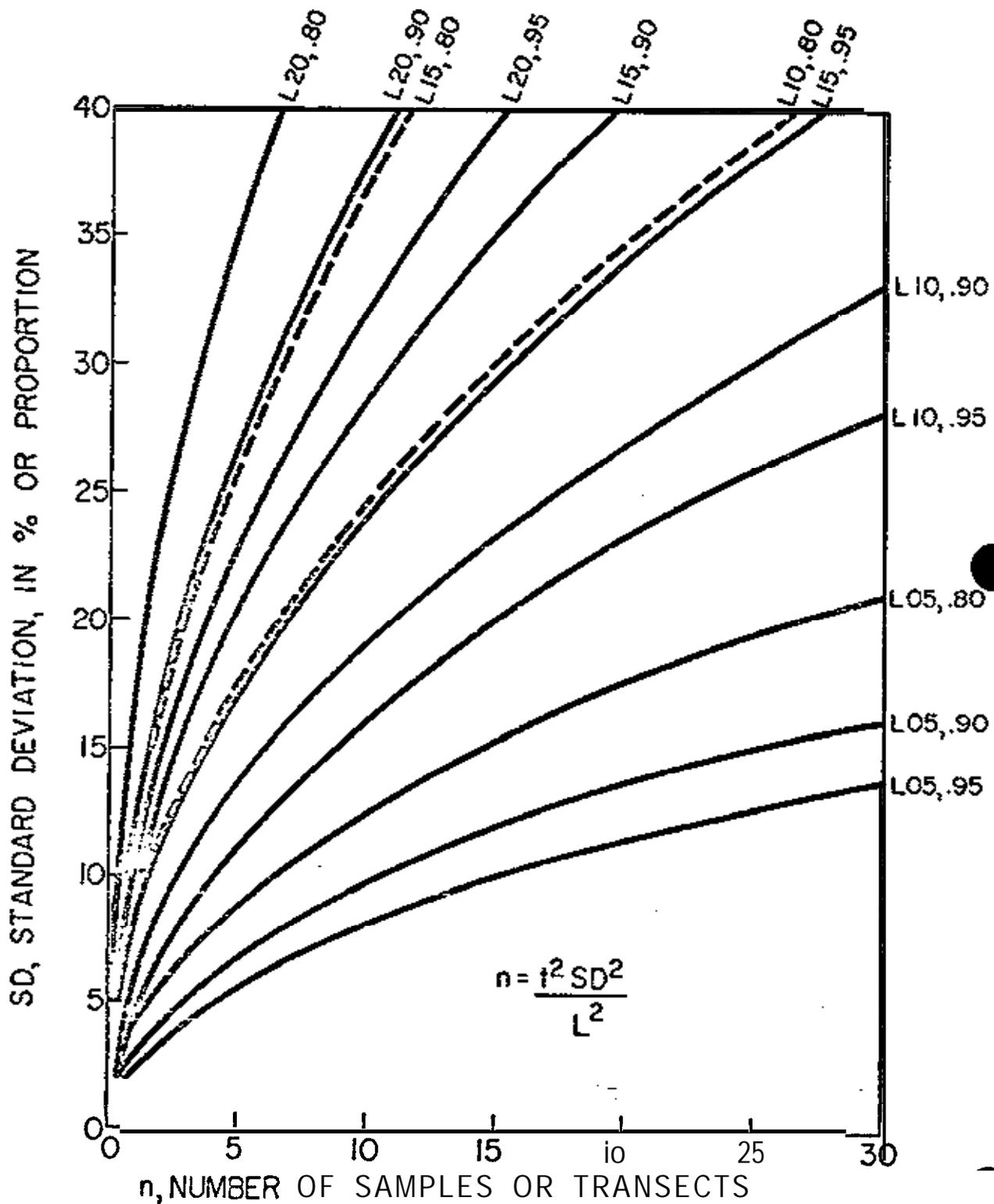
## Calculation Sheet - Map Unit Composition

The form in figure 3 is an example of a scheme to record calculations for map unit composition. All the terms have been explained previously. The working equations are provided at the bottom and values may be written in below each equation.

It is necessary to use a separate sheet for each component of each mapping unit. For example, in map unit X you may be evaluating the proportions and confidence intervals of soils A, B, and C. In this case, there would be three calculation sheets for map unit X. As you become more familiar with the calculations you may want to revise and simplify your record keeping system.

FIGURE 1

ESTIMATING NUMBER OF TRANSECTS





Named map unit \_\_\_\_\_

Component evaluated \_\_\_\_\_

TR.	$a_i$	$m_i$	$p_i$	$a_i^2$	$a_i m_i$	$m_i^2$	
1							$m =$
2							
3							$p = \sum a_i / \sum m_i$
4							$= /$
5							$=$
6							$2p =$
7							$p^2 =$
8							
9							$\bar{m} = \sum m_i / m$
10							$= /$
SUM							$=$

$$SD = \Delta = \frac{1}{\bar{m}} \sqrt{\frac{1}{m-1} \left[ \sum a_i^2 - 2p \sum a_i m_i + p^2 \sum m_i^2 \right]}$$

$$SE = SD / \sqrt{m}$$

$$CI = p \pm t SE$$

$$m = \frac{t^2 SD^2}{L^2}$$

Example Sheets ~ Transect Data and Calculations

Figure 4 is a hypothetical case of 7 transects that includes 4 soils. The far right column indicates that on the average neither soil C nor soil D will comprise 10% of the map unit. They likely would be described as integral parts of the map unit but not indicated in the reference name of the map unit. The calculations of the standard deviation, standard error, confidence intervals and number of transects for soil A are shown in figure 5. The



NYCSS

TRANSECT FIELD DATA COLLECTION - MAP UNIT COMPOSITION

Named map unit X Name R.W.A. Date 3/18/78

Observed Soil	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	SUM	$P = \frac{\sum B_i}{\sum N_i}$
A	9	4	14	5	13	10	5				60	.5882
B	3	1	9	2	7	2	1				25	.2451
C	2	1	3	0	2	1	0				9	.0882
D	0	1	5	1	1	0	0				8	.0784
SUM=mi	14	7	31	8	23	13	6				102	.9999

FIGURE 5

CALCULATION SHEET - USE UNIT CONVERSION

TR.	$a_i$	$m_i$	$P_i$	$a_i^2$	$a_i m_i$	$m_i^2$	
1	7	14	.6428	81	126	196	$m = 7$
2	4	7	.5714	16	28	49	
3	14	31	.4516	196	434	961	$p = \frac{\sum a_i}{\sum m_i}$
4	5	8	.6250	25	40	64	$= 60 / 102$
5	13	23	.5652	169	299	529	$= .5882$
6	10	13	.7692	100	130	169	$2p = 1.1764$
7	5	6	.8333	25	30	36	$p^2 = .3460$
8							
9							
10							$\bar{m} = \frac{\sum m_i}{m}$
SUM	60	102	-	612	1087	2004	$= 102 / 7$ $= 14.57$

$$SD = d = \frac{1}{\bar{m}} \sqrt{\frac{1}{m-1} \left[ \sum a_i^2 - 2p \sum a_i m_i + p^2 \sum m_i^2 \right]}$$

$$= \frac{1}{14.57} \sqrt{\frac{1}{6} \left[ 612 - 1.1764(1087) + .3460(2004) \right]}$$

$$= \frac{1}{14.57} \sqrt{\frac{26.6372}{6}}$$

$$= .1446$$

$$\begin{array}{r} 612 \\ 1305.3840 \\ 1278.7468 \\ \hline 26.6372 \end{array}$$

$$SE = SD / \sqrt{m}$$

$$= \frac{.1446}{\sqrt{7}}$$

$$= .0546$$

$$CI = p \pm t SE$$

$$t_{.90, 6} = 1.943$$

$$= .5882 \pm (1.943)(.0546)$$

$$= .5882 \pm .1061$$

$$\therefore .4821 - .6943$$

$$m = \frac{t^2 SD^2}{L^2}$$

$$t_{.95, 0.0} = 1.960$$

$$L = .10$$

$$m = \frac{(1.96)^2 (.1446)^2}{(.1)^2} = 8.03$$

number of observations the resulting value is called the standard error of the mean or simply the standard error. It is standardized in the sense that it is corrected or adjusted for the number of samples being used to estimate the spread or variance.

For example, let  $p_i$  be the observed proportion or percent of correct observations, and let  $p$  be the real but unknown proportion for the population, and let SE be the standard error.

By dividing the difference of the sample and true proportion by the standard error the values will all be adjusted, thus

$$\frac{p_i - p}{SE}$$

is adjusted by the number of observations being made.

This number will be less than some calculated value, call it "t", that is associated with a given probability level. At a 95% probability the value of t is 1.96. (See table 1) Thus one can say that there is a 95% probability (19 times out of 20) that  $\frac{p_i - p}{SE}$

S E

will be less than 1.96.

If we square both values and let them be equal, we can solve for p, the population proportions within which the true value is expected to occur. The width of this interval varies according to the probability level selected such as 95%, 90%, or 80%.

$$\text{If } \left( \frac{p_i - p}{SE} \right) = t \quad \text{then} \quad \left( \frac{p_i - p}{SE} \right)^2 = t^2$$

squaring them results in:

$$\frac{p_i^2 - 2p_i p + p^2}{SE^2} = t^2$$

The standard error, SE, is the standard deviation divided by n.

In a binomial distribution the standard deviation may also be expressed as  $SD = \sqrt{p(1-p)}$ . By substituting these for SE above we obtain

$$\frac{p_i^2 - 2p_i p + p^2}{\left[ \frac{SD}{\sqrt{n}} \right]^2} = \frac{p_i^2 - 2p_i p + p^2}{\left[ \frac{p(1-p)}{\sqrt{n}} \right]^2} = \frac{p_i^2 - 2p_i p + p^2}{\frac{P(1-P)}{n}} = t^2$$

Simplifying the above:

$$n(p^2 - 2p_i p + p_i^2) = t^2(p - p^2) = t^2 p - t^2 p^2$$

$$np^2 - 2np_i p + np_i^2 = t^2 p - t^2 p^2$$

rearrange to solve for p.

$$(np^2 + t^2 p^2) - (2np_i p + t^2 p) + np_i^2 = 0$$

$$(n+t^2)p^2 - (2np_i + t^2)p + np_i^2 = 0$$

This is now in the form of a general quadratic equation  $ax^2 + bx + c = 0$ , and the two roots of x may be obtained by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}, \text{ or using the values above it becomes}$$

$$p = \frac{(2np_i + t^2) \pm \sqrt{(2np_i + t^2)^2 - 4(n+t^2)(np_i^2)}}{2(n+t^2)}$$

Although this may appear rather long and difficult it is easy to solve if it is done a piece at a time.

Here is an example. A transect has 12 observations and 10 of them belong to the same taxon. Because this is only a sample of a much larger population of values we know that the true value may not be exactly  $\frac{10}{12} = \frac{5}{6} = .8333$  thus we want to set some limits.

Instead of a 95% probability level which has a "t" of 1.96, we will select a 90% level which has a "t" of 1.645; so  $t^2 = 2.706$  (These values are shown in Table 1).

Step 1

$$b = 2np_i + t^2 = 2(12) \frac{10}{12} + 2.706$$

$$= 20 + 2.706 = 22.706$$

$$b^2 = 515.5624$$

Step 2

$$a = n + t^2 = 12 + 2.706 = 14.706$$

$$c = n p_i^2 = \frac{12 (10) (10)}{(12) (12)} = 8.333$$

Step 3

$$p = \frac{22.706 + \sqrt{515.5624 - 4(14.706)(8.333)}}{2(14.706)}$$

$$= \frac{22.706 + \sqrt{515.5624 - 490.1804}}{29.412}$$

$$= \frac{22.706 \pm 5.038}{29.412} = \frac{27.744}{29.412} \quad \text{and} \quad \frac{16.668}{29.412}$$

Upper limit = .9433

Lower limit = .5667

Unless a 1 in 10 chance

error has occurred the true proportion

is expected to be between 56.7 and 94.3%

This is the quadratic equation form and the two roots are the upper and lower confidence intervals for the proportion.

The width of the confidence interval from one sample can be narrowed by including more observations in the sample. The more observations you make the closer the interval will be to the calculated proportion,  $P_i$

Confidence intervals for a transect of 10 observations are given in Table 2. For example, if 7 of the observations were of the same kind of soil one is reasonably confident that the true value is between 40 and 89%. The interval may seem quite wide but remember it is based on a very small sample. As more transects are made, additional intervals can be calculated and the interval will become narrower as the number of transects increase.

### Estimating Composition of Potential Map Units

The procedure for setting limits from a single sample is particularly helpful in establishing map units in a survey. Toposequence transects provide information on the dominant and subdominant components of potential mapping units. Confidence intervals at specified probability levels can be estimated for these components from even a single transect.

In practice it is more common to have information from more than one toposequence or transect and then the cluster type analysis for calculating the standard error, and setting confidence intervals is appropriate.

Table 3 lists some information about soil observation made along a toposequence which is schematically shown in Figure 6. If the observations are 30 meters apart this represents about 0.62 cm or 0.24 in on a map at 1:15,840. Although a 1/4-inch strip could be delineated as a potential unit it is probably better to consider about 1/2-inch as the minimum width for separation (representing about 60m).



Table 2. Binomial confidence intervals for 10 observations.

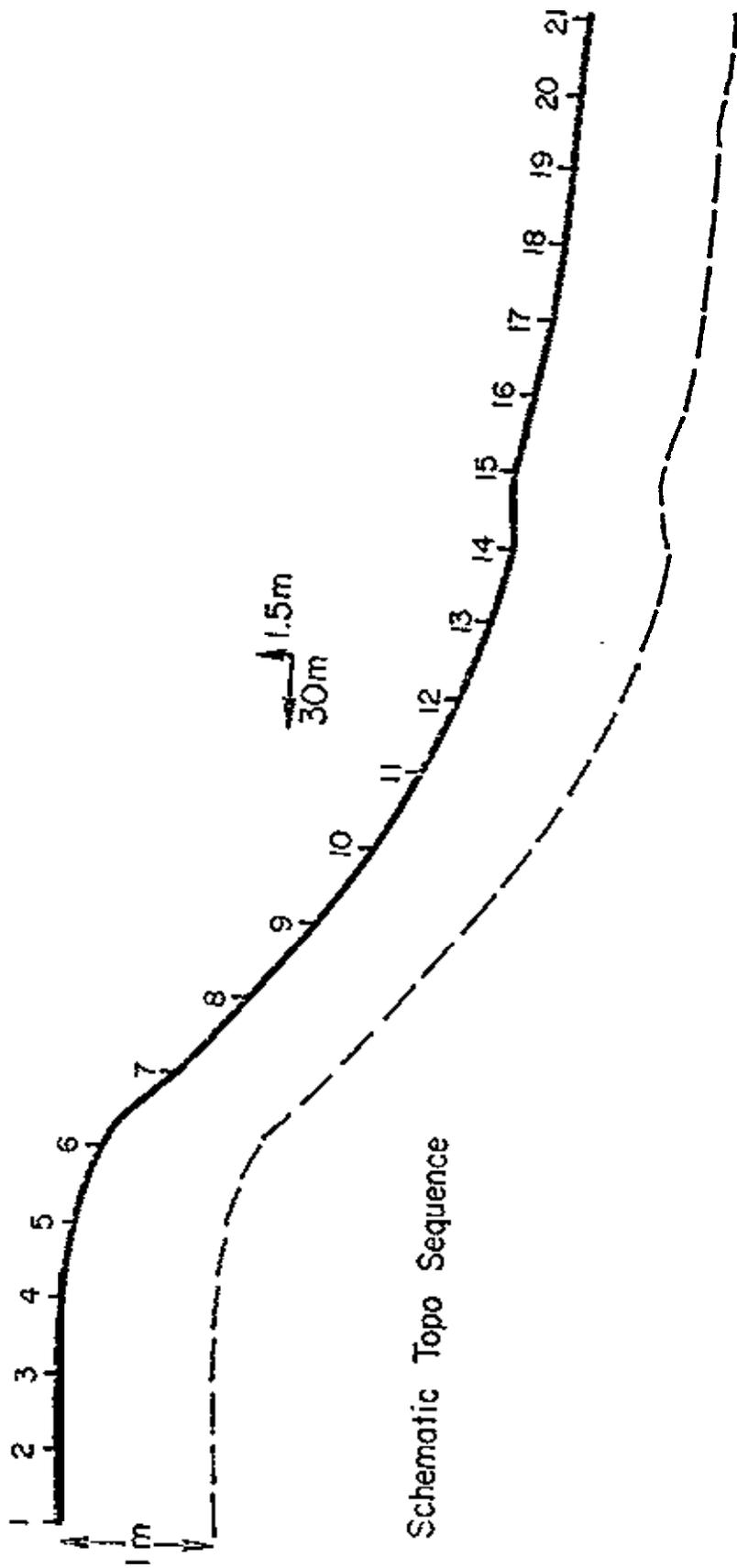
$N = 10$                        $t = 1.96$     $t^2 = 3.842$    95% probability  
 $m_i = 10$

$a_i$	$p_i$	P	
		Upper	Lower
0	.00	.2776	.0000
1	.10	.4042	.0179
2	.20	.5099	.0567
3	.30	.6032	.1078
4	.40	.6873	.1682
5	.50	.7634	<del>.2366</del>

Table 3. Toposequence observations

Site	Horizon	Texture			Drainage	Depth to:
		O-25	25-75	75-100		
1	cambic	CL	CL	CL	MW	45 R <sup>1</sup>
2	cambic	CL	CL	CL	W	55 R
3	cambic	CL	CL	CL	W	45 R
4	cambic	CL	CL	CL	MW	45 R
5	cambic	CL	CL	CL	W	40 R
6	7-cm argillic	CL	CL	CL	W	30 R
7	argillic'	CL	CL	CL	W	25 R
8	argillic	CL	CL	CL	W	30 A
9	cambic	CL	CL	CL	W	
10	argillic	CL	FL	CL	W	35 A
11	argillic	FL	CL	CL	W	35 A
12	argillic	FL	CL	FL	MW	40 A
13	argillic	FL	FL	FL	MW	40 A
14	argillic	FL	FL	CL	SIP	40 A
15	argillic	FL	CL	CL	MW	50 A
16	argillic	FL	CL	CL	MW	46 A
17	cambic	FL	CL	CL	MW	
18	cambic	FL	CL	LSk	MW	
19	cambic	CL	CL	LSk	MW	
20	cambic	CL	LSk	LSk	IV	
21	cambic	CL	LSk	LSk	IV	

<sup>1</sup>R = Depth to bedrock; A



As an exercise one should concentrate on those features that would likely permit consistent separations on the field sheets. Then the naming and description of potential mapping units takes place, Table 4 lists a possible classification of pedons as well as surface texture (as a family particle size class) and slope estimated from the schematic diagram.

An interpretation of the toposequence is provided in Figure 7 that may assist in establishing preliminary map units. In Table 5 some alternative suggestions of possible map units are provided as well as indicating the pedons which are taxonomically alike and an approximate interval estimate for the dominant component of the map unit. The intervals were estimated from Table 6 which is based on having only 6 observations. It must be remembered that the estimates improve and become narrower as the number of observations or number of transects are increased.

A few comments about the choices for pedons in the map units are given below, again assuming that the field map will be at 1:15,840.

#### Unit A

2 is a moderately deep inclusion in otherwise shallow soils. Numbers 1 and 4 might be taxadjuncts based on mottling, or could be used to broaden range of properties in the Lithic subgroup.

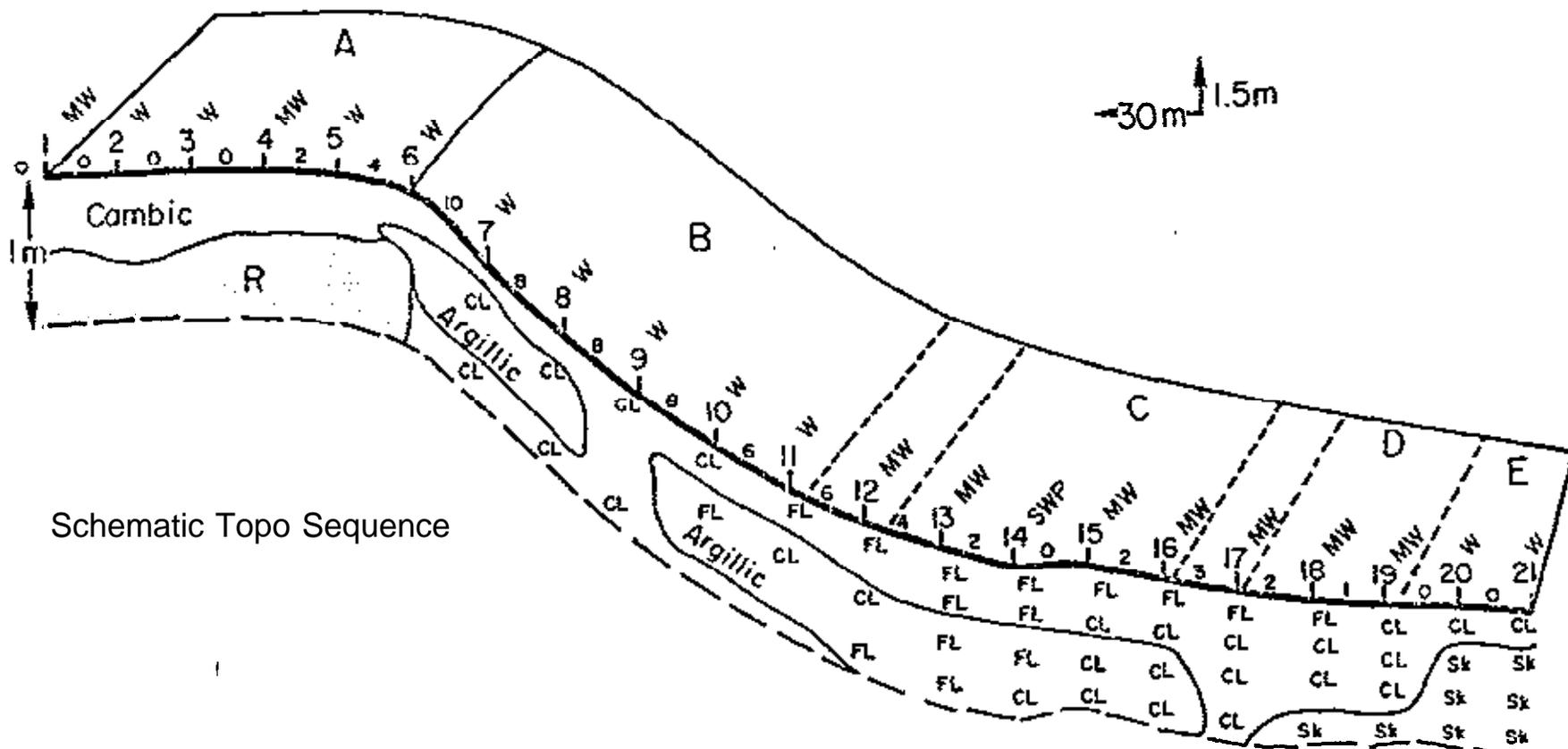
#### **Unit B**

8 appears to be an inclusion of a soil without an argillic horizon even though textures are similar. 10 seems to be a textural taxadjunct. If 12 is included in the unit it may be an inclusion or perhaps a taxadjunct based on mottling.



FIGURE 7

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Schematic Topo Sequence



Table 6. Binomial Confidence Intervals for 6 observations

a <sub>1</sub>	p <sub>i</sub>	p at .95		p @ .80	
		Upper	Lower	Upper	Lower
0	.0000	.3904	.0000	.2151	.0000
1	.1667	.5635	.0301	.2763	.0513
2	.3333	.7000	.0968	.5907	.1476
3	.5000	.8124	.1876	.7319	.2681
4	.6667	.9032	.3000	.8524	.4093
5	.8333	.9700	.4364	.9488	.5745
6	1.0000	1.0000	.6096	1.0000	.7849

Based on the equation

$$p = \frac{(2a_i - t^2) \pm \sqrt{(2a_i + t^2)^2 - 4(m_i - t^2)(a_i p_i)}}{2(m_i + t^2)}$$

and  $p_i = \frac{a_i}{m_i} = \frac{\text{no. of same observations}}{\text{no. of total observations}}$

#### Unit C

12, 15, and 16 seem to be coarse loamy aquic subgroups. 14 is likely an inclusion of a wetter soil. 17 might be included as a similar soil in which evidence for an argillic is weak but the texture is the same, and in some circumstances might be a taxadjunct, whereas in others it might be an inclusion of a similar soil. If 12 is excluded it would likely be due to its upper slope position.

#### Unit D

17, 18, and 19 seem to classify the same but if the skeletal portion were thought to be significant then 17 would be separated if possible or included with unit C.

#### Unit E

Although 18 through 21 all have skeletal materials, 18 and 19 are wetter and coarse loamy whereas 20 and 21 are better drained and definitely skeletal,

The above only mentions the taxonomy of the map units. In describing map units themselves it is important to consider those soils in the unit which are thought to behave similarly. For example, in Unit A for many purposes all 6 pedons would have a similar response; consequently it might be expected even from this one transect that 78-100% of the map unit will have similar responses for certain uses.

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1976-77 Connecticut Soil Conservation

NORTHEAST COOPERATIVE SOIL SERVICE CONFERENCE  
and  
NORTHEAST BRANCH MEETING AMERICAN SOCIETY OF AGRONOMY

University of Connecticut  
Storrs, Connecticut  
July 1976

prepared by

USDA, SOIL CONSERVATION SERVICE & STORRS AGRICULTURAL EXPERIMENT STATION

Soils of the Connecticut Valley

All of Connecticut, including the Connecticut Valley, has experienced and reflects the effects of Wisconsin glaciation. Parent materials of the Valley vary from lake bottom sediments to kames, kame deltas, outwash terraces and esters to organic materials and recent alluvium.

The mineral soils formed mostly in stratified loamy and sandy materials derived from basalt and reddish brown sandstone which underlie the area. The Valley soils commonly exhibit highly contrasting features within very short distances. They have variable drainage, mixed mineralogy, and low base status. They lack surface stones common to the adjacent uplands and are mostly friable and rapidly permeable. The soils have thin, light colored epipedons and are only weakly developed. All of the soils have a mesic temperature regime. Very poorly drained organic soils occur in scattered depressions. Tidal marshes consisting of wet organic soils occur in places along the coast.

Some Common Soil Series

ENTISOLS

Udifluvents  
Aquic - Windoski (CSMM)

(FINM)  
(SMM)

Udorthents  
Typic - Manchester (SSMM)

Udipsamment  
Typic - Penwood (MM)  
Windoski

MISOSOLS

Sulfhectists  
Typic - Westbrook (EH)

Medisapists  
Typic - Carlisle (EH)

ENFIELD SERIES

Taxonomic Class: Coarse-silty **over** sandy or sandy-skeletal, **mixed**,  
mesic Typic Dystrachrepts.

Ap1- -0 to 5 inches, **dark brown** (10YR 3/3) **silt loam**; **weak** coarse sub-  
angular blocky structure **parting to weak medium granular struc-**  
**ture**; friable; many **fine roots**; **2 percent** coarse fragments; **very**  
**strongly acid**; **clear wavy boundary**.

Ap2- -5 to 9 inches, **dark yellowish brown** (10YR 3/4) **silt loam**; **weak**  
coarse subangular blocky structure; friable; common **fine roots**;  
**2 percent** coarse fragments; **strongly acid**; **clear wavy boundary**.

B2- -9 to 15 inches, **dark brown** (7.5YR 4/4) **silt loam**; **weak coarse**  
subangular **blocky structure**; friable; common **fine roots**; **strongly**  
**acid**; **gradual wavy boundary**.

B22- -15 to 25 inches, **dark yellowish brown** (10YR 4/4) **silt loam**; **weak**  
coarse subangular **blocky structure**; friable; few **fine roots**; **2**  
**percent** coarse fragments; **strongly acid**; **clear wavy boundary**.

I1B3- -25 to 28 inches, **reddish brown** (5YR 4/4) **gravelly loamy sand**;  
**massive**; friable; few **fine roots**; **25 percent** coarse fragments;  
**medium acid**; **clear wavy boundary**.

I1C- -28 to 60 inches, **reddish brown** (5YR 4/4) **sand**; **single grain**;  
**loose**; **10 percent** coarse fragments; **medium acid**.

Location: **Hartford County, Connecticut, Town of East Windsor**;  
**Consolidated Cigar Farm**

PEDON DATA OF ENFIELD SOIL

July 1978 If 2/

TOUR-3

Horizon	Depth	% <u>3/</u> Coarse Parti- cles > 2mm	% <u>4/</u> Sand 2-0.05mm	% <u>4/</u> silt 0.05-0.002mm	% <u>4/</u> Clay < 0.002mm	% <u>5/</u> Organic Carbon	pH	Morgan Ca ppm	Morgan Mg ppm	Morgan K ppm	Morgan P ppm
Ap1	0-5 in 0-13 cm	7.3	52.0	42.0	6.0	2.9	4.7	< 25	< 10	30	2.3
Ap2	5-9 in 13-23 cm	2.6	56.0	38.0	6.0	1.3	4.8	< 25	< 5	15	1.3
B21	9-15 in 23-38 cm	0.4	73.6(?)	18.0(?)	8.4	0.5	4.9	< 25	< 5	20	1.5
B22	15-25 in 38-63 cm	0.1	61.6	34.0	4.4	0.4	5.4	< 25	< 5	10	1.0
IIB3	25-28 in 63-70 cm	-							-	-	-
IIC	28-60 in 70-150 cm	6.9	91.6	6.0	2.4	0.1	5.5	< 25	< 5	15	2.3

- 1/ Analyses performed by H. Luce, M. Woodward, and M. L. Pelletier  
2/ "Warning" - All values are based on a single unreplicated analysis  
3/ By weight  
4/ Hydrometer method, organic matter destroyed by H<sub>2</sub>O<sub>2</sub>  
5/ Walkey Black Method - Methods of Soil Analysis - ASA Monograph 9, Part II

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**Torvald A. Bertinuson and Titus S. Hale  
Consolidated Cigar Company  
A Division of Gulf & Western Corporation**

In 1810 the first cigar factories were established in East Windsor and Suffield, Connecticut, and "Tobacco Valley" became known throughout the world. The 61 square mile Connecticut River Valley is noted for the quality of its cigar type tobaccos. Here are grown the Broadleaf and Havana Seed Binder types, but the Valley is even more prominent for its unique shadegrown wrapper tobacco.

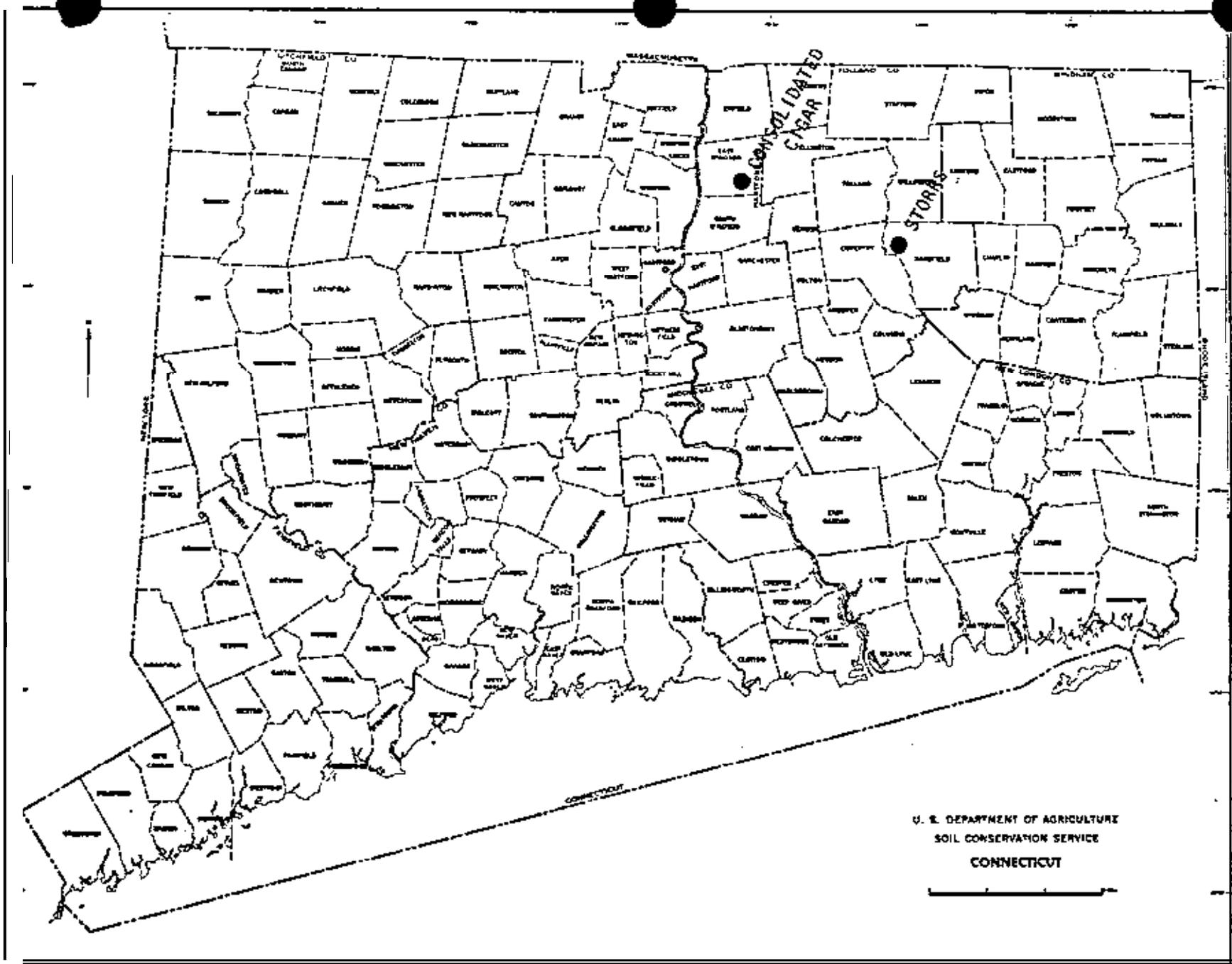
The controlled micro climate achieved under the shade tents helps to produce a cigar wrapper noted for its fine texture, elasticity, burn, and aroma. The 1978 Shade Tobacco Crop of approximately 3,300 acres plus additional acreage for outdoor tobaccos will cost \$30 - \$35 million to produce. Spin-off impact on the agricultural economy will be much higher.

This tour will show harvesting operations on a farm in the Consolidated Cigar Company, worlds largest manufacturer of cigars including brands like Dutch Masters, El Producto, Muriel, and others.

**TOUR- 4**

TOUR-5

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U. S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE  
CONNECTICUT

## BUSINESS MEETING

The business meeting was opened at 8:00 a.m. on July 22, 1978, by Chairman R. W. Arnold.

1. D. S. Fanning, Chairman of the Nominations Committee, presented the names for Vice-Chairman for the 1980 conference. Edward J. Ciolkosz was elected Vice-Chairman for the 1980 Northeast Cooperative Soil Survey Conference. William R. Wright was selected as second Northeast experiment station delegate to the 1979 National Cooperative Soil Survey Conference.

2. New state experiment station representatives to the Northeast Soil Taxonomy Committee were selected as follows:

H. D. Luce (replaces H. V. Rourke)	University of Conn.	1978-1981
J. Sencindiver (replaces E. J. Ciolkosz)	University of W. VA.	1979-1982

Current membership of the Northeast Soil Taxonomy Committee is as follows:

<u>NAME</u>	<u>LOCATION</u>	<u>PERIOD*</u>
J. D. Rourke, <b>Chairman</b>	<b>SCS, Broomall, PA</b>	---
E. J. Ciolkosz	<b>Penn State Univ.</b>	1976-1979
W. R. Wright	<b>Univ. of RI</b>	1977-1980
H. D. Luce	<b>Univ. of CT</b>	1978-1981
E. H. Sautter	<b>SCS, Storrs, CT</b>	1976-1979
<b>R. L. Gougins</b>	<b>SCS, Richmond, VA</b>	1977-1980
C.F. Eby	<b>SCS, Somerset, NJ</b>	1978-1981
<b>J. Sencindiver</b> (Will replace E. J. Ciolkosz)	<b>Univ. of W VA</b>	1979-1982

\*Term is for three years. It ends on January 1 of the concluding year indicated.

3. The next point of business was a discussion of this year's conference format and location and plans for the 1980 NECSSC. The consensus of the discussion was that this year's format was good and that the conference period should be from Monday noon to Friday noon. It was moved and seconded that the 1980 NECSSC be held in the summer at the Penn State University at a time set by the Steering Committee. Motion carried.

NATIONAL COOPERATIVE SOIL SURVEY  
Northeast Regional Conference Proceedings  
New York City, New York  
January 12-16, 1976

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U.S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE

**PROCEEDINGS OF THE**

Northeast  
Cooperative



**JUN 11976**

New York City, New York  
January 12-16, 1976

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Some Highlights of the 1976 Conference

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Purpose, Policies and Procedures of the Northeast Cooperative Soil Survey Conference

Summary of Remarks

N.E. State Agricultural Experiment Stations' Representative -  
R. M. Heermann

Technical Service Center Representative - H. R. Hilner

U. S. Forest Service Representative - DeVon Nelson

1975 National Soil Survey Conference - R. W. Arnold

Northeast Soil Research Committee - W. R. Wright

Committee Reports

1. Legal Aspects of the Use and Interpretation of Soil Surveys
2. Use of Soils for Waste Disposal
3. Inventory and Use of Forest Soils
4. Soil Survey Interpretations
5. Soil Moisture Regime
6. Soils Reflecting a High Degree of Physical Disturbance by Man
7. Evaluating Mapping Units
8. Histcsols and Tidal Marsh Soils
9. Soil Survey Research Needs and Priorities
10. Remote Sensing in Soil Survey

SOME HIGHLIGHTS OF THE 1976 NORTHEAST COOPERATIVE  
SOIL SURVEY CONFERENCE

R. W. Arnold, Vice Chairman for 1976 Conference

Representation of agency and institution administration was most welcome and encouraging and included:

N.E. State Agricultural Experiment Stations	- R. M. Heennann
SCS State Conservationists	- C. M. Right
<b>Technical Service Center</b>	- H. R. Hilner
SCS, Washington Office	- K. W. Flach
Forest Service	- D. Nelson

In addition to old members, we welcomed new participants and visitors who added to our overall effectiveness.

Several items of importance to the conference were acted on at the business meeting.

1. At the 1974 conference it was suggested that a statement of purpose, policy and procedure be drawn up for consideration. Drafts of November 1974 and October 1975 were circulated and the 1976 conference reworded and amended the document. Participants unanimously approved the amended document which is part of these proceedings. After review and approval by appropriate administrators the document will provide guidelines for future conferences.
2. The Steering Committee was asked to consider holding the conference outside of New York City, possibly in conjunction with the Northeast American Society of Agronomy meetings in 1978.
3. It was agreed to try the format of the National Conference at our next northeast conference. All committee reports will be compiled beforehand and reviewed by four discussion groups during the conference. Only the Research Needs Committee, composed of the chairman of the other committees, would need to meet separately at the conference.
4. Keith Schmude, SCS and Dick Arnold, AES are vice chairman and chairman for the 1978 conference.

A few brief comments on the committee reports indicate the scope of our 1976 conference.

1. Legal aspects of the use and interpretations of soil surveys.

Interest and concern for the professional status of soil scientists continues. Several states have organized societies for the exchange of information and to provide a nucleus of professionals who may become licensed in the future. Differences among state licensing regulations seems to preclude regional action.

2. Use of soils for waste disposal.

Two major themes were present: (a) the need to recognize the many kinds of "waste" as resources which can be useful in agricultural production, and (b) the importance of protection of soil and water from pollution which would harm them directly or impair their usefulness or safety as the first links in the food production chain.

3. Inventory and use of forest soils.

Forest lands are significant in the northeast and there are problems of mapping, classifying, and interpreting meaningful landscape units. More attention must be given to experience of others, including U. S. Forest Service, if we are to produce more effective and efficient soil surveys.

4. Soil survey interpretations.

Guidelines for rating frost potential were reviewed, tested, and it was felt additional work is needed. The development and use of soil potentials will require more data to support such ratings and is a challenge to all concerned. Part of the problem is to identify and document alternatives for overcoming limitations.

5. Soil moisture regime.

Although soil drainage classes have been used in the northeast there are difficulties with the concepts nationally, particularly in non-humid areas. It is recommended that a coordinated water table study should be conducted in the northeast to characterize perched water tables and determine their relationships to apparent water tables and their significance to soil survey interpretations.

6. Soils reflecting a high degree of physical disturbance by man.

It appears that about one million acres have been disturbed in the northeast, about 360,000 acres require reclamation, and about 45,000 acres a year are currently being disturbed. State laws affecting reclamation are summarized in a table. Changes in taxonomy were reviewed and generally approved for trial. The work on Spolents by West Virginia is really commendable.

7. Evaluating mapping units.

Continued attention must be given to the proper design and description of mapping units.

assist soil scientists in using transect methods to evaluate soil units.

8. Histosols and tidal marsh soils.

Wetland legislation exists in eight northeastern states and all essentially define tidal marshes as land under Or contiguous to tidal waters and contain Or grow one or more recognized salt marsh grasses or vegetation. Greater emphasis likely should be given to tidal marsh in the future. Current investigations are summarized.

9. Soil survey research needs and priorities.

A review of the operation of the National Survey laboratory at Lincoln assures the northeast of continued support. A proposed project on fragipans was outlined by our representative, Dr. Ron Yeck. The soil survey input program will identify sources and kinds of laboratory data currently available but requires inputs from experiment stations to be complete. Additional studies to assess morphological soil changes following soil uses for waste disposal would seem to have merit in predicting site lifetime and loading rates. A major challenge exists to cope with rapidly changing technology and uses demands for soil interpretations.

10. Remote sensing in soil survey.

It was felt that a land use base map for the northeast, although desirable, was of low priority because of differences of needs, scales, and land classes. A regional coordinator for remote sensing to be located at the TSC was recommended. A bibliography of remote sensing research has been assembled and is available.

The activities, discussions, and presentations of these committees constitute the operational heart of our conference and the Executive Committee expresses their thanks for a job well done to all members and participants.

In addition to the working sessions there were several informal sessions to keep us informed about special activities of some of our members.

- Horace Smith, SCS, Maryland, reported On the soil survey of the District of Columbia.
- Representatives of the State Agricultural Experiment Stations reported on soil survey related activities.
- John Foss, Maryland, reported on tephra and soil formation in northwestern U.S.

- Gerald Olson, New York, reported on soils and Maya mounds in Honduras.
- Roger Case, SCS, New York, reported on soil interpretations for the Eastern Ontario Commission.
- Vim VanEck reported on West Virginia's activities in eastern Africa.
- Dick Arnold, New York, reported on a climo-sequence of soils in Nigeria.
- A special panel discussion led by John Rourke considered a number of aspects of the revised Soil Survey Manual.

NORTHEAST COOPERATIVE SOIL SURVEY CONFERENCE

Taft Hotel  
New York City  
January 12-16, 1976

AGENDA

Monday, January 12

1:00-1:20 p.m. Opening Business - Bruce G. Watson, Chairman

1:20-1:40 p.m. ~~Ruben M. Heermann~~, Associate Director  
Cornell University Experiment Station

1:40-2:00 p.m. ~~Homer~~ R. Hilner, Assistant Director  
Northeast Technical Service Center  
Soil Conservation Service, USDA  
Broomall, PA

2:00-2:20 p.m. Craig M. Right, State Conservationist  
Soil Conservation Service, USDA  
Burlington, VT

2:20-2:30 p.m. Questions and Discussion

2:30-3:00 p.m. Break

3:00-3:45 p.m. Klaus W. Flach, Director  
Soil Survey Investigations Division  
Soil Conservation Service, USDA  
Washington, D.C.

3:45-4:15 p.m. Devon Nelson  
Forest Service, USDA  
Milwaukee, Wisc.

4:15-4:45 p.m. Richard W. Arnold  
Cornell University  
Report on 1975 National SSWPC

4:45-5:00 p.m. Discussion

Evening Session

7:30-11:00 p.m. Reports on sabbatical leaves and other experiences  
Discussion Leader: D. S. Fanning

Place: South Colonnade Room

John Foss - Tephra and Soil Formation in NW U.S.  
Gerald Olson - Soils and Maya Mounds in Honduras  
Roger Case - Soil Interpretations for Eastern  
Ontario Commission

Dick Arnold - Climo-sequences of Soils in Nigeria  
Vim VanEck - West Virginia's Program in E. Africa

Tuesday, January 13

8:00- 8:45 a.m.

8:45-

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Wednesday, January 14

8:00-11:45 a.m.

11:45-12:45 p.m.

1:30-4:30 p.m.

8:00-10:00 p.m.

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Tuesday, January 15

8:00-11:45 a.m.

11:45-12:45 p.m.

12:45- 3:30 p.m.

~~3:30-~~

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R.V. Rourke, Department of Plant and Soils, University of Maine, Orono, ME 04473

E.J. **Rubins**, Plant Science Department, University of Connecticut, Storrs, CT 06268

E.H. **Sautter**, USDA Soil Conservation Service, Mansfield Professional Park, Route 195, **Storrs**, CT 06268

K.O. Schmude, USDA Soil Conservation Service, P.O. Box 865, Morgantown, WV 26505

W.C. Sharp, USDA Soil Conservation Service, 1974 Sproul Road, Broomall, PA 19008

R. Shields, USDA Soil Conservation Service, **Hartwick** Building, 4321 **Hartwick** Road, College Park, MD 20740

H.W. Smith, USDA Soil Conservation Service, **Hartwick** Building, 4321 **Hartwick** Road, College Park, MD 20740

R.M. Smith, Department of Agronomy, University of West Virginia, Morgantown, WV 26505

M.B. Stone, Chief, Project Management, Vermont Department of Forests and Parks, State Office Building, Montpelier, VT 05602

K.G. Stratton, Maine Soil and Water Conservation Commission, State House, Augusta, **ME** 04330

R.A. Structemeyer, Department of Plants and Soils, University of Maine, Orono, ME 04473

D.E. Snyder, USDA Soil Conservation Service, 1974 Sproul Road, Broomall,  
PA 19008

A.T. Valmidiano, Bureau of Soils, Manila, Philippines

W.A. VanEck, 1076 Agricultural Science, West Virginia University, Morgantown,  
WV 26505

F.J. Viera, USDA Soil Conservation Service, Federal Building, Durham, NH 03824

J.W. Warner, USDA Soil Conservation Service, Midtown Plaza, 700 E. Water St.,  
Syracuse, NY 13210

B.G. Watson, USDA Soil Conservation Service, One Burlington Square, Suite 205,  
Burlington, VT 05401

R.M. Weaver, Department of Agronomy, New York State College of Agriculture,  
Cornell University, Ithaca, NY 14850

M.E. Weeks, Agricultural Experiment Station, University of Massachusetts,  
Amherst, MA 01002

W. Wertz, Soil Scientist, USDA Forest Service, Washington, D.C. 20250

J.E. Witty, USDA Soil Conservation Service, 1974 Sproul Road, Broomall,  
PA 19008

W.R. Wright, Department of Plant and Soil Science, University of Rhode Island,  
Kingston, RI 02881

R.D. Yeck, National Soil Survey Laboratory, Midwest Technical Service Center,  
Room 345, Federal Building & U.S. Courthouse, Lincoln, Nebraska 68508

D.L. Yost, USDA Soil Conservation Service, One Burlington Square, Suite 205,  
Burlington, VT 05401

## Business Meeting

The business meeting was called to order at 8:00 a.m. on January 16. The first order of business was the election of vice-chairman for the 1978 conference. R. V. Rourke, chairman of the nomination committee, conducted the election. Keith O. Schmude's name was placed in nomination and it was moved and seconded that the nomination be closed. The conference unanimously elected Keith O. Schmude as vice-chairman for the 1978 Northeast Cooperative Soil survey Conference.

Dr. Richard Arnold led a review and discussion of the proposed by-laws for the conference. All proposed revisions were completely discussed and have been included in the by-laws. It was moved and seconded that the by-laws be accepted as amended. A copy of the by-laws is in the proceedings.

The next point of business was the format and location of the 1978 conference. Dr. Ciolkosz opened the discussion by suggesting that the conference be held outside of New York City, possibly in the summer and in conjunction with the NEASA meetings. A field trip also was suggested. John Rourke stated that the clearance would be needed to hold the meeting at a different ~~time~~ of the year. Gerald Latshaw moved that the conference recommend to the steering committee that the conference be held in conjunction with the NEASA meeting (preferably the week prior to NEASA). Carried by voice vote that steering committee consider the proposal by Mr. Latshaw.

John Rourke suggested that as ~~format~~ for the next conference that we use the format that is used at the National Conference. If we accept that format it will have the following effects:

1. Each participant will serve on one committee.
2. Committee reports must be completed 4 to 5 months before the conference.
3. Reports will be sent to all participants prior to conference and would be reviewed in 4 discussion sections.
4. Research needs ~~committee~~ would be the only committee to meet at the conference.

It was moved by Dr. E. J. Ciolkosz and seconded by Frederick Gilbert that the National Conference format be tried at the 1978 NECSSC.

Dr. Richard Arnold reviewed the procedure for committee chairmen to follow in submitting their reports for the proceedings. Follow-up letters were sent to each chairman.

The following items were discussed by Dr. W. A. Van Eck.

1. The Nature Conservancy is interested in the purchase of unique soil sites, such as type location. Soil scientists in the NE region can contact the National office (1800 N. Kent Street, Arlington, VA 22209) or the Regional office (294 Washington Street, Boston, MA 02108).

2. Recommended to the steering committee that the next NECSSC include a committee on the presentation and use of soil survey data.
3. Recommended to the steering committee and editor of the proceedings to include the following in the proceedings.
  - a. List of state's financial contribution to soil survey for **FY** 1976.
  - b. List of soil survey personnel levels (local. state and federal) for **FY** 1976.
  - c. List of recent soil survey related publications since January 1974.
  - d. List of soil survey related research projects for **FY** 1976.
  - e. List of legal status of soil scientists.
  - f. List of current status of published soil surveys.

All of above listings should be by states and up-to-date.

John Rourke reviewed the membership of NE Soil Taxonomy **Committee**. The membership follows:

<u>Name</u>	<u>Location</u>	<u>Years</u>
J. D. Rourke, Chr.	Broomall, Pa.	---
E. J. <b>Ciolkosz</b>	Penn. State Univ.	1976-1979
R. V. Rourke	Univ. of Maine	1976-1978
R. W. Arnold	Cornell univ.	1976-1977
R. L. <b>Googins</b>	SCS, Richmond, Va.	1976-1979
E. H. <b>Sautter</b>	scs, <b>Storrs, Conn.</b>	1976-1978
S.A.L. Pilgrim	SCS, Durham, N.H.	1976-1977
W. R. Wright	Univ. of R.I.	1977-1980

Robert **Hartung**, Woodland Specialist, expressed appreciation for the invitation to the conference. He also indicated that Homer **Hilner** was grateful for the opportunity to meet with the group.

Robert Rourke moved that the business meeting be adjourned. This motion was seconded and approved by voice vote.

THE NORTHEAST COOPERATIVE SOIL SURVEY CONFERENCE

PURPOSE, POLICIES AND PROCEDURES

I. Purpose of Conference

The purpose of the **NECSS** conference is to bring together representatives of the National Cooperative Soil Survey in the northeastern states for discussion of technical and scientific questions. Through the actions of committees and conference discussions, experience is summarized and clarified for the benefit of all; new areas are explored; procedures are synthesized; and ideas are ~~ex-~~ changed and disseminated. The conference also functions as a clearing house for recommendations and proposals received from individual members and state conferences for transmittal to the National Soil Survey Conference.

II. Participants

Permanent participants of the conference are the following:

The SCS state soil scientist responsible for each of the 13 northeastern states, District of Columbia and staff soil scientist of the Caribbean area; Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Puerto Rico, Rhode Island, Virginia, Vermont and West Virginia.

The experiment station or university soil survey leader(s) of each of the 13 northeastern states and Puerto Rico.

Head, Soil Correlation Unit, Northeast Technical Service Center, Soil Conservation Service.

National Soil Survey Laboratory Liaison to the Northeast.

Cartographic Unit Liaison to Northeast.

One representative from each of the Eastern and Southern **Regions** of the U.S. Forest Service.

On the recommendation of the Steering Committee, the Chairman of the conference may extend invitations to a number of other individuals to participate in committee work and in the conference. Any soil scientists or other technical specialists of any state or federal agency whose participation is helpful for particular objectives or projects of the conference may be invited to attend.

III. Officers

A. Chairman and Vice-Chairman

An experiment station representative and an SCS state soil scientist or staff soil scientist of the Caribbean area alternate as chairman and vice-chairman. The **vice-chairman** elected at the biennial **meeting** serves as program leader for one conference and becomes conference chairman for the next one. The chairman functions as chairman of the biennial conference and his responsibilities include the following:

1. Planning and management of the biennial conference.
2. Function as a member of the Steering Committee.
3. Issue announcements and invitations to the conference.
4. Contact proposed committee chairman and vice-chairman to serve in those positions.
5. Provide for appropriate publicity for the conference.
6. Preside at the business meeting of the conference.
7. Maintain conference mailing list and turn it over to incoming chairman.

The vice-chairman functions as Program Chairman of the biennial conference and his responsibilities include the following:

1. Serve as a member of the Steering Committee.
2. Act for the chairman in the chairman's absence of disability.
3. Organize the program of the conference.
4. Make necessary arrangements for lodging accommodations for

The Steering Committee chairman functions mainly to call a meeting of this committee to handle its business and to ensure full committee membership.

The Steering Committee may designate a conference chairman and vice-chairman if the elected persons are unable to fulfill their obligations.

## 2. Meetings and Communications

At least one meeting is held at each regional conference. Additional meetings may be scheduled by the chairman if the need arises.

Most of the committees communications will be in writing. Copies of all correspondence between members of the committee shall be sent to the chairman.

## 3. Authority and Responsibilities

### a. Conference Participants

The Steering **Committee** formulates policy on conference participants, but final approval or disapproval of changes in policy is by consensus of the participants.

The Steering Committee makes recommendations to the conference for extra and special participants in specific conferences.

### b. Conferences Committees and Committee Chairman

The Steering Committee formulates the conference **committee** membership and selects committee chairmen and vice-chairmen.

The Steering Committee is responsible for the formulation and transmittal to committee chairman of committee charges.

### c. Conference Policies

The Steering Committee is responsible for the formulation of statements of conference policy. Final approval of such statements is by **concensus** of the conference participants.

d. **Liaison**

The Steering Committee is responsible for maintaining liaison between the regional conference and (a) the Northeastern Experiment Station Directors, (b) the Northeastern State Conservationists, SCS, (c) Deputy Administrator for Soil Survey of the Soil Conservation Service, (d) regional and national offices of the U.S. Forest Service and other cooperating and participating agencies, (e) the Northeast Soil Research Committee, and (f) the National Soil Survey Conference of the Cooperative Soil Survey.

C. Administrative Advisors

Administrative advisors to the conference consist of the Technical Service Center Director, SCS, and the chairman of the N.E. Agricultural Experiment Station Directors of their designated representatives.

D. Committee Chairman and Vice-Chairman

Each conference committee has a chairman and vice-chairman who are selected by the Steering Committee.

IV. Meetings

A. Time and Place of Meetings

The conference convenes every two years, in even-numbered year\*. The date and location will be determined by the Steering Committee.

V. Conference Committees

A. Most of the work of the conference is accomplished by duly constituted committees.

B. Each committee has a chairman and vice-chairman. A secretary or recorder may be selected by the chairman, if necessary. Committee chairmen and vice-chairmen are selected by the Steering Committee.

C. The kinds of committees and their members are determined by the Steering Committee. In making their selections the Steering Committee makes use of expressions of interest filed by the conference participants.

D. Each committee shall make an official report at the designated time **at** each biennial conference. Chairmen of committees are responsible for submitting the required number of **committee** reports promptly to the vice-chairman of the conference. The conference vice-chairman is responsible for assembling

and distributing the conference proceedings. Suggested distribution is:

One copy to each participant on the mailing list.

One copy to each State Conservationist, SCS, and Experiment Station Director in the Northeast.

Twenty-five copies to the Director, Soil Survey Operations Division, SCS, for distribution to other regional conferences and their committees.

E. Much of the work of committees will of necessity be conducted by correspondence between the times of biennial conferences. **Committee** chairmen are charged with the responsibility for initiating and carrying forward this work.

VI. Representatives to the National Soil Survey Conference.

The elected Experiment Station vice-chairman or chairman will attend the national conference. A second Experiment Station representative also will attend the conference. He is to be selected by the Experiment Station representatives at the regional conference.

The SCS representatives are usually selected by the Deputy Administrator, SCS in consultation with TSC Director and State Conservationists.

VII. Northeast Soil Taxonomy Committee

Membership of the standing committee is as follows:

Head, Soil Correlation Unit, NTSC, SCS (permanent chairman, non-voting).

Three Federal representatives.

Three State representatives.

The term of membership is usually three years, with  $1/3$  being replaced each year.

The elected Experiment Station conference chairman or **vice-chairman** is responsible for overseeing the selection of state representatives.

VIII. Amendments

Any part of this statement for purposes. policy and procedures may be amended at any time by agreement of the conference participants.

By-Laws Adopted January 16, 1976

Motion made by Oliver W. Rice, Jr., to accept the by-laws as amended.

Dr. Ronald D. **Yeck** seconded the motion.

Participants of the conference voted unanimously to accept the by-laws as amended.

NE State Agricultural Experiment Stations represented by  
R. M. Heennann, Associate Director, Cornell University  
Agricultural Experiment Station

I welcome this opportunity to greet you at the Northeast Cooperative Soil Survey Conference. The soil survey has contributed much to the region and to the State of New York. I have enjoyed many associations with people in soil survey and have learned much through these contacts. Perhaps I know more about soil surveyors than about soils or soil science.

The National Soil Survey has traditionally maintained very effective federal-state cooperation. It began in the days of the bureaus and has continued through and survived major reorganizations of the federal agencies. New federal agencies that must deal with non-federal agencies or institutions would profit from your experience. Staff members of these agencies would do well to confer with either state or federal participants in your cooperative venture. You have reason to feel proud of the achievements that you and your predecessors have attained. I hope you will continue to give your cooperative program your attention and support.

Cooperation between federal and state agencies does not happen automatically. It is fostered through meetings such as this and regular communication between the people involved. Your emphasis on joint planning and developing long-range work schedules, as well as efforts to standardize working procedures have been important factors. You have given wholehearted support to help carry out your plans on schedule and to go the "extra mile" when necessary.

The recently passed Freedom of Information Act is having some impact on soil survey cooperation. The Soil Conservation Service now must publish certain items in the **Federal Register** in order to meet the requirements of this Act. You will need to become familiar with the Federal Register and its role. **When** items appear in the register you will have an opportunity to comment on them before an announced deadline. State cooperators should make use of this opportunity just as you do now to correspond with your colleagues in the Soil Conservation Service. Perhaps the more difficult problem you face is easy access to the **register**. You might seek out where a copy or copies are available on your campus. Usually you will have some forewarning or clue as to when items are likely to appear. You can then scan the register temporarily or alert the individual on campus who may have responsibility for scanning it. Once you become familiar with the procedures that are followed for publishing rules and regulations in the Federal Register, you will be able to carry on as well as you have before.

I wish you continued progress in your meeting and your activities during the coming year.

SUMMARY OF REMARKS BY HOMER R. HILNER AT THE NORTHEAST COOPERATIVE SOIL SURVEY CONFERENCE, NEW YORK CITY, JANUARY 12, 1976

It is my pleasure to be here and to represent Rob Addispn, Director of the Northeast TSC. I am pleased to see the non-SCS agency and **organization** representatives in attendance. We appreciate the cooperation of the colleges and other agencies. Success in research, education, field mapping, and writing depends upon the close working arrangements of all involved.

The Northeast TSC operates as an extension of the Washington Office. The technical service center primarily exists to provide service to the states. Our goal is to provide timely sound service.

The soil survey is the basis for most of our SCS work -- in agriculture, in urban areas, and in project work. It is the basis for decisions in resource management and land use.

Future use of soil surveys appears to be unlimited. Concerns **for the environment** and recently enacted state sediment control laws are only two of the **areas** insuring future need and use of soils information,

I would encourage you to **keep** the users of the soil survey in mind at all times. We must remember that users are usually not professional soil scientists.

The goal of publishing soil surveys one year after completion of field mapping is a worthy goal. Much of the current criticism of the soil survey program will be eliminated by achieving this goal.

More sophisticated surveys and wider use of them will require :

1. A continuous effort in training soil scientists;
2. improved mapping techniques; and
3. sound analyses for interpretations,

Expanding interpretations into soil potentials is a good concept. Several factors **must** be considered as we move into the development and use of soil potentials: 1. Use will require care and good **judgment**; 2. additional **data-gathering** and *testing* will **be** required; 3. other disciplines, such as engineers, geologists, agronomists, biologists, and economists, will need to be consulted; 4. develop in context

of use-area; i.e., local engineering practices, economic bases, and social and environmental Setting.

Organizations involved in the cooperative soil survey must maintain coordination in order not to reduce effective service to the public.

Certification of soil scientists may be necessary, due to: 1. The dynamic characteristic of the soil survey field; 2. entrance of private soil scientists into the field; 3. development of new techniques; 4. need for maintenance of high quality of the standards.

it is important to keep management involved and informed in order to: 1. Realize technical ideas and goals; 2. facilitate soils work; and 3. provide information for sound management decisions.

I encourage you to take the opportunity this week to exchange ideas to further the soil survey program.

**Summary of Remarks** by **DeVon Nelson**  
**Soils Group Leader**  
U.S. Forest Service, Milwaukee, Wisconsin

The soils program in the Forest Service is designed to support land management. As on most of the 120 National Forests in the country, the soil scientists in the northeast find the demand for soils information exceeding their capacity to satisfy by conventional **means**. This presents some special challenges.

1. To plan soils work carefully. This requires an overview of the soils on a Forest and soil management problems to help establish priorities in matching limited manpower to information needs.
2. To develop and use special tools. One conceptual device is what we call the land systems approach to land analysis and unit identification. Data storage and retrieval programs and laboratory support **services** are in this category also.
3. To be flexible. The field soil scientist has the primary burden of evaluating the local soils situation and selecting the means to meet soils needs. This responsibility requires a high degree of professionalism.
4. To maintain high standards. As decentralized as we are, job quality is primarily a responsibility of individual soil scientists also. We do look to our cooperation with the SCS and our involvement in the National Cooperative Soil Program to lend a hand-here.

And we have received such help from our sister agency. The SCS has provided direct training for our soil scientist in Vermont. All of the detailed soil mapping on the Allegheny National Forest in Pennsylvania has been done by the SCS. In West Virginia we have a contract with the SCS for mapping 240,000 acres of National Forest land.

The Forest Service method of soil survey is called the soil resource inventory. We see a national trend for greater activity of the soil resource inventory under the National Cooperative Soil Survey Program. This topic was explored in a recent field trip by Bill **Wertz** of the Forest Service and Victor Link of the scs. Their report will soon be available. **Two** factors influencing this trend toward greater cooperation are the new "orders" of soil survey and the recently surfacing interest in the SCS in a holistic approach to soil mapping, best illustrated by Lindo **Bartelli's** statements on Natural Landscape Units. The Forest Service has considerable experience in the use of these techniques that should be of value to the Cooperative Soils Program.

Report on the 1975 National Soil Survey Conference  
January 26-31, 1975, Orlando, Florida

Richard w. Arnold

The focus of the national conference was "Better soil surveys for improving production and the environment" and the contents are reported in the 349 pages of those proceedings.

Personnel from the northeast region who attended were John Ferwerda, Luis Rivera, and John Rourke of the Soil Conservation Service and Robert Rourke and Richard Arnold of the experiment stations. The national conference had one day of formal presentations, one and a half days of discussion groups during which all committee reports were discussed, one half day tour, one day of revised committee reports and recommendations, and one-half day of special addresses and the closing. The format was similar to the 1973 conference.

It was a busy, enjoyable and successful conference. Our thanks went to the organizers and participants for making it a good working session.

I will not comment on each of the committee's reports because they contain recommendations and charges that will be discussed by our Northeast Technical Committees. Thus, we will be informed of specific items through our own reports. I would like to point out some highlights from other presentations at the national conference.

Reports from international guests

Rudy Dudal, FAO

He mentioned the long standing soil s-y program of FAO, the need for more work, and commented that the FAO world maps have permitted us to see some relationship among soils not well known before.

---

G. Flores Mata, Mexico

Hydraulic Resources Secretariat, Soil Science Administration  
Division

They handle irrigation surveys, both big and small projects, with an overall staff of 213 of which 75 are agronomists. In 1974, they reported on 24 big irrigation projects totaling 1,400, 100 ha and 589 small ones that covered 320,000 ha.

Anthony Smyth, England

British Soil Survey Overseas, Land Resource Division

They employ about 60 scientists, the larger part being soil scientists. A big project in Nigeria, when completed in 1977, will have covered over 200,000 sq. miles--more than half the country.

Their work utilizes land system analysis that enables them to do rapid surveys of large areas that have difficult access. It is a hierarchial approach to landscapes similar to the Australian PUCE method. It includes patterns of geomorphology, soil, vegetation and land use. As more detail is needed a shift is made from land systems to components, and to facets. He illustrated a recent project done for Guadalcanal with maps at 1:250,000 and 1:150,000.

A major concern is to ensure that the findings will be put to use. A desire to assess potential productivity has aroused new interest in parameteric methods of interpretation. In summary, many of the same problems we face in our soil survey activities.

#### Report from cooperating agencies

J. R. Balsley, U. S. Geological Survey

He reported on activities of their four main divisions: Geologic, Conservation, Water Resources and Topographic. SCS and TVA also joined in to help produce "Flood Prone" maps--as of then 417 completed, someday maybe 15,000. Orthophoto quads useful to USGS and to our soil survey program. A National Cartographic Information Center established for all U. S. cartographic information. Also training programs in Land Use data and analysis. An excellent review for those of you interested in the many activities of USGC.

H. L. Barrows, Agricultural Research Service

He mentioned project of mutual interest; seven research watersheds, erosion research, water use efficiency, soil characteristics associated with crop yield and quality (selenium work as one example), soil structure and infiltration, plans to control nonpoint sources of pollution-developing predictive runoff modes for EPA.

W. R. Booker, Bureau of Indian Affairs

He reported 1.7 M acres mapped in FY74 and 2.2 M planned for 75. They only have 30 soil scientists so they contract work but he pledged support to the perfecting and implementing of one uniform system of classification and mapping.

J. S. Hagihari, Bureau of Land Management

They are responsible for the National Resource Lands (450 M acres) and have a very active program of inventory. They only have about 30 soil scientists, consequently in FY75 they will reimburse SCS for 4.5 M acres. They also work with Bureau of Reclamation. They have training problems and hope to involve some of their resource managers with the field mapping to help development management interpretations.

W. B. Peters, U. S. Department of Interior, Bureau of Reclamation

Some areas of interest: (1) Reclamation of coal mined areas--they inventory, sample and develop plans, including costs and benefits. They coordinate with BIM, USGS, FS and SCS. In 1974, 4 sites--Montana, Colorado, Utah. In 1975, 6 more sites and 4 more each year for 3 years thereafter. (2) Irrigation Mgt. Services--for more efficient use of water. (3) Colorado River Water Quality Improvement--controls on salinity. (4) A Land Use and Water Planning Institute at Colorado State under Bob Heil for top level management people to look at many aspects of land use (analogous to Soil Science Institute). (5) Remote Sensing Research--including land classification suitability for irrigation--contract with Texas Agricultural Experiment Station at College Station--27 projects. Other multipurpose planning 12 projects.

E. V. Miller, Cooperative State Research Service, USDA

He reported that in 1974 there were 101 projects that related in some manner to soil survey. Fifty supported with federal funds and 50 were state supported. In these projects the frequency of effort was (1) correlation, class and mapping, (2) Interpretation, (3) characterization, (4) land use planning, (5) remote sensing and data bank, and (6) genesis and morphology. The first four were about 20% each, and the last two about 10% each. Publication related to soil survey; 48 in NE out of 163 for US, and the national leader in 1974 was Pennsylvania with 32. Since 1966, the experiment station support for research under heading of appraisal of soil resources has declined from 136 m-years to only 28. Although it looks bleak, he feels that there is a great need to train a new generation of soil scientists, and maintaining cooperation is important.

H. I. Owens, Extension Service

He noted that efforts to assist in getting surveys used in counties is part of their training function. They also help with joint publications, such as Indiana soil productivity ratings, etc.

W. A. Wertz, Forest Service, USDA

They are responsible for obtaining information for the management of the National Forest System Lands. They have stressed the need for a soil survey geared to immediate and practical use--and also the interdisciplinary nature of the approach to soil survey. They are now operational with 165 soil scientists. The Forest Service has completed over 24 M acres under Cooperative Soil Survey and 65 M reconnaissance not correlated by SCS.

Report from Washington Office, Soil Conservation ServiceJ. E. McClelland, Soil Survey Operations

Quality is still a primary objective of the National Cooperative Soil Survey. He mentioned the need for good long range planning to get our backlog cleaned up and move into project surveys. He mentioned the Soils Handbook which most of us are now more familiar with.

L. J. Bartelli, Soil Interpretations

Two major objectives to guide us: (a) adopt a more positive approach, including analysis of potential for given land uses, and (b) develop guidelines to help predict impact that various uses, with improvements, will have on the environment. He reviewed the concept of soil potentials and the need to begin to deal with over-coming limitations, and assessing what will happen. Thus, the future challenge will be to develop efficient and effective methods for delivering complex soil information.

K. W. Flach, Survey Investigations

The theme of the meeting was "Better Soil Surveys for Improving Production and the Environment" and this requires relevant quantitative information for kinds of soils and the interaction of soils and management systems. We need hard data on (a) behavior of water in the soil landscape, (b) interactions of kinds of soils with fertility tests and crop response, (c) interaction of soils and potential pollutants. There will be more emphasis in the future on relating findings to named kinds of soils. Work will continue on improving taxonomy, the laboratories will be consolidated, and investigation positions will be created at TSCs. He also mentioned data management--such as a pedon data bank which is nearly operational now.

R. I. Didcriksen, Land Inventory and Monitoring

A wide variety of inventories being done and he identified 15 activities of 1974. By now most of you have seen or been involved in the Prims Farmland inventories, which is one of the many facets of the LIM program.

J. A. Gockowski, Cartographic Division

Reported on orthophotos, which will bring our surveys into the map user community where standard formats will meet national map accuracy. Orthophotos will provide better accuracy, make compilation easier where difficult terrain makes it hard to mosaic, and will reduce manpower costs in the long run.

M. E. Austin

He reported that the Soil Survey Manual would go out for review during the year and that comments were due back in Jan. 1976.

Special Addresses

George R. Bagley, President of National Association of Conservation Districts

He gave an invigorating pep talk that assured us that being soil scientists was a good profession and that every day we are more appreciated. The NACD is behind soil survey and recommends acceleration of such activities.

Kenneth E. Grant, Administrator of SCS

He commended the cooperative nature of effort, by agencies and among countries. He said Soil Taxonomy will not remain static, the Manual will get finished, the National Soils Handbook will be forthcoming. All such publications, policies, and procedures are to ensure that soil surveys are meeting the needs of all users. After reviewing the numerous activities related to surveys, he said that an important goal of the SCS framework plan is "a soil survey of the nation that is complete and correct"--a goal about 60% accomplished now. He reminded us that American people--all kinds of them--are not an interference with our work, they are the reason for it. "The time for soil science to aid America in catching up and getting ahead of resource dilemmas is now. Your cooperation, your dedication, and your enthusiasm will be vital."

Report of

W. C. C. C.

by

Dr. John **Axley** reported on progress with the regional research project NE-39 (Nitrogen). This group has been actively engaged in research associated with mineralization potential, organic matter decomposition, denitrification, nitrogen fixation, **nitrification** inhibitors (N-serve), and nitrosamines. The project is currently being revised.

Other *regional* research projects which we have a great deal of interest in, but which were not reported on, include: NE-96 (heavy metals), NE-48 (soil - plant atmosphere continuum), and NE-63 (Animal wastes). The NESRC indicated that annual reports from the various regional committees would be greatly desired in the future.

Dr. J. R. Miller (University of Maryland) lead a brief discussion on the increased use of urea fertilizer and the possible **consequences** of its use. Because of **increased losses** of nitrogen by volatilization from urea forms, more research is needed considering methods and rate of application, particularly as it relates to no-till corn.

As an advisory committee to the N.E. Agr. Exp. Sta. Directors, the NESRC often reviews project proposals. This year an interregional project entitled "An Experiment Station Network to Pleasure Changes in the Chemistry of Atmospheric Deposition on Agricultural and Forested Land and on Surface **Waters** in the United States" was sent to us for review. The NESRC recommended to the Agr. Exp. Sta. Directors that this project proposal be turned down because it was incomplete and poorly written, the work was not that important in the N.E. to justify funding, that hatch funds should not be used for monitoring, and that other agencies were already doing much of this work.

Other recommendations to the N.E. Agr. Expt. Sta. Directors included:

1. Because of persistent heavy metals and other detrimental materials, **indiscriminate** use of sludge on **cropland** should be **discouraged** at this time.
2. An active research program with sludges should be continued and northeast sludges and other wastes should be characterized in reference to source.
3. New granular forms of urea should be investigated as to efficiency under various **cropping** and management systems.
4. In view of the necessity of the preservation of agricultural land in the northeast we encourage research to be conducted that will provide basic information for the wise use of all land. For example, **innovative** methods of utilizing marginal land for non-agricultural purposes.

The NESRC meeting was adjourned until January 12 and 13, 1977 at **New** York City. The new officers for the next two years **are:**

J. R. Miller, Chairman

D. Baker, Vice Chairman

L. Douglas, Secretary

COMMITTEE 2

USE OF SOILS FOR WASTE DISPOSAL

CHARGES

The Committee was given four charges as follows:

1. Review findings that have resulted from field testing of "Guide for Rating Limitations of Soils for the Disposal of Waste" dated April 27, 1973. Include any state guidelines that have been developed.
2. Review parameters that must be met for safe waste disposal, comparing state standards and EPA guidelines. On this basis, group categories of waste disposal that can be considered together for land disposal of wastes.
3. Review and summarize any available data on the morphological effects of waste disposal on or in the soil.
4. Compile priority list of current research needs relative to

In addition, Maine has published guidelines for Septic Tank Sludge Disposal on The Land, and for Field Disposal of Waste Potatoes. There is a draft of guidelines being tested in Maine for Sludge Disposal on Land. It emphasizes the nitrogen loading of the soil and the hazards of heavy metal additions.

In Maine's Plumbing Code, Part II Private Sewerage Disposal Regulations, July 1974, limitations are placed on soil depth, drainage, flooding hazard and slope at disposal sites. A table based on soils and slope phases is included to indicate suitability for development with on-site subsurface sewage disposal. The limitations placed on depth to high water table and depth to rock are less than the EPA guidelines for depth to limiting zone. Verification of site conditions by a Registered Soil Scientist is required.

New Hampshire has been using guidelines very similar to Maine's. Recently they have been adopted as regulations.

New Hampshire also has developed guidelines for Septage (liquid Wastes) and Septage (solid Wastes) suggesting parameters for site characteristics and relating rates of application to nitrogen requirements of the crops. These guidelines are very similar to the April 1973 Guide.

Vermont has adopted stringent on-site sewage regulations. Soil investigations are required for proposed developments. For subdivisions larger than three acres, the survey by the Soil Conservation Service may be used along with the Soil Conservation Service interpretations. Soils having "slight" limitations for septic tank sewage disposal or those having limitations that are easily overcome are to be considered acceptable. A certified report of a Soil Scientist acceptable to the Soil Conservation Service obtained through a Natural Resources Conservation District after an on-site review of the terrain and soils may be accepted in place of the Soil Conservation Service Report. Limitations imposed are equivalent to the EPA guidelines, although worded somewhat differently.

New York's guide for dairy manure management was issued in 1973. It uses parameters for land application based on Advisory Soils 14.

In Pennsylvania, a guide for the application of dairy manure has been developed jointly by the Experiment Station, Soil Conservation Service, and Extension Service using Advisory Soils 14 as a guideline. This has not been released as an Extension bulletin because of technical questions about the distinction between optimum application for nutrient and maximum safe application. Use of sewage sludge on farmland is regulated by Department of Environmental Resources through treatment plant permits. Soil evaluation by use of soil surveys or by field investigation is required. Guidelines have not been drafted and approved, but rate of application is based on Nitrogen content and heavy metals. A chemical analysis of representative sludge from the plant is generally required. Guidelines are in use for municipal solid waste to be placed in soil based landfills. There are also drafts of proposed guidelines for special categories of waste including demolition waste, mine waste, industrial sludges, oil and gas well wastes including brine and drilling sludge, and septic tank pumpings.

In August 1974, the regulations under the Pennsylvania Sewage Disposal Act were revised to include some alternatives to the conventional septic tank seepage trenches or beds. At the same time, a list of soil series grouped on the basis of depth, drainage, and flooding hazard was added to the regulations. Slope parameters for various types of systems were also added to the regulations. The regulations conform to the current EPA guidelines.

Spray irrigation of treated sewage effluent is regulated in Pennsylvania with rates keyed to soil depth, drainage, slope, and hazard of ground water pollution.

## CHARGE 2

Some of the parameters for safe waste disposal were mentioned in general terms in the discussion of state guidelines under Charge 1. The comparison with EPA guidelines was also made where there are recognized EPA guides.

In general, state standards or guidelines are more liberal than the EPA guidelines. The latter are mostly in the stage of being considered as suggested guides with the ultimate goal of adoption as standards and incorporated into state regulations for enforcement. Very recently EPA has issued some tentative guidelines which suggest parameters for significant soil and site characteristics. Some may reach the stage of being prerequisite for support of state programs by federal funds. The federal clean streams program exerts a strong indirect pressure for improvement of waste disposal on the land.

Summarizing the state guidelines that are available, it is apparent that they have drawn heavily on the Soil Conservation Service interpretive guidelines for various categories of waste disposal.

A chart showing parameters for a few key soil parameters for several categories for waste is attached. It includes data from states where reports were available to the committee.

It is evident when we scan many guidelines that some degree of grouping of types of waste can be used without sacrificing effectiveness of interpretations. Soil site characteristics which ordinarily affect the suitability of soils for waste renovation and protection of surface and ground waters, and which are common to the needs for many types of waste disposal are: Effective soil depth to rock or other non-soil contact, depth to seasonal high water table, permeability, slope of site, and hazard of flooding. For some uses physical factors such as stoniness, rockiness, or excess clay content hinder the installation and effective operation of disposal sites. Additional factors enter into evaluation when the disposal involves use on agricultural land. These include nutrient needs of the crops, nutrient storage capacity of the soil, effect of the waste on soil structure and erodibility, and the presence of toxic or infective materials in the waste.

When the needs of the various categories of waste are considered it appears that the following key categories could be listed and common soil parameters developed under the principal headings:

1. Farm manures
  - a. Digested sewage sludge
  - b.

When we consider the requirements of soil lined waste lagoons, we have to look to California for data obtained under controlled conditions. Effects of feed lot waste are now being studied in the Midwest and Plains Region.

CHARGE 4

All of our northeastern states responding recognize a need for research on waste disposal on soil. With projects.

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Two main themes were present in the committee discussions and in conference consideration of the Committee's Report. They were:

1. The need for recognition of many kinds of "waste" as resources which can be useful in agricultural production.
2. The importance of protection of the soil and water from pollution which would harm them directly or impair their usefulness or safety as the first links in the food production chain.

The first may be described and illustrated as the "Nitrogen Question" and the second as the "Heavy Metal Hazard". It was felt that the name of the Committee "Use of Soils for Waste Disposal" was a compromise between the old emphasis on disposal and the recent re-emergence of interest in the use of waste in agricultural production.

When the emphasis is put on waste disposal, the goal is getting rid of as much waste as possible per unit-area of land. When the emphasis is shifted to the utilization of the waste, particularly of nutrients such as nitrogen in manures, sludges, and effluent for fertilization, the emphasis changes to determining how much can be applied to produce an economic increase in crop yield. There is a wide range in the quantities as now recommended in state guidelines and regulations. The lowest is in Pennsylvania's tentative guidelines which recommend applying on the equivalent of the nitrate need of the crop to several states which recommend applying twice the crop requirement for available nitrogen. A middle view expressed by some, holds that in an initial year the application should be double the nitrogen requirement of the crop and in subsequent years applications should be reduced to a maintenance level. Some attention should be directed toward the ratio between optimum rate of nitrogen application and the maximum safe rate. It may develop that the maximum is about twice the safe rate or some other simple ratio. Both are dependent to a large degree on the same set of soil and plant characteristics.

For sewage sludges and industrial wastes containing metals and for agricultural or household wastes contaminated with pesticides, herbicides, metal salts, or chemicals there are direct hazards. The greatest concern is the presence of harmful heavy metals. Research is underway at Beltsville and several state stations on the safe limits for these.

It is recommended by the Committee and by resolution of the conference that the Committee be continued for the next two years with a slight change in name to emphasize the use aspect of waste when applied to soil rather than disposal.

COMPARISON OF SOME SITE PARAMETERS - ESTABLISHED OR TENTATIVE

	SCS	EPA	MAINE	N.H.	R.I.	N.Y.	PA
On-site Sewage							
Depth to water table	6' slight 4' moderate	4'	2' conv. 1 1/2' alt.		3' below bed		6' conv. 1 2/3 alt.
Depth to rock	6' slight 4' moderate	4'	2' conv. 1 1/2' alt.		5' below bed		6' c. 1 2/3 a.
Percolation Rate min/in.	0 - 60	0 - 60			0-20 min.-bed 20-60 min.		6-60 min. c. 0-6 min. a. 60-90 min. a.
Farm Manure							
Max. rate of app.	2 N. req. of crop or monitor	2 N. req. of crop or monitor				30T/ac/yr	
Sewage Sludge							
Max. rate of N. app.	2 N. req. of crop or monitor	2 N. req. of crop or monitor	500 lb/ac/yr	4' sl. 2' mod.			
Composted Sludge							
Max. rate of N. app.		2 N. req. of crop or monitor		4' sl. 2' mod.			
Spray Irrigation							
Permeability in./hr.	0.6-6.0 sl. 6-20' mod. 0.2-0.6 mod.			0.6-2.0 sl. 2.0-6.0 mod. 0.2-0.6 mod.			Variable application
Septic Tank Pumpings							
Depth to water table				4' sl. 2' mod.		> 2 1/2' 1 1/2-2 1/2' Rest.	3' 4'
Depth to rock				4' sl. 2' mod.			4'
Solid Waste-Landfill Site							
Depth to water table	6'		1 2/3'				6' from base
Depth to rock	6'		5'				6' from base
Permeability	< 2"/hr.		< 2"/hr.				
Demolition Waste Site							
Depth to water table							3'
Depth to rock							4'

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NORTHEASTERN COOPERATIVE SOIL SURVEY CONFERENCE

JANUARY 12-16, 1976

REPORT OF COMMITTEE 3, INVENTORY AND USE OF FOREST SOILS

Members of the Committee are as follows:

Chairman - J. Ferwerda (FTS 833-7393)  
(Comm. 207-866-2132)

Vice Chairman - De Von Nelson (FTS 362-3344)

J. Foss  
F. L. Gilbert  
F. Putnam  
R. Rourke  
K. Schmude  
M. B. stone  
R. Hartung

The Committee was charged by the general chairman as follows to:

1. Determine how soil taxonomy fits into the ecosystem approach of forest site classification.
2. Determine what kinds of soil surveys (scale, mapping units and interpretations) are needed in forest management for:
  - a. small forested areas
  - b. extensive forest areas.
3. **Explore** techniques for mapping soils in forested areas.
4. Review the criteria for rating potential erosion hazard of soils in forested areas in the Northeast.

Committee Summary on Charge I

The major criticism on the Use of Soil Taxonomy in the ecosystem approach to classifying forested lands is that Soil Taxonomy and its resulting soil surveys are agricultural, that the differentiating properties are minutely detailed and not significant for forest lands and that soils observations are not deep enough.

There appears to be a misunderstanding of the purposes of Soil Taxonomy and its resulting soil surveys. Soil surveys inventory just one thing

and that is soil - one component of a natural resource inventory, soils. Many still harbor the idea that there is only one kind of soil survey and that is a "detailed soil survey" at 1:15,840 or 1:20,000 scale. Soil surveys can and are made at many different scales to serve the objective of the surveys. Soil surveys are made primarily to learn more about the environment (soils, soil gneiss, plant relationship, etc.) and how to use and manage the soils and still maintain a quality environment. Many land systems maps are the equivalent of soil maps; many use soil series and some are correlated.

#### Recommendations

1. That Soil Taxonomy be published and given wide distribution.
2. That the basic philosophy and purpose of soil surveys be publicized.
3. That the different kinds of soil surveys (order 1-5) and scale of mapping and the uses of these kinds of surveys be publicized.
4. That those engaged in classifying forested lands in the U.S. be encouraged to use Soil Taxonomy in their classification systems.
5. That a team (forester, pedologist, geologist) approach be considered in mapping forested lands in the U.S.
6. That the use of taxonomic units above soil series be publicized.

#### Committee Summary on Charge II

The comments and review indicate that scale and intensity of mapping forested lands will depend on the objectives of the survey and complexity of soils on the ground. In general it appears that most small forested areas can be effectively mapped at order 2 level at scales of 1:20,000 to 1:31,680. For extensive forested areas the general consensus is an order 3 type soil survey with scales of 1:24,000 to 62,500. Choice of scale will again depend on the kind of management units one will be dealing with. In both small and extensive forested areas more detailed soils information is needed for special studies as growth plots and research areas.

#### Recommendations

1. That in soil mapping forested areas the objective of the survey will be the main factor governing choice of order and scale. Other factors are the complexity of soils and the manpower available for the survey.

2. That careful planning from the beginning is essential. That a hierarchal approach can be used going from broad mapping units and small scale to more detailed or refined units and larger scale.
3. That this committee get together in the field with the U.S. Forest Service to see what they are doing; the kinds of mapping units used and interpretations made. That Dr. Bartelli and Bill Lloyd also attend. De Von Nelson will be in the White Mountain National Forest in September this year. This would be a good time to implement this recommendation. **That De Vo** Nelson inform the chairman of this committee as early as possible a definite date so this recommendation can be carried out.

#### Committee Summary on Charge TII

High quality up-to-date stereo air photos are a necessary tool in soil surveying extensive forested areas. The techniques presently used by most surveys are to delineate landforms by photo interpretation in the office after one has become familiar with the area by preliminary field studies. Typical mapping units are then tested by transecting to determine their composition and predictive value for the soils associated with landscape features. Each tested discrete **landform** becomes a **valid** mapping unit. Mapping can then proceed rapidly by photo interpretation verified by field transects, traverses and observations. Aircraft can be used to verify some kinds of mapping units. All terrain vehicles and snowmobiles can be used to observe areas inaccessible by other means. Use of infrared, color photography, radar and other remote sensing techniques are still in the experimental stage for soil surveying. Small forested areas that are generally surrounded by open land can be and generally are mapped by the techniques used for detailed mapping of open land. These areas can be mapped by making closely spaced transects, generally at right angles to the drainage pattern.

#### Recommendations

1. That the committee keep in touch with those states making soil surveys in extensive forested areas to evaluate some of the newer innovations for mapping forested areas, such as the use of aircraft, all terrain vehicles, the use of remote sensors and other techniques.

#### Summary of Committee on Charge IV

The consensus of the committee appears to be that K value (those issued by the Principal Correlators Office, Ithaca, N.Y., dated Nov. 12, 1963) as a guide for rating Erosion Hazard in Woodland Operations

is not **satisfactory**. These K values are based on surface texture of **cropland** soils and do not take into account the surface stoniness of many uncultivated forested soils. K values of the B and C horizons appear to be a more satisfactory criteria but is not a meaningful interpretation by itself. Most of the erosion in forested areas is caused by forest harvest operations disturbing the forest floor and occur as rill and gully erosion. Erosion hazard is also dependent on position in the landscape, slope gradient, slope length, slope shape, coarse fragments, vegetative cover, etc.

The present (Draft National Handbook for Woodland Conservation Section 400 pp 5) uses K value and slope gradient and does not take into account those **items** listed for Erosion Hazard on pp 4 of Soils Memo 26. It still **uses** K values, issued by the Principal Soil **Correlators** Office, **Ithaca**, New York, Nov. 12, 1963.

#### Recommendations

1. That consideration be given to replacing Erosion Hazard in Woodland Interpretations in the Northeast by limitation ratings for Road and Skid Trails. Updated K values for B and C horizons can be a criteria for this rating.
2. That criteria for rating soils for rill and gully erosion in forested areas be developed.
3. That this **committee** gather data and poll the Northeast states on the credibility of using K value as an indication of soil erosion hazard in woodland operations.

#### COMMENTS ON REPORT OF COMMITTEE 3

#### INVENTORY AND USE OF FOREST SOILS

1. Soil Taxonomy:
  - F. Gilbert - Dog and pony show - communicate **with** schools, popular kind of soil taxonomy.
  - J. Rourke - Taxonomy will be used. Would be more widely used if better known.
  - K. Flach - Can't read Soil Taxonomy - unless for series as applied - need a readable account.
  - R. Field - Need to inform cooperators on overview of taxonomy available.
  - R. Arnold - Civil engineers need a key work list.

J. Ferwerda - Interpretations at series and family level but also need interpretations at subgroup level.

K. Flach - Soil survey manual is written for order 2 level of interpretations. Soil survey appraisal - asked state forester how used - useless - thinks right on **inter-**discipline. Some treatment of aspect should be included. Don't consider the organic pad.

O. Rice - Chapter 11 is on how to interpret soils by order.

F. Gilbert - Mapping broader is confused with classifying broader. Need to think of individual pedon.

J. Rourke - Must have representative profiles but must describe mapping unit broadly.

K. Flach - Don't gain much in terms of generalizations. Must still combine individuals. "Typifying pedon" - couldn't disagree more with idea. Minnesota has had experience with this.

O. Rice - Weyerhaeuser hung series names on soils.

J. Foss - Rig difference. Soil Resource Inventory (SRI) has a geological bias.

R. Hartung - Weyerhaeuser said we aren't mapping series.

K. Flach - Moll types for regeneration.

Van Eck - Different kinds of people - but can still say something worthwhile.

F. Gilbert - Higher levels have strange bedfellows.

K. Flach - Soils map of U.S. based on series.

H. Hildner - Question on detail - need to determine a given level.

J. Foss - Need a 1"/mile map to get into the ball game,

2. Kind of Scale:

Nelson - Flexibility needed for different levels of management, money available for survey and time frame in which information is needed.

3. Techniques :

K. Flach - One more technique - slope maps - topo sheets - tapes from ortho photos.

4. Soil Erosion:

F. Cleveland - Memo 19 - rating soils for **woodland crops** - erosion hazard. W. O. - K values in **Engineering Handbook** when **developed criteria had forestry people** from Universities - decided to use **K values** - tied in with slope - woodland crops under forested conditions - assumed vegetative cover. Other regions have **different k values**.

R. Hartung - **K value by itself is useless**. Need something we can tie directly to specific practices.

F. Cleveland - Will overhaul **ordination systems** and will take a look at erosion problems.

Nelson - May be mixing apples and oranges - erosion and **mass** movement are different critters.

5. It was recommended that Committee 3, Inventory and Use of Forest **Soils be continued to improve communication and liaison with U.S. Forest Service and other foresters in** using soils information in forest management **operations** and to follow up on other recommendations in this report.

1976 NORTHEAST COOPERATIVE SOIL SURVEY CONFERENCE

NEW YORK CITY, JANUARY 12-16, 1976

REPORT OF COMMITTEE 4

SOIL SURVEY INTERPRETATIONS

Charges:

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Recommendations of the Committee:

1. When the guide for rating potential frost action is revised, the presence of a source of water within reach of a forming ice lens should be stressed. The following footnote should be added to the guide "This guide is based on the assumption that a source of free water is present. If the source of water is not present, the rating may be reduced one class."
2. Suitability ratings of soils for road fill continue to use susceptibility to frost action as a rating criteria. This recommendation is made to reverse a recommendation of the 1974 NSSWPC.
3. The Assistant Principal Correlator for Interpretations for the 4 regions jointly prepare general guidelines for states to use in preparing soil potential ratings. These guidelines should result in soil potentials ratings that have comparable meaning and application.
4. Soil potential ratings should be developed only after alternatives for overcoming limitations are identified and documented for the survey area or area for which they are prepared. The committee supported the concept of soil potentials as outlined in Dr. Lindo J. Bartelli's report to the National Work Planning Conference in 1975.
5. Each state in the Northeast should send other states in the Northeast a copy of each set of potential ratings it prepares. This will promote familiarity with quality and more uniformity in soil potential ratings.
6. Recommendations for improving the ADP preparation of Forms SW-SOILS-5 and interpretations tables are in Appendix 8. The items accepted by the committee are marked "endorsed by committee." Others are marked "already in effect."

Committee Report:

Charge 1

This was also a charge to the Soil Survey Interpretations Committee of the 1974 Northeast Soil Survey Work Planning Conference. The 1974 conference made two recommendations which the 1976 committee considered: They are 1) Frank Vieira and Robert Rourke serve as a committee to propose a new guide for rating soils for potential frost action in the frigid temperature regime and Sy Ekert and Robert Shields prepare a new guide for the mesic soils; and 2) a recommendation to delete susceptibility to frost action as an item affecting the suitability rating as a source of roadfill.

The purpose of including charge 1 to committee 4, 1976 NECSSC, was to test the guides developed by Vieira-Rourke and Shields-Markley (Markley as a substitute for Ekert) asked for in Recommendation 2, 1974 NECSSC.

The proposed guide for Frost Action Classes by Vieira-Rourke and Shields-Markley is attached as Appendix 1. The application of the proposed guide to the soils in several states is attached as Appendix 2.

The Committee concluded that the proposed change in the way potential frost action is rated is not an improvement over the present guide. The Committee is still not satisfied with the present guide but does not have a better overall guide to propose. Specific improvements were suggested as follows:

In the past we have rated potential frost action as if a water source were always present. The Committee recommended that the presence of a source of water be stressed more in the guide when it is revised.

The recommendation of the 1974 Conference to delete susceptibility to frost action as an item affecting suitability rating as a source of roadfill was reconsidered in light of the information contained in Appendix 3. The Committee recommended that we continue to rate potential frost action of soil material as a factor affecting its suitability as road fill. The reasoning is that many fills, if not most, are in low areas when a source of water may be present. The rating will warn that frost action may be a problem with susceptible soil material unless placed beyond the reach of or protected from free water.

## Charge 2

In the 1974 conference, Committee 3 was responsible for the subject covered in this charge.

There were several reasons for including this as a charge to Committee 4 of the 1976 conference. The National Cooperative Soil Survey appear to be moving toward rating soils according to their potential suitability.

We hoped that enough states would have developed potential ratings to have several examples for review by the conference. There has been only limited use of the potential concept in the Northeast. Examples are attached as Appendix 4, 5 and 6. A copy of the narrative, part of a report supplied by Gene Grice of Massachusetts is attached as Appendix 4. Comments by Robert Joslin and examples of a format for relating potentials, limitations, suitability, etc. used in Vermont, are attached as Appendix 5. Part of a report from New York by Roger J. Case is attached as Appendix 6. This is a very interesting approach.

Dr. Fred Miller and Robert Shields summarized their thoughts on soil potentials. The report by Dr. Miller is attached as Appendix 7.

Discussion of this charge centered around the following items:

Concern was expressed about the ability to collect the data needed to support rating the potential of soils for various uses. The data collecting job appears to be extremely challenging in the Northeast because of complex soil patterns.

Reservations were expressed about the statement in Chapter 11 of the draft soil survey manual that potential ratings would be made for mapping units rather than taxonomic units.

Concern for the amount of coordination of soil potentials between survey areas within a state and between states was expressed.

The possibility that soil potential ratings might create legal problems through jeopardizing privacy was mentioned.

The committee concluded that, at a minimum, each state should have guidelines for making soil potential ratings.

In making potential ratings the **Committee** recognized the following steps:

1. Making limitation ratings for the soils
2. Establishing objectives or the purpose for which potential ratings are being made and constraints if any
3. Determining alternatives to overcome limitations and reach objectives
4. Assigning potential rating

The Committee felt that a multidiscipline team, including representatives of the group that will use the ratings, should work together in making potential ratings. "That the term "**soil potentials**" be reserved for use with ratings which are accompanied by an agreed upon set of criteria and a documented source of data for practices which overcome limitations. In other words, we should reserve the term "**soil potential**" for a specific kind of documented **interpretation and** the rating would have meaning only within a defined **universe** and context. This would preclude the use of the terms "**soil potential**" in a general **sense in** published soil **survey** reports and other material.

### Charge 3

When we first solicited ideas for charges to Cowittee 4 back in 1974, there seemed to be a good bit **of** interest in this charge. However, fewer comments were received than expected. A summary of the **comments** received are attached as Appendix 8. The **recommended** Improvements accepted by the **Committee** are **marked** "endorsed by Committee.": Others are marked "already **in effect**." The remainder were not endorsed by Committee.

### Charge 4

In May 1974 the **Committee** members were informed about the final charger and plans for **completing** them. At that **time**, it was speculated that the **GIEUS** would be revised sometime in the future. The call for suggested changes in the **GIEUS** came about faster than anticipated. **Recommended** changes have already been solicited from all **states**. Most of the Conference members participated in the reviews of the guides. This may account for the **very few** responses received relative to **this** charge. Recommended changes for **some** of the guides have already been summarized and forwarded to the **Washington Staff**. These are for:

Embankments, Dikes and Levees  
Pond Reservoir Areas  
Land  
Gravel  
Grassed Waterways  
Terraces and Diversion<sup>6</sup>

Irrigation  
Drainage  
**Excavated Ponds,**  
Aquifer Fed



Appendix 2

Frost Action Potential for New Jersey Soils

Soil Series	Classification	Frost Action Class	
		Markley Shibles	Rourke Viera
Adelphia	Fine-loamy, mixed, mesic, Aquic Hapludults	High	High
Amwell	Fine-loamy, mixed, mesic, Aquic Fragluudults	High	High
Annendale	Fine-loamy, mixed, mesic, Typic Fragluudults	Moderate	High
Atsion	Sandy, siliceous, mesic, Aeris Haplaquods	Moderate	Moderate
Aura	Fine-loamy, mixed, mesic, Typic Hapludults	Moderate	High
Bartley	Fine-loamy, mixed, mesic, Typic Fragluudults	Moderate	High
Berryland	Sandy, siliceous, mesic, Typic Haplaquods	Moderate	Moderate
Boonton	Coarse-loamy, mixed, mesic, Typic Fragluudults	Moderate	Moderate
Caiffon	Fine-loamy, mixed, mesic, Typic Fragluudults	Moderate	High
Cokesbury	Fine-loamy, mixed, mesic, Typic Fragluquults	High	High
Colemantown	Clayey, glauconitic, mesic, Typic Ochraquults	High	High
Collington	Fine-loamy, mixed, mesic, Typic Hapludults	Moderate	High
Colts Neck	Fine-loamy, mixed, mesic, Typic Rhodudults	Moderate	High
Croton	Fine-silty, mixed, mesic, Typic Fragluquults	High	High
Downer	Coarse-loamy, siliceous, mesic, Typic Hapludults	Moderate	Moderate
Dunellen	Coarse-loamy, mixed, mesic, Typic Hapludults	Moderate	Moderate
Evesboro	Mesic, coated, Typic Quartzipsamments	Low	Low
Fort Mott	Loamy, siliceous, mesic, Aracic Hapludults	Moderate	Moderate
Fredon	Coarse-loamy over sandy or sandy-skeletal, mixed, nonacid, mesic, Aeris Haplaquupts	High	High
Haledon	Coarse-loamy, mixed, mesic, Aquic Fragluudults	High	High
Halsey	Coarse-loamy over sandy or sandy-skeletal, mixed, nonacid, mesic, Mollic Haplaquupts	High	High
Hamonton	Coarse-loamy, siliceous, mesic, Aquic Hapludults	High	High
Hazen	Coarse-loamy over sandy or sandy-skeletal, mixed, mesic, Mollic Hapludults	Moderate	Moderate
Hibernia	Coarse-loamy, mixed, mesic, Aquic Fragluudults	High	High
Holmdel	Fine-loamy, mixed, mesic, Aquic Hapludults	High	High
Keaneburg	Fine-loamy, mixed, mesic, Typic Umbraquults	High	High
Keyport	Clayey, mixed, mesic, Aquic Hapludults	High	High
Kresson	Clayey, glauconitic, mesic, Aquic Hapludults	High	High
Lakehurst	Mesic, coated, Haplaquodic Quartzipsamments	Low	Low

Frost Action potential for New Jersey Soils-2

Soil Series	Classification	Frost Action Class	
		Markley Shield	Rourke Viers
Lakewood	Mesic, coated, Spodic Quartzipsamments	Low	Low
Lansdale	coarse-loamy, mixed, mesic, Typic Hapludults	Moderate	Moderate
Lansdowne	Fine mixed, mesic, Aquultic Hapludalfs	High	High
Lincroft	Siliceous, mesic, Typic Udipsamments	Low	Low
Monmouth	Clayey, mixed, mesic, Typic Hapludults	Moderate	Moderate
Natcong	Coarse-loamy, mixed, mesic, Ruptic-Ultic Dystrochrepts	Moderate	Moderate
Nixon	Fine-loamy, mixed, mesic, Typic Hapludults	Moderate	High
Norton	Fin., mixed, mesic, Ultic Hapludalfs	Moderate	Moderate
Parker	Loamy-skeletal, <input type="checkbox"/> ix.d. mesic, Typic Dystrochrepts	Moderate	Moderate
Parsippany	Pin., mixed, mesic, Aeris Ochraqualfs	High	High
Pattenburg	Loamy-skeletal, mixed, mesic, Typic Hapludults	Moderate	Moderate
Pemberton	Loamy, mixed, mesic, Arenic Hapludults	Moderate	Moderate
Pompton	Coarse-loamy, mixed, . sic, Aquic Dystrochrepts	High	High
Preakness	Coarse-loamy, mixed, acid, mesic, Typic Humaquepts	High	High
Quakertown	Fine-loamy, mixed, mesic, Typic Hapludults	Moderate	High
Rockaway	Coarse-loamy, mixed, mesic, Typic Fragiudults	Moderate	Moderate
Royce			
Shrewsbury			
Tinton			
Washington			
Woodmansie			

## Appendix 2

### Potential Frost Action for Series That Vermont is Responsible For

<u>Soil Series</u>	<u>Bourke-Vieira Guide</u>	<u>Engineering Guide</u>
Rensselaer	Moderate	Moderate
Buckland	High	High
Cabot	High	High
Celala	Moderate	Moderate
Colrain	Moderate	Moderate
Covington	High	Moderate
Eldridge	Low	Low
Enosburg	Moderate	Moderate
Georgia	Moderate	Moderate
Glover	Moderate	Moderate
Hartland	High	High
Hinsburg	Low	Low
Limerick	High	High
Livingston	High	Moderate
Munson	High	High
Panton	High	Moderate
Peacham	High	High
Pomfret	Low	Low
Raynham	High	High
St. Albans	Moderate	Moderate
Stowe	Moderate	Moderate
Tunbridge	Moderate	Moderate
Vergennes	Moderate	Moderate
Vershire	Moderate	Moderate
Woodstock	Moderate	Moderate

Appendix 2

MARYLAND SERIES RATED  
FOR  
POTENTIAL FROST ACTION

<u>SOIL SERIES</u>	<u>SOIL FAMILY</u>	<u>FROST ACTION CLASS</u>
		<u>THE</u> <u>ROURKE-</u>
<u>ALDINO</u>		

SOIL SERIES	SOIL FAMILY	FROST ACTION CLASS	
		'THE GUIDE (MARKLEY- SHIELDS)	ROURKE- VIEIRA
GALESTOWN	SANDY, SILICEOUS, MESIC PSAMMENTIC HAPLUDULTS	LOW	LOW
GLENELG	FINE-LOAMY, MIXED, MESIC TYPIC HAPLUDULTS	MODERATE	HIGH
HOWELL	CLAYEY, MIXED, MESIC TYPIC HAPLUDULTS	MODERATE	MODERATE
JOPPA	LOAMY-SKELETAL, SILICEOUS, MESIC TYPIC HAPLUDULTS	MODERATE	MODERATE
KINKORA	CLAYEY, MIXED, MESIC TYPIC OCHRAQUULTS	MODERATE	HIGH
KLEJ	MESIC, COATED AQUIC QUARTZIP- SAMMENTS	MODERATE	MODERATE
LANTZ	FINE-LOAMY, HIKED, MESIC TYPIC UMBRAQUALS	HIGH	HIGH
LEGORE	FINE-LOAMY, MIXED, MESIC ULTIC HAPLUDALFS	MODERATE	HIGH
LEONARDTOWN	FINE-SILTY, MIXED, MESIC TYPIC PRAGIAQUULTS	HIGH	HIGH
LICKDALE	FINE-LOAMY, MIXED, ACID, MESIC HUMIC HAPLAQUEPTS	HIGH	HIGH
LINGANORE	LOAMY-SKELETAL, MIXED, MESIC ULTIC HAPLUDALFS	MODERATE	MODERATE
LOYSVILLE	FINE-LOAMY, HIKED, MESIC TYPIC FRAGIAQUALFS	HIGH	HIGH
MANOR	COARSE-LOAMY, MICACEOUS, MESIC TYPIC DYSTROCHREPTS	MODERATE	MODERATE
MARR	FINE-LOAMY, SILICEOUS, MESIC TYPIC HAPLUDULTS	MODERATE	HIGH
MATAPEAKE	FINE-SILTY, MIXED, MESIC TYPIC HAPLUDULTS	HIGH	HIGH
MATAWAN	FINE-LOAMY, SILICEOUS, MESIC HAPLUDULTS	HIGH	HIGH
MONTALTO	FINE, MIKED, MESIC ULTIC HAPLUDALFS	MODERATE	MODERATE
MT. AIRY	LOAMY-SKELETAL, MICACEOUS, MESIC TYPIC DYSTROCHREPTS	MODERATE	MODERATE
MUIRKIRK	CLAYEY, KAOLINITIC, MESIC, ARENIC PALEUDULTS	MODERATE	MODERATE
OTHELLO	FINE-SILTY, MIXED, MESIC TYPIC OCHRAQUULTS	HIGH	HIGH
RELAY	FINE-LOAMY, MIXED, MESIC TWIC HAPLUDALFS	MODERATE	HIGH
ROHRERSVILLE	FINE-SILTY, MIXED MESIC AQUIC FRAGILDAUFS	HIGH	HIGH
SUNNYSIDE	FINE-LOAMY, SILICEOUS, MESIC TYPIC HAPLUDULTS	MODERATE	HIGH
TALLEYVILLE	FINE-SILTY, MIXED MESIC TYPIC HAPLUDULTS	HIGH	HIGH
TREGO	FINE-LOAMY, MIXED, MESIC TYPIC FRAGIUDULTS	MODERATE	HIGH

SOIL SERIES	SOIL FAMILY	FROST ACTION	
		THE GUIDE (MARKLEY SHIELDS)	ROURKE- VIEIRA
URBANA	<b>FINE-LOAMY, MIXED, MESIC</b> AQUIC <b>FRAGIUDALFS</b>	HIGH	HIGH
WATCHUNG	FINE, MIXED, <b>MESIC</b> TYPIC <b>OCHRAQUALFS</b>	MODERATE	HIGH
WESTPHALIA	COARSE-LOAMY, SILICEOUS, MESIC <b>OCHREPTIC HAPLUDULTS</b>	MODERATE	MODERATE
WHITEFORD	<b>FINE-LOAMY, MIXED, MESIC</b> TYPIC <b>HAPLUDULTS</b>	<b>MODERATE</b>	HIGH
WOODSTOWN	<b>FINE-LOAMY, SILICEOUS,</b> <b>MESIC</b> AQUIC <b>HAPLUDULTS</b>	MODERATE	HIGH

Charge 1

Appendix 2

MAINE SOILS RATED FOR POTENTIAL FROST ACTION

Rourke-Viera

SHIELDS-MARKLEY & GIBBS

Allagash	Low	Low
Bangor	Moderate	Moderate
Biddeford		Moderate
Burnham	High	High
Buxton		High
Caribou	Moderate	Moderate
Conant	Moderate	Moderate
Deagle	High	High
Dixmont	Moderate	High
Easton	High	High
Elmwood		High
Hermon	Low	Low
Hiram	High	High
Howland	Moderate	High
Linneus	Moderate	Moderate
Nachiee	Low	Moderate
Madawaska	Moderate	Moderate
Mapleton	Moderate	Moderate
Nelrose		Moderate
Monarda	High	High
Ondava		Low
Perham	High	Moderate
Pleisted	High	Moderate
Redish		Moderate
		High
		Moderate
		High
		Moderate
		High
		Moderate
		Low
		High
		High
		High
		Moderate
		High

Appendix 2

SOILS FOR WHICH NEW YORK STATE HAS RESPONSIBILITY

RATINGS FOR POTENTIAL FROST ACTION

<u>SERIES</u>	<u>ENG. GUIDE</u>	<u>ROURKE-VIEIRA GUIDE</u>
ADAMS	LOW	IDW
ALDEN	HIGH	HIGH
<b>ALLARD</b>	HIGH	HIGH
ALLIS	MOD. - HIGH	HIGH
ALTMAR	<b>MODERATE</b>	MODERATE
<b>ALTON</b>	MODERATE	MODERATE
<b>AMBOY</b>	HIGH	HIGH
AMENIA	HIGH	HIGH
ANGOLA	HIGH	HIGH
<b>APPLETON</b>	HIGH	HIGH
<b>ARKPORT</b>	MODERATE	MODERATE
ARNOT	<b>MODERATE</b>	MODERATE
ATHERTON	HIGH	HIGH
AURORA	HIGH	HIGH
<b>BARBOUR</b>	<b>MODERATE</b>	MODERATE
BARRE	MOD. - HIGH	HIGH
<b>BASHER</b>	HIGH	HIGH
BATH	<b>MODERATE</b>	MODERATE
<b>BLASDELL</b>	<b>MODERATE</b>	<b>MODERATE</b>
BOMBAY	MODERATE	MODERATE
BONAPARTE	<b>LOW</b>	<b>LOW</b>
<b>BRAYTON</b>	HIGH	HIGH
<b>BRIGGS</b>	MODERATE	MODERATE
BROADALBIN	MODERATE	MODERATE
<b>BROCKPORT</b>	<b>MOD. - HIGH</b>	HIGH
<b>BURDETT</b>	HIGH	HIGH
<b>CAMILIUS</b>	MODERATE	HIGH
<b>CAMRODEN</b>	HIGH	HIGH
CANAAN		
<b>CANADICE</b>	MOD. * HIGH	HIGH
CANANDAIGUA	HIGH	HIGH
<b>CANASERAGA</b>	HIGH	HIGH
<b>CANEADEA</b>		
<b>CASTILE</b>	HIGH	HIGH
<b>CAYUGA /</b>	<b>MOD. - HIGH</b>	HIGH
CAZENOVIA	<b>MODERATE</b>	HIGH
<b>CHATFIELD</b>	MODERATE	<b>MODERATE</b>
CHAUMONT	<b>MODERATE-HIGH</b>	HIGH
CHEEKTOWAGA	<b>MODERATE</b>	MODERATE
CHENANG	MODERATE	MODERATE
CHIPPEWA	HIGH	HIGH
CHURCHVILLE	MOD. - HIGH	HIGH
<b>CLAVERACK</b>	MODERATE	MODERATE
COLIAMER	HIGH	HIGH
<b>COLONIE</b>	LOW	<b>LOW</b>

<u>SERIES</u>	<u>ENG. GUIDE</u>	<u>ROURKE-VINTIRA GUIDE</u>
COLOSSEE	MODERATE	MODERATE
COLTON	<b>LOW</b>	<b>LOW</b>
CONESUS	MODERATE	HIGH
CONSTABLE	<b>LOW</b>	IDW
COOK	<b>MODERATE</b>	MODERATE
COPAKE	MODERATE	MODERATE
COSAD	MCDERATB	MODERATE
HONEOYE	<b>MODERATE</b>	HIGH
HOOSIC	<b>LOW</b>	<b>LOW</b>
HORNELL	<b>MOD. - HIGH</b>	HIGH
HOWARD	MODERATE	<b>MODERATE</b>
HUDSON	MOD. - HIGH	HIGH
ILION	HIGH	HIGH
IRA	MODERATE	MODERATE
JUNIUS	<b>MODERATE</b>	MODERATE
KANONA	MOD. - HIGH	HIGH
KARS	<b>MODERATE</b>	<b>MODERATE</b>
KENDA IA	HIGH	HIGH
KINGSBURY	MOD. - HIGH	HIGH
<b>LAIRDSVILLE</b>	MODERATE	MODERATE
<b>LAKEMONT</b>	MOD. - HIGH	HIGH
<b>LAMSON</b>	HIGH	HIGH
<b>LANGFORD</b>	HIGH	HIGH
LANSING	<b>MODERATE</b>	HIGH
<b>LIMA</b>	<b>MODERATE</b>	HIGH
<b>LOCKPORT</b>	MOD. - HIGH	HIGH
<b>LORDSTOWN</b>	<b>MODERATE</b>	<b>MODERATE</b>
<b>LOWVILLE</b>	MODERATE	MODERATE
<b>LYONS</b>	HIGH	HIGH
MADALIN	MOD. - HIGH	HIGH
MADRID	MODERATE	MODERATE
<b>MANHEIM</b>	HIGH	HIGH
MANLIUS	MCDERATE	MODERATE
MARCY	HIGH	HIGH
<b>MARDIN</b>	<b>MODERATE</b>	<b>MODERATE</b>
<b>MARILLA</b>	MODERATE	HIGH
<b>MARTISCO</b>	HIGH	HIGH
<b>MASSENA</b>	HIGH	HIGH
<b>MIDDLEBURY</b>	HIGH	HIGH
<b>MINOA</b>	HIGH	HIGH
MOHAWK	MODERATE	HIGH
<b>MONTAUK</b>	MODERATE	<b>MODERATE</b>
MOSHERVILLB	HIGH	HIGH
NASSAU	<b>MODERATE</b>	MODERATE
NAUMBURG	<b>MODERATE</b>	MCDERATB
<b>NELLIS</b>	<b>MODERATE</b>	MCDERATB
<b>NEWSTEAD</b>	HIGH	HIGH
NIAGARA	HIGH	HIGH
<b>NICHOLVILLE</b>	HIGH	HIGH

<u>SERIES</u>	<u>ENG. GUIDE</u>	<u>ROURKE-VIEIRA GUIDE</u>
NORWICH	HIGH	HIGH
NUNDA	HIGH	HIGH
ODESSA	<b>MOD. - HIGH</b>	HIGH
ONTARIO	MODERATE	HIGH
<b>OQUAGA</b>	MODERATE	MODERATE
ORPARK	HIGH	HIGH
<b>OTISVILLE</b>	<b>LOW</b>	<b>LOW</b>
OVID	HIGH	HIGH
PALATINE	MODERATE	<b>MODERATE</b>
<b>PALMYRA</b>	MODERATE	HIGH
PHELPS	HIGH	HIGH
PINCKNBY	MODERATE	MODERATE
PLYMOUTH	<b>LOW</b>	<b>LOW</b>
<b>POTSDAM</b>	<b>MODERATE</b>	<b>MODERATE</b>
RED HOOK	HIGH	HIGH
REMSEN	MOD. - HIGH	HIGH
RHINEBECK	<b>MOD. - HIGH</b>	HIGH
<b>RIGA</b>	MOD. - HIGH	HIGH
<b>RIVERHEAD</b>	MODERATE	MODERATE
ROMULUS	HIGH	HIGH
<b>SALMON</b>	HIGH	HIGH
<b>SCHOHARIE</b>	MODERATE	<b>MODERATE</b>
<b>SCHUYLER</b>	HIGH	HIGH
SC10	HIGH	HIGH
<b>SCRIBA</b>	HIGH	HIGH
<b>SODUS</b>	<b>MODERATE</b>	MODERATE
<b>STAFFORD</b>	<b>MODERATE</b>	<b>MODERATE</b>
SUN	<b>HIGH</b>	HIGH
TEEL	HIGH	HIGH
<b>TIOGA</b>	<b>MODERATE</b>	MODERATE
<b>TROUT RIVER</b>	<b>LOW</b>	<b>LOW</b>
<b>TUGHILL</b>	HIGH	HIGH
<b>TULLER</b>	HIGH	HIGH
<b>UNADILLA</b>	HIGH	HIGH
<b>VALOIS</b>	MODERATE	MODERATE
<b>VARICK</b>	HIGH	HIGH
VARYSBURG	MODERATE	MODERATE
<b>VOLUS IA</b>	HIGH	HIGH
<b>WALLINGTON</b>	HIGH	HIGH
<b>WALKILL</b>	HIGH	HIGH
<b>WAMPSVILLE</b>	<b>MODERATE</b>	HIGH
WARNERS	HIGH	HIGH
WASSAIC	MODERATE	HIGH
<b>WAYLAND</b>	HIGH	HIGH
<b>WESTBURY</b>	HIGH	HIGH
WILLIAMSON	HIGH	HIGH
<b>WILPOINT</b>	MOD. - HIGH	HIGH
<b>WORTH</b>	MODERATE	MODERATE

Dual ratings **are** for clayey **soils** which range from **slow** to **very** slow permeability

Appendix 3

UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

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Washington, D. C. 20250

COPY  
SUBJECT: SOILS-12-Interpretations - Steuben County  
New York

DATE: March 28, 1975

TO: John D. Rourke  
Principal Soil Correlator  
SCS. TSC, Upper Darby, Pa.

We have discussed the issues raised in your memo of March 21, regarding soil interpretations in the Steuben County, New York, manuscript with members of the soils and engineering staffs. We have the following suggestions:

Potential frost action

Very poorly drained

John D. Rourke

2

Roadfill

Our interpretations are made for low **fills**, generally less than **six** feet. Thus we believe that for **most** such fills moisture would be available in soils that we rate **as** having moderate or high frost action. We are most concerned that frost action is probably the greatest single **cause** of failure in small roads and **streets** in cold areas. It may well be possible to properly design the fill **so** that adequate drainage is accomplished and thus no frost action **occurs**. Such drainage may be costly, however, and may not be feasible on the smaller roads. We prefer not to make an exception in the guides used in **New** York unless we can be assured of consistent ratings in nearby **states**.

Does the fact these are low fills affect the position New York wants to take?

Paragraph deleted.

/s/ Keith K. Young, Acting

LINDO J. BARTELLI

Director

Soil Survey Interpretationa Division

**cc:**

D. P. **Ralston**, SCS, **Engineering** Division

Example from **Mass.**

Soil Limitation<sup>8</sup> for Sanitary Landfill

(trench method)

**This** section indicates the relative **ease** or difficulty with which sanitary landfill sites can be developed on **various** soils. The **ratings** do not consider location, **size**, or cost of site, hauling **distance**, or access to sites. The ratings are designed to apply to the "trench" method of sanitary landfill.

**The** factors by which **soils** are rated for this purpose are as follows:

- a. depth to seasonal high water table,
- b. depth to bedrock and amount of bedrock outcrops,
- c. amount **of stones** and boulders on the surface and below,
- d. permeability,
- e. slope of the land,
- f. **kinds** of **soil** material,
- g. flooding by **stream** overflow.

Three degrees of **soil** limitations for sanitary landfill are shown on the map, "Soil Limitations for Sanitary Landfill (trench method)." The **Massachusetts** Department of Health approves all sites proposed for sanitary landfills. The soil limitation map **indicates areas** most likely to meet their requirements. The **use** of the map does not eliminate the need for on-site investigation **to** determine conditions at a **specific site**.

The three degrees of limitation are described **as** follows:

1 - Slight limitation

No special **problems** are expected to be encountered in developing these **areas** for sanitary **landfill**. **The soils are well drained.** **Slope of the land ranges from 0 to 15 percent.**

2 - Moderate limitation

These areas are generally satisfactory for sanitary landfill, but costs of developing sites are **usually** greater than these areas indicated as having a light limitation. These soils are similar to those in the slight limitation **class**, but have slopes of 15 to 25 percent, numerous surface stones or moderately clayey or sandy. Additional care is needed to lay out trenches and access roads.

3 - Severe limitation

Soils in these areas have properties that require corrective **measures** to **overcome** soil limitations. The cost of such measures can be great. The soil problems involve one or more of the following conditions.

- a. extremely stony surface,
- b. slope gradients greater than 25 percent,
- c. bedrock within 6 feet of the **surface** or many bedrock outcrops,
- d. clayey materials, **sands** and gravel, or organic deposits,
- e. flooding by stream overflow,
- f. permeability great enough to possibly cause ground water pollution,
- g. high water table.

The severe limitation **class** is divided into five subclasses. The letter, designating the subclass indicates the major limiting factor for **use as** sanitary landfill.

- D - permeable
- M - very permeable
- R - **bedrock** at shallow depth
- s - **excess** slope
- W - wetness

The second **numeral** in the subclass symbol shows the potential for overcoming the factor **responsible** for the severe limitation.

Appendix 4

1- good potential

2

## Appendix 4

3D2 -- Areas which have a severe limitation due to permeability, but offer a fair potential for overcoming the **problems**. Soils in these areas formed in loamy, massive, heterogenous glacial **till**. They are friable loams or sandy loams to a depth of 5 or 6 feet. In many places the till becomes firm with depth. The soils also contain a moderate amount of gravel, 1 to 3 inches in size. Water and air are transmitted **freely** through these soils. Contamination of ground water is a possibility. The soils also have a 15 to 50 percent surface cover of stones, 1 to 3 feet in size.

The **stones** can be bulldozed or otherwise removed from the **site** for satisfactory operation of the landfill.

The Department of Health on site investigations and percolation **tests** of **possible** sites in these areas may indicate the water movement is satisfactory for safe disposal of refuse. Some sites may have percolation rates that are too fast. A thin blanket of clay, silty clay loam or silty clay **material** in the bottom of the pit will retard downward water movement. The liquid **wastes** are retained or **released** so slowly the ground water is not imperiled. Such treatment could permit these areas to be used for landfills.

3M2 -- Areas which have a severe limitation due to **permeability**, but have a fair potential for overcoming **the' problems**. . . Most soils in these areas formed in water **deposited** stratified sand and gravel. They are friable or loose, sandy loam, loamy sand or sand and contain varying **amounts** of gravel. Water and air **are** transmitted very freely through these **soils**. **The** soil water percolates so fast that **proper** filtering is a problem. Contamination of ground water could occur.

A blanket of clay, clay **loam** or silty clay material in the bottom **of the** disposal area will retard the downward water movement. **The** liquid wastes then **are** retained or are released **so slowly** that groundwater is not imperiled. Such treatment could permit movement of these areas to be used for sanitary **landfills**.

3W1 -- Areas which have a severe limitation due to **wetness**, but offer a good potential for overcoming the problem. Soils in these **areas** formed in firm, loamy, massive, heterogenous glacial **till**. **They** are friable in the upper part of the soil, but are very firm below a depth of 2 or 3 feet. Soil textures are loam or sandy loam and they contain **some** gravel. During periods of wet **weather, usually** in winter or early spring, a few inches of the soil immediately above the very firm **hardpan** is saturated with water. The water tends to move laterally over the **hardpan** and can accumulate in excavations. **This** can create **problems** in filling, compacting and covering the **refuse** each day.

## Appendix 4

A diversion terrace, constructed up slope from the landfill, will intercept the water, convey it around the site and discharge it in a **safe** place. Such treatment could permit many of these areas to be used for **landfills**.

- 3W2 -- Areas which have a severe **limitation** due to wetness, but offer a fair potential for overcoming the problem. **Soils** in these **areas** formed in firm, loamy, massive, glacial till. They are friable in the upper **part** of the soil, but are very firm below a depth of 2 or 3 feet. **Soil** textures are loam or sandy loam and they contain some gravel. During periods of **wet weather**, usually in winter or early spring, a few inches of the soil immediately above the very firm **hardpan** is saturated with water. The water tends to move **laterally over** the **hardpan** and can accumulate in excavations. This can create problems in **filling, compacting,** and covering the refuse each day. These soils also have a 15 to 50 percent **surface** cover of stones 1 to 3 feet in size.

The **stones can** be bulldozed or otherwise removed from the **site** for satisfactory operation of **the** landfill.

A diversion terrace, constructed up slope **from** the landfill, **will** intercept **the** water, convey it around **the** site and discharge it in a **safe palce**.

Such treatments will permit many of these areas to be used for **landfills**.

- 3R3 -- Areas which have a severe limitation due to bedrock at shallow depths. Soils in these **areas** have a poor potential for **use** as landfills. The hard bedrock is difficult and **expensive** to excavate for a trench type landfill. These areas would not be economically feasible for landfills.

- 3S3 -- Areas which have a **severe limitation** due to slope. These areas have a poor **potential** for overcoming the problem. The slopes are **greater** than 25 percent and create problems in operating the landfill.

- 3W3 -- Areas which have a **severe** limitation due to wetness, **They** have a poor potential for use as **landfills**. The soils in these areas have **wetness** problems so severe as to be economically unfeasible to treat or alter the areas for landfills.

x -- Unclassified

These soils have been removed, buried or otherwise altered. Characteristics of individual areas are too variable for proper soil classification, therefore the areas are not rated and placed into one of the limitation classes. These areas require on-site determination.

Example from vt .

### SEPTIC SYSTEM GROUP 13

Soils in this group are deep, somewhat poorly drained and poorly drained, and sandy.

Dominant slope range: 0 to 3 percent slopes.

Dominant percolation range: Rapid (0 to 5 minutes per inch).

Seasonal high water table: Seasonal high water table typically is within a depth of 1 to 2 feet from the surface during the spring and other wet periods. As the season progresses the water table drops.

Depth to bedrock: Typically below 3 feet throughout most of the mapped area. Bedrock may be within 3 to 5 feet of the surface in small places.

Potential problems: The dominant limitation to the use for septic systems is the seasonal high water table during the spring and other wet periods. Effluent tends to surface during the spring and other wet periods.

Estimated Range  
in Percolation

Map Symbol and Name

Minutes per inch

0-5	<b>21A</b> - Au Gtes loamy fine sand, 0 to 3 percent slopes
0-5	<b>22A</b> - Wareham loamy fine. sand, 0 to 3 percent slopes

A Word of Caution: This information is intended to serve only as a guide. It indicates potential soil-related problems and does not substitute for detailed on-site Investigation for a specific small house lot. The soil areas outlined on the detailed soil map ordinarily are comprised of the dominant soil after which the area is named, as well as small areas of other soils. The information on this sheet pertains only to the dominant soil within the mapped area.

Possible Corrective Measures:

1. Underground drains to lower water table.
2. Diversions to keep surface water away.
3. Mound system to keep above water table.

## SEPTIC SYSTEM GROUP 15

Soils in this group are deep, **moderately** well drained and clayey.

Dominant slope range: 8 to 15 percent slopes.

Dominant percolation range: Moderately slow (30-60 minutes per inch).

Seasonal high water table: Typically below 3 feet throughout most of the mapped area, but during the spring these soils tend to be saturated for a short period of time,

Depth to bedrock: **Typically** below 3 feet throughout most of the mapped areas. Bedrock **may** be present within 3 to 5 feet of the surface in places.

Potential problems: The major limitation to the use for septic systems is the slow percolation rate. But slope is **also** a problem in the layout and construction of a system.

Estimated Range  
in Percolation

Map Symbol and Name

Minutes per inch

30-60

3CC - Buxton silt loam, 8 to 15 percent slopes

A Word of Caution: **This** information is intended to serve only as a guide. It indicates potential soil-related problems and does not substitute for detailed on-site investigation for a specific small house lot. The **soil** areas outlined on the detailed soil map ordinarily are comprised of the dominant soil **after** which the area is named, as well as small areas of other **soils**. **The** information on this sheet pertains only to the dominant soil within the mapped area.

Possible Corrective Measures:

1. Lend leveling to reduce slope.
2. Hound system to reduce problem of slow percolation.  
Underground drains to lower water table.
- 2: **Sand** filter system, where legal, to reduce problem of **s** low percolation .



*Appendix 6*

ST. LAWRENCE-EASTERN ONTARIO COMMISSION

317 WASHINGTON ST., WATERTOWN, N. Y. 13601

PHONE (315) 782-0100

EXTENSION 2634

JOSEPH A. ROMOLA, Chairman

WILLIAM E. Fyson, Executive Secretary

November 7, 1975

Mr. Oliver Rice  
Soil Correlator

## Soil Use Management Practices

The first consideration in preparing a soil use management index is that there ~~may~~ be no management practice applicable to the site. There could be two reasons for this conclusion:

- 1) The site is ideally suited to the particular use and no management is required.
- 2) The site is so **poorly** suited to the particular use that no measure of management could improve it.

(The number listed next to the management practice in this index is the number also shown in the Table of Natural Soil Limitations and Managed Soil Potentials).

1. **Install** tile field on the contour--Where slope is the main limitation to the installation and functioning of a septic system, installation on the contour may overcome the problem. By excavating into the slope and installing the filter lines on the contour with precautions against seepage, the system should function similarly to one installed on level ground. Careful consideration should be given to the design and installation where this management practice is to be implemented.
2. Consider alternate system<sup>6</sup> or modify for septic system installation--Soils with severe restrictions of depth to bedrock, drainage, or permeability or slope may be able to be modified **by certain** practices to accept a septic system. Where modifications are not practical to accept a conventional septic tank **system**, professional assistance should be obtained to help select an alternate method for waste disposal which will function under the existing soil condition?

Some alternate **systems are**:

- a) Sand filter **systems**
  - b) Evapotranspiration **systems**
  - c) Holding tanks
  - d) Individual sewage **treatment plants**
3. Pipe septic material to more level area and install filter field--This management is **mainly** applicable when slope is the only limiting factor in terms of developing a structure with a conventional septic system. The septic system could be constructed on a more level site apart from the actual structure location and sewage and waste piped to the filter field.
  4. Artificial drainage is probably the most commonly employed management practice for most types of development. Included in the broad definition of artificial drainage is almost any type of excess water management such as:
    - a) Tile drainage
    - b) Open ditch drainage
    - c) Surface runoff **interceptor<sup>6</sup>**

Where wetness is a problem, again, the developer should consider obtaining professional help to assist in the decision of what practice would work best and for technical assistance in design and installation.

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15. Soils with high clay content or fragipans can be more easily excavated if attention is given to their moisture content. Clayey soils become very to extremely firm during dry periods and become very sticky and difficult to maneuver equipment in when wet. A moderate moisture content allows such clayey soils to be most easily excavated. Soils with pans also become extremely hard during dry periods and, except for extremely wet conditions, are more easily excavated at high moisture contents.
16. A thick, well graded gravel sub-base along with good drainage practices will reduce damages to road surfaces due to frost heave.
17. Organic soils have very low strength and in most cases very severe limitations usually based on wetness more than texture. However, where the organic layer is the most limiting factor, it could be mechanically removed and the mineral substratum utilized for the intended use, or fill could be imported to replace the organic layer and then the site could be utilized.
18. Maintenance of vegetative cover can be both an aesthetic and an erosion management. Erosion, especially on more steeply sloping soils, is extremely accelerated when vegetation is removed. Maintenance of woody vegetation can help in establishing landscape when construction is completed.
19. The aesthetic or recreational quality of an area may outweigh the natural limitations of the site as a camping area. Where depth to bedrock or slopes or both are limitations of developing natural campsites, level concrete pads can be constructed with adapters for anchoring tents of various sizes.
20. Areas subject to rare, occasional or even frequent flooding may still have potential use for most purposes where no structural improvements are to be made. By scheduling use of the area during non-flood season such sites could be used for picnic areas, hiking, bridal and biking trails, and a variety of other recreational activities.
21. Where wetness is the main limitation for recreational use of an area, some use may be realized by scheduling activities for the driest season of the year. This could be done for unimproved picnic areas, playgrounds and athletic fields.

Structures with Basements - This section rates undisturbed soils on which single-family dwellings or similar structures with similar foundation requirements. Soils are rated exclusively in terms of properties affecting foundation construction and bearing strength and properties influencing excavation and installation of underground utilities. Those properties are:

- a) Slope
- b) Susceptibility to flooding
- c) Depth to seasonal high water table
- d) Soil drainage class
- e) Potential frost action
- f) Stoniness class
- g) Rockiness class
- h) Depth to bedrock

These ratings do not reflect the suitability of the soil for lawns, landscaping or septic systems. These ratings are also invalid for buildings larger than three stories. It is important to remember on-site investigations are always needed for specific interpretation relevant to detailed design and final placement of any building foundation and utility lines.

Those soils rated slight for structures with basements are: excessively, somewhat excessively, or well drained; have a seasonal high water table below 60 inches; not subject to flooding; have slopes of less than 8 percent; low shrink swell potential; Low frost action potential; less than .1% surface stones no rockoutcrops; deeper than 60 inches to bedrock.

Those soils rated moderate for structures with basements are: moderately well drained; have a seasonal high water table below 30 inches; not subject to flooding once in 5 years; have slopes 15 to 25 percent; high shrink swell potential, high frost action potential; 3 to 15 percent surface stones; 10 to 50 percent surface rockoutcrops; 40 to 60 inches deep to bedrock. Soils with one or more of these features would be rated moderate in addition soils would have features rated slight.

Those soils rated severe for structures with basements are: somewhat poorly drained; have a seasonal high water table above 30 inches; are subject to flooding once in 5 years; have slopes 15 to 25 percent; high shrink swell potential; high frost action potential; 3 to 15 percent surface stones; 10 to 50 percent surface rockoutcrops; end bedrock to 20 to 40 inches. Soils with one or more of these features would be rated severe, in addition the same soil may have features rated moderate or slight.

Those soils rated very severe for structures with basements **are:** poorly or very poorly drained; have a seasonal high water table above 12 inches; are flooded more than **once** in 5 years; have slopes steeper than 25 percent; more than 15 percent of the surface is covered with stones; more than 50 percent of the surface **is** covered with **rockout-**crops; have bedrock at less than 20 inches from the surface. Soils with one or more of these properties or characteristics would be rated very severe, in addition the same soil may have features rated as **severe**, moderate or slight.

## RATINGS OF MANAGED SOIL POTENTIAL

- Good -- Soils with good managed potential would be relatively free of soil related maintenance once natural limitations if any had been overcome.
- Fair -- Soils with a fair managed potential for structures without basements would have some soil related maintenance even though the most prohibitive aspects of the limitation had been overcome. Generally these maintenance factors would not outweigh the positive potential of the site for its intended use.
- Poor -- Soils with a poor managed potential for structures without basements should be carefully considered before proceeding with a structure. Such soils would require extensive maintenance and both time and money to protect any investment in a structure.
- Very Poor -- Soils rated very poor for managed potential would require extensive technical and financial maintenance expenditures. This type of maintenance would be out of the reach of most individuals for conventional use as a home or small business.

TABLE OF NATURAL SOIL LIMITATIONS AND MANAGED SOIL POTENTIALS

<u>Soil Name &amp; Symbol</u>	<u>Septic Systems</u>	<u>Management</u>	<u>Potential</u>	<u>Structures w/o Basements</u>	<u>Management</u>	<u>Potential</u>	<u>Structures w/Basements</u>	<u>Management</u>	<u>Potential</u>
Madalin silt loam      8	Very Severe High W.T. @ 0-6"	4	Very Poor	Very Severe High W.T. @ 0-6"	4	Very Poor	Very Severe High W.T. @ 0-6"	4	Very Poor
Hudson silt loam      25B	Severe: slow permeability	5	Good	Severe High W.T. @ 12-24" Moderate frost action	4  12	Good  Good	Severe High W.T. @ 12-24" Moderate frost action	4  10	Good  Good
25c	Severe slow permeability	5	Good	Severe High W.T. @ 12-24" Moderate slope 8 to 15% Frost action	4  8,9,11 12	Good  Good Good	Severe High W.T. @ 12-24" Moderate slopes 8 to 15% Frost action	4  8,9,11 10	Good  Good Good
Ennon loam            27AB	Very Severe depth to bedrock	2	Fair	Severe depth to bedrock	7,13	Good	Very Severe depth to bedrock	7,13	Fair
Elmwood fine sandy loam            32B	Severe slow permeability High W.T. @ 12-24"	5  4	Good  Good	Severe High W.T. @ 12-24" Frost action	4  12	Good  Good	Severe High Y.T. @ 12-21" Frost action	4  10	Good  Good
Williamson very fine sandy loam    34B	Severe slow permeability High W.T. @ 12-24"	5  4	Good  Good	Severe High W.T. @ 12-24" Frost action	4  12	Good  Good	Severe High W.T. @ U-24" Frost action	4  10	Good  Good

4.35  
80

<u>Soil Name &amp; Symbol</u>	<u>Septic Systems</u>	<u>Management</u>	<u>Potential</u>	<u>Structures w/o Basements</u>	<u>Management</u>	<u>Potential</u>	<u>Structures w/Basements</u>	<u>Management</u>	<u>Potential</u>
Niagara silt loam 35A, 35B	Severe slow permeability High W.T. @ 6 - W		Good  Fair			Fair  Good	Very Severe High W.T. @ 6-18" Severe Frost action	A  10	
Rhinebeck silt loam 37A, 37B	Severe slow permeability High W.T. @ 6-18"		Good  Fair			Fair  Good	Very Severe High W.T. @ 6-18" Moderate Frost action	4  10	Good
45A, 45B	Severe depth <del>at</del>		Good			Good	Severe		Good
Windsor loamy fine sand			Good			Good			Good
shallow) gravelly loam 62A <del>B</del>									
Newstead silt loam 65						Poor  Fair			

4.36  
81

<u>Soil Name &amp; Symbol</u>	<u>Septic Systems</u>	<u>Management</u>	<u>Potential</u>	<u>Structures w/o Basements</u>	<u>Management</u>	<u>Potential</u>	<u>Structures w/Basements</u>	<u>Management</u>	<u>Potential</u>
Nellis silt loam 81B	Severe Moderately slow permeability								
	81C	Severe Moderately slow permeability Moderate Slopes 8 to 15%							
Amenia silt loam 82A, 82B	Severe moderately slow permeability Moderate High W.T. @ 18-36"		Good	Moderate High W.T. @ 18-36"		Good	Severe High W.T. @ 18-36"	4	
	83A, 83B	Severe High W.T. @ 6 to 18" Moderately slow permeability		Very Severe High W.T. @ 6 to 18" Moderate Frost action	4 10				Poor
Massena silt loam	Slight								
	Severe depth to bedrock Slopes 15% Moderate Slopes 8 to 15% large stones								

4:37  
85

<u>Soil Name &amp; Symbol</u>	<u>Septic Systems</u>	<u>Management</u>	<u>Potential</u>	<u>Structures w/o Basements</u>	<u>Management</u>	<u>Potential</u>	<u>Structures w/Basements</u>	<u>Management</u>	<u>Potential</u>
Hudson and Vergennes soils steep 041DE	Very Severe very slow permeability slopes 15%	2	Fair	Very Severe slopes 25%	8,9,11	Very Poor	Very Severe slopes 25%	8,9,11	Very Poor
		1,2,3,8	Very Poor	Severe slopes 15 to 25% High W.T. @ 12-24"	8,9,11	Poor	Severe slopes 15 to 25% High W.T. @ 12 to 24"	8,9,11	Fair
					4	Good		4	Good
Rock Outcrop Benson Complex	Very Severe depth to bedrock Moderate slopes 8 to 15%	2,7,13	Poor	Severe depth to bedrock Moderate slopes 8 to 15%	7,13	Poor	Very Severe depth to bedrock Moderate slopes 8 to 15%	7,13	Very Poor
		1,3,8,11	Good		8,9,11	Good		8,9,11	Good
057DF	Very Severe / slope depth to bedrock	2,7,13	Very Poor	Very Severe slope depth to bedrock	7,13	Very Poor	Very Severe slope depth to bedrock	7,13	Very Poor
			Poor			Poor			Very Poor

3  
23



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Agronomy Dept.

Appendix 7

OCT 16 1975

October 13, 1975

TO: Oliver W. Rice, Jr.

FROM: Fred P. Miller /S/

KE: Charge No. 2, Committee, No. 4 NECSSC

**Oliver:** I've discussed the soil potential format with Bob Shields on several **occasions** and we've not come up with much to suggest. So I'll briefly review several **items** which the committee might consider.

1. A **portion** of the 1974 **Committee** No. 3 report dealt with this change and I still **think some** of the ideas and **recommendations** put forth in that report merit **consideration** and possibly an ad hoc test in a county or region. The quantitative approach used in the San Diego experience is still a valid concept which we could pursue.

2. Bob Shields has developed **soil interpretation** guides for urbanizing **areas** with the soil limitation classes indicating both the degree and type of limitation. We discussed the possibility of adding another section or column to this interpretation **guide** ( a one aided wall chart on **poster** board) which would provide general **methods** or **alternatives** for overcoming the limitation. This could definitely be tried in a county **as** a pilot study or evaluation.

For example, a few paragraphs of the text could point out the energy requirement of soils (draft horsepower for cultivation, manipulation, caloric input vs. caloric output, etc.) and show graphically the general trend of energy required per unit of difficulty in "sing the soil. While some data are available on this subject, the general picture is the important point. For instance, a county planning staff may conclude that a certain area should be preserved for agriculture because of the prime soil conditions. But they may be better able to sell the idea to the local leaders if they could also point to the long term energy savings as compared to a more marginal site requiring more energy inputs (grading, drainage, pan ripping, irrigation, erosion control, etc.) to manage.

General graphs and illustrations could point out the increasing energy requirement as the capability class ( or other groupings) increases. Cost data could also be used to illustrate this concept. This latter point was also addressed in the aforementioned 1971 Committee No. 3 report.

5. Similarly a graph or illustration could point out the general capacity of soils to not only absorb effluents but also to renovate them. For example, a diagram illustrating a soil as an electrophoresis medium would provide the user with a general picture that the effluent constituents are filtered, sorbed, oxidized or diluted as they pass through the soil medium. The objective here is to provide the user with an understanding that there is more to waste management than just disposal. This would also provide the sanitarians with additional clout or creditability in their attempt to be more restrictive in permitting the use of soils as a medium for waste disposal.

6. I would also like to see a general series of maps published within the survey (1-3 pages) showing the general geology, hydrology, topography, etc. of the county. These maps would be at the same scale as the general soil map and would provide the user with additional criteria on the general suitability of an area for a given use. In other words, the user may be led to a limitation which the soil survey did not reveal. The public would be served much better - and that is our primary objective.

### Summary

I realize the budget end policy constraints regarding the incorporation of some of these ideas. Perhaps they could be financed by the Local unit of government or prepared as a supplement to the published survey. The latter is probably the most viable alternative, especially as a pilot program to evaluate the concepts.

FPM/ss

cc: Mr. Robert L. Shields

## Appendix 8

### Recommendations for improvement: (Subcommittee report Charge 3)

1. - Hold meetings to coordinate interpretations by resource areas after all forms SCS-SOILS-5 are completed. Agreement on series concepts could be developed at these meetings also. Review group\* of similar soils to insure consistent interpretations. 1/
2. - Give states responsibility for soil series in a drainage sequence instead of different states having one or two soil series in a sequence. 1/
3. - Refine criteria so that ratings will be the same for like soils. In some cases, different people interpret criteria differently resulting in different ratings for like soils and even different ratings for the same soil. 1/
4. - Develop a computer program that will produce ratings for the interpretation. This will insure consistency and eliminate coordination problems.
5. - The Northeast Technical Service Center prepare explanatory text for use with forms SCS-SOILS-5. 1/
6. - Modify key words so there is a difference indicated when degree of limitation differs, eg., moderate wetness for moderate limitations and wetness for severe limitations.
7. - Provisions should be made to allow entry of statements similar to the following - "rock at 1½ to 3 feet". "seasonal high water table at 1½ to 3 feet."
8. - Devise a system whereby moderate limitations can be reflected even though a soil is rated as severe for another feature such as slopes. A different style of type could be used to reflect moderately limiting features that are secondary to severe rating. 1/
9. - Provide for use of rocky unit modifiers on SCS-SOILS-5. This need is more evident in light of new naming conventions currently included in the National Soil Handbook. 1/
10. - Develop forms SCS-SOILS-5 by major land resource area to permit more precise crop yield, frost action, and woodland interpretations for a single soil that occurs in more than one MLRA. 2/
11. - Develop a program whereby summary interpretive tables can be developed for groups of similar soils. Such a procedure would be invaluable in coordinating interpretations for similar soils. 1/

12. - a. The following additions or deletions of key phrases were suggested :
  - b. Add "compressible" for embankments, dikes, and levees.
  - c. Add "small stones" for **sources** of sand. 1/
  - d. Delete "not needed" for grassed waterways.
  - e. Can key phrases be dropped when **a** soil is rated **as** unsuited for a use?
  
13. - Can a program be developed whereby the computer can be used to designate mapping units that qualify as prime farmland? This will be very helpful in light of increased emphasis **on** this type of inventory.
  
14. - Monitor proposed LIM inventories to determine ways to alter existing programs to permit maximum **utilization** of ADP procedures in conducting inventories.
  
15. - Table **H**, Engineering Properties and Classifications (table generated from forms **SCS-SOILS-5**) - Could a program be written to allow computer to adjust data (sieve sizes, unified, etc.) for a specific texture phase of a series? Also to adjust data for a **narrower** subsoil and **substratum** texture range than given for the range of the series on forms SCS-SOILS-5. Present method of adjusting this **table** is cumbersome and slow - computer adjustment would eliminate the need for this process. 1/

1/ Endorsed by Committee

2/ Already in effect

REPORT OF COMMITTEE 5  
SOIL MOISTURE **REGIME**  
New York City, January 12-16, 1976

- Charges:**
1. Evaluate data from previous and on-going water table studies with a view towards developing a regional project.
  2. Continue to compile a bibliography of water table studies in the Northeast.
  3. Group a number of Northeast soils into categories of "patterns of soil-water states" as defined in the revised Soil Survey Manual (draft 4). Evaluate placements from  
  
grouping.
  4. as a guide to whether or not irrigation will be beneficial on a particular soil. In the Northeast, this mainly applies to intensive farming.

Committee Members:

R. Alvis	R. <b>Pennock, Jr.</b>
R. J. Bartlett	O. W. Rice, Jr.
D. S. Fanning, Vice Chairman	R. A. Structemeyer
R. L. Googins	J. W. Warner
G. J. Latshaw	R. D. <b>Yeck</b> , Chairman
F. G. Loughry	

Recommendations of the Committee:

1. A coordinated water table study should be conducted to characterize perched water tables to determine their relationships to apparent water tables and their significance to soil survey interpretations.
2. The committee should continue to maintain an updated list of published and current water table studies in the Northeast.

Committee Report:

The three studies are described below.

\*\*\*

Beltsville Soil - Silver Springs, Maryland

### Objectives

1. Try to detect perched water and compare data from wells with solid and perforated casings.
2. Test installation techniques.

### Installation

Two wells were placed at each of three depths as follows:

<u>Depth (inches)</u>	<u>Type of Casing</u>	<u>Remarks</u>
15½	solid	Above fragipan
28	solid	In fragipan
46	1 solid, 1 perforated	Lower part of pan

Monitoring Period: February-July 1975

The wells at 15½ and 46 inches were installed by alternately augering inside of the casing and driving the casing into the excavation. The well at 28 inches was installed by excavating to the top of the fragipan, boring and driving into the pan, and tamping at the top of the pan, prior to backfilling, as recommended by R. B. Daniels.

### Results

The perforated 46-inch tube fluctuated with the precipitation, approaching the surface after significant rainfall. The well to 46 inches with solid casing never did contain free water. Only slight wetness ever occurred in the wells at 28 inches. There was a maximum of 2½ inches of water in the wells to a depth of 15½ inches.

### Conclusions

1. The alternate augering and driving method of installation was highly satisfactory in this type of silty soil (casings appeared to be sealed all along their length).
2. The tamping backfill method produced a well-sealed installation. This would be more difficult on the deeper installations.
3. Perforated wells respond quickly to precipitation.
4. Water held above a dense horizon is not shown by water levels in the well with perforated casing.

5. Wells to 15½ inches and 28½ inch wells together depict the perched water.
6. Wells at 15½ inches fluctuated little, reflecting the slow perviousness of the **B2t horizon** in which they were placed. Perhaps there was even secondary perching above the **B2t**.

#### **Morgantown, west Virginia**

##### Objectives

1. Compare solid and perforated casings on a landscape with slopes in excess of 20 percent.
2. Test installation method of driving tubes on which points had been fashioned (soils contained varying amounts of coarse fragments).

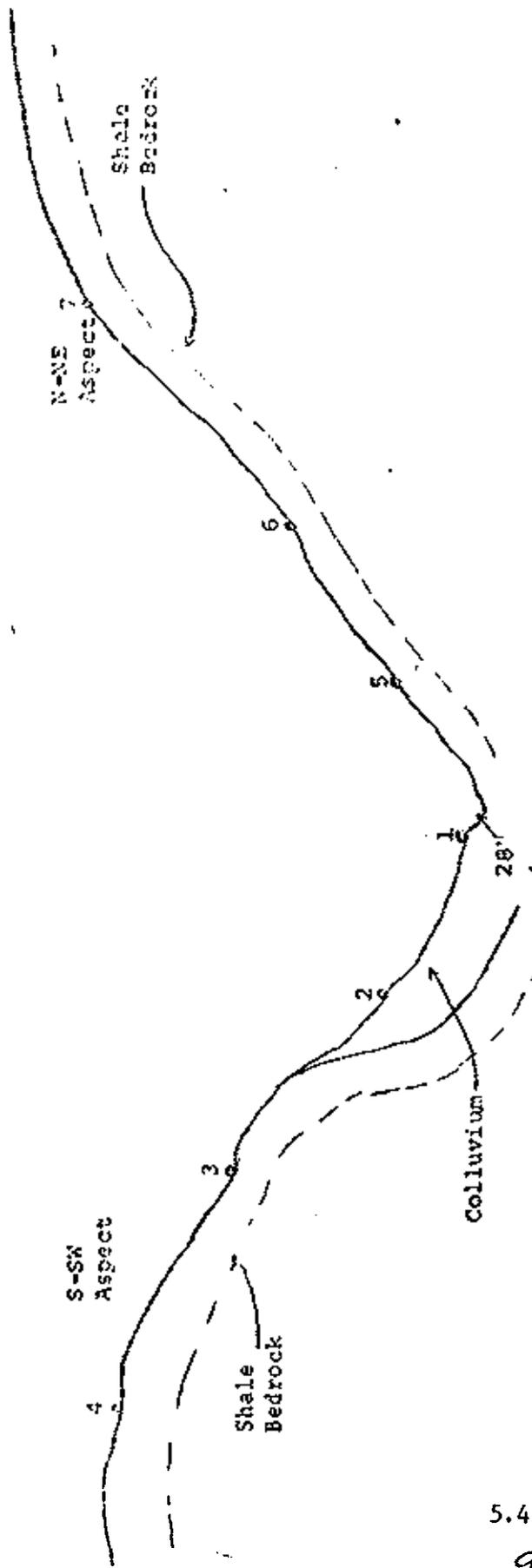
##### Installation

See attached diagram. Perforated casings were 2 inch aluminum tubes installed by **alternate augering** and driving. **Solid** tubes were 1 inch EMT on which points had been fashioned by cutting the end in a saw-tooth manner and bending the points to form a point (Handbook of Soil Survey Investigations Field Procedures). A 1/4 inch hole was driven just above the point in each tube. Monitoring period: **March-November 1975**.

##### Results

Wells with perforated casings responded quickly to precipitation. Wells with solid casings were filled prior to the first reading from surface water. They stayed at the same level until they were bailed and failed to respond to rains after they were bailed. Five driven tubes developed cracks along their length, while only one of the **augered** and driven tubes had cracking.

Figure 1--Landscape and Installation Positions, Soil Moisture Study, WVU Animal Husbandry Farm (3-6-75)



1. Clarksburg - Mottles at 28-30" - Pan-like 31" - 1 perforated to 60" <sup>a/</sup> one 20" solid, ~~one~~ 40" solid.
2. Clarksburg - Mottles at 18-20" - Pan at 22" - 1 perforated to 36" - one 18" solid, one 30" solid.
3. Library-like - (poorly drained bench - Mottles 18" - Pan at 27 1/2-30" - 1 perforated to 36" - one 16" solid, one 28" solid.
4. Dormant-like - Mottled at 18" - Coarser lense 24" solid - 27"-fine texture at 30" - 1 perforated to 40" - one 44" solid, one 16" solid, one 22" solid.
5. Culleoka - No mottling - perforated pipe 24" to shaley bedrock.
6. Westmoreland - Slightly mottled 36-40" - 1 perforated pipe 40" driven to shaley bedrock.
7. Culleoka - No mottling - perforated pipe 18" to shaley bedrock.

<sup>a/</sup> Indicates depth to which perforated and non-perforated (solid) tubes were installed.

### Conclusions

1. Wells with perforated casings respond well but do not indicate perching.
2. Driven tubes **appear** to seal as a result of being driven. (**This** will be verified by forcing the points open with solid rod.)
3. There seems to be a higher incidence of soil cracking around the driven pipes than the **augered/driven** ones.

Washington, D. C.

### Objectives

1. Compare solid and perforated casings.
2. Compare driven and **augered/driven** installations.

### Installation

These installations were in East and West Potomac Park in the District of Columbia on grounds administered by the National Park **Servie** of the National Capitol Region. Eleven sites are being monitored with at least four wells at each site. Solid and perforated 2-inch casings were installed by the auger/driven method and 1-inch perforated and solid pipes were driven. The soil material is in general silty fill material containing coarse fragments and a variety of anthropic materials. Monitoring period: March-November 1975.

### Results

Results were somewhat variable but generally solid cased wells fluctuated less but in the same pattern as the wells with perforated casings. (See attached plot of data for Site 1.)

Driven 1-inch perforated cased wells gave essentially identical results to 2-inch perforated **augered/driven wells**. A few results were erratic with solidly cased wells fluctuating more than perforated ones.

### Conclusions

1. Diameter of casing is immaterial.
2. The lower fluctuation of the water table in the solidly cased wells indicates somewhat impeded movement through the soil material (this may be a form of perching).
3. If only one type of installation is possible in this type of soil, the perforated casing is preferred.
4. Perhaps bailing water from each pipe after readings would shed some light on why the solid pipe fluctuates less than the perforated one.



## General Summary of Installation Experiences

These studies underlined **some** pitfalls of the methods of installation, such as sealing the points of driven pipes during driving and perhaps the need for additional **shallow** wells at various depths above dense layers to insure detection of perching.

Generally, there was less problem associated with the **augering** plus driving method of installation than with **simply** driving the casing into the soil. The use of the auger and driving method using smaller tubes (1 inch EMT) to reduce installation costs appears to have the most promise. Neutron probe measurements could also be made with 2 inch solid pipe installations. Tensiometers and other moisture measuring devices should not be ruled **out**.

## Developing a Regional Project

The mechanics of well installation are probably well enough understood that that aspect of a project need not consume a great deal more of our time, except in soils with a high percent of coarse fragments. We do feel, however, that a combination of solid and perforated casings provides a more complete understanding of the water regime than perforated alone. Data to detect perched water are **generally**, lacking in the Northeast. A recent draft section on Soil Wetness Classes that may become part of the revised Soil Survey Manual is based on apparent water table depths; therefore water table data from **uncased or** perforated cased wells may be needed to describe wetness classes. A major concern pointed out in the Proceedings of the 1975 National Soil Survey Conference was the need for a well conceived monitoring program to accompany any well installation program.

**In** light of the continuing need for water regime data throughout the Northeast, we **recommend** the initiation of a regional project. Perhaps a small committee should be appointed whose members can meet together to prepare a comprehensive proposal to be submitted to the Northeast research committee for funding to cover costs of **materials and** perhaps stipend money to provide graduate student assistance over a period of five years. The objective of the project would be to characterize perched water tables, their relationship to apparent water tables, and their significance to soil survey interpretations. Studies would be designed to represent geomorphic surfaces that are extensive in study areas.

Another alternative is to incorporate a water table study as part of a regional fragipan study.

## Conference Discussion:

General - Questions regarding stony soils.

Arnold - In 2-inch holes, you could also measure dissolved oxygen.

General - Discussion on alternative ways to monitor wells if a water table study is set up.

Arnold - We need to have the concurrence of and a commitment from Area Conservationist if SCS soil scientists are to monitor.

Fanning - I think that Ron **Yeck** or someone from the laboratory should coordinate any such study to insure uniformity of installations.

**Yeck** - I will agree to go to states and help with initial installations.

CHARGE?

Experiment station and SCS soil scientists were contacted in all North-east states to submit additions to the bibliography submitted as part of the Committee 5 report in 1974. The updated list is as follows.

Completed Summary of Water Table Studies

AMOS, D. F. and EDMONDS, William.

Water tables in selected Chesterfield County, Virginia soils.

FANNING, D. S., HALL, R. L HA FOSONDies

LATSHAW, G. J. and THOMPSON, Robert F.

1971. Water table study for selected soils in Montgomery County, Pennsylvania. USDA, Soil Conservation Service, 14 pp., **illus.**

LATSHAW, G. J. and THOMPSON, Robert F.

Water table study verifies soil interpretations, Journal of Soil and Water Conservation, Volume 23, No. 2, March-April, 1968, pp. 65-67, **illus.**

MILLER, F. P. and FOSS, J. E.

1969. Ground water table investigations at the Wye Institute, Crops and Soils Research, MD. Agr. Exp. **Sta.**, Progress Report 2: pp. 243-246.

PALKOVICS, W. E., PETERSON, G. W., and MATELSKI, R. P.

1975. Perched water table fluctuation compared to streamflow. Soil Science Society of America, Proceedings **39(2):343-348.**

PALKOVICS, William E.

1973. The Pennsylvania State University, University Park, Pennsylvania, Comparisons, mottling and quantifications of **stream-flow** and perched water table relationship above a fragipan, **PhD.** Thesis, 131 pp., **illus.**

WRIGHT, W. R.

1972. **PhD.** Thesis, Pedogenic and Geomorphic Relationships of Associated **Paleudults** in Southern Maryland, 151 pp.

#### Data Not Published

New Jersey - Cooperative study between Exp. Sta. and SCS in 1959, 1960, and 1961. One-inch pipes were used for water table study and problems were encountered in plugging. Records were made on **some wells** for several years.

#### Current Studies

AMOS, D. F. and KASTER, D. L.

Physical Factors Affecting Perched Water Tables in Soils of Prince William County, Virginia. (Draft report of **study** is available. Authors plan to publish in **the** near future.)

PATERSON, J. C.

In the District of Columbia, employees of the National Park Service are collecting water table data using several different types of water **well installations.**

LIEBHARDT, William C.

At the University of Delaware, observations on water tables are being made to study the effect of poultry manure on nitrogen and **heavy metals** in the ground water. The water table is 5 to 8 feet below **the** soil surface. Water samples taken monthly in the wells at 10, 15 and 20 foot depths.

LYFORD, W. H., Harvard Forest, Petersham, MA.

Water table study on two small drainage basins using neutron probe to check water table depth for a period of five years. (Report is to be summarized by July 1976.)

PETERSON, Nobel K.

Nitrogen content of ground water in Durham, New Hampshire area.

#### MAINE

York County Water Table Study by the Soil Conservation Service. Maine State Department of Health and Welfare, Health Engineering is monitoring water tables on selected soils.

#### MARYLAND

Measuring water tables on silty Coastal Plain soils in Queen **Annes** County, MD. Monitoring water tables with **piezometer** tubes and perforated tubes at the University of Maryland Hopkins Farm in Beltsville soils.

ROBINETTE, C.

Water table studies of selected Richmond County, Virginia soils.

#### RHODE ISLAND

University of Rhode Island and Soil Conservation Service cooperative study. Water table studies on fragipan soils of Rhode Island. Three years of data on seven soil series.

#### VERMONT

Franklin County - Measuring water tables of major soils by Dennis Flynn and John Pratt, Soil Conservation Service.

Lamoille County - Measuring water tables of major soils by Carl Britt, Soil Conservation Service.

#### USDA-FS

Work on measurement of water tables in Pennsylvania and West Virginia by graduate student at the University of Georgia.

#### WEST VIRGINIA

Soil moisture study using perforated and nonperforated tubes to determine and understand water movement in soils occurring on steeply sloping areas. Study located at West Virginia University Animal Husbandry Farm in Clarksburg, Library, **Dormont, Culleoka,** and Westmoreland soils.

#### Conference Discussion:

**Yeck** - We should continue to maintain an up-to-date list such as this.

**Arnold** - There is a recent study from the University of Guelph by a student of **MacIntosh**.

### CHARGE 3

Several changes have been made in the soil-water relations section of Chapter 4 of the revised Soil Survey Manual since this charge "as written. Revision 5 replaced "patterns of soil-water states" with "soil-water systems". The notes on why those changes were made were sent to Dr. McClelland by those responsible for the review and are attached. Subsequently a draft for defining soil wetness classes (enclosed) "as written to replace the soil-water systems section. The purpose of the soil wetness classes section is **to** actually define classes within given parameters rather than simply describe water regimes for a soil as the first two did. All of these seem to have their strengths and weaknesses.

John Warner has placed several soils into groupings by (1) soil water systems and (2) patterns of soil water states. His comments and placements are attached.

R. W. Arnold placed 18 New York soils into soil wetness classes. In general, they fell into reasonable relative classes. "**Soil**" wetness classes have advantages of objectivity and simplicity. On the other hand, wetness class alone is insufficient as a basis for wetness interpretations because the nature of the wetness is not reflected.

The soils chosen comprise a drainage sequence and occur extensively on till plains in northwestern New York.

<u>Soil</u>	Family	<u>Soil Drainage Class</u>
Honeoye - fine-loamy, mixed, mesic	Clossoboric Hapludalf	Well drained
Lima - fine-loamy, mixed, mesic	Clossoboric Hapludalf	Moderately well drained
Kendaia - fine-loamy, mixed, <b>nonacid</b> , mesic	<b>Aeric</b> Haplaquept	Somewhat poorly drained
Lyons - fine-loamy, mixed, <b>nonacid</b> , mesic	Mollic Haplaquepts	Very poorly and poorly drained



3. Duration as defined in the new manual seems to be too restrictive. You will note that I assigned two apparently conflicting states in some cases, e.g., **continuously** moist vs. commonly wet. A pattern of this sort would require a minimum duration for the two states. Perhaps further subdivisions of duration would help overcome this problem.
4. With regard to my first comment; we may want to consider what types of data we will need for assigning soil-water states to series. **What** investigation projects will be needed to obtain these data?
5. Will there be problems in characterizing series that include two soil drainage classes; particularly those covering both well and moderately well drained classes and somewhat poorly and poorly drained classes?

Reasons for Replacing "Patterns of Soil-Water  
States" by "Soil Water Systems"

Dr. John E. McClelland (Director, Soil Survey Operations)  
April 25, 1975

Page **44-69** - The section on soil-water relations was extensively revised. The soil-water states were kept to three, dry, moist and wet although saturated is implied. An effort was made to keep the same concepts but define the "states" so that a field soil scientist could consistently recognize them. There was little revision regarding water tables. Available water was rewritten and placed with the soil-water states because of its definition.

The sequence of soil-water-states was rewritten. The complicated sequential arrangement was simplified so that consistent field observations and evaluations could be made, In that light we thought it best to change the title to Soil-Water-System and place this section after **soil-water-states**. No attempt was made to relate soil-water-systems to soil moisture regimes in the Soil Taxonomy as it was thought best not to inventory landscapes with **preconceived arbitrary** classifications but rather to try to discover the facts as they really are.

Little was done with the section on water movement except that the definition of the classes of perviousness were clarified and the terminology was made to be consistent within each class.

The reorganization and shortening of the soil-water-relations resulted in b pages less than the original and as the various sections of chapter 4 were retyped at different times, you **will note** the absence of pages 63-68.

(Submitted by Western Soil Correlation Unit)

## Soil wetness Classes

The presence, depth, and duration of a water table are important properties of polypedons. The presence of a water table affects the interpretation of a soil for many farm and **nonfarm** uses.

The presence, depth and duration of water tables were used in the definition of Soil Drainage Classes of the previous edition of this manual and they are used in the definition of aquic (and **peraquic**) moisture regimes in Soil Taxonomy.

Wetness classes as defined are based on field observations of apparent water tables. They differ from the definitions of Soil Drainage Classes which assumed a close relationship to soil morphology and the definition of aquic suborders and subgroups which are based on soil morphology if an aquic moisture regime is present unless the soil is artificially drained. Aquic moisture regimes, as defined in Soil Taxonomy specifically require reducing conditions. Reducing conditions are not implied in wetness classes. Inasmuch as soil water tables are highly variable from season to season and year to year, soil wetness classes are based on the lowest depth and greatest duration of water tables in 6 or more out of 10 years. Few long-term records of soil water tables are available for the precise placement of soils in wetness classes. Until more detailed information is available the placement of soils in wetness classes has to be based on **short-term** records on a few sites and on inferences from records on related soils.

The following should be considered in placing sites in wetness classes.

1. Climatic data.

Observed apparent water table data should be related to the **precipitation evapotranspiration** balance of the observation period and the driest and wettest conditions that can be expected in 6 out of 10 years from **long-term** weather records. Comparisons with meteorological records should be based on the amount of **excess** precipitation during those parts of the year when monthly **precipitation** exceeds monthly evaporation.

2. Factors controlling the water table.

The water table regime in any given polypedon or soil series may be controlled primarily by the position of the polypedon in the soil landscape as it affects runoff and **runon**, the perviousness of the soil **or**, in highly pervious soils, by regional factors.

3. Soil morphology.

Soil morphology, primarily the depth to low **chroma** mottles or the presence of **umbric** and **histic** epipedons **may be** used as an indicator of water tables. **Mottling, however**, may be related to a pre-existing water table regime that has been altered artificially or through natural changes in the regional drainage. While mottling and other expressions of water table may form rapidly, they may persist for long periods of time after a water table has been removed.

High water tables, on the other hand, **may** not be reflected by low chroma colors if the high water **table** does not induce a reducing environment. Usually, this happens if the soil **is** too cold for microbiological activity when saturated or when no source of energy for micro organisms is available. There is some evidence that in some **Andepts** organic matter is **so** highly complexed with amorphous material as to be unavailable for micro organisms. Also low chroma colors tend to be a poor indicator of a soil wetness in **lithochromic** soils, in albic horizons and some **Psamments** that have low chroma not related to wetness.

Soil wetness classes are defined in terms of the duration and depth to water tables.

Soil Wetness Classes

Class	Depth to Water Table (cm)	Duration of Water Table* (days)
<b>0</b>	Never	Never
<b>I</b>	25-100	<b>&lt;30</b>
<b>II</b>	0-25	<b>&lt;30</b>
	25-100	<b>&gt;30</b>
<b>III</b>	0-25	30-180
<b>IV</b>	0-25	MO-330
<b>V</b>	0-25	<b>&gt;330</b>

\*In 6 or more out of 10 years.

Soil Information Grouped by Wetness Classes  
(R. W. Arnold)

	Weeks wet within		Soil Series	Est. Drainage Class	Comments
	0-25 cm	25-100 cm			
CLASS.1	0	2	Lansing	W	
CLASS2	0	15	Hudson	MW	
	0	18	<b>Conesus</b>	MW	
	1	26	<b>Scio</b>	MW	
	0	27	<b>Langford</b>	MW	
	0	29	<b>Honeoye</b>	W	Excess snow site
	0	30	Kendaia 2	SWP	
	1	39	Kendaia 1	SWP	
	3	32	Rhinebeck	SWP	
3 consec.	34	*Lima	Mw	Site appears <b>misclassified</b>	
CLASS3	6 cum.	34	*Lima	MW	
	12	33	Erie	SWP	
	4	52	<b>Culvers</b>	MW	Red color may mask
	9	52	Volusia 1	SWP	
	11	51	Dalton	SWP	
	11	52	Volusia 2	SWP	
	23 consec.	44	<b>*Ellery</b>	P	
	14 consec.	52	*Morris	SWP	Red color may mask
CLASS 4	27 cum.	44	<b>*Ellery</b>	P	
	26 cum.	52	<b>*Morris</b>	SWP (red)	
	38 cum.	52	Lyons 1	P-VP	
	38 cum.	52	<b>Lyons 2</b>	P-VP	

\*Soils that shift classes depending on whether weeks of wetness in 0-25 cm depth are consecutive or cumulative.

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Information About Soils in Which Apparent Water Tables Were Measured  
(R. W. Arnold)

Series	Drainage Class	Weeks wet within*		Wetness Class (Cumulative)	Classification	Comments
		0-25 cm	25-100 cm			
Langford	MW	0	27	2	Typic Fragiochrept	10YR
Erie	SWP	2,10=12	33	3	Aeric Fragiaquept	2.5Y
Ellery	P	4,23=27	44	4	Typic Fragiaquept	2.5Y
Hudson	MW	0	3,12=15	2	Glossoboric Hapludalf	fine
Rhinebeck	SWP	3	32	2	Aeric Ochraqualf	fine
Lansing	W	0	2	1	Glossoboric Hapludalf	
Conesus	MW	0	6,3,9=18	2	Glossoboric Hapludalf	
Kendaia 1	SWP	1	39	2	Aeric Haplaquept	
Lyons 1	P-VP	33,4,1=38	52	4	Mollic Haplaquept	
Honeoye	W	0	29	2	Glossoboric Hapludalf	snow drifts
Lima	MW	1,3,2=6	34	3	Glossoboric Hapludalf	winter wetness
Kendaia 2	SWP	0	30	2	Aeric Haplaquept	
Lyons 2	P-VP	34,4=38	52	4	Mollic Haplaquept	
Scio	Mw	1	1,1,24=26	2	Aquic Dystrochrept	
Canaseraga	Mw	3	32	2	Typic Fragiochrept	
Dalton	SWP	11	51	3	Aeric Fragiaquept	
Culvers	MW	4	52	3	Typic Fragiochrept	5YR
Morris	SWP	14,12=26	52	4	Aeric Fragiaquept	5YR
Volusia 1	SWP	11	52	3	Aeric Fragiaquept	10YR
Volusia 2	SWP	7,2=9	52	3	Aeric Fragiaquept	2.5Y

\*Consecutive and cumulative weeks given where they differ.

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5.17

Conference Discussion

Witty - Shouldn't season be added to soil wetness classes?

Snyder - What is the significance of 25 cm?

Yeck - I'm not sure.

Arnold - This is similar to a British System.

Olson - These classes can't be mapped.

Arnold - Here we make measurements whereas with drainage classes we only infer wetness.

R. Rourke - I think the 25 cm depth is too shallow.

Latshaw - A soil-water table curve (plot) is more valuable than a class. Last year this committee recommended expressing the water table graphically (as part of the description).

General discussion regarding wide application and use of soil wetness classes.

Foss - Can we ever get a Soil Survey Manual that **covers** world conditions?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Hilner - With as much objection as you have to soil wetness classes, you shouldn't endorse them. Perhaps you should form a task force to offer alternatives.

Foss - The fact that these can't be mapped is an Important drawback.

Arnold - It would help to add one or more subdivisions to Class II.

Ciolkolz - Maybe we could go back to drainage classes.

#### CHARGE 4

Both generalized data by E. Epstein (University of Maine Tech. Bull. 69) and more specific data (data of R. Pennock, Penn State University) establish that some soil moisture deficits occur in the Northeast during the growing season. Discussions with soil scientists and irrigation engineers in the Northeast indicate that a combination of soil survey data, based primarily on water retention difference, and generalized **evapotranspiration** data are combined in the SCS engineering handbook to provide adequate irrigation information.

One suggestion was to develop soil moisture data to express the probability of soil water tension of greater than, say one-bar on a monthly basis. This would need to be combined with the economics of a particular cropping system to determine the advisability of irrigation for a given mapping unit. With increasing land values, there may be a greater need for soils information for irrigation planning. The general response to this topic suggests that it is not particularly viable right now.

#### Conference Discussion

None.

Committee Number 6  
Soils Reflecting A High Degree of  
Physical Disturbance by Man

Charges:

1. Determine the amount of data (field and laboratory) that is **availble** on these kind of soils. Develop bibliography of articles and papers pertinent to this subject.
2. Estimate the amount of land that will be disturbed in the near future.
3. Summarize state and federal laws regarding distrubed soil areas.
4. Review and respond to report of the national conference on classification of soil areas that are greatly disturbed,

Committee Members:

E. Ciolkosz (chairman)*	J. Patterson*
D. <b>Grice</b>	<b>K. Schmude*</b>
D. Hallbrick (Vice Chariman)	W. Sharp*
J. <b>Kubota*</b>	R. Smith'
G. <b>Latshaw*</b>	D. Snyder*

Charge 1:

Determine the amount of data (field and laboratory) that is available on these kind of soils. Develop a bibliography of articles and papers pertinent to this subject.

- a. Pennsylvania - 25 **minesoil** pedons (field descriptions and complete characterization analysis), Pennsylvania-39 **minesoil** pedons (descriptions, engineering data of selected horizons); West Virginia - many sinesoils (sea Ph.D. thesis John C. Sencindiver, M.S. thesis Charles H. **Delp** and M.S. thesis **Carlos P. Cole**); Washington, D. C. - 20 pedons of various types of fill material (descriptions and various physical and chemical lab data); New York-U.S.D.A. Plant, Soil, and Nutrition Laboratory at Ithaca is studing the mineral element composition of feed and crop plants grown on minesoils in the northern great plains and in the eastern **states**; Virginia, New Hampshire, and Vermont- no known data available.
- b. See list **below** for a **bibliography** of selected reference on this subject.

\*Present at meeting

- Caspall, F. C. 1975. Soil Development on Surface **Mine** Spoils in Western Illinois. Third Symposium on Surface Mining and Reclamation, National Coal Association, Washington, D.C. Vol. II **221-228.**
- Ciolkosz, E. **J.**, et al 1977. Characteristics, Interpretations **and Uses** of Pennsylvania **Minesoils.** Pa. State **Ag.** Exp. Sta. Prog. Rept. (In preparation).
- Cole c. **P.** 1976. A comparison of subsoil structure. West Virginia University, **Morgantown.** M.S. **Thesis.**
- Delp, **C. H.** 1975. Properties and classification of minesoils. West Virginia University. Morgantown. **M. S.** Thesis.
- Grube, W. E., Jr. and Andrew A, Sobek. 1975. Analysis of Mineral **Overburden**s and minesoils. Presented at the 67th Annual Meeting of the American Society of Agronomy, Knoxville, Tennessee.
- Grube, W. E., Jr. 1974. Pedologic Potential of Selected Upper Pennsylvanian Sedimentary Rocks Using Chemical Parameters, Ph.D. Dissertation. West Virginia University.
- Grube, W. E., Jr., R. M. Smith, **J. C.** Sencindiver, and A. A. Sobek. 1974. Overburden Properties and Young Soils in Mined Lands. Second Research and Applied Technology Symposium on Mined-Land Reclamation, Louisville, Kentucky. Published by Bituminous Coal Research, Inc., Monroeville, Pa. pp. **145-149.**
- Grube, W.E., Jr., and R. M. Smith. 1974. Field Clues Useful For **Characterization** of Coal Overburden. Green Lands Quarterly, Vol. 4, No. 1. pp. 24-25. W. Va. **Surface** Mining and Reclamation Association, Charleston, **W.** Va.
- Grube, W.E., **Jr.**, and R. **M.** Smith, and R. N. Singh. 1973. Interpretations of Mottled Profiles **in Surficial** Ultisols and Fine-grained Pennsylvanian Age Sandstones,

- Bituminous Coal Research, Inc., Monroeville. Pa.  
pp. 134-152.
- Omodt, H. W., F. W. Schroer and D. D. Patterson. 1975. The Properties of Important Agricultural Soils as Criteria for Mined Land Reclamation. N. Dakota Agr. Exp. Sta. Bull. 492.
- Ruffner, J.D. (NETSC) is **working on** a bibliography on disturbed soils and plant adaptation to minesoils.
- Sencindiver, J. C. 1976. Genesis and Classification of Minesoils. Ph.D. Thesis West Virginia University Morgantown.
- Smith, R. M., 1971. **Properties** of Coal Overburden that Influence Revegetation and Economic Use of Mine Soils, Proceedings of the Revegetation and Economic Use of Surface-Mined Land and **Mine** Refuse Symposium, West Virginia University, Morgantown, W. Va.
- Smith, R. M., A. A. Sobek, T. Arkle, Jr., J. C. Sencindiver and J. R. Freeman. Extensive Overburden Potentials for Soil and Water Quality. Environmental Protection Technology Series, Environmental Protection Agency, Washington, D. C. (In Press)
- Smith, R. M., W. E. Grube, Jr., J. C. Sencindiver, R. N. Singh and A. A. Sobek. 1974. Properties, Processes and **Energetics** of Minesoils. Transactions of the 10th International Congress of Soil Science (Moscow, USSR). IV: 406-411.
- Smith, R. M., W. E. Grube, Jr., T. Arkle, Jr., and A. A. Sobek. 1974. Mine Spoil Potentials for Soil and Water Quality. Environmental Protection Technology Series **S800745**, Environmental Protection Agency.
- Smith, R. M., E. H. Tryon and E. H. Tyner. 1971. Soil Development on Mine Spoil. W. Va. Agr. Exp. Sta. Bull. 604T.
- West Virginia University. 1971. Mine Spoil Potentials for Water Quality and Controlled Erosion. Environmental Protection Agency, Washington, D. C. Water Pollution Control Research Series 14010EJE.
- West Virginia University. 1974. Mine Spoil Potentials for Soil and Mater Quality. Water Pollution Control Research Series 5800745. **Environ-**

Charge 2: Estimate the amount of land that will be disturbed in the near future.

- a. Appendix A is a table taken from the SCS Advisory **CONS-6** (March 26, 1974) that gives an estimate of the disturbed land in the U.S. by states. The table below updates the CONS-6 estimates for some northeast states. It was reported that CONS-6 is being updated and should be available later in 1976.

State	Estimated Acreage Disturbed		Total Land Requiring Reclamation Acres	Total Land Disturbed
	1974	1975		
Pennsylvania	20,000	20,000	250.00	518,000
<b>New Hampshire*</b>				
<b>West</b> Virginia	13,378	13,803	69,000	303,000
Vermont**				9,350
Virginia	8,000	8,000	38,000	88,000

Charge 3: Summarize state and federal laws regarding disturbed soil areas.

- a. See Appendix B for a copy of a table from the report "Analysis of Strip Mining Methods and Equipment" by R. Stefano, et al. 1973. U.S. Dept. of The Interior, Office **of Coal** Research. No update of this table was noted by the committee except that West Virginia is updating regulations and is considering some **requirements** of overburden analysis as well as soil napping before and after mining,

Charge 4: Review and respond to report of the national conference on classification and interpretations of soil areas that are greatly disturbed,

- a) Considerable discussion revolved around the classification of disturbed soils. It was concluded by the committee that **not** all of these kind of soils should or could be grouped under the same **categories**. It was also the consensus that **man's** influence should be identified in the classification **name**. Dick Smith's proposed classification of Spolents was discussed. Some concern was voiced about the presence of cambic horizons in minesoils and the possibilities that many **spol-**ents have cambic horizons. Dick Smith provided the following on this problem **"1.** Weak subsoil structure and some concepts of what constitutes a cambic horizon should not be **permitted** to fragment minesoils at a **high** level of clastification. This could be handled by **ex-**

\*CON-6 data is current,

- \* 5,000 acres of slate quarries not entered on CON-6

cluding soils from the Inceptisol Order regardless of whether or not they may be considered to contain cambic horizons, if they meet all other requirements of Spolents. This exception could be stated under the definition of Inceptisols. 2. It should be emphasized that a number of properties used defining Spolente are likely to be overlooked in normal soil profile descriptions unless these properties are checked deliberately. Nine such properties have been identified and described which help to define Spolents and which constitute reasons why Spolents need to be grouped for scientific and applied study rather than being placed in existing categories which largely ignore these properties and their implications. 5. Our knowledge of how to interpret some minesoil properties is quite limited. This is a prime reason why we need to divide these soils into classes that can be subjected to scientific study and testing by practical experience. Without consistent classes we can't expect to make such progress, either theoretical or applied." The committee wished Smith's proposal well on its way to the Northeast Soil Taxonomy Committee.

- b) The committee didn't discuss specific recommendations for interpretation but did list the following items as worthy of consideration when making interpretation:
- 1) Methane problem (mainly in land fills)
  - 2) Subsidence and sliding
  - 3) Extreme acidity
  - 4) Hydrophobic character
  - 5) Soil Atmosphere (due to compaction)
- c) The committee endorsed new efforts to classify disturbed soils and to develop mapping units that are feasible and interpretable.

### Conference discussion

Dick Smith requested that the statement he read on cambic be added to the proposal on Spolents. This was agreed.

Del Fanning: Suggested that this would prevent these soils from going to Inceptisol as they age. He suggested the possible need for Spolepts.

John Witty: Suggested that a statement could be made to prevent mineroids with very weak cambic horizons from being classified as Inceptisols.

Dick Smith: We shouldn't let the weak structure which could be inherited due to placement procedure in mining alter the classification. This weak structure can be observed immediately after placement. He suggested that these structural aggregate do not have stability in laboratory testing.

Dick Googins: Moved that Dick Smith's proposal be endorsed as amended. The conference supported Dick Smith's proposal on spolents that has been submitted to the ND taxonomy committee.

Jim Pattersen: Described the term Hydrophobic used in the compaction and sealing of the surface due to traffic. He said that water will penetrate in time but intake rates are very slow.

Dick Googins: Stated that many interpretative implications can be made from the classification on mine soils such as pyrite weathering.

TABLE 1  
**Appendix A Table 1**  
 STATUS OF LAND DISTURBED BY SURFACE MINING IN THE U.S.  
 AS OF JANUARY 1, 1974, BY STATE 1/  
 (Acres)

State	Land Mining Disturbance						Land Not Requiring Reclamation	Total Land Disturbed
	Reclamation Not Required by Law			Reclamation Required by Law				
	Coal Mines	Sand & Gravel	Other Mining Areas	Coal Mines	Sand & Gravel	Other Mining Areas		
Alabama	27,670	27,340	17,767	7,418	2,000	2,418	15,432	154,300
Alaska	2,600	1,000	0,000	---	---	---	0,300	22,500
Arizona	100	3,100	40,700	---	---	---	43,900	95,100
Arkansas	0,001	7,073	10,205	004	2,417	2,519	14,822	47,000
California	---	43,730	6,000	---	---	---	100,000	170,000
Caribbean Area	---	---	---	---	---	---	---	---
Colorado	4,527	20,633	513	641	10,400	417	13,523	50,070
Connecticut	---	0,000	100	---	0,071	425	150	10,330
Delaware	---	3,550	330	---	---	---	2,717	4,000
Florida	---	13,164	110,402	---	1,467	71,472	54,004	209,570
Georgia	---	2,203	10,770	---	1,325	10,475	4,344	70,300
Idaho	---	23	1,000	---	---	---	250	1,375
Illinois	---	10,633	13,300	172	204	302	2,252	80,100
Indiana	49,748	4,044	2,130	30,099	43	1,304	307,070	145,047
Iowa	2,500	8,500	7,000	0,000	---	200	123,602	140,600
Kansas	25,650	20,300	2,410	---	---	---	---	40,000
Kentucky	43,700	13,001	10,002	2,500	000	3,000	14,000	95,000
Kentucky	00,000	---	---	117,000	2,057	7,003	00,000	200,000
Louisiana	---	14,000	000	---	---	---	0,015	22,700
Maine	---	20,000	3,000	---	2,250	455	13,007	20,000
Maryland	2,110	11,025	3,042	3,011	4,740	004	15,005	44,000
Massachusetts	---	00,000	0,000	---	00,000	0,000	00,000	00,000
Michigan	000	43,402	24,700	---	7,706	000	22,000	80,000
Minnesota	---	20,700	25,000	---	0,100	0,200	00,000	130,000
Mississippi	---	34,000	10,000	---	---	---	072	45,070
Missouri	70,000	0,400	11,000	1,000	70	425	20,000	110,000
Montana	000	0,000	0,000	000	000	000	15,000	21,000
Nebraska	---	15,100	4,007	---	---	---	0,300	25,000
Nevada	---	10,074	0,400	---	---	---	10,000	20,000
New Hampshire	---	7,000	---	---	---	---	0,000	17,000
New Jersey	---	15,000	000	---	000	000	13,000	20,000
New Mexico	---	0,000	10,100	25,700	---	---	1,000	47,715
New York	---	20,100	12,400	---	0,325	3,732	10,000	61,000
North Carolina	---	11,000	4,500	---	2,700	2,000	7,000	22,000
North Dakota	10,000	9,000	2,000	200	100	100	15,000	45,000
Ohio	22,000	15,017	10,370	45,205	---	---	210,000	230,000
Oklahoma	22,000	0,000	0,000	0,350	3,000	2,000	21,000	87,000
Oregon	---	0,100	1,400	---	00	00	2,000	9,000
Pennsylvania	100,000	10,000	20,000	15,000	11,000	20,000	200,000	470,000
Rhode Island	---	2,000	700	---	---	---	1,000	4,000
South Carolina	---	0,000	12,000	---	---	---	10,000	20,000
South Dakota	700	0,400	0,400	---	0,017	000	03,000	75,000
Tennessee	20,000	0,000	0,000	3,700	100	000	40,000	125,000
Texas	1,470	100,000	11,007	---	---	---	20,000	84,000
Utah	120	7,000	1,000	---	---	---	2,000	0,000
Vermont	---	4,350	---	---	---	---	---	4,350
Virginia	10,000	0,325	0,070	0,010	770	2,415	10,000	72,100
Washington	431	10,320	0,000	1,010	0,000	1,100	2,000	35,000
West Virginia	25,700	1,000	---	11,000	---	---	107,000	270,000
Wisconsin	734	40,000	0,000	70	7,000	000	10,000	70,000
Wyoming	3,070	000	11,000	2,000	000	7,000	15,000	41,000
<b>TOTAL</b>	<b>621,017</b>	<b>710,000</b>	<b>500,000</b>	<b>337,000</b>	<b>170,000</b>	<b>117,000</b>	<b>2,000,000</b>	<b>4,410,000</b>

16.7

Based on information supplied by State Conservation Service state conservationists.

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March 1974

Appendix B TABLE 20 SUMMARY OF STATE ENFORCEMENT AND OTHER LAND RECLAMATION LAWS IN EFFECT OCTOBER 1, 1977

State	Title or Code Chapter	Minerals Covered	Licenses and/or Permit Requirements		Seed Requirements	Reclamation Requirements	Priority for Reclamation Activities		Remarks	
			Application	Fees			Priority	Priority of Seed		Priority of Reclamation
ALABAMA	Alabama Surface Mining Act of 1968. Effective Oct. 1, 1976.	Coal, clay, sand, gravel, plus other minerals except limestone, marble, and dolomite.	Application for permit must be filed with the Dept. of Industrial Relations. Reclamation plan is required.	\$200, \$50 fee for annual permit.	Not less than \$200 per acre plus \$5000. Min/for strip-mining 1000 to 2500.	1000 for each acre covered by the permit.	Grass seeds in sodding (applicable where two of total surface) must water to reduce siltation, erosion or other damage to streams and wetlands. (where approved) paragraphs attached to it.	Yes	Yes	
ALABAMA	The Arkansas River Land Reclamation Act of 1971. Effective July 1, 1971.	Coal, clay, limestone or other minerals except sand, sand and gravel.	Application for permit must be filed with the Arkansas Reclamation Control Commission. Reclamation plan is required.	Up to 2 acres (1000) \$20-\$50 (over 2000) \$200. 20 acres above \$1000.00 (over 2000).	Not less than \$200 per acre plus \$1000. Each day in default a separate violation.	\$200 for each acre affected.	Grass seeds and pliers in a sodding or sodding (applicable) must water down when rains are forecast. (where approved) (where approved) paragraphs attached to it.	Yes	Yes	
ARIZONA	The Colorado River Land Reclamation Act of 1968 as amended. Effective July 1, 1972.	Coal	Application for permit must be filed with the Land Reclamation Board. Reclamation plan is required.	\$1000 per-100 plus \$20 for each acre up to 1000. Over 1000, \$2000 plus \$10 per acre.	Not less than \$20 per acre plus \$1000.	The Land Reclamation Board determines the amount of seed necessary to insure compliance with the law.	In response, subject to approval of the Land Reclamation Board, determine the area for which the land is to be reclaimed. Reclamation requirements may according to proposed land use.	Yes	Yes	
ARIZONA	Colorado River Reclamation Act of 1968 as amended by Chapter 208, Session Law of 1968.	All minerals except coal.	The operator is required to file a notice of activity with the Director, Bureau of Mines. Upon approval of the proposed activity another the operator may be permitted to engage in mining.			Determination of these requirements whether or not a performance bond is required.	Where possible, type of reclamation to be determined through agreement between the Commissioner of Mines and the operator.	Yes	Yes	
ARIZONA	Georgia Surface Mining Act of 1968. Effective Jan. 1, 1968.	Coal, shale, gravel, sand, phosphate, rock, mica, mica, and any other mineral substances of commercial value found in surface deposits or in the earth.	Application and license must be filed with the Surface Mining Land Reclamation Board. Reclamation plan is required.	Less than 100 acres \$200 annually. More than 100 acres \$200 plus an additional \$200 for each acre over 100 acres.	Not less than \$200 per acre plus \$2000 for each acre.	To be filed by the Board of Reclamation and Land Conservation Act 1968. The operator accepted land use by operator in 1968.	Grass seeds and pliers in a sodding (applicable) must water down when rains are forecast. (where approved) (where approved) paragraphs attached to it.	Yes	Yes	
ARIZONA	The Idaho Surface Mining Act as amended. Effective March 10, 1971.	Coal, shale, sand, gravel, sand-limestone and sand-limestone with clay and any other mineral material or substance of commercial value.	No permit is required. Permitting to conduct operations and Surface Mining Operations must obtain and be approved by the Board of Land Reclamation. A performance plan is required.		Not less than \$200 per acre plus \$2000 for each acre.	The Board of Land Reclamation and Conservation determines whether a bond is to be filed and what the amount should be.	Grass seeds and pliers in a sodding (applicable) must water down when rains are forecast. (where approved) (where approved) paragraphs attached to it.	Yes	Yes	
ARIZONA	The Surface-Mined Land Conservation and Reclamation Act. Effective Sept. 27, 1972.	All minerals.	All operations of all open and operating of this in depth must have a permit from the State Department of Mines and Minerals. Reclamation plan is required.	\$20 plus \$20 for every acre to be reclaimed.	Not less than \$20 per acre plus \$2000 for each acre.	\$2000 and \$2000 per acre.	Grass seeds and pliers in a sodding (applicable) must water down when rains are forecast. (where approved) (where approved) paragraphs attached to it.	Yes	Yes	

\* Source - U.S. Bureau of Mines, Director of Enforcement.

6.8  
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REPORT OF COMMITTEE 7

EVALUATING MAPPING UNITS

New York City, January 12-16, 1976

Charges to the Committee:

1. Determine if the mapping unit names and descriptions in recently published soil surveys are adequate for accurate interpretations.
2. Evaluate and list problems that have arisen from the use of Soils Memo 66 in naming mapping units. Determine if the naming of a mapping unit in a manner that presented its major inclusions would be helpful in interpretations.
3. Determine which techniques are most efficient and **accurate** for determining the extent of significant inclusions and the composition of mapping units.

Committee Chairman: Darrell G. **Grice**

Committee Vice Chairman: Robert V. Rourke

Members : R. Arnold                      S. **Holzhey**  
E. **Ciolkosz**                      R. Smith  
W. Ellyson                      J. Witty  
W. Wright                      D. Yost

Recommendations by the Committee:

1. Mapping unit descriptions should be prepared **early** in the soil survey and be carefully and periodically updated. Careful attention to the format used to establish models of mapping unit descriptions will result in soil mapping unit descriptions that lead to accurate mapping unit interpretations.
2. Since Memo 66 is presently being redone and will appear as Section 300 in the National Soils Handbook it is hoped that attempts will be made through the use of various graphic techniques **to** improve its definition. It is not recommended to have the mapping unit name be composed of the major soil plus included soils. Rather that the mapping unit descriptions will be complete in their discussion of inclusions. It is the recommendation of the committee that mapping unit component research be continued by the various cooperating research agencies to determine the best methods for delineating mapping unit composition.
3. The committee recommends that procedures be initiated to establish guidelines that would assist the soil scientist in the use of transect techniques to evaluate mapping unit inclusions. The combination of transect and field notes of the soil scientist should be tested to estimate the number of transects needed.

## Committee Report:

### Charge 1.

The naming of mapping units is generally adequate and the interpretation of these units has few problems. The use of models to establish formats for mapping unit descriptions has assisted in the accurate description of the unit within the mapping area. Instructions as to the description of a mapping unit are adequate. At times there are errors that may result from correlation techniques. These errors can be overcome through careful review of the final mapping unit descriptions remaining following correlation. Additional information and research are needed to better understand water relationships as they influence soil behavior.

### Charge 2.

The major problems of Memo 66 are those that need to be defined in a quantitative manner. The use of observable differences as a criteria has led to problems that might be overcome by applying statistical evaluation to mapping unit data in those areas that lend themselves to this type of evaluation (texture, coarse fragment content, percent base saturation, thickness of horizons or **solum**, etc.). The memo is difficult to understand and might be improved by the use of diagrams, charts or tables that could show graphically the major concepts of the memo. The use of the included soil names as part of the name of the mapping unit would prove to be too cumbersome and create more problems than it could prevent and can not substitute for good field notes and complete mapping unit descriptions.

### Charge 3.

The committee feels that stratified random transects of the mapping unit is the best method to evaluate mapping unit inclusions. The necessary replications needed to adequately describe the mapping unit needs to be determined. It is possible that a grid system technique would better express the spatial extent of the mapping unit inclusions.

## Conference Discussion:

### Charge 1.

No discussion.

### Charge 2.

R. Googins - Does the recommendation describe how transects are to be made?

J. Rourke - Information formerly given in Memo 66 is given in the 5th draft of Soil Survey Manual Chapt. 6 and in Section 300 of the National Soils Handbook and should be critically reviewed to overcome possible shortcomings.

### Charge 3.

E. Ciolkosz - Explain stratified random transects.

R. Rourke - Not completely randomized transects but those that are biased by landscape and mapping unit shapes.

D. Fanning - Guides should be included in the Manual for making transects.

R. Rourke - Better guides need to be developed but the Manual should not be held up to include them.

RATIONAL COOPERATIVE SOIL SURVEY  
NORTHEAST SOIL SURVEY WORK-PLANNING CONFERENCE

JANUARY 12-16, 1976

Report of Committee 8 -- Histosols and Tidal Marsh Soils

- Charges:
1. Review report of National Committee 8 on organic soils with respect to application of the guides and other terms.
  2. Evaluate the level at which organic soils should be identified. Will it differ in different states or different soil temperature areas.
  3. Summarize information on procedures, equipment, etc. for mapping Histosols and tidal marshes in other parts of the county.
  4. Summarize studies and laws on tidal marsh areas.

Committee Members:

R. L. Gogins, Chairman	E. H. Sautter
J. E. Foss, Vice Chairman	K. G. Stratton
J. M. Duxbury	J. E. Witty
S. A. L. Pilgrim	L. A. Douglas
R. V. Rourke	

Recommendations of the Committee

1. The committee be continued, but that greater emphasis be placed on tidal marsh soils in the future.
2. In view of recently published thesis, investigation, etc., the committee recommends a summary of results with respect to pH, sulfur content, O.H. content, etc. The intent of this recommendation is to test the validity of the definition for sulfidic materials.

Committee Report:

- Charge 1. Testing of the guides referred to in Charge 1 was initiated within the northeast region by TSC Advisory SOILS UD-14 (see attached). At the writing of this

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Conference Discussion:

Ed Sautter: The major reason for classification at the series level is that it forces one to look more closely at the soil.

General discussion of Charge 2 concurred with the report.

- Charge 3. Normal traverse procedures using either a bucket auger or the McCauley Peat sampler supplemented with a tile spade seems to be dominant procedure for observing Histosols and tidal marsh areas. Tidal marsh areas that are extensive and subject to tidal flooding of 2 to 3 feet or more require other kinds of equipment. A large area of tidal marsh behind the Barrier Islands along the Eastern Shore of Virginia was surveyed using an 18<sup>t</sup> boat for transportation to and from the area and for access to points well within the marsh lands themselves. David Slusher, State Soil Scientist in Louisiana, has indicated in personal communication that they have tried boats, swamp buggies and helicopters equipped with pontoons for exploration of large extensive areas of tidal marsh in Louisiana. He noted his personal preference for helicopter exploration because of the added safety features of this kind of equipment.

High altitude photo imagery including ERTS infra-red imagery is a highly beneficial tool in mapping undisturbed areas.

Conference Discussion:

Oliver Rice and Fred Gilbert mentioned using a boat with a hole in the bottom (in a well) to examine tidal marsh soils.

- Charge 4. The following listed states in the northeast are known to have Wetlands Acts:

1. New Jersey - Wetland Act of 1970  
Coastal Area Facility Review Act of 1973
2. New York - Fish and Wildlife Law Art. 25 (Tidal Wetlands)
3. Connecticut - General Statutes of Connecticut  
Chapter 440, Section 22a-28 (Preservation of Tidal Wetlands)

4. Maryland - Wetlands Act
5. Virginia - Code of Virginia Chapter 2.1
6. Rhode Island - Coastal Resources Management Council 1973
7. New Hampshire - Water Resources Board Chapter 483A (Tidal Waters)
8. Maine - Department of Environmental Protection - Revised Statutes, October 1975

All of the above essentially define tidal marshes as land under or contiguous to tidal waters (some to a mean high elevation) and containing or growing one or more of a list of recognized salt marsh grasses or vegetation. These include such species as *Spartina Patens* or *Alterniflora*; Saltworts, Groundsel, Marsh Elder, *Bistichlis*, etc.

All of the above provide for state or local authority to protect, regulate, issue use permits, and levy penal ~~ties~~ with respect to tidal marshes or wetlands. The New Jersey Act delineates the land. The line on the map encompasses some tidal marsh areas. To this extent, the delineation of land dilutes the effectiveness of the act.

#### Studies of Tidal Marsh Areas

1. Pedogenic Investigation of Tidal Marsh Soil in Virginia - Reusche 1975
2. Soil Survey of New Hampshire Tidal Marshes - Pilgrim 1973
3. Recon. Survey of Tidal Marshes of Maryland - Darmody 1975
4. Morphological, Physical, Chemical and Mineralogical Characteristics of Some Tidal Marsh Soils in the Patuxent Estuary - Baxter 1973
5. Tidal Marshes of Connecticut and Rhode Island - Hill and Shearin 1970

Conference Discussion:

John Foss noted that in the Maryland studies, some of the soils now in tidal marsh positions had evidence of argillic horizons. Such soils are believed to be submerged upland soils.

John Witty noted that such soils could conceivably classify the same as some upland soils.

Dick Googins displayed several slides depicting use of infra-red photography in mapping marsh areas in Virginia.

RATINGS FOR CROPS GROWN IN VIRGINIA 1/

Soil	Corn	Soybeans	Small Grains
Hemic Medisaprists	6	6	6
Typic Hedisaprists	5	5	5
Terric Medisaprists	5	5	5
Histic Humaquepts	6	5	5

1/ Limited acreage of Histosols are devoted to crops in Virginia.

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**RATING SHEET FOR PLANNING PURPOSES FOR FLOATING LIGHT LOADS ON ORGANIC SOILS**

FACTOR	Rating for Named Soil or Condition			
	Hemic Medisaprists	Typic Medisaprists	Loamy Terric Hedisaprists	Sandy <u>1/</u> Terric Medisaprists
Depth to Underlying Material	100	100	50	50
Logs or stumps	20	20	20	20
Kind of Material	0	50?	50	50
Decomposition	0	30	30	30
Mineral Strata	50	50	50	50
Surface Densification (Organic Soils)	60	60	60	60
Surface "Ripening" (Hydraquents)	100	100	100	100
<b>TOTAL</b>	<b>330</b>	<b>410</b>	<b>360</b>	<b>360</b>

COMMENTS: 1/ Rated since it is known to occur. No description attached.

REMARKS: Surface "Ripening" may not be rated correctly.

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**RATING SHEET FOR PLANNING PURPOSES FOR EXCAVATION AND REHOVAL OF ORGANIC SOIL  
(includes displacement of soft materials below a depth of 12 to 15 feet)**

	Rating for named soil			
	Hemic edisapristis	Typic Hedisapristis	Loamy Terric Medi sapri sts	Sandy 1/ Terric Medisapristis
<b>Factors affecting excavation</b>				
Depth to firm underlying material	100	75	30	30
Logs and stumps	20	20	20	
Subtotal				
<b>Factors affecting displacement</b>				
Mineral strata	0	0	0	0
Decomposition	20	0	0	0
Water content	0	0	0	0
Subtotal				
<b>Total</b>	<b>140</b>	<b>95</b>	<b>50</b>	

100  
60/1

Soil Family and Series	Management		Development		RATINGS FOR SPECIFIC CROPS										FORESTRY		RATING FOR PLANNING PURPOSES								POTENTIAL SITES INDEX							
	Group	Series	Group	Series	Com. Grain	Soy-beans	Pea-ture	Oil-seeds, Carrots, Celery	Mint & Potatoes	Lettuces, Radishes, Cabbage, Spinach	Wild Rice	Penalty Factors	Tree Potential Groups	Flooding Light Loads	Excavation & Material	Black Spruce	Tamarack	White Cedar	Balsam Poplar	Black Ash	Red Maple	White Spruce	White Pine									
Typic Boronudakta, eolic hills	5	2	2	105	135	40	65	70	45	45	15	1:0	3	180	95	30	40	30	45	-	-	-	-									
Typic Medisaprista, eolic Caribola	1	1	1	20	30	10	10	15	10	10	0	90	3	210	75	-	50	35	-	80	-	-										
Lignic Medisaprista, eolic Seward	5	1	1	70	90	45	80	85	80	65	35	90	3	170	60	-	50	35	-	80	-	-										
Terric Medisaprista, eolic Adram	5	2	2	70	80	35	70	60	50	35	5	90	3	110	110	-	50	35	-	80	-	-										
Terric Medisaprista, eolic Pallas	5	3	3	45	55	35	70	75	70	70	25	90	3	110	110	-	50	35	-	80	-	-										
Terric Medisaprista, eolic Villatte	5	2	2	45	55	35	70	75	70	70	25	90	3	110	110	-	50	35	-	80	-	-										
Mineral soils																																
Mollis Epilaeophis, mesocid	3	-	-	25	35	10	15	20	15	20	0																					
Cambisidign	5	-	-	65	65	65	70	75	70	70	30																					
Ferolis	5	-	-	55	65	25	40	45	40	40	20																					
Terric Epilaeophis, mesocid Fredon	2	-	-	35	45	15	30	35	30	25	0																					
Typic Fragisaprista, frigid Inconcern	7	-	-	165	185	100	120	125	120	150	70																					
Biartic Eumagnum, carbonatic Marlboro	6	-	-	105	125	70	110	115	100	110	60																					

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NATIONAL COOPERATIVE: SOIL SURVEY  
NORTHEAST COOPERATIVE SOIL SURVEY CONFERENCE  
JANUARY 1976

Report of Committee 9: Soil Survey Research Needs and Priorities

The Committee considered five charges:

1. Assess consequences of the establishment of the National Soil Survey Laboratory on Soil Survey Investigations in the Northeast.
2. Make recommendation for alternative disposition of the Benchmark Soil Program.
3. Assess morphological soil changes following soil uses for waste disposal.
4. Assess means by which the Cooperative Soil Survey can cope with rapidly changing technology and user demands.
5. Reassess purpose of the Committee.

Charge 1. Assess consequences of the establishment of the National Soil Survey Laboratory on Soil Survey Investigations in the Northeast.

The establishment of the National Soil Survey Laboratory in Lincoln, Nebraska could materially redirect soil survey investigations in many northeastern states. Proposal review nationwide might reasonably be expected. Less competitive ones, if from the Northeast, may receive lower priority to indicate a need to upgrade those submitted.

An understanding of the philosophy and operational procedures of the National Soil Survey Laboratory seemed essential to the Conference, and this need was recognized by both the Executive Committee and this Committee.

Disposition of charge: Inclusion in the Conference program of talks by the Director, Soil Survey Investigations, SCS, and the Research Liaison to the NE TSC largely fulfilled the charge. Dr. Flach gave an overview of the Laboratory including its staffing, internal organization and proposed operational procedures against a background of shortcomings arising from the operation of three smaller laboratories at Beltsville, Maryland; Lincoln, Nebraska; and Riverside, California. He also gave an outline of how regional research needs are to be met through the Research Liaisons, one assigned to each TSC region. An outline of a Laboratory research proposal for the Northeast Region was given by Dr. Yeck. The proposed study deals with fragipans and how they might be distinguished from firm basal till.

The basic procedure for requesting Laboratory assistance is outlined in SCS Advisory Soils-34, dated December 29, 1975.

Keeping soil scientists informed of findings and activities of the National Soil Survey Laboratory, especially those pertinent to the region, will be essential.

The Committee considers that Charge 1 has been fulfilled.

Charge 2. Make recommendations for alternative disposition of the Benchmark Soil Program. The preparation of an inventory of benchmark soils in the Northeast was a charge outstanding from the past committee. Anticipated support for this program has not materialized to indicate a need to seek alternative means, if the goals established for the Benchmark Soils Program were to be attained.

The Soil Survey Input form (draft copy attached) is a program that could fulfill in part the needs originally conceived under the Benchmark Soil Program. This is an automatic data processing procedure under development and trial by the Soil Data Storage and Retrieval Unit of the SSIU, SCS. The program is intended to identify sources and kinds of laboratory data currently available at various laboratories in the Northeast Region. It would serve to bring together scientists seeking information about certain soils or groups of soils with laboratories that may have such information. The kinds of laboratory data available are identified by soils, so that only those of use can be requested.

Currently, it is planned to have the program located at the Principal Correlators Office, NE TSC.

Inputs from the Agricultural Experiment Stations are essential for this program to succeed.

Recommendation: The Committee recognizes that the Soil Survey input program provides the best alternative to the Benchmark Soils Program and recommends its support by the Conference.

Charge 3. Assess morphological soil changes following soil uses for waste disposal. The consequences of waste disposal on land are being assessed largely through plant uptake and studies of extractable heavy metals from treated soils. Changes in soil morphology associated with changes in chemical and physical properties appears to be essential if a total assessment is to be made of consequences of waste disposal on soils. Digested sewage sludge buried in a trench for 19

months appears to develop an oxidized upper zone (1974 Agron. Abst., p. 40) and parallels increases in extractable Zn and Ni. Morphologic changes may provide a means to assess projected lifetime of waste disposal sites and loading rates, as they may reflect changes in heavy metal availability with time. Evidences of poor soil drainage may provide guides to changes in trace element behavior.

There are several active projects in the Northeast. Morphologic soil changes after 11 years of effluent application are currently under investigation in Pennsylvania; seepage from disposal sites is under investigation in New York; and soil changes with effluent application are being monitored in New Hampshire.

Recommendation: The Committee recognizes and supports research in this area of soil investigations.

Charge 4. Assess means by which the Cooperative Soil Survey can cope with rapidly changing technology and user demands. In recent years, agricultural practices have been closely scrutinized with successive crises stemming from lagging economy, international balance of payment, fuel shortages and environmental pollution. Research interests as indicated by journal publications and current research activities suggest a crisis-to-crisis approach to problem solutions. Emphasis in research needs have shifted from  $\text{NO}_3$  leaching to denitrification, organic waste to organic nutrients, and municipal garbage to fuel sources. The assessments of food production practices are also being made on basis of fuel consumption. The elimination of heavy metals like Cd at industrial or sewage disposal plants through

improved technology possibly may change the outlook on sewage sludge disposal. Research when undertaken is often focused on one or a few soils and raises questions concerning the applicability of research findings across broad soil regions.

Recommendations:

1. Continued improvement in all phases of Soil Survey activities is essential to enhance recommended interpretative uses made of soils.

2. Reemphasize the need for close working relationships between Soil Survey personnel and researchers in ARS and the Agricultural Experiment Stations, so that soils used for research are properly identified. Effectiveness is greatly enhanced when Soil Survey inputs are made in the planning stages of research.

3. Continue to seek opportunities, through existing programs, to obtain much needed but difficult to obtain information such as substratum characteristics.

4. Encourage greater interaction of soil scientists with those in other scientific disciplines so that potential problems can be identified and research initiated.

Charge 5. Reassess the purpose of the Committee. The present Committee is an outgrowth of the Committee on Benchmark Soils. The scope of the Committee was expanded to identify existing sources of information, facilities and expertise, and specific research needs. A list of 27 institutions in 12 states was compiled with capabilities and interest to support the Soil Survey program in the

Northeast (Appendix I, Committee Report, 1974 Proc. NESSWP Conf.).

A number of specific research needs was identified to enhance the usefulness of soil surveys for interpretative purposes.

A current reassessment of this Committee seems essential to meet increased user demands. Significant progress has been made to automate publications of soil survey reports, and data processing and retrieval, and means are under investigation to accelerate, improve and monitor field mapping. Continuing research seems essential to maintain overall quality of the Soil Survey program.

The Committee reviewed the charge from several points of view:

A. Purpose of the Committee. Two alternatives were considered:

1. The Committee could serve primarily as a clearing-house of ideas.

2. The Committee serves actively to solicit, evaluate and select one research proposal, preferably regional, for financial support from the Northeast Soils Research Committee. Such a proposal with strong documentation could be competitive with those usually submitted to the NE Soil Research Committee. A need for seed money, although small, was considered essential for the initiation of some kind of regional project in Soil survey.

No strong preference was expressed for either of the alternatives and the question was not resolved.

B. Place responsibility for assessing research needs on each of the existing committees. This proposal places added responsibility on each of the established committees. It recognizes the fact that members of' the

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The recommendations were accepted by voice vote of the Conference.

Joe Kubota\*, Chairman  
R. Pennock, Vice Chairman  
R. Arnold  
R. Bartlett  
R. Cunningham  
R. Matelski\*  
F. Miller\*  
DeVon Nelson  
G. Olson\*  
M. Weeks  
R. Yeck\*  
S. Holzhey

"Member present at Committee meeting. K. Flach and F. G. Loughry were observers.

INPUT FORM FOR INDEX OF SOIL LABORATORY DATA

(Where multiple entries are provided, circle appropriate code. Numbers in parentheses are card numbers for guidance of keypuncher and the two-digit numbers are item numbers.)

(Entered by SDSMGU)

RECORD NUMBER \_\_\_\_\_

(1) \_\_\_\_\_

01 CURRENT SERIES NAME AND 02 TAXONOMIC CODE

03 SOURCE DOCUMENT

04 EARLIER SERIES NAME (Items 04 and 05 are optional) 05 SOIL SYMBOL 06 LAB. SAMPLE NUMBER 07 LABORATORY (State and kind) 08 SAMPLE ON HAND

(2) \_\_\_\_\_

09 SOIL SURVEY SAMPLE NO. 10 HLRA 11 COUNTY NAME 12 REFERENCE CITATION

(3) \_\_\_\_\_

13 SUBGROUP MODIFIER 14 GREAT GROUP

(4) \_\_\_\_\_

15 SOIL FAMILY TERMS

F (Soil Family)  
L (Series type location)  
R (In series range)  
T (Tasadjunct)  
V (Variant)

I (Publ. Soil Survey Invest. Rpt.)  
M (Publ. Soil Survey)  
O (Other Publ. Source, Journal, etc.)  
P (Thesis, College or Univ.)  
U (Unpublished Data)

E (SCS-SS)  
N (SCS-Mech)  
S (State-ES)  
K (State-Hwy)  
O (Other)  
Y (Yes)  
N (No)  
U (Unknown)

SUMMARY OF KINDS OF ANALYSES AVAILABLE  
(In "amount of data" column, use code "3" for 3 to 3 samples and code "4" for 4 or more.)

CODES			Analysis Subclass
Kind of analysis	Amount of data		
16	3 4	5	P.S. with coarse fragments UNSPECIFIED
		6	" " " " MEASURED
		7	" " " " ESTIMATED
		8	" " " " MEASURED AND ESTIMATED
<b>PARTICLE SIZE</b>			
<b>BULK DENSITY</b>			
17	3 4	5	BULK DENSITY without COLE
		6	" " with COLE
<b>MINERALOGY</b>			
18	3 4	5	CLAY FRACTION
		6	SAND and/or SILT FRACTION(S)
		7	CLAY, SAND and/or SILT FRACTION(S)
		8	FAMILY MINERALOGY CLASS
<b>HIGHWAY LABORATORY</b>			
19	3 4	5	STANDARD ITEMS (mechanical analysis and Atterberg Limits)
		6	STANDARD ITEMS and MAXIMUM DENSITY
		7	STANDARD ITEMS, MAXIMUM DENSITY, and SHRINK-SWELL

CODES			Analysis Subclass
Kind of analysis	Amount of data		
20	3 4		WATER CONTENT, MOISTURE TENSIONS
21	3 4		ORGANIC CARBON or ORGANIC MATTER
22	3 4		pH
23	3 4		EXTRACTABLE CATIONS or BASES
24	3 4		CARBONATE
25	3 4		ELECTRICAL CONDUCTIVITY, SALT ELECTRICAL RESISTANCE or RESISTIVITY
26	3 4		SATURATION EXTRACT SOLUBLE CATIONS and ANIONS
27	3 4		EXTRACTABLE IRON (pyrophos, dith-cit, etc.)
<b>OTHER DATA</b> (Enter a maximum of 8)			
28	3 4		ALUMINUM (pyrophos, dith-cit, NaOH, KOH)
29	3 4		ATTERBERG LIMITS
30	3 4		CLAY, carbonate or noncarbonate, fine clay
31	3 4		FIBER CONTENT
32	3 4		GYPSUM (Total)
33	3 4		MINERAL CONTENT of organic soils
34	3 4		MANGANESE (any method)
35	3 4		NITROGEN
36	3 4		PHOSPHORUS (Total)
37	3 4		SULFUR (Total)
38	3 4		FIELD MEASUREMENTS OF PERMEABILITY, WATER CONTENT, WATER TABLE, etc.
39	3 4		THIN SECTIONS
40	3 4		TOTAL ELEMENTAL ANALYSIS
41	3 4		HYDRAULIC CONDUCTIVITY
42	3 4		AVAILABLE PHOSPHORUS
43	3 4		AVAILABLE POTASSIUM

NATIONAL COOPERATIVE SOIL SURVEY  
NORTHEAST COOPERATIVE SOIL SURVEY CONFERENCE  
January 1976

Report of Committee 10 - Remote Sensing in Soil Survey

The Committee considered four charges:

1. Inventory the application of remote sensing in the Northeast for soil survey related activities.
2. Investigate the feasibility of developing a land use base map for the Northeast.
3. Investigate the possibility of coordinating remote sensing efforts in the Northeast associated with soil survey.
4. Assemble a bibliography of remote sensing research in earth resource evaluation.

Charge 1. Inventory the application of remote sensing in the Northeast for soil survey related activities.

Soil boundaries have been drawn on aerial photograph base maps since the **1930's**. Recently, improved quality, time of photography, and scale are being requested. Satellite and high altitude photography are permitting access to base maps that "**show the big picture**" and that also are nearly orthographic. These photographs used as atlas sheets provide greater efficiency and accuracy than with previous cartographic techniques. The same photo interpretative techniques using tone and texture are used in determining earth resources. Boundaries are drafted identifying mapping units. Color and color infrared photography often enhance interpretation.

Multispectral scanner reflectance data permit computer processing and classification of data if spectral signatures for earth resource units have been developed. This aspect of remote sensing is presently being researched and has proven effective in the mapping of water bodies, some wetlands, land cover, and several other special categories. Most of these delineations can be photo interpreted; however, the computer assisted classification is accurate, rapid, capable of storage, and can interface with other data bases. Photograph-like images can be procured from spectral reflectance data for each increment of the spectrum. These images can be photo interpreted but distortion and resolution may be more of a problem than with photography.

In the Northeast, high altitude photography base maps are being used in several field surveys. The forest service photo interpreted **LANDSAT Band 5** images for rapid survey of soil **associations**. Marsh lands in Virginia were separated using high altitude infrared photography.

The following are research progress notes according to research agency: Cornell University, **J. W. Kelley** and J. T. Roach.

Research has been completed and a preliminary report has been prepared which discusses the characteristics of the LUNR system and feasibility of application to the Susquehanna River Basin including an overview of the LUNR system: LUNR chronology; technical and cartographic considerations; classification of inventory items; computer aspects of LUNR process; innovations; expenditure estimates and user services and, examples of LUNR applications to the Susquehanna River Basin including watershed management: land use monitoring, scale analysis; pollution identification and surveillance; environmental impact statements and other potential uses of LUNR.

Cornell University, E. E. Hardy

To develop a low cost, manual technique for enhancing ERTS-1 imagery and preparing it in suitable format for use by users. Goals of the project include development of enhancement techniques based on concepts in photographic sciences, provide manual means of allowing interpretation of the imagery, low cost products, wide applications compatible with existing information systems. The 70mm film chip received from NASA are standardized. A subtractive color process is employed to produce step enlargements of the 1:25,000,000

The Pennsylvania State University, F. Y. Borden and B. J. Turner

A data processing system for analysis of digital **multi-**spectral scanner data was used on ERTS-1 data for land use classification and resource inventory as follows: urban, suburban, industrial, and rural; forest types; vegetative cover; and deep mine refuse, strip mines, water types, vegetation, and urban. A mix of supervised and unsupervised classifiers was found more useful than either used exclusively. Satisfactory results were generally found, but one major target confusion was apparent. Agricultural areas dominated by small fields were generally confused with low-to medium-density suburban targets. Preliminary maps have been produced for the Southern and Middle Anthracite Coal Fields of Pennsylvania showing the location and extent of deep mine refuse banks as well as associated strip mines and urbanized areas. Remote sensor data are limited to the classifi-

geologic faults and correlation of these with known mineral deposits and ground water, mapping of mine spoils in the anthracite region of eastern Pennsylvania, and mapping of strip mines and acid mine drainage in central Pennsylvania. Both photointerpretive techniques and automatic computer processing methods have been developed and used, separately and in a combined approach.

Recommendations: The current inventory needs a greater number of specific examples. The Committee recommends that the inventory activity continue.

Charge 2. Investigate the feasibility of developing a land use base map for the Northeast.

Several states have land use maps and most are in preparation stage. Remotely sensed data are often used in the preparation. **U.S.G.S.** are preparing at a **1:250,000** scale land use maps for many of the published topographic maps of this same scale. The Level I classes are: Urban, agricultural, range, forest, wet, and barren lands, water, tundra, and perpetual snow or ice. From the feasibility study under this charge, map scale, land classes, needs, and other characters are too variable to permit a regional map at this time.

Disposition of charge. The Committee considers that the charge has been fulfilled.

Charge 3. Investigate the possibility of coordinating remote sensing efforts in the Northeast associated with soil survey.

Remote sensing is recognized as an important tool applicable to soil survey. The Committee identified individuals in several disciplines related to soil survey who are benefitting by the use of remote sensing techniques. Publications, workshops, and conferences are available for those who would like to develop competence in the use of remote sensing.

Recommendations: The Committee recommends:

1. Appointment of a member of the Technical Service Center as Coordinator for Remote Sensing for the region.

2. Encouragement of soil surveyors in the Northeast to subscribe to Warren **Philipston's** Newsletter on Remote Sensing, published through the Civil Engineering Department, Cornell University, Ithaca, N. Y. and other publications pertaining to remote sensing.

3. Participation of soil scientists in workshop, conferences, and meetings pertaining to remote sensing. A conference is scheduled for fall '76 at The Pennsylvania State University, University Park, PA sponsored by ORSER.

4. Continuance of the charge.

Charge 4. Assemble a bibliography of remote sensing research in earth resource evaluation.

A list of nearly 100 publications was assembled by the Committee. The bibliography is now available.

Recommendations: The Committee recommends that the bibliography be maintained and kept current by the coordinator to be identified at the Technical Service Center.

R. L. Cunningham, Chairman  
G. H. **Sautter**,\* Vice Chairman  
J. A. **Ferwerda**\*  
D. C. Hallbick  
R. **Alvis**  
W. C. **Kirkham**\*  
G. W. Petersen  
D. E. **Pettry**  
W. A. VanEck\*

• Members present at Committee meeting. **DeVon** Nelson was an observer.

REPORT OF THE CONNECTICUT AGRICULTURAL  
EXPERIMENT STATION REPRESENTATIVE

David E. Hill

Several projects of the Department of Soil and Water support our effort to create new soil survey interpretations and to improve older ones. The study of septic tank ~~systems~~

Quantitative evaluation of performance which introduces the concept of smearing end early failure rates will require that the rating of several of our well drained soils developed on loose glacial till be changed from slight to moderate. The soils on compact glacial till rated severe, will remain the same. The study also concluded that weather has little effect on the longevity of any operating system but systems installed in excessively wet years have higher failure rates than systems installed in dry years. Smearing of infiltrative surfaces is undoubtedly more pronounced when soils are wet.

A study of 23 Connecticut lakes in 1973-74 has shown that several water quality parameters have declined since an earlier study in 1937-39. Most lakes showed a general increase in such pollution parameters as total P and oxygen deficit and decreased transparency. The decline in water quality was modest in most lakes but severe in a few. To determine the probable causes of rapid eutrophication we are studying changes in land use within the watersheds of the lakes. We have retrieved land use data from a 1970 state-wide inventory and are currently determining earlier land use from 1940 photos. A complete inventory of soils and such watershed characteristics as lake to watershed ratio, and characteristics of the drainage system feeding the lakes is being evaluated. At present the most probable causes of rapid rates of eutrophication are large lake to watershed ratios, predominance of hardpan and shallow soils, numerous high-volume, point-source discharges of waste, changes in fertilization practices on farms, and rapid suburbanization within the watershed.

REPORT OF THE CORNELL UNIVERSITY AGRICULTURAL  
EXPERIMENT STATION REPRESENTATIVE

Richard W. Arnold

There are a number of projects that have some relationship to soil survey concerns which I will briefly mention. If you are interested in details we will be glad to help you contact the principal investigators.

The point and non-point sources of N and P in the Fall Creek watershed were investigated by a multidisciplinary group involving people from the departments of Agricultural Economics, Agricultural Engineering, Agronomy and Poultry Science. They developed a model of behavior and possible behavior of nutrients with changing land management for the 33,000 ha watershed. Many of the results are contained in a book titled, "Nitrogen and phosphorus - food production, waste and the environment" and published by Ann Arbor Science Publishers, Inc.

Another joint project examined manure handling in crop management systems. Methods and amounts of manure spreading, time of operations, and the fate of P and N in, through, and off of the soils were studied. The data will be used to help establish reasonable guidelines for animal waste management. The Department of Agricultural Engineering has initiated a study to develop base line data for a continuing manure management project. A dynamic moisture balance and nutrient budget will be examined.

As part of the international study of the Great Lakes system, a nutrient budget for organic soil areas is being developed. In the Typic, Terric and Linnic Medisaprists where water tables and oxidation are controlled by pumping there appear to be large quantities of P released. Also the nature of some organic matter constituents are being studied.

A joint study of sanitary landfills will attempt to determine what is happening at representative sites. Soils and leachates will be analyzed to try to determine the loading capacity of various soil materials.

An ongoing project to examine surface soil test variability as it relates to named mapping units is beginning to accumulate information on ranges of values that exist. Some properties, such as pH, appear to be quite uniform whereas others may require thousands of samples to provide reasonable estimates of population mean values.

We observed that some of our experimental farms and demonstration fields do not have adequate soil surveys so we are working with SCS to update the information and correct a deficiency.

An important project headed by Marlin Cline and Ray Marshall is a new soil association map and bulletin on "Soils of New York Landscapes." It is a hierarchical process going from 1:63,360 maps to 1:250,000 to 1:500,000 and to 1:1,000,000. An attempt to estimate percentages of limiting conditions such as steep slopes, wet soils, and very stony areas for each mapping unit is being made. The map and information will be used to estimate prime agricultural land on small scale maps.

A study is underway to develop a three-dimensional model of several floodplain areas. By using buried layers enriched in organic matter and radiocarbon dating it is hoped to determine flooding events as recorded in soils. Such information may permit more accurate estimates of flood prone areas based on soil surveys.

Efforts to utilize the Conservation Needs Inventory data are continuing. Previously, estimates were made about areas that may have frigid climates and indicated soil series that could be affected as more information is gathered. Judgments about rooting depth, available water adjusted for coarse fragments, lime, phosphorus and potassium status were made for the mapping units reported in the CNI to help us understand the magnitude of potential limitations of use by kinds of soils. Our most recent effort was to determine the distribution of elevation classes for each CNI mapping unit. They range from nearly normal, to highly skewed, and occasionally bimodal distributions. This may help us locate potential correlation problems and alert us to difficulties in making meaningful statements about crop management.

Measurements of water tables, moisture contents, and soil temperatures continue at a number of selected sites. We seem to have difficulty in establishing a long range comprehensive program for the state.

A soil geomorphic study with Ray Daniels was completed in Erie County. They determined the location of lacustrine sediments in several glacially scoured valleys. The information assists in designing mapping units and improves the interpretations for these potentially unstable landscape areas.

#### International Agriculture

The Agronomy Department conducts cooperative soil fertility research in Puerto Rico, Brazil, and Ghana. This project is supported by USAID and studies are directed toward developing practices to overcome liming, nutrient, and moisture deficiencies in the deep, acid, well drained soils in humid and subhumid tropical areas.

A five-year program to increase our institutional capability in assisting on soil problem related to cultural system has just concluded. This AID-sponsored program involved five universities--Cornell, North Carolina State, Puerto Rico, Prairie View Texas, and Hawaii. In addi-

tion to bringing experts to the U.S. to inform us about cropping systems in some tropical areas, a subproject on a soils bibliography was initiated. Mr. Orvedal, a retired SCS employee, has been collating the card file of the SCS, USDA World Soil Geography unit which will be published by AID in five volumes.

In the teaching area, Gerry Olson and myself had the opportunity to participate in the training program for specialists at the International Center for Integral Development of Land and Water (CIDIAT) in Merida, Venezuela.

A project to develop methods for evaluating and planning strategies of soil resource inventories, and to investigate some problems of biological nitrogen fixation is being proposed for possible U.S. AID funding this year.

Report to the Northeastern Soil Survey  
Work-Planning Conference 1976

J. E. Foss, Dept. of Agronomy  
Maryland Agr. Exp. Station

This report summarizes the status of the various research projects that support the National Cooperative Soil Survey Program. Essentially, all projects are cooperative with the USDA, Soil Conservation Service.

The following projects have been completed during 1975:

1. Yield Study of Selected Maryland Soils (C. Robinette, M. S. Thesis)

Corn yields were taken on farmer-operated fields for 3 years on 12 soil series. Three sites were selected for each soil series. The yields obtained will provide useful information to evaluate potentials of the major agricultural soils in Maryland.

2. Reconnaissance Survey of Tidal Marsh Soils in Maryland  
(R. Darmody, M. S. Thesis)

Soil characteristics of tidal marsh areas were studied at 43 locations, and the tidal marshes were found to exist in three physiographic provinces - Submerged Upland, Estuarine, and Coastal.

3. Loess Deposits on the Eastern Shore of Maryland

The distribution and characteristics of a silty deposit mantling palcosols on the upper Eastern Shore of Maryland were studied to determine its origin. The silty materials were 175 to 150 cm in thickness near the Chesapeake Bay and thinned eastward to less than 75 cm about 16 km from the bay. Particle-size analysis also indicated the Chesapeake Bay as a primary source for the loess.

Other projects currently being completed are:

4. Computerization of Land Resource Data

5. Soil Survey of Theodore Roosevelt Island

Innovative methods are being tested to provide new types of soil maps for urbanizing areas.

6. Study of Aquifers of the Lower Eastern Shore of Maryland

7. Study of Soils Developed on Cretaceous Red Clays

Report to Northeast Soil Survey  
Work Planning Conference - 1976

R.V. Rourke

Department of Plant and Soil Sciences  
University of Maine  
Orono, Maine 04473

This report summarizes soil related research of the past two years that is of interest to the National Cooperative Soil Survey. The projects are varied and are supported by several agencies and organizations. The projects are as follows:

Potato Waste Disposal by Land Application - (R. Glenn)

Potato waste will be applied to soils to determine the loading capacity and frequency that will result in maximum recycling of nutrients and a minimum degradation of the water supply. Changes in the chemical, physical and organic properties of the soil are being monitored.

Potato Yield as Related to Soil Cation Balance and Fertility - (R. Glenn)

The interaction of soil fertility and physical soil properties as they relate to maximum potato yield are being assessed.

Soil Acidity Sources as Relates to Lime Requirement - (R. Glenn)

Soil acidity sources are being studied in terms of the total input of each source into the lime requirement of the soil and the pH range over which each source exerts its influence. Seasonal fluctuation in acidity as related to losses or gains of organic matter will be evaluated. Variations of cation exchange capacity and base saturation as related to pH level are measured.

Fertility Requirements for Apple Production - (R. Glenn)

Micronutrient needs for apple production in **Paxton-Woodbridge soils** both for annual fertilization programs and for corrective fertilization before orchard establishment are being studied. A comparison of soil solution nutrient levels against traditional soil tests as relates to fertilization needs for tree growth and apple yield is continuing since present soil tests do not correlate well. The influence of the organic pad in orchards as it effects movement and tree uptake is also part of this study.

Fertilizer Movement Under a Spruce Forest - (R. Struchtemeyer)

The movement of surface applied materials in the soil surface of a native spruce forest is being evaluated. N, P, and K rates of 0 to 900 kg./ha. have been applied. Suction lysimeters are used to collect solution samples from two depths.

Soil Test Development - (R. Struchtemeyer)

Rapid soil test methods are being developed that will be applicable to forest soil.

Mycorrhizae Influence Upon White Spruce - (R. Struchtemeyer)

A study of the effect of mycorrhizae on the ability of white spruce to take up nutrients is continuing.

=-Solution-Plant Relationships With Special Reference to Nutrient Balance in Potatoes - (E. Lotse)

The objective of the research is to determine the relationship between: ion activities in soil solution; free energy of ion transfers between soils and soil solution; concentration of labile ions; ion sorption capacity; rate of ion release from soil as these factors influence yield and composition of potatoes.

Movement of Heavy Metals in Soils - (E. Lotse)

The objective of this study is to develop and test two and three dimensional hydrodynamic models to describe the transport of heavy metals in water, flowing through soils of varying physical, chemical, and mineralogical composition.

Land Development Alternatives - (W. Mitchell)

The development of coastal Maine in an orderly and reasonable manner using soils as a interpretive basis is investigated with alternative models developed for various land uses.

Nitrate Movement as Influenced by Spodic and Argillic-Like Horizons - (R. Rourke)

Soil solution nitrate levels are being monitored using suction lysimeters. Potatoes are rotated annually with buckwheat and N is applied only to the potatoes at rates of 0, 168, 228 kg./ha. Soil solution samples are removed from the spodic and argillic-like layers at bi-weekly intervals when soil is not frozen.

Pesticide Container Land-fill - (R. Rourke)

Pesticide containers were crushed and buried in a Caribou loam. Samples are removed and tested for pesticide contamination using suction lysimeters.

Soil Series Characterization Study - (R. Rourke)

Soils are sampled at **five** locations separated by at least one mile. Each sample is analyzed for stone volume, texture, water retention, bulk density, **pH**, organic carbon, Ca, **Mg, K, Na**, exchange acidity on an **horizontal** basis. Composite analyses are developed. New series are analyzed and identified in this manner as an assistance to the soil survey of the **big** woods area of Maine.

REPORT OF **THE** PENNSYLVANIA STATE UNIVERSITY **EXPERIMENT**  
 STATION REPRESENTATIVE  
 Roy P. **Matelski**

The present staff in Pennsylvania's Basic Soils Inventory **are** --

Dr. Roy P. **Matelski**, Prof. of Soil Genesis and Morphology  
 Dr. Robert L. Cunningham, Prof. of Soil Genesis and **Morphology**  
 Dr. Roger Pennock, Jr., Assoc. Prof. of Soil Genesis and  
 Morphology  
 Dr. Gary W. Petersen, Assoc. Prof. of Soil Genesis and  
 Morphology  
 Dr. Edward J. Ciolkosz, Assoc. Prof. of Soil Genesis and  
 Morphology  
 Mr. Richard **M. Fletcher**, Scientific Aide  
 Miss Barbara Grove, Secretary  
 Dr. Raymond P. Shipp, Asst. Prof. in Agronomy Extension

Since reporting in 1974 the Pennsylvania Basic Soils Inventory has included not only the research *and* field service activities but also an expanded teaching program. For example --

Courses Taught by Soil Survey Staff  
 During **1975** Calendar Year

<u>Course</u>	<u>Semester Credits</u>	<u>No. of Students</u>	<u>Student Credits</u>
Soil Resources and Land Use (2 semesters)	3	213	639
Soil Morphology, Mapping, and Land Use	3	29	<b>87</b>
Soil Genesis and <b>Classifi-</b> <b>cat ion</b>	3	17	51
Forest Soils	3	53	159
Soil and Water Conservation	3	26	76
Soil Judging	1	12	12
Soils and Environmental Quality	3	<u>32</u>	96
		<b>382</b>	1122

Graduate students (3 • Ph.D.; 6 • M. S. ) in **Soil** Genesis and **Morphology**.

It is significant that many students not in agriculture are becoming interested in soils as an essential component of the environment. We as soil scientists have a great challenge and responsibility to stimulate this interest and to open student's eyes to the many ways that soils are **"the staff of life."**

Research included the improving of methods of soil mapping and providing soil information to land users by using cells located and identified by a data base. Because many of the computer techniques are already available, the major thrust is the field gathering of soils data compatible with the computer.

Spectral reflectance data obtained by **LANDSAT (ERTS)** for 62,000 ha. of rugged, mountainous terrain were digitized and classified by computer to obtain land and soil resource maps. Merging of the October and May scene data improved the separation capability. Mapping by an experienced land resource evaluator increased the precision of the mapping units with a minimum (3 days) of on-site investigation.

In 1972, an interdisciplinary group was established, called the Office of Remote Sensing for Earth Resources. This group consists of faculty and graduate students from the Colleges of Agriculture, Arts and Architecture, Earth and ~~Mineral~~ Sciences, and Engineering.

Data from the **Landsat**, Skylab and aircraft have been used to ascertain the usefulness of remote sensing techniques in the areas of natural resources and land use inventory, geology, biology and environmental quality. Specific results include -- mapping of anthracite mine spoils from aircraft in eastern Pennsylvania; mapping of strip mines and acid mine drainage in central Pennsylvania; studies of land use in the Harrisburg and Philadelphia areas; techniques of previously unknown **line-**aments of geologic features and correlation of these with known mineral deposits; mapping of Gypsy moth defoliation and vegetation affected by air pollution; and inventory of land resources and vegetation in selected areas. Both land photointerpretation techniques, computer processing techniques and computer programs have been developed and used effectively in this research. Support has been received from NASA; the Army Corps of Engineers for floodplain mapping along the west branch of the Susquehanna River; and from the Susquehanna River Basin Commission to provide land cover maps of watersheds at a scale of **1:24,000**. Financial support of the Office for Remote Sensing has generally been at a level of approximately \$150,000 per year.

Base saturation with PSA on selected samples contributed to more accurate soil mapping in 12 attended county field reviews. More complete laboratory analyses nationally correlated and made more useful surveys in two counties. The data were processed by digital computer; tables were prepared and stored on magnetic tape. Soil moisture characteristics, permeability and hydraulic conductivity of all horizons of the **Murrill** and Hagerstown soil series have been initiated.

Soil factors associated with landslides indicated a greater than 35% clay content; high **(40-70%)** content of expandable minerals in the soil clay and abundant slickensides in the B horizon.

Soil properties were used to separate and assist in delineating flood-prone alluvial soils which differ by 1500 years in age (C<sup>14</sup>). Cambic horizons appeared to form in less than 200 years and are still present after 2000 years of soil formation.

Soil fragipan prism faces receive material from overlying horizons. These materials apparently move under two different processes resulting in a bimodal distribution of particle sizes in the prism face area.

Mine soil studies indicate that salt content in the middle and lower parts of the profile may contribute to poor plant growth noted on mine soils. A two-year field study was started on the interactions of acid mine water and soils. This study will field test the feasibility of using soil as a renovating medium for acid water.

Publications since the 1974 NESSWPC report include:

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(R. L. Cunningham, advisor)

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REPORT OF THE RHODE ISLAND  
AGRICULTURAL EXPERIMENT STATION

W. R. Wright

- January 1976 -

This report summarizes the progress on various research projects for 1974-75 in support of the National Cooperative Soil Survey Program.

1. Water-Table Measurements

This is a continuing study with observations currently being made on 10 different soil series. After three years of measurements the following relationships have been found.

- a) Well drained soils: No water-table within 5 feet of surface.
- b) Moderately-well drained soils: No water-table above 18 Inches, but at or above 36 inches for about 50% of the year.
- c) Poorly drained soils: Water-tables at or above 18 inches for about 60% of the year.
- d) Very-poorly drained soils: Water-tables never dropped below 18 Inches and were at the surface of the ground for nearly 50% of the year.

2. Soil Characterization Studies

Morphological, chemical, and physical analyses were completed on 6 soil series. (Agawam, Au Gres, Mansfield, Paxton, Windsor).

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4. Freshwater Wetlands

Preliminary investigations were carried on in 1975 to correlate various soil conditions and properties with wetland vegetation. Examinations of water-table depths, pH, nitrate-N, and organic matter provided evidence of seasonal trends and interdependencies. No one factor alone appeared to be responsible for the distribution and abundance of wetland flora. The classification of organic materials (i.e. **fibric**, **hemic**, **sapric**) appeared to be correlated with water-table fluctuations but were not related to specific wetland species.

**NATIONAL COOPERATIVE SOIL SURVEY**

**Northeast Regional Conference Proceedings**

**New York City, New York  
January 7-11, 1974**

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File Copy  
Soils

**PROCEEDINGS OF THE  
NORTHEAST COOPERATIVE  
SOIL SURVEY  
WORK-PLANNING CONFERENCE**

U.S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE

**NEW YORK CITY**

**JAN. 7-11, 1974**

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## INTRODUCTION"

The 1974 Conference was deemed a success by most of its participants. These paragraphs point out a few of the highlights of the conference and some administrative details about this and future conferences.

In the past most of the committee work for these biennial conferences has been done in response to charges from committees of the National Soil Survey Work Planning Conference, which meets in alternate years from the regional conferences. Since the 1973 National Conference operated under a new format (there were discussion groups, instead of committees, that considered wide-ranging topics) that resulted in no direct charges for consideration by regional

will become more involved with environmental law. **We also need** to be thinking about developing good guidelines for land use, based on soil properties, so that environmental laws can reflect our best knowledge. Another new committee, the one on using soils for waste disposal, is also addressing itself to similar problems -- by working on guidelines for the use of soils for waste disposal. The reports of these committees tell their stories more completely and won't be discussed in more detail here. However, there was much interest in the work of these committees and they, like several of the others, will be standing committees -- carrying on their work by correspondence and other means in the interim between conferences.

A committee on soils that have been highly influenced by man took a positive look at the extent, properties, kinds, and a classification scheme, for such soils (e.g. strip mine soils, man-made urban soils). A considerable amount of research is commencing in this area. It seems long overdue in view of the extent and the intensive use that many of these soils are or will be receiving. We must view these materials as soils and give them the attention they deserve. This committee has helped this to happen. It also makes us aware that attention needs to be given to the best ways of building soils (from waste materials, etc.). If an area is to be disturbed there must be a best way to put things back together. Perhaps this is more an engineering problem, but soil scientists know more than engineers about many of the properties of soil materials and about what constitutes a desirable soil profile. Also, soil scientists are being asked to map the man-made soils. So why shouldn't we give some advice on how they should be built.

The other committees, although not mentioned specifically here, all worked very hard. Their reports deserve the attention of soil scientists and

administrators who are involved with soil survey programs -- and even of those students and members of the general public interested in specific problems. The executive committee thanks all the committee chairmen, vice chairmen and members for their many contributions.

Some committees and conference participants felt that there should be regional soil survey-related research projects in our region. It was pointed out that other regional soil survey groups do have such projects. Projects were suggested by two committees -- on soil moisture regimes (by the soil moisture committee) and on fragipan properties and genesis (by the committee on family and series criteria). It was agreed to pursue one in the area of soil moisture regimes, particularly with respect to water tables -- but perhaps also considering the non-saturated zones. It was felt that better moisture regime information, especially considering landscape hydrologic dynamics, is needed to answer questions pertaining to soil and water pollution as well as to crop production. Against my better judgment I agreed to try to do a draft outline for a project. Ron Yeck has agreed to give me some assistance on this. If anyone has ideas that they would like to see go into this, please send them to Ron or to me. One of the problems is to get techniques to measure water tables in soils with slowly pervious horizons (this ties in with fragipans). Some thought is going into this and we hope to field test some techniques in Maryland.

An approach that would seem interesting would be to look at existing water table data, and perhaps to collect more, to see if the high and low points of water table fluctuation patterns can be predicted with reasonable accuracy from a small number of measurements (perhaps one in summer and one in winter). This wouldn't allow for an examination of landscape water movement dynamics but could lead to some water table information for many soils in a short period of time and to techniques for getting it for others.

A standing regional soil taxonomy committee was set up at the conference. This committee is to consider any suggested changes in Soil Taxonomy that are initiated in the region and funnel those deemed worthy of consideration to Washington. The committee will presumably also react to suggestions from elsewhere if they are sent to the region for consideration by Washington. The regional committee members and the years that they are to serve on the committee are J. D. Rourke (SCS, permanent chairman), Sid Pilgrim (SCS, 3 years), Keith Schmude (SCS, 2 years), Ray Marshall (SCS, 1 year), Bob Rourke (Expt. Stas., 4 years), Dick Arnold (Expt. Stas., 3 years), and Del Fanning (Expt. Stas., 2 years).

A new event at the 1974 conference was an evening session devoted to seminars by some of the participants on sabbatic leave and other extraordinary soil survey related experiences. This helped to lend some national and international perspective to our meetings, and I think it is fair to say that a good time was had by all who attended this slightly long-winded session. Thanks to all who participated. Some speakers even prepared a written version of their talk for the Proceedings.

Thanks also to the Experiment Station representatives who reported on the soil survey related activities in their states. These reports were very informative and they help us all to keep in touch with what is going on in the various states.

Thanks are also extended to Bill Johnson and Linda Bartelli, representing the SCS Washington Office, for their talks and discussions with the group. Thanks also to Mel Davis for bringing us administrative views from the NE Regional Technical Service Center in Upper Darby and to Bob Hilliard, SCS State Conservationist in Connecticut, for his views on legal aspects of soil survey-land use problems in Connecticut. Thanks too to Ed Ciolkosz for his fine report on the 1973 National Work Planning Conference.

An apparent oversight by the executive committee was the failure to invite an Experiment Station administrator to attend and speak to the Conference. Thought should be given to this for future conferences.

Pertaining to future NE conferences -- Bruce Watson (vice chairman for this conference, doing yeoman work including the organization and assembly of these Proceedings) moves up to Chairman for the 1976 Conference. Dick Arnold was elected as the new vice chairman (Chairman for 1978). John Rourke continues to serve on the executive committee.

It was pointed out at this Conference that our group has no written by-laws for its operation. Such a document would be helpful at times, e.g. in determining who should represent the Northeast Experiment Stations at the National Work Planning Conference. It was decided that the executive committee for the 1976 Conference should develop some by-laws for discussion and possible adoption at the 1976 Conference. John Rourke volunteered to contact the western regional group, who are supposed to have some good by-laws.

Also discussed was whether future conferences should always be in New York in January. The consensus was that the executive committee should look into, and strongly consider, having the next conference at some other location and at some other time of the year -- when it might be possible to have a field trip to look at soils.

NORTHEAST SOIL SURVEY WORK PLANNING CONFERENCE

Taft Hotel

New York City

January 7-11, 1974

Agenda

Monday - January 7

- 1:00 - 1:10 p.m. Opening Business - D. S. Fanning
- 1:10 - 1:30 p.m. Remarks, R. PI. Davis (Director, NE RTSC, USDA SCS)
- 1:30 - 1:45 p.m. Remarks, R. L. Hilliard (USDA SCS State Conservationist, Connecticut)
- 1:45 - 2:30 p.m. Soil Survey Objectives - W. M. Johnson
- 2:30 - 3:00 p.m. Break
- 3:00 - 3:30 p.m. Modern Thrust in Soil Survey Interpretations - I. J. Bartelli
- 3:30 - 4:15 p.m. Published Soil Surveys in the Future - I. J. Bartelli (Discussion Leader)
- 4:15 - 4:45 p.m. Report on 1973 National SSWPC - E. J. Ciolkosz
- 4:45 - 5:00 p.m. Discussion of Interaction between Regional and National Conferences - E. J. Ciolkosz (Discussion Leader)

Evening session

- 7:30 - 10:30 p.m. Reports on Leaves and Other Extraordinary Experiences

<u>Speaker</u>	Topic
F. P. Miller	Soil and Land Use Problems in California
Roger Pennock	Aspects of Soil & Water Management under Monsoon Climatic Conditions in Central India
Dick Arnold	Conucos and Tatucos in Venezuela
Gerry Olson	Yermosols, Solonchaks, Quanats, Kavirs, and Land Use in Iran



Wednesday -- January 9

8:00 - 12:00 a.m. Committee Reports (1-2-3)

12:00 - 1:00 p.m. Lunch

1:00 - 4:30 p.m. Committee Reports (4-5-6)

Thursday -- January 10

8:00 - 12:00 a.m. Committee Reports (7-8-9)

12:00 - 1:00 p.m. Lunch

1:00 - 3:00 p.m. Committee Reports (10-11)

3:00 - 3:30 p.m. Break

3:30 - 4:30 p.m. Report of NE Soil Research Committee Meeting

Friday -- January 11

8:30 - 9:30 a.m. Natural Soil Group Maps for State Land Use  
Planning - R. I. Shields (presentation and  
discussion leader)

9:30 - 10:30 a.m. Business meeting - D. S. Fanning

1. Reaction to Common Particle Size Scale  
Proposal of SSSA Particle Size  
Distribution Committee
2. Setting up Regional Soil Taxonomy  
Committee
3. Election

10:30 - 11:00 a.m. Break

11:00 - 11:30 a.m. Concluding Remarks - J. D. Rourke

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New York City, January 7-11, 1974

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## BUSINESS MEETING

The meeting was called to order by Chairman, D.S. Fanning, and the following items of business were discussed and acted on.

One discussion centered on the possibility of reaching agreement on particle sizes with other disciplines. It was moved and seconded the N.E. group would be agreeable to .0625 to .002 mm for silt and less than .002 mm for clay.

The location of the next conference was discussed and it was moved and seconded that the executive committee consider a different meeting site for the 1976 conference.

John Rourke outlined the proposed procedure for the next National conference to be held in Orlando, Florida. The eight committee chairmen will prepare reports by June and revise and send to the entire conference by October. Four discussion groups will review all reports and the reporter from each group will meet with the respective committee chairmen to develop a report for the conference.

It was moved and seconded that the Executive Committee develop proposed by-laws for the operation of the N.E. group.

John outlined the operation of the regional soil taxonomy committees. The committee will react to suggestions from conference committees, regional soil taxonomy committees, and individuals. The regional committee members and the years that they will serve follows.

J.D. Rourke, Chairman SCS  
R.V. Rourke - 4 years  
R.W. Arnold - 3 years  
D.S. Fanning - 2 years  
S.A. Pilgrim - 3 years  
K.O. Schmude - 2 years  
R.L. Marshall - 1 year

Other comments by the participants follows.

Executive committee should consider legislation and laws that might affect soil survey. Suggested that someone should speak on this at the next conference.

Suggested that we have a committee to arrange for a symposium and joint projects within the region.

SOIL SURVEY OBJECTIVES

Presented by William **M.** Johnson at the Northeast Regional Soil Survey  
**Work-Planning Conference, New York City, January 7, 1974.**

## INTRODUCTION

The complex and multiple demands on the **Nation's** soil resource base are increasing and will continue to increase more rapidly in the future. These demands are directly related to the continued growth of the Nation's population, the concentrating of selected activities by geographical areas, and the expanding demands for goods and services. The resulting land-use patterns created by these demands directly affect the social, economic, and physical well-being of all people. In some places land-use patterns have restricted the potential opportunities for people to live, work, and play. A lively soil survey program is in the national interest, therefore, so that needed soil information will be available to public and private decision-makers. Land use that is directed by policies and procedures based on soil surveys and evaluations will be in the best interest of all the people,

## SOIL SURVEY OBJECTIVES

The objectives of the soil survey program are to complete soil surveys, including publication, of all land in the United States and the Caribbean Area and provide this soil information to the people making land-use decisions.

### Long-Range Soil Survey Goals

#### I

To complete, by the year 1998 and sooner if possible, field mapping and publication of a well-designed soil survey on all land in the United States and the Caribbean Area.

### Degrees of Intensity of Soil Surveys

Soil surveys are made at varying degrees of intensity depending on the complexities of the soil patterns and the intensity of uses for which surveys are made. In the beginning, 75 years ago, soil surveys were of small scale and rather general. As technology became more refined and complex, as farmers' management skills increased, and as soil surveys began to be used for many non-farm land-use decisions, the need for a larger scale and more detail became obvious.

In order to provide the kind of soil spatial and behavioral data required in a given area, it is important to design the soil survey carefully. To achieve our goals efficiently, the correct level of survey intensity should be carried out.

### General Soil Maps

General soil maps are soil maps not drawn directly from field observations but compiled from other data. They are **not** considered to be soil surveys. They are useful for town-and-country planning in counties, multi-county areas, resource conservation and development projects, and for general planning in states, river basins, and multi-state regions. Scales **generally are 2, 3, or 4 miles to the inch** for county general soil maps. The preferred scale for state general soil maps is **1:1,000,000**.

A new soil map of the United States is being compiled at the scale **1:1,000,000**. The goal is to complete and publish this map by 1983.

### 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 and 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 way 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 the 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.

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 air-fields, town-and-country planning of residential, industrial, and commercial development and locating areas of potential flood 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

**Itisan** 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 land-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 and 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 users, and key leaders and officials to understand the use and limitations of the soil information they have.

## MODERN THRUST IN SOIL SURVEY INTERPRETATIONS

- Lindo J. Bartelli

As we look ahead in the soil survey program we can predict with confidence that demands for soil survey will continue to increase. The demands will outstrip our capability to produce unless we adopt more efficient techniques in both making and using maps. This discussion will deal with using maps which is the care of soil survey interpretations. The modern thrust in interpretations reflects ways and means for making our soil maps most useful in a language understood by the user. Too many of our interpretations are made in a language peculiar only to the soil scientist. The modern soil survey interpretation program reflects the following guidelines.

1. Present alternative practices designed to overcome limitations for non-farm soil uses.
2. Adopt a more positive approach for presenting soil interpretations, including analysis of potential or suitability for given land uses.
3. Provide national guidelines and procedures for special and interim reports. We propose to improve the quality of both soil maps and interpretations. Our objective is to keep duplication to a minimum.
4. Develop guidelines that can be used to predict the impact that various uses of soil will have on the environment.
5. Adopt automatic data processing techniques.

Presented at the Northeastern Soil Survey Work Planning Conference, New York City, New York, January 7, 1974.

Soil use is varied, complex and competitive. This demand generates interpretations of high quality and as complete as possible. We strive to foresee as many uses that we can.

### Soil Survey Interpretation

Soil surveys continue to be an integral part of the farm management system. The soil survey input has become more sophisticated. In addition to predictions of yields, fertilizer needs, drainage requirements, water spreading criteria, and other requirements, the soil's capacity to lock up excess phosphate, pass nitrates, and degrade pesticides is considered. The impact of the management system on the environment is evaluated. In addition to having a favorable cost input/output ratio, farming should not pollute the environment. Farming practices need to be geared more closely to the soil's behavior pattern.

Work in Louisiana shows that denitrification rates are related to drainage. Well drained permeable soil passes nitrates into the ground water readily. Yield response curves should be formulated for each major soil. Application rates should not exceed the plants' requirements for optimum growth. Nitrogen applied in excess of the point of maximum return to this soil with a "flushing" moisture regime has a good chance of polluting the ground water. Nitrates will not flush out of this soil; the second gray layer indicates perched water and a good chance for denitrification. Pesticides also have unique interactions with soils. Atrazine passes through Fayette silt loam readily.

### Use of Soil Maps in Forestry

The use of soil survey in forestry also has grown. The potential for wood production can be developed and used to determine the most suitable woodland management. Being under tree cover is not the only justification for woodland management; it must provide economic incentive and contribute to the economic growth. If not sufficiently productive, woodlands can be managed for aesthetic values, water storage, or recreation and still enhance the environment. Not all woodland is treated the same.

### Edaphic Planning

The serious attempt to clean up the rivers, lakes, countryside, seashores, and cities, and the urge to set aside refuge for wildlife and havens for city dwellers have rejuvenated land use planning. People also are taking a critical view of land pollution. This leads to seeking sites that are most suitable. It means matching a use with the proper soil to prevent pollution of land, ground waters, lakes, or rivers. This is edaphic planning of the landscape. The soil scientists predict the behavior on the basis of the soil qualities. This is not land use planning, but it is an important input. The soil survey is an introduction to the landscape. It reveals landscape characteristics. In addition, it provides adequate soil behavior predictions to formulate the plan. The landscape model can now be placed into the computer. The landscape is divided into grids which form the unit planning cell.



### Land Spreading of Waste

The disposal of waste has become a critical problem. Flushing down the streams and blowing into the atmosphere are not in favor. The complexity of the waste products makes the problem more acute. Secondary ~~treatment~~ is not successful in removing viruses, phosphorous, nitrogen, and heavy metals. The soil does provide an adequate facility, and in many cases it is much cheaper than chemical treatment. Resultantly, scientists are studying the behavior between waste material and soil properties. We are learning to select the good performing soils. Soils high in 2:1 clays, low sand content, and with high cation exchange capacities and low base saturations are the good performers in the removal of cations from effluent. Soils high in aluminum and iron, low in acidity, and with slow permeabilities are good removers of anions from effluent.

### Accelerating Publication

The ability to predict soil behavior for the many new uses has placed a heavy demand on soil surveys. We can make a significant contribution to environmental planning with the proper timing of soil survey release. We are placing ~~coordinated~~ interpretive data for each series into the computer. With the use of equipment that has ~~text-~~ editing capabilities, (our ~~equipment~~ is the IBM 2741 Communication Terminals and IBM 360 model 50) we are able to adapt standarized stored data to local surveys. Interpretations are now being fed into a computer

at Ames, Iowa. This will serve as a national bank. This is being done for phases of series. We are getting the original drafts of tables from this source for specific survey areas. A yield table for significant phases in the survey is recalled from the storage unit. The party chief adapts to the local conditions. The adjustments are fed into the computer, and the final yield table is produced - which is ready for printing. Other tables also can be produced to fit the particular survey area in a like manner. Modular writing also saves time and money. A model from an edited manuscript of a nearby survey area is stored in the computer. It is recalled and given to the party chief for adaptation to his survey area. Results from our pilot project in Fort Worth, Texas, show that 60 to 75 percent of manuscripts can be automated. Time in preparing a manuscript through the TSC level was reduced from 12 to 2 months. Party chief time was reduced by 50 percent. Quality control is exercised prior to storing data. A spin-off benefit is that interim or special reports are produced from the same storage. Map drafting also is automated. The S-3 Advance Mapping System is designed to produce negatives of soil survey atlas sheets, ready for the printer. Digitizing and automatic drafting equipment is now being used in production and developmental work. Once the soil map is stored varied kinds of interpretation maps can be generated - cheaply and timely.

### Challenge

As we wonder about the potentials of remote sensing and photographs from outer space, land-use legislation currently being considered by Congress and many state legislative bodies will have far-reaching effects on management of public and private lands. Government control of land use will vary among the regions. Several states have regulatory measures tied directly to the soil map. Maine has passed such legislation, Colorado requires a soil map prior to issuing any permit for subdivision development. Septic tanks are allowed only on soils rated suitable by the soil scientist in Wisconsin. All developments around Lake Tahoe in California are based on soil map suitability ratings. Hard political and economic choices must be made if land development is to lead to better environmental and social results.

But adequate data properly analyzed are a necessary base for sound regulatory actions in land use. We need to develop means for predicting soil behavior in all uses of land. In addition, our recommendations must be more quantitative. This is the challenge of modern soil surveys.

## 1973 National Soil Survey Work Planning Conference

Edward J. Ciolkosz

As a preface to my remarks, I would like you to know that I don't intend to try to present all that transpired at the conference, but just what I consider significant or interesting. For a more complete report please refer to the conference proceedings.

The 1973 National SSWPC was held January 22-26 in Charleston, South Carolina. As many of you know, the conference has been held in Charleston for many years; last year it was suggested that the next conference (1975) be held in Texas, most probably in San Antonio. This suggestion apparently has not been accepted, for I've noted in some recent **correspondence** that the 1975 conference will be held in Charleston. (Bill Johnson corrected this statement by relating that the 1975 conference will be held in Orlando, Florida).

The 1973 conference followed a new format. In previous conferences committees were organized around subject matter areas such as: Environmental Soil Science, Soil Family Criteria, etc. Most of these committees had regional counterparts, consequently allowing for a relatively good regional-national interaction on the same subject area. The new format for the 1973 conference centered around four subject areas: 1) operations, 2) interpretations, 3) classification and correlation, and 4) investigations. Prior to the conference, **questions** in these four subject areas **were** distributed to all participants for study. At the conference the participants were divided into four discussion groups and each group discussed all the questions. Each group had a recorder designated for each of the four subject areas. In addition there were advisors assigned to the four subject areas and they rotated between groups when their subject area was being discussed. After the discussion, the recorders and a designated individual got together and synthesized a report that was presented to the conference.

It is my understanding that the question format will not be followed at the 1975 conference. The committee approach is to be followed in which committees will draft a report and it will be distributed to conference participants prior to the conference. At the conference, the participants will be divided into four discussion groups, and each group will consider all the committee reports. A recorder will be designated for each discussion group, who together with the committee chairman will prepare a final report that will be presented to the conference by the committee chairman.

### Soil Survey Operations Report

1) Elimination of the terms detailed soil survey and reconnaissance soil survey, and use of only survey was discussed. In general, it was

agreed that the "se of two **terms** was more workable than just one,

2) Because of increased demands for higher soil mapping production, and the limitations of manpower as well as other needs, it was recommended that non-professionals such as biological aids be trained as mappers, but that they only be used in areas where there are simple soil patterns and where the soil scientists provide close supervision. In addition, non-professionals could also be used for inking and map compilation,

3) Publication of more than one level of generalized map in the soil survey report was discussed; it was agreed that usually only one was needed but its scale and type should be decided locally, according to local needs.

#### Soil Survey Interpretations

1) Problems in the **use** of SCS Soils-5 form were discussed. Lack of space for recording all the different phase information was stated as a major problem.

2) It was agreed that the kind of restrictions that caused a soil limitation should be stated and in addition, information should be provided the user on how to overcome these limitations. This is a major step in the right direction I think, away from a very conservative past position. I remember some years ago hearing an SCS administrator state to a group of soil scientists not to mention how these limitations could possibly be overcome, but to refer the person to a consultant. The conference felt that although information on alternate ways to overcome soil limitations should be provided, design criteria and cost should not be provided, but this information should be collected and incorporated into technical guides.

3) It was agreed that more soils information below the depth of 5 feet is needed to improve our engineering interpretations. This could be accomplished through more cooperation with geologists and/or more deep observations.

4) In a discussion of some criteria for the new Guide for Interpreting Engineering Uses of Soils, it was pointed out that there were very few references or explanations on how these criteria were established, and that it would be easier for the user to understand these interpretations if more background information were provided on the development of these criteria.

5) Most conferees **agreed that more** information on geology and geomorphology should be incorporated into the soil survey report. This information should be prepared by an authoritative geologist in the state geological survey or USGS, and tied to the soils, possibly at the level of the general soils map in the report.

6) Pedon data for partial samples should not be considered for storage in the ADP soil data bank until the time of final correlation, at which time it would be approved or rejected for permanent storage.

#### Soil Classification and Correlation

1) It was agreed that the fluventic subgroup should not be dropped, and that flooding itself should not be used as a criterion because it would be difficult to apply, and we commonly lack the data that would be needed. It was also thought that the definition of the **cambic** horizon should be changed to require stronger development than is now required in order to include more of the very weakly developed soils in the **entisol** order. This item is under consideration in our committee on criteria for classifying families and series, and John Witty has put together a nice review and **some** recommendations for our committee to consider.

2) There was divided opinion on re-correlation of old surveys, particularly if any enlargement of the maps is considered. The thought was that enlarged old maps may convey to the user **more** accuracy than they really have.

#### Soil Survey Investigations

1) It was concluded that we need more studies on water movement in the soil profile and **in** the landscape, **particularly** in relation to soil and water pollution. We also need **more** field tests for soil parameters such as: potential acidity and sulfides.

2) It was suggested that we need more soil-geomorphology studies both **of** long and short duration. Another suggestion was that at least one more soil-geomorphology team be set up and that it be located in the northeast region.

3) Benchmark soil reports were discussed and it was concluded that we should have fewer benchmark soils, and that they be sampled in areas that are readily accessible. and that their use as research sites and **sampling** sites be encouraged.

4) The possibility of assigning promising soil scientists to a **soil-geomorphology** group for from 2 years to a few weeks was discussed. Because of cost involved, long assignments don't seem feasible, but short term assignments with a home based and financed (county, state, or region) project, which **the** soil scientist could pursue with only limited help after the initial stages seemed feasible. This could be justified under research as well as career development for the soil scientist.

In addition to these subject matter discussion groups, two task

force reports were presented to the conference.

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5) Ben Hajek gave the southern region report and stated something I believe is worth quoting:

"I believe many soil survey users in the future will continue to call a soil scientist for soil survey information and I think the calls will increase. Automation will only make more information available in less time and improve the predictions we make. Thus we must consider the use of increased numbers of well trained soil scientists as an alternative solution."

about the lack of, and late responses he received on review of the chapters of the manual. He expressed hope that the manual would be finished the following fiscal year. (Bill Johnson stated it-would be printed in late 1975).

Special reports were given by John Day, Senior **Correlator** for the Soil Survey in Canada, and Dave **Unger**, Assistant Executive Secretary of the National Association of Conservation Districts.

A special added attraction was an afternoon field trip in which a **Wagram** loamy fine sand (loamy, siliceous, thermic, family of **Arenic Paleudults**) was examined and the Middleton plantation was visited. The plantation has been in the Middleton family since 1741, when it was cleared of native forest by Henry Middleton (President of the first Continental Congress).

NATURAL SOIL GROUP MAPS FOR STATE LAND USE PLANNING

By R. L. Shields-  
State Soil Scientist  
Maryland & Delaware  
Jan. 11, 1974

I. INTRODUCTION

A. Project started as a whirlwind

1. State Planning ordered to prepare land use plan.
2. State Planning hired David S. Simonett, Director of Land Use Studies, Earth Satellite Corporation, Wash., D.C. (used soil survey - familiar with it).
3. They came - discussed urgency.
4. Could not use the mass of detail on our detailed maps - needed more detail and better interpretive potential than on published general soil maps.
5. They were inclined to use old published survey color line maps.
  - a. Detail app. 1" = 1 mile - just right.
  - b. All counties available.
  - c. Conversion legends could be prepared.
6. We discouraged it (poor at phase level) but experimented with it.
7. Also experimented with generalization of detailed soil maps by way of natural soil groups.

Advantages

- a. Based on detailed, modern soil surveys.
- b. Available for all counties except two.
- c. Could produce a multi-purpose map.
- d. Fringe benefit to SCS and others - would introduce a new generalized map of max. interpretive value at intermediate scale of 1" = 1 mile. Would give Maryland a fourth kind (scale) of map.
- e. Would likely be the most rapid technique.

II. Decision made - use natural soil groups.

- A. Md. State Plan. Dept. secured \$13,000 grant from HUD (Hurricane Agnes Funds).
  - a. HUD required that a floodplain map could be produced from the project.
- B. We prepared natural soil groups
  - a. Converted 2,100 mapping units to 35 nat. soil groups
  - b. State Plan, Dept. said - "Keep it simple".

II. Decision made - Use Natural Soil Groups (Cont)

- C. We supplied S.P.D. with planimetric (non-photomosaic) sets of published soil maps at both 1:15,840 and 1:20,000 for the 15 published counties. Six counties had only paper copies from Atlas film positive field compilation, but were used like published maps. Two counties had only color-line maps from old published surveys (map legends were converted to natural soil groups).'

III. Contracts & Agreements

- A. S.P.D. contracted with American Map Data of Rockville, Md., to make the natural soil group delineations on detailed maps and affix nat. soil group symbols.
- B. S.P.D. contracted with SCS Carto. Division to make reduction (1' = 1 mile) negatives and positives of all counties. These were then converted to 1" mile mylars. (3 copies - 2 to S.P.D and 1 to SCS).
- C. Agreed that all map work done by America Map Data would undergo review by SCS Soil Scientists. SCS would prepare text and interpretive table:
- D. S.P.D. would publish in color the entire state in five sections.
- E. S.P.D. would introduce all the nat. soil group data into computer program with geological map (90 ac. cell).
- F. S.P.D. would prepare a "present" land use map at same scale for superimposing on natural soil group maps (47 different land use categories)
- (1) Wetlands map of state
  - (2) Other LIM studies
  - (3) Prime agricultural land map of state.

Iv. What are the advantages of generalizing a detailed soil survey with natural soil groups?

- A. Can best be demonstrated by demonstrating the system by using the general soil map of Delaware and interpretive chart.
- 1. Soil association interpretation by color pies.
  - 2. Natural soil group maps show large areas of each dominant soil (keeps the soils that have like character, use, and management together in same nat. soil group - splits out the contrasting soils)
  - 3. Automatically increases detail (desirable)
  - 4. Brings interpretive value of each delineation up to purity level of a mapping unit on a detailed soil map (70% for slope phase, 95% series)
  - 5. Therefore, a color spot interp. chart of a natural soil group map consists of all solid color spots - all green, yellow or red - no mix.

## V. Constitution of Maryland Natural Soil Groups

### A. Different from those developed in Connecticut

1. Maryland groups not organized around parent material or geomorphic similarities.
2. Maryland groups emphasize a few major soil characteristics and features that strongly influence many kinds of major land use. De-emphasiscs parent material differences. Could be considered as interpretive groups.

#### a. Major characteristic and features considered:

- (1) Drainage class
- (2) Texture
- (3) Depth to bedrock and character.
- (4) Permeability
- (5) Flooding & Ponding
- (6) Stoniness or rockiness
- (7) Slope (3 divisions)

- (a) 0 - 8 %
- (b) 8 - 15%
- (c) 15 + %

## VI. Map Methodology

- A. 1:15,840 and 1:20,000 scale individual map sheets  
Borders cut off and joined together with rubber cement on 4' width wrapping paper to form partial mosaics of County (about 5 of these partial mosaics per County). This done by workers in State Planning Dept.
- B. Natural soil groups first delineated roughly in light blue pencil, then affirmed with black felt tip pen making lines about 1/8" thick. This done by America Map Data, Inc.
- C. Paste on or rub off natural soil group symbols applied.
- D. Partial mosaics joined by natural soil groups.
- E. All map work routed through SCS State Office for intensive review. Review called for both adding and removing natural soil group delineations. Review time per County ranged from 1-3 man-days.
- F. Full scale, reviewed map mosaics delivered to Hyattsville Cartographic Division for reduction and reproduction described in Section IIIB.

VII. Preparation of Text

A. S.P.D. requested State Soil Scientist to prepare text-to be published with maps by S.P.D.

1. Natural Soil Group Descriptions

a. Two introductory paragraphs describing the setting, characteristics and features that would apply to all soils in the group.

b. Interpretive Paragraphs

- (1) Unique value
- (2) Intensive cropping
- (3) ~~Urban~~
- (4) Recreation
- (5) Wildlife
- (6) Woodland

c. Photos and illustrations

VIII, Expected Benefits from the Project (Continued)

- B. Two maps in one at 1" = 1 mile scale (with a magnifier, one can read the detailed soil map under the natural soil group map)
  - 1. Permits broad planning on natural soil group map with option of "telescoping" through to a specific spot on the detailed soil map for more detailed planning.
- C. New level of detail exposes geomorphic patterns of soils not formerly disclosed on general soil maps or detailed ones.
- D. Permits just as many soil interpretations as from detailed soil map with about same percentage accuracy for the delineated areas.
- E. Good map and scale for overlaying on county geology maps for soil-geology-involved interpretations (re: trench-type sanitary land fills; deep "dry" wells for sewage disposal; potential ground water recharge areas).
- F. Multiple mylar copies of 1" = 1 mile map can be zip colored for multiple overlay demonstration.
- G. System is such that maps and interpretive material can be used at State, Regional, County or local level to advantage.
  - 1. Outstanding for:
    - a. Designating prime agricultural land.
    - b. Designating wetlands.
    - c. Designating floodplains.
    - d. Designating truck crop suitable lands.
    - e. Designating urbanizing potential.
    - f. Designating least costly pipeline routes.
    - g. Designating LIM studies.
- H. Best kind of map for multi-county or regional planning.

IX. Conclusions

- A. Through this project we have established better working relations with Maryland Department of State Planning. They, in turn, have publicized SCS work to many others.
- B. Funding and cooperation with S.P.D. has enabled us to do in less than a year a job that would not have been feasible to undertake with our own personnel.

IX. Conclusions (Continued)

- C. We now have 4 kinds of soil maps available:
  - 1. General soil map of state.
  - 2. Natural soil group map of state and counties.
  - 3. General soil maps of counties.
  - 4. Detailed soil map of state and counties.
- D. We expect this project will have one of the best B/C ratios of any soil survey interpretive project we have been involved in.

REPORT FROM NORTHEAST SOIL RESEARCH COMMITTEE

R. J. Bartlett

Each year brings **new** research needs and new problems to be listed. Last year's needs and problems sometimes become obsolete without having been solved. Ideas for research needs spread like prairie fire. An article appears in the New York Times on Monday, and by the end of the week the subject may be incorporated into a **committee** report.

Last year's concern was with environmental protection and disposal of wastes such as manure and sewage sludge. This year, the battle cry is **utilization** of waste. It is acceptable to be interested in manure again as fertilizer for growing plants. Its major importance is not necessarily as a pollutant of the environment. Even more exciting is the prospect of utilizing the protein in manure, about 16%. Perhaps the recycling of this material through the soil and the green plant to obtain food is the long **way** around as far as energy is concerned. Through simple biochemical transformations, wastes may become valuable sources of food for animals, or even humans.

Approximately 40% of the class 1, 2, and 3 land in the United States is in metropolitan **areas**. I.e., the cities grew on the best land. Perhaps the concept of imposing limitations on **development** of housing or other urban uses on soils considered "unsuitable" is encouraging **development** on the best land. Land suited to growing food is being used up or paved over. Should preservation of land for agriculture be our first priority?

Efficient use of fertilizer is again the watchword, not because of pollution hazard, but because of shortages of energy and costs of materials. There is interest in growing protein **which** is free of fat and cholesterol, that is, plant protein. Through breeding and management it **may** be possible to grow plant protein of better quality as far as balance of amino acids is concerned. There is a need to develop cropping systems which require less energy. An **example** is **minimum tillage** corn or soybeans. Agricultural products for export may increase in importance. Possibilities for the northeast are calves, apples, potatoes, hardwood lumber, **cheeses**, and wine.

These and other philosophies **emerged** in the reports of CSRS, ARS, SCS, Administrative Advisor, and NE-39, and **NE-48** Regional Committees. Steve Holzhey reported "**too many specific questions** for which we have only general answers". We need answers in language users can understand.

Gary Heichel of the Connecticut Agricultural Experiment Station presented a talk concerning his work in studying relative energy uses of different agricultural systems.

The research committee voted to recommend to the Station Directors that the following areas of research be emphasized:

1. Mineralogical and chemical characterization of representative northeast soils as they effect behavior of phosphorus and heavy metals. (This is the title of a regional project to be proposed by a group of soil chemists and **minerologists** in the region.)

2. Soils research dealing with land use planning.
3. Efficient use of soil and fertilizer nitrogen to produce protein.
4. Development of **waste** management **systems** for maximum recycling of manure and **sewage**.
5. Development of cropping systems with more caloric return.

The committee voted to meet for 1 **1/2** days next January 14 and 15.

R. J. Dartlett

RJB/mt

UNIVERSITY OF ARKANSAS  
DIVISION OF AGRICULTURE  
College of Agriculture and Home Economics  
Agricultural Experiment Station

November 2, 1973

*107 Consideration  
NESSWPC  
Jan. 1971*

Fayetteville, Arkansas  
Department of Agronomy  
575-2355

MEMORANDUM

TO: Chairmen, Regional Work Planning Conferences,  
National Cooperative Soil Survey:

✓ D.S. Fanning  
C.L. Schrivner  
B.F. Hajek  
Richard Huff

FROM: Particle Size Distribution Committee (S-8751,  
Soil Science Society of America:

Joe B. Dixon  
John E. Foss  
D. E. McCormack  
W. D. Nettleton  
Ronald E. Phillips  
Goro Uehara  
E. Moye Rutledge, Chairman *EMR*

SUBJECT: Common Particle Size Scale

On the occasion of the 25th anniversary of the Soil Science Society of America, Dr. C. E. Kellogg addressed the Society ("A Challenge to American Soil Scientists", SSSA Proc. 25:419-429, 1961) and said, among other things, "I see no reason why soil scientists, engineers and geologists could not reach an agreement on a common system for particle size groups." After thorough consideration of this challenge, President C. A. Black initiated this committee on April 26, 1962 and stated the first charge thusly" . . . a practical short range objective is to represent SSSA in cooperative efforts with other scientific groups in working toward a system that is uniform or a system that permits satisfactory translation of results among the various groups concerned . . ." The second charge dealt with methods of analysis.

Memorandum

Page 2

November 2, 1973

Although the first charge was issued some 13 years ago and noted as a "short range objective", it has not yet been realized even though many members of our society as well as those of other societies have labored long and hard in behalf of this objective. In order to move a step closer to the objective of a common scale, our committee has requested President Low to contact the other societies and groups regarding their reaction to a scale suggested by our committee. The committee is proposing the scale for two reasons: 1) Because they think it a reasonable suggestion for a particle size scale, 2) In order to get some reaction from the other societies and groups, in the hope of finding common ground on which to move toward a uniform scale.

I am attaching a copy of President Low's memorandum to the various other groups. As you will note the proposed size limits apply only to sand, silt and clay and do not include size limits for the various fractions within these three major divisions. We think it would be impractical to try to agree on more than the limits of the three major fractions at this time and furthermore we assume there will be considerable difficulty in agreeing on these limits.

If the other groups and societies respond favorably to this proposed scale, the committee envisions that the common scale would be voted on by SSSA and the other interested groups. This vote would be worded in such a way that the "common scale" would not go into effect unless it were passed by all or essentially all the groups (the problem of failure by a small or minor group has not been worked out). Therefore, if SSSA, for example, voted for the common scale and other groups voted it down the commonscale would have failed and SSSA would continue with the scale they were using prior to the conference. No group would be left committed to a common scale, which in fact wasn't truly common.

Our committee realizes that particle size measurements are very basic to soil surveys and that members of your group have long had a deep interest in a common scale. We, therefore, would appreciate the regional conferences considering the following questions:

-----  
1) 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?

*if anticipated  
units taxonomy  
OK. it creates a  
problem*

2) What would be the impact of such a shift on soil survey?

3) Would you agree that such a shift should be made in the soil science field?

4) If not, please indicate all reasons for not making the change?

~~The particle size committee~~

~~He realizes that~~ quest on No. 2 may be difficult to answer and the answer may in fact change with time.

After the regional conferences have considered the questions we would like to have the ext National Work

regional

cl

1. ...
  2. Taxonomy unit may be
  3. It may change some plus
- ... separations*

*would require much work in repeating series descriptions.*



**SOIL SCIENCE  
SOCIETY OF AMERICA**

HEADQUARTERS: 677 SOUTH SEBODE ROAD • MADISON, WISCONSIN 53711

P. F. Low  
President

FOR REPLY, please address  
Dept. of Agronomy  
Purdue University  
Lafayette, Indiana 47907  
Phone: 317-494-4071

June 13, 1973

TO: Presidents and chairmen of the following societies and boards:

American Association of **State Highway Officials**  
American Society for Tasting and Materials  
American Society of Civil Engineers  
Building Research Advisory Board  
Geological Society of America  
Highway Research Board  
Society of **Economic Paleontologists and Mineralogists**

FROM: Philip F. Low, President, Soil Science Society of America

SUBJECT: Common scale for reporting grain or particle size data.

Our societies have been in communication over the past several years in an effort to arrive at a common scale for reporting grain or particle size analysis. A Particle Size Distribution Workshop, co-sponsored by most of our societies, was held at Columbus, Ohio, on November 2, 1965. Accord was reached among the various representatives on the need for a Joint Work Group and on methods of approaching a uniform set of grain size limits for the various groups working with earthy materials. Following this meeting, several societies published "Position Papers" on their grain size scales.

The Joint Work Group issued the following statement:

"April 1968"

"Joint statement on particle or grain size classes of sand, silt and clay for use by professional groups of engineers, geologists, and soil scientists.

Examination of position papers prepared by engineers, geologists and soil scientists, and other evidence available, indicates that the upper size limits in  $\mu\text{m}$  of clay, silt, and sand fractions now in common use are as follows: clay = 0.002, 0.0039 and 0.005; silt = 0.05 (no. 270 sieve), 0.0625 (no. 230 sieve), and .074 (no. 200 sieve); sand = 2.0 (no. 10 sieve) and 4.76 (no. 4 sieve.)"



**SOIL SCIENCE  
SOCIETY OF AMERICA**

HEADQUARTERS: 677 SOUTH BEECH ROAD . MADISON, WISCONSIN 53711

P. F. Low  
President

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Lafayette, Indiana 47907  
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Memorandum: **Commonscale for reporting grain or particle size data**  
June 13, 1973  
page 2

"The prospects of attaining agreement on the upper size limits of clay seem good and we recommend the 0.002 mm limit. The possibilities of attaining agreement on the upper size limit of silt are slight.



**SOIL SCIENCE  
SOCIETY OF AMERICA**

HEADQUARTERS: 677 SOUTH SEBEE ROAD - MADISON, WISCONSIN 53711

P. F. Low  
President

FOR REPLY, please address:  
Dept. of Agronomy  
Purdue University  
Lafayette, Indiana 47907  
Phone: 317-494-4071

Memorandum: **Common scale for reporting grain or particle size data**  
June 13, 1973  
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Name of Fraction	-----Size Limits-----	
	Upper	Lower
Sand	2 mm	0.0625 mm
Silt	.0625 mm	.002 mm
Clay	.002 mm	none

(No. 10 sieve for the 2 mm separation and No. 230 sieve for the 0.0625 mm separation).

The Committee points out that the upper limit of 2 mm for sand and the upper limit of .002 for clay appear to be in most common usage and are the ones previously recommended by the Joint Work Group.

I shall appreciate your consideration of the above scale, and any reactions you have regarding the current prospects for achieving a common scale. If your reactions are favorable, as I hope they will be, I suggest we consider reconvening the Joint Work Group. I envision the Joint Work Group would be concerned mainly with; 1) making a statement regarding the above scale, 2) working out the mechanics for consideration of a common scale by the various groups, and 3) discussing other areas of common interest that might be pursued in the future. With regard to the mechanics, the Joint Work Group would need to decide just how many groups and/or scientists would need to approve the scale before it would become adopted.

I hope we will be able to make positive steps toward simplifying a matter of basic concern to many workers.

February 19, 1974

Dr. E. Moya Rutledge, Chairman  
SSSA Particle Size Distribution  
Committee (S-675)  
Department of Agronomy  
University of Arkansas  
Fayetteville, Arkansas

Dear Dr. Rutledge:

The memorandum that you sent to the chairmen of the regional soil survey work planning conferences regarding a common particle size scale was discussed at the Northeast Soil Survey Work Planning Conference on January 11, 1974. It was agreed that I should respond to you (this letter) with a copy to Bill Johnson. It was also agreed that this letter would appear in the Proceedings of our Conference so that anyone having disagreements or reservations could correspond directly with you and/or Bill Johnson (if it is felt that the matter should be considered at the National Soil Survey Work Planning Conference).

In your memorandum you asked our conference to consider the following questions:

1. 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?
2. What would be the impact of such a shift on soil survey?
3. Would you agree that such a shift should be made in the soil science field?
4. If not, please indicate all reasons for not making the change.

The feeling of the conference was that (assuming other disciplines went along) the changes should be acceptable from the cooperative soil survey point of view as long as changes were integrated into our soil taxonomic system. The only real change would be in the upper size limit of silt (from 0.05 to 0.0625 mm) (the 0.05 to 0.1 mm fraction has been considered to be silt for some particle size families and at the 1971 National SSWPC it was voted that the upper limit of silt should be 0.1 mm - however, this has not been done in the in-press version of Soil Taxonomy).

Dr. E. Noye Rutledge, Chairman  
February 09 1974  
Page Two

Thus the main impact on the soil survey would be the time and work required to integrate the change into our classification system. It was also pointed out that some soil series separations might change and that considerable work might be needed in updating soil series descriptions.

With regard to Question 3, the consensus was that the change should be made in the soil science field if a reasonable number of other disciplines go along.

Although the group indicated they would favor changing if enough (this wasn't defined) other disciplines did, some reasons for not going along were suggested:

- a. Some of our pest particle size data would become obsolete - perhaps the most severe and least correctable problem.
- b. Soil Taxonomy would be out of line. However, once Taxonomy was updated, the overall effect here could be positive.
- c. As mentioned previously, some soil series separations might change and work would be needed to update some series descriptions.

Any new correspondence from you to our conference should be directed to the new chairman for our region:

B. G. Watson  
USDA Soil Conservation Service  
96 College street  
Burlington, Vermont 05401

Sincerely yours,

Delvin S. Fanning  
Pest Chairman, NESSMPC

DSF:eg

P.S. for possible effects on the new Soil Survey Manual you probably should correspond directly with Harlin Cline, Department of Agronomy at Cornell who is in charge of preparing the Manual. Dr. Cline was not at our conference.

## REPORT OF COMMITTEE I

### LEGAL ASPECTS OF THE USE AND INTERPRETATION OF SOIL SURVEYS

New York City, January 7-11, 1974

#### SUMMARY

##### Charges

1. Summarize and distribute existing or proposed ordinances and regulations that involve soil surveys.
2. Develop guidelines and give a status report on registration of soil scientists (classifiers) and the development of state and national soil classifiers' associations.
3. Examine the use of soil surveys in regional and state planning as this pertains to legal issues.
4. Determine areas of potential conflict with private consultants in the collection and especially in the use of soil survey information. How can these best be handled by the National Cooperative Soil Survey?

##### Committee Recommendations

1. Committee I should be a standing committee and continue to work to distribute summaries of laws involving soils information. Recommendation accepted.
2. The SSSA committee dealing with certification of soil scientists be contacted to clear up terminology problem relative to use of terms such as soil scientist, soil surveyor, soil classifier, etc. in state registration laws. Recommendation accepted with the amendment that the National Soil Survey Work Planning Conference also work on the problem.
3. Committee I, in communication with the SSSA committee on certification of soil scientists, develop a model ordinance on registration of soil scientists. Recommendation accepted with the amendment that the National Soil Survey Work Planning Conference also be asked to address the problem.

4. The Soil Conservation Service should develop a policy statement **specifying** the kinds of **soils** information **that** may be distributed upon request and also the extent to **which** the requests for services to consultants and individuals are handled. Recommendation accepted.

REPORT OF COMMITTEE I

LEGAL ASPECTS OF  
THE USE AND INTERPRETATION OF SOIL SURVEYS

New York City, January 7-11, 1974

Committee Members

D. N. Brom	S. A. L. Pilgrim
E. J. Ciolkosz	L. H. Rivera
L. J. Cotnoir	J. D. Rourke (Vice Chairman)
R. L. Cunningham	E. J. Rubins
s. Elkart	E. H. Sautter
W. Kirkham	R. L. Shields
F. G. Loughry	K. G. Stratton (Chairman)
R. L. Marshall	W. A. van Eck
F. P. Miller	M. E. Weeks
G. W. Olson	R. D. Yeck
N. K. Peterson	

Charges and Committee Response

1. Summarize and distribute existing or proposed ordinances and regulations that involve soil surveys.

A survey of all states, Puerto Rico, and the Virgin Islands was made, and the results of that survey are given in Appendix A, for the northeast region, and Appendix B, for states outside the northeast. Because of constant changes in state and local laws and regulations, the committee felt it important that we be kept aware of all changes in laws having reference to soils information. The committee therefore recommended that it remain as a standing committee and continue to publish and distribute summaries of such

working to get a program established.

The matter of soil classifiers' associations is one that many see as a first step in achieving success in establishing a registration program. Getting legislation passed can be quite an effort, and having an established organization, such as an association of soil scientists or classifiers, is almost a **must**.

Soil scientists in Wisconsin did organize a professional society in 1972. As a society, they are facing the problem of state registration programs and a certification program for their own society. The stated purpose of the society is "The advancement of applied soil science, and the promotion of professional and social interests of the members".

Relative to the development of guidelines, the committee did not work to develop guidelines but did make two recommendations: (1) The Soil Science Society of America, particularly the committee on Certification of Soil Scientists, should be contacted and encouraged to provide guidance on the use of terms such as soil scientists, soil surveyors, and soil classifiers. It would be desirable to have one term used in certification programs and avoid confusion. The recommendation was amended to have the National Soil Survey Work Planning Conference address itself to the problem, and it was accepted. (2) The Committee recognized the need to have a model registration ordinance developed for states to use as a guide. A third recommendation, then, was that a model ordinance be developed by Committee I, in communication with SSA's committee on certification. This recommendation was also accepted in an amended form, the amendment being that the National Soil Survey Work Planning Conference be requested to discuss the matter.

3. Examine the use of soil surveys in regional and state planning as this pertains to legal issues,

Essentially, this charge was incorporated with Charge 1 above. We have tried to include a summary of the use of soil surveys in regional and state planning along with summaries of other state legislation.

4. Determine areas of potential conflict with private consultants in the collection and especially in the use of soil survey information. How can these best be handled by the National Cooperative Soil Survey?

This topic is a serious issue, and there seems to be confusion as to how it might be handled. Some of the committee response follows:

Brown: The consulting soil scientists are evaluating characteristics of a site relative to **one** specific land use, according to the plans of the client. **When** making investigations, they are doing their work in much greater detail than the regular soil survey, and consequently must deal **with** transitional soils as specific soil bodies rather than grouping them with the more clearly identifiable soils. This presents problems for interpretation.

Ciolkosz: Who will have the authority to determine if an area or **soil** is suitable for a particular use, and if unsuitable, what measures have to be undertaken to make the area or soil suitable.

Sautter: **Most** potential conflict with private consultants is in the area of on-site investigations work,

Loughry: A client may be charged a consultants' fee for a copy of data that was collected and interpreted by tax-supported public agencies.

Miller: Similar **comment** as **Loughry**. **How** far can we go in interpreting the data for someone engaged in a legitimate profit oriented enterprise?

It was generally agreed that the National Cooperative Soil Survey could help resolve some of these conflicts by providing more and better guidelines for overcoming soil limitations. Strong certification or registration programs and codes of ethics for soil scientists may also help resolve the issue, and protect the National Cooperative Soil Survey at the same time.

The Committee recommended that the Soil Conservation Service develop a policy statement specifying the kinds of information that may be distributed upon request and also the extent to which the requests for services to consultants and individuals are handled. The recommendation was accepted.

Discussion on Committee Report

Most of the discussion centered on qualifications and competency of soil scientists for on-site investigations.

Miller: Expressed question of competency of soil scientists dealing with interdisciplinary problems.

Fanning: Also expressed a problem with the range of expertise of soil scientists.

Ferwerda: In Maine, soil scientists are being recognized for their expertise in soils only.

The legal status of the National Cooperative Soil Survey was questioned.

Nelson: References to National Cooperative Soil Survey in legislation not valid,

Rourke: Maine's Attorney General reviewed legislation having reference to National Cooperative Soil Survey and saw no problems.

Rice: If the standards of the National Cooperative Soil Survey is ever challenged, who is challenged? Who answers to the charge?

It is clear that with legislation that is in existence and the legal questions arising, the work of this committee will be important.

Appendix A

Summary of Legislation, **Ordinances** and  
Regulations **related** to the Legal Aspects  
of the Use and Interpretations of **Soil** Surveys  
**in** the Northeast Region

CARIBBEAN AREA

In 1971, the Legislature of the Virgin Islands  
passed a bill which added a new chapter, **Environmental  
protection, Soil** and Shore Erosion Control and for Other  
Purposes. This chapter stated, "**the** Virgin Islands **Soil**  
and Water **Conservation** District shall prepare and adopt  
an

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on file in the office of the Town Clerk entitled, 'Soil Survey Map of Redding, Connecticut.' In each Instance, however, the actual character of the soil shall determine whether the land in question is subject to regulation. The regulations state that any person wishing to carry on any regulated activity must submit a preliminary application. Among the information required in this application is a complete description of the area "in sufficient detail to allow identification of the property on the Soil Survey Map, Redding, Connecticut." The regulations stipulate that. "any person claiming that an area is not a wetland or a water course shall have the burden of so showing by presenting documentation prepared by a qualified Soil Scientist to the ~~Commission.~~"

Proposed Amendments to Zoning Regulations

Town of Durham, Connecticut. Under this proposed amendment, a section of **soil limitations** is added to the zoning regulations. This section states, "No subdivision, plan, pl shall be approved excepting

purpose of **categorizing soils** and **organization** of material. Actual delineation of a town map should be based on the **soil** boundaries shown on detailed **soil** survey maps."

## DELAWARE

### Local Regulations

**Septic Tank Regulations**, Department of Public Works, Newcastle County, Delaware, dated March 3, 1973. **Soil** characteristics as well as percolation tests are considered in evaluating the disposal area for infiltrative capacity. The slight, moderate or severe limitations used by the **Soil** Conservation Service in the published **soil** survey of Newcastle County are utilized as part of the standards. Where soil characteristics and features are classified as severe, **septic** tanks shall not be used. **Septic** tank systems will be used only under **special engineering consideration** when **soil characteristics** and features are classified as moderate.

## MAINE

### Major State Acts

1. **Maine Land Use Regulation Commission**. **Zoning** and land use control in the unorganized territory of Maine is administered by the above **commission** and **pertains** to detailed rules and regulations to control development in areas without municipal government. The Commission may regulate all development **including**: "any land-use activity or **activities** directed toward using, reusing or rehabilitating **air** space, land, water or other natural resources." Under this regulation, four major land use districts are to be identified: (1) **Protection Districts**, where development would jeopardize significant, natural, **recreational** and historical resources; (2) **Management Districts**, including those lands which are currently being utilized for commercial forest products, or agricultural uses; (3) **Holdings Districts**, for future use; and (4) **Development Districts** for residential, **recreational**, **commercial**, or industrial use.

Administrative Policy of the Maine Land Use Regulation Commission pertaining to Sewage Disposal for Dwellings. The purpose of the administrative **policy** is to **reconcile** and clarify four statutory **criteria** as they relate to sewage disposal when the Commission is consid-

ering land-use applications. Among the four criteria is "that the use of topography, soils, and subsoils meet or are adaptable to the standards of the current **Soil Suitability Guide for Land-Use Planning In Maine.**" This guide was developed by the Soil Conservation Service, the Maine Soil and Water Conservation Commission and the Maine Agricultural Experiment Station. The criteria listed are considered when the Commission is reviewing land-use applications, which include: (1) septic tank and leach field, (2) privy for human waste, and (3) leach field for waste water.

Comprehensive Land Use Plan for the Unorganized Areas of Maine. To be administered by the Land Use Regulation Commission. Among the many elements to be analyzed in the development of this plan, is the description and characterization of soil resources.

2. Mandatory Shoreland Zoning for Municipalities. This law was passed in June 1973 and will become effective July 1, 1974. The law identifies and defines the types of water bodies which will be protected for a distance of 250 feet back from the shoreline. In the land use guidance standards mention is made of soil conditions and the importance of determining the suitability

The ordinance establishes specific land uses which will be permitted in each of the three districts. One section of the ordinance sets the standards for various land uses. As pertaining to agriculture as a land use, the ordinance states: (1) all spreading or disposing of manure shall be accomplished in conformance with the Maine Guidelines for Manure and Manure Sludge Disposal on Land, published by the University of Maine and the Maine Soil and Water Conservation

3. **Municipal** Regulation and Land Subdivlslon Law of the State of **Maine** was amended on October 3, 1973. This amendment changed **certain** language In the old law. When promulgating any subdivlslon regulation and when **review- ing** any subdivlslon for approval, the planning board, agency or **office**, or the **municipal** offloers shall consider certain **criteria** and before granting approval shall determlne that the proposed subdivlslon **will** not result in undue water or **air** polluton. In making **this** determination, they shall at least **consider** the elevaton of land above sea level and **its** relatlon to the flood **plains**, the nature of **soils** and subsolls and ~~thru~~

industrial development, including subdivisions, but excluding state highways and state aid highways, which require a license from the commission, or which occupies a land or water area in excess of 20 acres, or which contemplates drilling for or excavating natural resources. on land or under water, excluding borrow pits for sand, fill or gravel, regulated by the State Highway Commission and pits of less than 5 acres, or which occupies on a single parcel a structure or structures in excess of a ground area of 60,000 square feet. Consideration of soil types is one of four criteria used to evaluate applications. The law states, "The proposed development will be built on soil types which are suitable to the nature of the

2 or more persons, firms, corporations or other legal entities." Projects falling under the regulation of this Act must receive a permit from the Board. The applicant must demonstrate that the project will not cause, among other things, unreasonable soil erosion.

MARYLAND

Major State Acts

Regulations Governing Water Supply and Sewage Systems in the Subdivision of Land. Maryland State Department of Health and Mental Hygiene, March 3, 1972. By these regulations the Cooperative Soil Survey in Maryland becomes a primary tool in determining periods for conducting percolation tests and for approving permits for sewage systems. The regulations state that in those areas where the soil survey indicates moderate or severe restrictions due to seasonal high water tables, percolation tests shall be performed at the time of year when the highest water table can be expected as indicated for a given area by the soil

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storm flowage, or flooding without filing wrlitten notice of his intention to so remove, fill, dredge or alter, including such plans as may be necessary to describe such proposed activity and Its effect on the environment, at least sixty days prior to any such removing, filling, dredging or altering." The administration of this Section lies primarily with the local

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Is much broader and is a stronger permanent law. Wetland Is one of the **eight** types of open-space land defined by **this** law. Wetland Is defined as "means any marsh, swamp or bog subject to permanent or **periodic flooding** and **including** the **surrounding** shore and **including** any **soil** designated as very poorly drained by the National Cooperative **Soil** Survey or as determined by **criteria** developed by the Board." Flood plain is **defined** as "to mean a low area **joining** and **Including** any water or drainage course subject to **periodic flooding** or overflow and delineated as alluvial **soils** by the National Cooperatlve Soil Survey In operational **soil** surveys or In county soil survey **publications, which-** ever Is more **current.**"

2. An Act Establishing a **Critical Lands Commission** and Providing for the **Classification** of Certain Land **Areas** of the State as **Critical**. This Act is **still** under consideration by the State legislature In New Hampshire. Included among the **critical** areas defined as to be protected under **this** law are **37** soil types which have been delineated by the **National** Cooperative **Soil** Survey and published **In** various **soil** surveys. **Pertaining** to these **37** soil types, the law states that the **Commission** shall not approve an application to develop any **critical** area unless **it finds** the results of such **activity will** not endanger the agricultural **utilization** of these soil types as may be located in the designated areas **specified** through long-term **commitment** to **essentially irreversible** uses.

3. **In a** fact sheet prepared by the Society for the **Protection** of New Hampshire Forests, the use of soil survey data in developing land use regulations and as a **basis** for property tax assessment on wet lands **is discussed,**

4. Septic Tank System for Sewage **Disposal Adapted** for Rural Homes, Camps, and Cottages. Issued by the New Hampshire Water Supply and Pollution Control **Commission** in **1973**. Included among the requirements to be submitted with the plans and **specifications** submitted for a **permit** Is **Soil** Conservation Servloe **soil classifications** or equivalent for the general area of **subdivision or lot** (available from the U.S. **Soil** Conservationist in each County **Office**).

#### Local Ordinances

1. An Amendment to the **Zoning** Ordinance of the Town of Amherst, New Hampshire **Establishes** a Flood Plain Conservation **District**. "This conservation district is

determined to be the low area **enjoining** and including any water or drainage course subject to **periodic flooding** or overflow and delineated as **alluvial soils** by the **Soil Conservation Service**, U.S. Department of Agriculture in the operational soil survey of Hillsboro County **in progress.**" The purpose of this amendment is to control development on the flood plains of the town.

2. The **Zoning Ordinance** of the Town of Gullford, dated 1972. Included in this ordinance is an **article** pertaining to Wetland **Conservation Areas**. The purpose of this **article** is to prevent the development of **structures** in land uses on naturally occurring wetlands **which will contribute** to **pollution** of surface and ground water by sewage. Wetland conservation areas are defined as "those areas delineated as poorly drained, very poorly drained, and **alluvial soils** identified in the soil survey of Belmont County, New Hampshire issued in November 1968." Special exceptions **which will be permitted** are tied to each of the three above-listed **kinds of soils.**

3. **Building Code and Zoning Proposals** of the Town of Millford, New Hampshire. A **Wetland Conservation District** is to be established under these **zoning proposals**. The **Wetland Conservation District** is defined to be "those areas identified and delineated as poorly drained, very poorly drained, and as bodies of water by the National Cooperative **Soil Survey** through field mapping surveys completed in 1972 and shown on **its field mapping** photographs sheets for the Town of Millford, New Hampshire."

## NEW JERSEY

### State Acts

1. Farmland Assessment Act of 1964. This statewide **regulation** allows farmlands to be assessed at their value for **agricultural**

3. New Jersey Department of Environmental Protection. Sewage construction guidelines recently developed

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3. Proposed Sediment Control Law. Under this proposal, standards for the control of **soil** erosion and **sedimentation** shall be based upon relevant **physical** and developmental **information** concerning the watersheds and topography of the State, **including**, but not **limited** to, data relating to land use, **soils**, slope, hydrology, geology, size of land area being disturbed, proximate water bodies and their characteristics.

## PENNSYLVANIA

### Major State Acts

1. Act 241. Solid Waste Management Act. August 1968; Revised 1/70, 8/72. The **solid** wastes **included** under this act are **municipal**, **agricultural** and **industrial**. This act provides for the planning and **regulation** of solid waste storage, **collection**, transportation, **processing** and disposal systems. It requires **municipalities** to **submit** plans for solid waste management systems in their jurisdiction; requires permits for operating and **processing** of disposal systems; and authorizes the Department of Health to adopt rules, regulations, standards and procedures.

Among the **items** required in the plan is a soil report of the proposed site. The **soils** report is to be based on the published standard **soil** survey or **equivalent** data. The **soils** report is to **include** data on the characteristics and availability of **soil** as a cover material.

The Act requires that a Ground Water Module has to be completed and submitted to the Department of Environmental Resources prior to approval of the landfill operation. Very specific data on the **soils** of the site are required for this module as follows: List of each of the **soil** series and phases present on the site; a copy of the USDA **Soil** Conservation **Service** **soils** map for the area showing the site boundaries; borings or test pits made to describe **soils** and determine their depth; **location** of these borings or test pits on both large-scale maps and the **soils** maps; minimum thickness of **soil** to horizon or horizons **containing** 60 percent or more coarse fragments and how this **thickness** was determined; **percolation** rates for the **soils** and how these **percolation** rates were determined; if **percolations** were run, are the **percolation** tests always shown on the **soil** maps; the **maximum** slope at the proposed site; the **shallowest** depth from the surface to **mottling** and how this was determined; if there is a fragipan present, the

shallowest depth to the fraglpan and how thls was deter-  
mined; and the name and address of the soil **scientist**  
supplying this data.

2. Pennsylvania Sewage **Facilities** Act. March **1970**.  
This Act requires each **municipality** to submit to the  
Department of **Environmental** Resources an **official** adop-  
ted plan for sewage systems servlng areas wthln **its**  
jurisdiction. The plan shall include a survey and  
analysis of **soils** and proposed sewage needs In those  
areas not served by sewage services. The plan **is** to  
include an evaluation of the **soils** to determine their  
sultablllty for lndlvldual sewage systems and community  
sewage system, Based on the analysis and evaluation of  
**soils** the land **classification** system **is** to be estab-  
lished to determine the sultablllty of the area for on-  
lot dlsposal of sewage and **is** to **include** four **categories**  
by degree of **limitation** as follows: (1) None to **slight**;  
(2) **Moderate**; (3) **Severe**; and (4) **Hazardous**. These are  
deflned in the Act.

3. The Clean Streams Law of Pennsylvania. Approved  
In **1937**, amended in **1945**, **1956**, **1965** and 1970. Sedlment  
**is included** as a form of pollutant by deflnltlon under  
this Act. In 1972, the Pennsylvania Envlronmental  
Quality Board adopted regulatlons for the control of  
eroslon and sedimentation. The Department of **Environ-**  
mental Resources has developed a program to lmplement  
these regulatlons and thereby prevent **pollution** of the  
waters of the Commonwealth. The **Soil** Conservatlon Ser-  
vice assisted the Department in the preparatlon of a  
Manual on **Soil** Eroslon and Sedlment Control. The **regu-**  
latlons adopted by the Environmental Quality Board **re-**  
**quire** that **certain** earth-movng actlvltles obtain a per-  
mit from the Department prlor to the tlme any earth **is**  
dlsturbed. However, the earth-mover **is** not required to  
obtain a permlt for those actlvltles for **which** a plan  
has been developed by the **Soil** Conservatlon Service.

#### Local Ordinances

1. Tovmshlp in Centre County, Pennsylvania. An  
**Ordinance** to Amend and Supplement the Township Zoning  
Ordinance of **1965** and in Addlng Thereto an Article  
**Entitled**, "**Flood Plain Conservatlon District**." This  
**ordinance** establshes **Flood Plain Conservatlon Districts**  
in the Townshlp; enumerates permltted and prohlblted  
uses of ground in these dlstrlots; requires approval of  
Townshlp Plannng Commlsslon in certain Instances; and  
provides for **exceptions** by **modification** of the flood  
plain boundary by the Zoning Board. In this **ordinance**,  
flood plain **is** deflned as "**those** areas subject to

**flooding and** delineated as alluvial soils by the U.S. Department of **Agriculture, Soil Conservation Service** in the **interim** soils report<sup>6</sup> of Centre Region, 1969. Although infrequent floods will exceed the **limits** of alluvial soils, these **alluvial soils** which are water deposited soils, represent those areas most often inundated by flood waters and represent the most **realistic flood plain.**" The **ordinance** goes on to state that "the Flood Plain Conservation District shall include all lands designated by map **symbols** and mapping unit names." It includes a **list** of these map **symbols** and **mapping unit** names. It **identifies** the map sheets by number and the **Interim Soil Report<sup>6</sup>** that are involved.

2. Allegheny County, Pennsylvania. An **Ordinance**, dated **April 1972**, which regulates the **Design, Construction, Maintenance, or Alteration of Grading, Excavations and Fills.** **Soil survey is** defined in the **Ordinance** as "the **unpublished and operational soil survey** of Allegheny, Pennsylvania, and **accompanying text Soil Survey Interpretations of Allegheny, Pennsylvania,** as prepared by the U.S. Department of **Agriculture, Soil Conservation Service.** When applicable the **soil survey** shall mean 6011 survey Allegheny, **Pennsylvania,** when this **publication is** completed." In the section **pertain-**ing to Standards for **Excavation, the Ordinance, in deter-**mining the maximum slope steepness of a cut, makes reference to **certain soils** by map unit **symbols,** delineated during the **soil survey,**

3. Newtown Township, Delaware County, Pennsylvania. An Ordinance to Govern and Regulate the Grading of Land, the **Modification of Natural Terrain, the Alteration of Drainage, the Maintenance of Artificial Structures and Surfaces, and Maintenance of Drainage Necessary to Control Soil Erosion.** Although the **soil survey is not men-**tioned **specifically in this Ordinance,** it does state that if a load-bearing fill is proposed, a **soils inves-**tigation report shall be submitted by a **soils engineer:** it mentions the kinds of data required. It also states that the **design, installation** and maintenance of erosion and sediment control **measures** shall be accomplished in accordance with **guidelines** as may be established from **time to time** by the Delaware County **Soil and Water Con-**servation **District,** as adapted from standards and **speci-**fications of the U.S. Department of **Agriculture, Soil Conservation Service.**

4. An ordinance which establishes flood way **regula-**tions along Neshaminy Creek and **its tributaries** in Bucks county. In setting forth the **limits** of flood ways, the **ordinance** makes reference to **soil survey information** as

**follows:** "For all of the streams **within** the Neshamlny Creek Watershed, *not* described in paragraphs A and B above, areas subject to frequent, **periodic** flooding and delineated as alluvial **soils** by the U.S. Department of **Agriculture**, Soil Conservation Service in maps and data comprising the soil survey of Sucks County, **Pennsylvania.**"

5. A **resolution** adopted. by the County Commissioners of **Lehigh** County **in 1972** includes the **following:** "To call the attention of all **individuals, corporations** and municipalities to the **services** and resources of the **Lehigh** County Soil and Water Conservation **District.** The County Commissioners are strongly recommending that all construction projects involving earth-moving operations be

## RHODE ISLAND

### Proposed Zoning Regulations

1. North Kingston, Rhode Island. Proposed Zoning Districts. Under this proposal, five primary land-use districts will be recognized. In addition, three soil districts shall be recognized. These are severe limitations district, very severe limitations district, and steep slope district. The purpose of each of these three overlay districts is to establish additional requirements for the primary zoning districts based on specific hazards and problems outlined in the soil interpretation tables prepared for the State of Rhode Island by the U.S. Department of Agriculture, Soil Conservation Service. Each of the three soil overlay districts is defined in terms of speelflo map unit symbols which occur on map sheets of the Soil Survey of the Town of North Kingston.

2. Town of Exeter. Subdivision Regulations. Under these regulations, a soil survey of the land being subdivided and a soils interpretation report from the Southern Rhode Island Soil and Water Conservation District is one of the items required with the preliminary plat application. The regulations also state that minimum lot dimensions and minimum building set-back lines shall be established for all lots unless the need for larger lots is indicated by the standard soil survey. In the subsection pertaining to Compliance with Regulations, Procedures, and Specifications, this regulation states: (1) many of the standards and specifications contained in the District Standards and Speelfloations Handbook will be based on the types of soil existing in the area of development, and (2) the standards and specifications will vary according to conditions and slopes that exist on the development site.

## VERMONT

### Major State Acts

1. Act No. 250. Subdivisions, and Commercial, Industrial and Residential Developments. 1970. Administered by Environmental Board and District Environmental Commissions. Subdivisions of 10 or more lots of Less than 1.0 acres: any commercial or industrial development on one acre of land, or 10 acres if in a town with permanent subdivisions and zoning ordinances, must have a "250" permit.

Chapter 151 of the Act, requires the Board to develop and adopt a **capability** and development plan for the State of **Vermont**. A **General Soil Map** of each county has been used to prepare two of the maps included **In** this plan: (1) **Limitations** for Development, and (2) **Resource Opportunities**. A State land-use plan, based on the **capability** and development plan, **is** also to **be** developed and adopted by **the** Board.

**Soil survey information is** also used under **this** Act by the **District Environmental Commissions** in their **review** of proposed developments.

2. **Regulations of the** Vermont Health Department **Pertaining to Subdivision** Development. The soils data required **In** a **permit** for **on-site sewage** disposal **may** be obtained from either a report by the **Soil Conservation Service** or in a report of the **Soil Scientist acceptable** to the **Soil Conservation Service obtainable** through a **Natural Resources Conservation District** after an on-site review of the terrain and the **soils**.

3. On January 2, 1973, the **Environmental** Board of the State of Vermont adopted a Vermont Land Capability and Development Plan. General roll maps were used and are **being used in**

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## VIRGINIA

### State Acts and Regulations

1. State Land Use Tax Act. This Act requires **soil** information before a land owner can secure a lower assessment for **specified** purposes.

2, Board of Health Regulations. Among the rules and regulations **governing** the disposal of sewage, there is a requirement for soil evaluation. The **soil** evaluation for a drainfield system shall follow a systematic approach including ~~insulation~~

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## Appendix B

### Summary of **Legislation, Ordinances** and **Regulations** Related to the Legal Aspects of the Use and Interpretations of **Soil** Surveys in States Outside the Northeast Region

#### ARKANSAS

##### State Regulations

In **constructing** septic fields and in other **sanitation** considerations, the **soils** information such as **percolation** tests are required.

#### FLORIDA

##### State Regulations

**Soils** information **is** used for **locating** sites for sanitary landfills and **septic** tanks. **Soils** information **is** also used to **designate** wetlands.

#### IDAHO

##### State Regulations

**Soils** information **is** referenced as **criteria** for locating septic tank leach field **sites**. However, there are no real **speciflcs**. and an individual **is** not charged with the **responsibility** to get or use **soils** information.

#### ILLINOIS

##### State Regulations

The **Soil** and Water Conservation District Law was amended in 1971 to add a new Section **22.02a**, as follows: "The Soil and Water Conservation District shall make all natural resource information available to the **appropriate** county **agency** or municipality in the promulgation of zoning **ordinances** or **variances**. Any person who **petitions** any municipality or county agency **in** the district for **variation, amendment, or other relief** from that **municipality's** or county's **zoning ordinance** or who proposes to subdivide vacant or **agricultural** lands therein shall furnish a copy of such petition or proposal to the Soil and Water Conservation District. The **Soil** and

Water Conservation District shall be given not more than 30 days from the time of receipt of the petition or proposal to issue its written opinion concerning the petition or proposal and submit the same to the appropriate county agency or municipality for further action."

## MONTANA

### Major State Laws

1. The Montana Strip Mining and Reclamation Act. This Act requires a soil survey describing all major soils being present on the area of operation and their suitability for revegetative purposes. The soil survey shall include the following information: (1) Sampling and analysis of soil horizons in sufficient detail to identify the soil types present within the area of operations and to determine the depths to which soil should be saved within each soil type. Each horizon sample shall be analyzed for the pH, salt hazard (conductivity), sodium absorption ratio, cation exchange capacity if the sodium absorption rate is greater than 10, and mechanical analyses (texture) and determination of the percent of macronutrients for each soil horizon present at two or more locations within each soil type. (2) A soils map acceptable to the Department. The scale shall be one (1) inch equals two hundred (200) feet unless otherwise altered by the Department. Enlarged aerial photographs may be used as a map base. The map or photograph shall include the soil types present and their boundaries (the operator shall indicate within the various soil types the depth to which he plans on stripping topsoil); soil sample map locations correlated to soil type and horizon testing; and further soil studies if required by the Department.

2. Open Cut Mining Act. In the applications for a mining contract, a reclamation plan has to be submitted, and this includes (1) areas where soil material will be replaced and (2) information about soil type which may include a standard soil survey if required, among other items. In addition to the above, a reclamation plan for a bentonite operation may be required to contain a standard agricultural soils analysis of the surface materials and each major stratum in the overburden, including determinations of texture, porosity-permeability, nutrient content, alkalinity, leachable salts, and additional analyses as required by the Board. In submitting this information, the operator shall also list the number of samples taken, the method by which they were taken, the location from which they were taken, the

name and address of the persons who took the samples if other than the operator, and the names and addresses of those persons who analyzed the samples. The **soils** analyses shall be accompanied by a map **delineating** soil types. the location of the **soil** samples taken, depths of soils materials to be salvaged for each soil type and the **donlnate** vegetative **species** present on each **soil** type.

'j. Control of Refuse Disposal Areas. The **selection** of a refuse disposal area involves the use of **soil** survey information, and may require a **soil** scientist to **inspect** the site.

4. Motor Vehicle Wrecking Facilities. As in the statute dealing with refuse disposal areas, the **selection** of a motor **vehicle** wrecking **facility** involves the use of **soil** survey information. A **soil** scientist may be required. to **inspect** the site.

5. Montana Subdivision and Platting Act. This Act calls for maps and tables showing **soil** types in the several parts of the proposed **subdivision**, and their **suitability** for any proposed developments in those several parts.

6. Montana Utility Siting Act, **effective March 1973**. Soil information is used for determining **powerline corridors**, vegetation, and **construction** of towers. The **Energy Planning Division** of this Department approves the **powerline corridors**, power plant **sites**, etc.. and **soil** surveys are **studied** for all **planning**.

## NEW MEXICO

### State Regulations

1. In 1973, the New Mexico Legislature gave the Natural Resource Conservation Districts the **responsibility** of developing **guidelines** for terraln **management** as they relate to subdivisions. With the adoption of these guidelines, subdivlders are required to furnish detailed **soils** maps on all new **subdivisions**. In addition, all land within the **subdivision** must have **soils** which are suitable for the uses proposed by the subdivlder.

2. The Coal Surfacemlng Commsslon has adopted **regulations** which require **companys** engaged in **strip-mining** operations to submit general **soils** maps as a part of their **mining** plan. This **soils** information along with information concerning the grading and **re-vegetating**

of **spoil** piles is used to determine the conditions under which a **mining** permit is Issued.

3. The **Environmental** Improvement Agency has developed guidelines regarding the suitability and use of soils for **sanitary** land fills and septic tank filter fields.

## NORTH DAKOTA

### State Laws

North Dakota **Reclamation** of Strip-Mined Lands Law. A provision for returning "up to two feet of top soil or approved surface material" was added by the 1973 **Legislature**. Topsoil means, "that material (normally the A and, in some cases, the upper portion of the B horizon) which, based upon an **official** national cooperative soils survey, is acceptable for respreading on the surface of regraded areas to provide a medium for plant growth." The operator's **reclamation** plan and the **commission's** approval or **modification** thereof shall be based upon the advice and **technical assistance** of the state soil conservation **committee**, among other agencies,

NATIONAL COOPERATIVE SOIL SURVEY  
NORTHEAST SOIL SURVEY WORK PLANNING CONFERENCE

JANUARY 7-11, 1974

COMMITTEE 2: USE OF SOILS FOR WASTE DISPOSAL

COMMITTEE CHARGES:

1. Development of regional guidelines for using and interpreting the use of soils for disposal of wastes and review of interim national "Guide for Rating the Limitations of Soils for the Disposal of Waste".
2. Enlist help of geologists, hydrologists, sanitary engineers, and others in developing these guidelines.
3. Develop a list of references for each of several kinds of wastes.
4. Suggest research needed.

Development of guidelines

In developing guidelines for the use of soils for waste disposal, we assume that the soil is one way to dispose of various kinds of wastes, But it is well to remember that not all soil scientists agree on the use of soils for disposal of many kinds of wastes for there is a lack of understanding of the consequences of waste disposal, especially the biological recycling of some trace metals in wastes. Long term observations in this country are scant. With the exception of farm animal manures, our experience is relatively short. Researchers throughout the country have shown that certain kinds of solid and liquid wastes can be degraded and stabilized without apparent harm to the environment. But what about the long pull? How long can wastes be applied to a site before the soils exceed their capacity to fix or immobilize various constituents in wastes? Our lack of long-term knowledge in some areas may cause some misdirection in waste management for no one can fully predict all interactions between the waste and the soil to which it is applied. At best, soil scientists should proceed with caution in their advocacy. Further, areas of soils that meet the requirements as waste disposal sites have many properties in common with our agriculturally productive soils and they do not constitute an unlimited national resource.

The first question for discussion was whether guidelines should be prepared at the national level or regional level or should they be developed at the state level guided by local factors and tempered by state law. In several cases, soil limitation ratings for septic tank drainfields were not compatible with state

regulations. Variances from national interpretations as set forth in the national "Guide for interpreting engineering uses of soils" were cited for Connecticut and **Pennsylvania**. In **Pennsylvania**, for example, soils with percolation rates less than 6 min/in are rated severe because of poor renovation of effluent. In the national guide rates faster than **45 min/in** are rated slight but footnoted to indicate possible pollution hazard. In Connecticut, rates 30-60 min/in are deemed moderate because it requires a professional engineer to design the system and under proposed **changes** to also supervise and certify its installation. After much **discussion** the committee recommended the following:

**RECOMMENDATION:** The Principal Soil Correlator of the Northeast Region should determine to what extent liberties can be taken at the state level with regional and **national** criteria **ratings**. Local variances would have to be **supported** by local information showing that national or regional guidelines are not applicable.

In view of the possible conflicts between national guidelines **already** developed for use in some aspects of waste disposal **and** guidelines that will be developed for the Northeast Region, the Committee felt it premature to develop the **guidelines** for this conference.

The committee agreed to consider guidelines for the following kinds of wastes:

1. Animal wastes.
2. Effluent from sewage treatment **plants**.
3. Effluent from septic **tanks**.
4. Sewage sludge..
5. Solid wastes in sanitary landfills including interpretations for Soil host, Soil cover, and leachate collected for soil treatment.

The committee felt that although most industrial **wastes** are problems unto themselves, they cannot be ignored if soil **can** be used to stabilize them, Industrial wastes **may** reach the **soil** by two pathways: 1) **those** discharged to sewage treatment **plants** and **accidentally or** intentionally contribute to the **chemical** behavior of sewage treatment plant effluent; 2) those treated by other means to change their form before disposal.

#### Review of "Guide for Rating **Limitations** of Soils for **Disposal** Of **Waste**"

In response to the request to review and offer recommendations for improvement of these national guidelines, the following are suggested.

1. In Tables 1 and 2, relax the restrictions in Footnote 1 assigning "no better than moderate" limitations for regional interpretative groupings to mesic soils. Regional interpretations should be based on the best available soils for waste disposal. It cannot be denied degradation rates in mesic soils do not compare with rates in thermic soils but in the absence of thermic soils regionally, mesic soils are the best we have and should receive slight limitations. Wastes will not be exported to thermic regions to take advantage of faster degradation rates. For mesic soils, adjustments can be made in rates of application.

2. Tables 1 and 2 may have to be treated differently for different kinds of wastes depending upon their composition. For example, separate tables may have to be developed for highly nitrogenous wastes. It is becoming clearer that poorly drained soils may be superior to well drained soils for reducing nitrogen contents by denitrification. There may be some reluctance to suggest spreading wastes in wetlands areas but the fact that denitrification may become the most important pathway to reduce nitrogen contents of wastes and it works best in poorly aerated soils cannot be altered. Perhaps the interpretations may suggest the kinds of upland soils that could be artificially converted to a denitrifying environment by addition of excess water and alteration of the C/N ratio. Perhaps this suggests that separate tables should be prepared for more specific kinds of wastes rather than the two broad types developed for liquid and solid wastes.

3. For Table 1, the parameter on flooding should reflect severe limitation for any flooding irrespective of growing season or non-growing. Although flood plains are normally thought to be landforms of deposition, soil that has adsorbed nutrients may be subject to some erosion and resolubility during prolonged flooding. Dissolved nutrients and those adsorbed on suspended particles may become subject to entrapment in adjacent water bodies if detention time is great thus contributing to eutrophication.

For Table 2, some members of the committee felt that the parameter on flooding could distinguish between manure that was plowed under within a reasonable time after application or allowed to remain on the surface. This interpretation would bring an element of management into the interpretation and result in the following:

Slight - None  
Moderate - Soils flooded - manure plowed under  
Severe - Soils flooded - manure unplowed.

4. The committee felt that the assumptions used in developing Tables 1 and 2 should be clearly stated. What guided the rationale for the breaks between slight, moderate, and severe for each of the parameters listed in the tables?

5. In the narrative under "Management Guide" there was some disagreement voiced that the quantities of waste that provided  $1\frac{1}{2}$  times that which would be used by a crop were not enough under certain circumstances. This is based on the assumption that  $\frac{1}{3}$  nitrogen will be lost by volatilization. Studies in Connecticut have shown that liquid animal waste slurries spread thinly over the ground will lose up to one-half of its nitrogen by volatilization. Thus if a crop requires 150 lb/acre nitrogen it will require twice that be added to offset volatilization losses unless it is plowed under immediately. To fully compensate for volatilization losses, crop utilization, and very slow release of part of the nitrogen tied up in the manure, then a factor of  $2\frac{1}{2}$  could be used for application rates of liquid animal wastes.

6. In the narrative "Biological Impact of Some Elements" the statements on the toxicity of chromium need clarification especially the availability of valence form of chromium. Although chromium toxicities can be produced in the laboratory, evidence that it has caused toxicity in the field is not conclusive.

#### Development of complete systems approach to waste management

In discussing Charge 2 that sought to enlist the assistance of geologists, hydrologists, and sanitary engineer in developing guidelines, the committee felt that it should concentrate its efforts on guidelines for soils only. We must also recognize however, that a complete systems approach for waste management is essential and this requires integrated efforts from other disciplines. Guidelines that interpret soils for waste disposal must take into consideration 3 bodies of knowledge: 1) the physical, chemical and biological properties of the waste, 2) the physical, chemical and biological properties of the soil to which the waste will be applied and 3) the interactions between waste and soil to understand the stabilization of the waste and the mechanisms of attenuation of potential pollutants as they move from the disposal site. Each potential pollutant must be assessed differently for their rate of attenuation and stabilization are vastly different. We must fully understand such mechanisms of attenuation as dilution by rainfall, dispersion in ground water (diffusion, density gradients), cation exchange, fixation (precipitation, chelation), volatilization, biological utilization and transformation and mechanical filtration. A complete systems ~~isolate~~

Soil:

**Physical** - permeability, texture, **textural discontinuities**, temperature

**Chemical** - **pH**, CRC, base saturation, free iron and **aluminum content**, organic matter

**Biological** - enzymatic activity of resident soil organisms, aerobic or anaerobic system.

Guidelines prepared for soil interpretations should include a statement that other factors require investigation. Some of these parameters deal with the environment, others do not. These fall into the realm of economics and politics.

If guidelines take on a quantitative aspect and recommendations are made on application rates of waste we can consider three different rates. 1) a safe sustained utilization rate using the waste as the soil **amendment** in crop production. **This rate** should not injure the crop or render it useless as a feed; 2) a safe maximum disposal rate applied annually that will not degrade the environment.; 3) a safe disposal rate applied one time only.

#### Development of reference lists

Development of reference lists is a herculean task. Good use should be made of **existing** reference lists and abstracting services. For current research the **CRIS** program can identify and compile if fed the proper key words. An abbreviated list known to committee members who **responded will** be found in the Appendix.

#### Research needs

1. Long-term studies are needed that will assist in determining the longevity of waste **management and disposal** systems.

2. Studies of **interactions** between waste and soil. We not only need to know what effect the soil has on the waste but what effect the waste has on the soil. The latter may be helpful in anticipating the longevity of waste disposal in soil.

3. Heavy metals in effluent and sludges merit considerable attention for they may present health hazards if used in crop production systems. It is important to better understand the capacity and mechanisms of storage, resolubility due to changes in **pH** or **redox** potential, and release during decomposition of organic matter.

#### **RECOMMENDATIONS:**

The committee recommends that it be continued as a working committee to prepare waste disposal **guidelines**. If the task can be completed for the 1975 Rational Work Planning Conference, the

guidelines will be transmitted separately to the appropriate national committee and be considered an **appendix** to this report.

**COMMITTEE MEMBERS:**

D. E. Hill, Chairman  
F. G. **Loughry**, Vice-Chairman  
R. J. **Bartlett**  
D. S. Fanning  
J. **Kubota**  
R. P. Matelski  
M. Meyer  
F. P. Miller  
D. Nelson

**G. W.** Olson  
J. C. Patterson  
**S. A. L. Pilgrim**  
O. W. Rice  
D. Snyder  
J. **W.** Warner  
R. M. Weaver  
M. E. Weeks  
W. R. Wright

DISCUSSION:

**K. Schmude:** An escape clause can be used to cover variances between **SCS** criteria and local ordinances.

**G. Olson:** We should be prepared to assist local agencies in preparation and revision of ordinances **so** that they **can** be **most useful** to the community -- in light of all data available on a national, regional, and local scale. In **many cases** present ordinances were developed on the basis of archaic information, which **may** need to be revised because of new data. Many regulators, for example, might classify areas **as** "completely unsuitable" when in fact those **areas** are good sites with proper investment and management. Restrictions on depths to water tables in the past have ignored seasonal fluctuations, which have been characterized in considerable detail in **some** soils in the past **few years**. Soil scientists need to continually **work** with planners, developers, and public health officials to inform them **of the** latest data on **soils**, so that local **communities** can benefit **from** data and criteria developed **outside** of their community.

**S. Holzhey:** We should stick to **soil** facts in published soil surveys. **Local** ordinances can be handled with interim and other special reports.

**D. Fanning:** Additional research is needed relative to building suitable soils at **landfill** sites. The natural occurrence of impervious floors to contain **leachate** and pervious **soil** covers to permit escape of gases is not **common**. Soils **must** be manipulated to get the desired effect. Are we over **stressing** the use of soil as a **medium** for waste disposal?

## APPENDIX A

The third charge to the committee was to develop a list of references pertaining to waste disposal in soils. The following list is by no means complete but offers some recent publications, especially those which contain excellent bibliographies covering earlier work.

### Septic Tank Effluents

- Bouma, J., et al. 1972. Soil adsorption of septic tank effluent. Univ. of Wisconsin-Extension. **Infor. Circ. 20. Madison, Wisc. 235p.**
- Clayton, J.W. 1973. An analysis of septic tank survival data in Fairfax County, Virginia 1952-1972. **Groundwater Jour.** May-June 1973 **29-32 National Water Well Assn.**
- Hill, D.E. 1973. Potential contamination of water bodies and water courses from septic tank drainfields. Special Report to Conn. Public Health Task Force. **Conn. Agr. Exp. Sta., New Haven, 6p. (Mimeo).**
- Huddleston, J.H. and Olson, G.W. 1967. Soil survey interpretations for subsurface sewage disposal. **Soil Sci. 104:401-409.**
- Miller, J.C. 1972. Nitrate contamination of the water table aquifer in Delaware. Univ. of Delaware **Rpt. of Investigations 20. Newark, Del. 36p.**
- Mokma, D.L. and Whiteside, E.P. 1972. Performance of septic tank disposal fields in representative Michigan soils. Res. Rpt. 157. **Mich. State Univ., East Lansing, Mich. 15p.**
- NTISearch. 1973. **Septic Tanks: a bibliography with abstracts.** NTIS-WIN 73-c&. Nat. Tech. Inf. Service. **Springfield, Va. 56p.**
- N.Y. State Dept. Health. 1972. The Long Island ground water pollution study; N.Y. State **Dept. Environmental Conservation.** Albany, N.Y. **388p.**
- Olson, G.W. 1964. Application of soil survey to problems of health, sanitation, and engineering. Cornell Univ. Memoir **387,** Ithaca, N.Y. 77p.
- Olson, G.W. 1973. Using soils for waste disposal. Cornell Agron. **Mimeo 73-18,** Ithaca, N.Y. **9p.**
- Preul, H.C. 1967. Underground movement of nitrogen. IN Adv. in Water Pollution Research. **1:309-328.** Water **Pollution Control Fed., Washington, D.C.**

Thomas, R.E. 1973. Spray-runoff to treat ran domestic waste-water. **Proc. International Conf. on Land for Waste Management.** Ottawa, Canada. (In press).

**Sewage Treatment Plant Effluent**

Hill, D.E. 1972. Waste water renovation in Connecticut soils. **Jour. Env. Qual. 1:163-167.**

Nat. Assoc. State Univ. and Land Grant Colleges. 1973. **Proceedings Joint Conf: Recycling municipal sludges and effluents on land.** Washington, D.C. 244p.

Parizek, R.R. et al. 1967. Waste water renovation and conservation. Penn. State Studies 23, University Park, Pa. 71p.

Pennsylvania Dept. Environmental Resources. 1972. **Spray Irrigation**

Lence, J.C. and F.D. Whisler. 1972. Nitrogen Balance in Soil Columns Intermittently Flooded with Secondary Sewage Effluent. J. Environ. Qual., Vol. 1, no. 2, pp. 180-186.

Mosier, A.R., K. Haider, and F.E. Clark. 1972. Mater Soluble Organic Substances Leachable from Feedlot Manure. J. Environ. Qual., Vol. 1, no. 3, pp. 320-323.

Tietzen, C. and S.A. Hart. 1969. Compost for Agricultural Land? J. Sanitary Eng., Proc. Paper 6506, p. 269-287.

#### Sanitary Landfills

Cartwright, K. and F.D. Sherman. 1969. Evaluating Sanitary Landfill Sites in Illinois. Environ. Geol. Notes. Illinois St. Geol. Sur. Mo.

Schoenberger, R.J., and A.A. Fungaroli. 1971. Incinerator - Residue .. Fill Site Investigation Journ. Soil Mech. and Found. Siv., Proc. ASCE, Vol. 97, No. SM10, Proc. Paper 8451, pp. 1431-43.

Steiner, R.L. A.A. Fungaroli, F.J., Schoenberger and P.W. Furdum. 1971. Criteria for Sanitary Landfill Development. Public Works, PP. 77-79.

#### Animal Manures

Anonymous. 1970. Agricultural and Processing Wastes in the Eastern Region: A perspective. Proc. Eastern Exp. Sta. Collaborators Conf., ARS, Washington, D.C. 90p.

Anonymous. 1971. Proceedings Annual Waste Management Conference. Univ. Maine, Orono, Me. 48p. (Mimeo).

Anonymous. 1972. Maine guidelines for manure and manure sludge disposal on land. Maine Agr. Exp. Site., Misc. Report 142. Orono, Me. 21p.

Frink, C.R. 1970. plant nutrients end animal waste disposal. Conn. Agr. Exp. Sta. Circ. 237, 10p.

Frink, C.R. 1970. Animal waste disposal. Compost Sci. 11:14-15.

Stephens, G.R. and Hill, D.E. 1970. Utilizing liquid poultry wastes in forests, Conn. Agr. Exp. Sta. Spec. Soils Bull. 31, 7p.

Stephens, G.R. and Hill, D.E. 1973. Using liquid poultry wastes in woodlands. Proc. Int. Conf. on Land for Waste Management, Ottawa, Canada, (In press).

**COMMITTEE 3**  
**GUIDELINES FOR OVERCOMING LIMITATIONS**  
**OF SOILS FOR DIFFERENT USES**

**Charges to the Committee:**

1. Determine the feasibility of developing Development Difficulty Indices for soils with severe (also moderate and slight) limitations.
2. Examine the feasibility of developing cost analysis for different management practices for overcoming limitations (and methods for so doing).
3. Develop a format for presenting recommendations for overcoming limitations.

**Committee Chairman: K. O. Schmude**

**Vice Chairman: P. P. Miller**

**Members:**

R. L. Cunningham	E. H. Sautter
S. Ekart	R. Shields
W. Kirkham	K. G. Stratton
M. Narkley	W. A. van Eck
R. L. Marshall	J. W. Warner
M. Meyer	B. C. Watson
G. W. Olson	W. R. Wright
J. C. Patterson	S. J. Zayack
R. Pennock	
O. W. Rice	

**Recommendations by the Committee:**

1. Guidelines for overcoming soil limitations for non-farm uses should be made a part of the format for soil survey reports. This should be communicated to the national task force now working on a proposal to revise the format of soil survey reports.
2. A county report in the Northeast should adopt a format which includes guidelines for overcoming soil limitations for non-farm uses.
3. The executive committee should determine whether this committee (Committee 3) should continue in view of the fact that there is some duplication between this committee and the committee on interpretations.

Members assigned to the committee were asked to respond to the three charges. To stimulate discussion, the committee chairman gave a brief account of his initial reactions to the charges. The response **was** reasonable in that 50 percent of the membership replied. **Following** is a summary of the response by charge.

Charge 1. Determine the feasibility of developing Development Difficulty Indices for soils with severe (also moderate and slight) limitations.

Generally planners and developers, etc., are not satisfied with the current rating **system** of slight, moderate and **severe** as an **index to** difficulty of **development**. If a "severe" limitation exists based on our criteria for rating **soils** (and it frequently does in the **Northeast Region**) developers would like to have some idea of the degree of **severity**. **Although** these limiting criteria are spelled out in **soil surveys**, it appears that a more quantitative approach is desired.

An **illustration** of a quantitative approach used in San Diego County, California, is **given** below for **rating** homesites.

#### FACTORS FOR HOMESITE LIMITATION:

San Diego County, California 1/

Soil Property		Weight
1. <b>Drainage -</b>	Slight	10
	Moderate	5
	Severe	0
2. <b>Erosion Hazard</b>	Moderate	10
	<b>Severe</b>	0
3. <b>Rockiness-</b>	Slight	20
	Moderate	10
	Severe	0
4. <b>Slope</b>	0-9%	25
	10-30%	13
	31.2-i.	-25
5. <b>Shrink-Swel.1</b>	Slight	35
	Moderate	18
	<b>Severe</b>	0
	Very Severe	-15

Soil Property	<b>Weight</b>
---------------	---------------

6. Alluvial Soils

Recent Alluvium	-30
Present	

100%

HOMESITE RATING RANGES

HOMESITE RATING	SLIGHT	MODERATE	<b>SEVERE</b>
Numeric Score	73 or greater	45 to 72	44 or less

1/ Source: Preliminary Draft; Soil Survey Volume II, Soil Interpretation Manual San Diego County, California (Chapter 2). Prepared by the San Diego County Planning Department with SCS

This information can be adapted to tables that give both the adjective and numeric form of limitations. It was suggested that a pilot attempt such as this be developed for a county publication in the Northeast.

Another approach was illustrated for a septic tank absorption field:

The degree of limitations are assigned a numerical value of 0, 1, 5 and 6. The soil properties have a numerical value weighted to reflect the severity of the soil property for its use for community development. A soil rated slight would have a numerical value sum of 0 (zero). A soil rated moderate would have a range from 2 to 9 and subdivided into two categories. A value of 2 to 5 would be rated moderately low. A value of 5 to 9 would be rated moderately high. A soil rated severe is subdivided into two categories, severe and very severe. A value of 10 to 20 is rated severe. A value of 20 or more is rated very severe.

It follows that a soil with only one moderately or severely rated soil property would have a smaller numerical value than a soil with two or more moderately or severely rated soil properties. The numerical value assigned to the degree of limitations are arbitrary. If numerical values are larger the sum of the products will have a greater spread. Each category could be subdivided further.

The following table illustrates items affecting use, factor weight and numerical values used to establish the ranges for slight, moderate and severe ratings.

## SEPTIC TANK ABSORPTION FIELD

Item Affecting Use	Factor Weight	Numerical Values			
		0 Slight	1 Moderate	5 Severe	6
Slope	2	0-8%	8-15X	15-25%	25+%
Depth to bedrock	2	> 72"	48-72"	< 48"	
Stoniness	2	0, 1	2	3	4, 5
Water table	3	> 72"	48-72"		< 48"
Permeability	3	7.2		0.2	
Rockiness	3	0	1	2	3, 4, 5
Flooding	4	None	Rare		occasional or frequent

**Slight** = sum of products = 0

**Moderate** (moderately low = 2 to 5  
(moderately high = 5 to 9

**Severe** (severe = 10 to 20  
(very severe = 20)

Some committee members saw little or no value in assigning difficulty of development indices, but recognized it might fit in with computer programming. It was pointed out that too many variables exist to arrive at a simple index for all the different uses and users of soil surveys. The index is really not very connotative and may usurp the professional ability and prerogative of developers and others to determine the degree of development difficulty based on their own level of expertise, equipment availability, and financing. Most developers, contractors, and the like prefer to determine the development difficulty themselves.

**Charge 2.** Examine the feasibility of developing cost analysis for different management practices for overcoming limitations (and methods for so doing).

Many felt that the developer, consultant, or planner should determine the cost analysis after he has selected the most feasible solution. Differences in local costs and expertise of contractors can complicate the cost analysis over a large geographic area.

Some illustrated that a fact sheet, by series, pointing out "major factors affecting use" was a feasible approach to helping people "see soil survey data,

Also pointed out was the fact that cost analysis was a very useful concept but that it should be done only on a local or an "on-site basis.

A report submitted based on a PhD thesis by Bruce Kloosterman, University of British Columbia. 1968, discussed "Using a Computer Soil Data File in the Development of Statistical Techniques for the Evaluation of Soil Suitability for Land Use". Conclusions seemed to be that rating soils according to treatments and costs seems feasible by statistical methods. However, the difficulty seems to be in the ability to identify an acceptable soil model, since the ideal soil is strongly user dependent.

Several references are available which have looked at costs of developing soils with severe limitations as compared to soils that are well suited to development. Following are some examples from Leeson's PhD thesis from Montana State University giving several land uses which have been compared with costs for developing soils with differing suitability potentials.

<u>Land Use</u>	<u>Cost Difference Between Good Soil and Severe Soil</u>
1. Typical Residential Street (1 mile) on unfavorable textured soil	\$36,137.00
2. Commercial Development - Septic tank drain field and campground road system on high water table soil	5,500.00
3. Commercial Development - basement waterproofing sump pump and sub-basement drainage system on high watertable soil	3,500.00
4. Private home septic tank drain field in area of steep slope cost to a creek	816.00
5. Semi-private development church - wet soil. and poor load bearing capacity	23,941.00
6. Private residence - septic tank drain field in high water table	1,780.00

<u>Land Use</u>	<u>Cost Difference Between Good Soil and Severe Soil</u>
7. Private residence reconstruction of drain field to comply with State Health stream setback <b>regulations</b>	451.00
8. Private residence septic system backup into home due to rising water table	97.00

Detailed accounts were given of the **situation and costs for each of the above cases. Other expense in addition to these costs were illustrated by amortizing at 8% for 20 years plus adding certain maintenance costs.**

**This illustrates feasibility of getting cost data but also suggests the approach of using local data and input.**

Charge 3. Develop a format for presenting recommendations for overcoming limitations.

This charge received the most clear-cut response of the three charges to the committee.

All comments were favorable toward **the need for suggesting solutions for overcoming soil-related problems. The suggested format for accomplishing this varied from using prepared tables, charts, and graphs to simply writing a letter of transmittal to the user. The main emphasis was on the idea that we need to get away from the erroneously held concept (to some) that soils with "severe" limitation rating indicate "unusable soils".**

It was also emphasized **that we probably need to approach this from the standpoint that the recommendations we develop will be applicable before construction with the assumption that the recommendations will be considered in the preliminary planning and design work.**

One commenter stated that if **soil scientists, working with SCS and consulting engineers and developers, could come up with some good suggested corrective measures to overcome soil limitations that this is all that would be needed in terms of the three charges to this committee.** In other words, if we could come up with some good design criteria for such things as basement walls, footers, retaining walls, septic tank systems, roads and the like for soils having various problems such as high water table, slow permeability, high shrink-swell, steep slopes, shallow bedrock, etc., **this would fulfill the need outlined in charge 3, and at the same time automatically provide what the developer needs to estimate the difficulty of development and cost analysis, thus satisfying the implications of charges 1 and 2.**

The thought of **translating soil** limitations such as slipping, high water table, shallow bedrock, steep slopes, high shrink-swell and **flooding** to examples of real problems such as cracking walls, wet basements, costly excavation, excessive erosion and unstable **foundations**, etc., appealed to most committee members responding to the chairman's correspondence to them. Then taking this one step **further** to include some general suggestions to help overcome these problems such as using retaining walls, footer drains, minimum disturbance, wider footers and the like also appealed to many.

Special studies, research and other work being done on soil-related problems for common uses such as waste disposal, building **foundations** and roads were most frequently discussed. Suggested **solutions** to soil-related problems are frequently illustrated. For example in a document prepared by Gerald Olson on "Using Soils in Kansas for Waste **Disposal**," several suggestions were given such as: builders of homes with **septic tanks** should select sites with slight limitations for effluent **disposal**. However, he also gave **alternatives**. For example: For soils with **slow percolation rates**, areas of tile lines in gravel can be expanded. For **sloping soils** **tile** lines can be run (on specified grade) along the contour of the **soil** surface. Some sites with **almost** impermeable **soils** can have sand filters (extremely expensive). Resting periods are beneficial; alternate dozing of two smaller seepage fields will **enable** better filtration than continual soaking of one larger field of the same size.

A report from New York illustrated a format prepared by field soil scientists, the area engineer and district conservationist. This format used a table format including the mapping **unit**, degree of limitation, limiting soil properties and possible remedial measures.

Another reviewer suggested a tabular format with headings including: **soil map unit**, items affecting use, rating of items affecting use, practices for overcoming problems, relative **cost** and cost range per **unit of measure**. Relative costs were expressed as low, moderate or high and **cost** range per unit of measure were in actual **dollars**

The emphasis being put on interpretations for disturbed soils also needs to be considered here. More work is being done in recent months on fitting disturbed soils into the classification system, hence their interpretation merits attention. One **commenter** stated that strip mine soils are prime examples but urban soils will need consideration **also**. For example, Metro **in** Washington and other major construction **projects** produce considerable amounts of earthy material, with each having **specific** characteristics as to their best use and placement. In this **light** the proposal of rebuilding or restacking soils in the best order has considerable merit. This will be treated in detail by another **committee** of this conference.

It **was** pointed out that there is increased public concern for **preserving** good agricultural cropland. Soils rated best for **cropland** are **generally** rated best for urban development. Accordingly, soil survey **interpretations** tend to direct the urban developer to the land also best **suited** to **cropland**. Providing guidelines to help the urban developer **overcome soil limitations**

CONFERENCE DISCUSSION NOTES FOR COMMITTEE 3

F. P. Miller, Recorder

1/9/74

Charge #1

1. Index of difficulty - o.k. for regional planning, not for on-site analysis.
2. Add categories in severe class which would indicate it to be completely unfeasible to develop.

Charge #2

3. Cost data should be used locally, for technical backup only. Providing cost figures implies competency in design.
4. Suggested that cost be omitted due to inflation, energy crisis, etc. However, cost can always be indexed.
5. One comment encouraged collection of cost data as local tool for gross estimating of cost.
6. Cost figures would be limited to technical guides - not to be published in soil survey report.
7. One comment praised Klingebiel's article on cost-return figures as to how soil survey was economically beneficial.
8. By providing alternatives to overcome limitations, one can then determine his own costs if he wishes, to choose this alternative. It was pointed out that this is considered in Charge #3.

Charge #3

9. SCS does not have a definite policy on how far we can go in providing guidelines for overcoming limitations. A policy is
-

**Charge #3 (Continued)**

11. Encourage incorporation of local interpretation alternatives in soil survey manuscripts.
12. Executive committee will determine whether this committee (Committee J) should continue in view of the fact that there is some overlap with this committee and the committee on interpretations.

NATIONAL COOPERATIVE SOIL SURVEY

NORTHEAST SOIL SURVEY WORK PLANNING CONFERENCE

January 7-11, 1974

REPORT OF COMMITTEE 4 ON SOIL SURVEY INTERPRETATIONS

The charges of this committee were:

1. Review the newly revised section on potential frost heaving in the "Guide for Interpreting Engineering Uses of Soils", and make recommendations for improvement.
2. Determine kind of information that users of soil surveys wish to have and are not currently receiving and suggest policies for dealing with these needs.
3. Review and comment upon the proposal for a soil survey interpretation handbook (Advisory SOILS -9).

Charge 1

A review was made of the guide for rating soils for potential frost action. Four questions emerged from this review as follows:

(1) Is the design freezing index map shown in the guide adequate for use in the northeast?

(2) Is the guide adequate for rating soils for frost action in the northeast or does it need revision?

(3) Should potential frost action be used when rating soils as a source of roadfill since the criteria is based on the moisture regime of the natural soil?

(4) The guide for rating soils for potential frost action is based on the average texture of the whole soil to the depth of frost penetration. Should the average of the whole soil be used for soils that have contrasting textures within the depth of frost penetration?

Discussion on Item (1):

A map showing the distribution of design freezing index values in ~~con-~~**terminous** United States is in the Guide for Interpreting Engineering Uses of Soils. The 250 degree-days line is used as the cutoff for rating soils for potential frost action in the current guide.

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Charge 1 - Discussion on Item (1)- (Contd.)

This map was found to be a reliable cutoff line in the northeast for all areas except Long Island. Frost related

Charge 1 - Discussion on Item (4).

Recommendation 4

Use the particle size class that has the greater hazard for potential frost action when rating soils that have contrasting textures in the area of frost penetration.

Charge 2

Members of the committee were asked for kinds of information that users of soil surveys wish to have and are not currently receiving. The following list was provided by the committee:

(1) Rating of soils in regard to pollution hazard to water supply, streams, ponds, or marshes when used for septic tank adsorption fields.

(2) Rating of soils when used for disposal of animal waste, septic tank pumping, and sewage sludge.

(3) Rating of soils for sewage effluent flow under varying antecedent moisture conditions.

(4) Rating of soils when spray irrigated with sewage effluent and other wastes.

(5) Lifetime loading ability of soils for heavy metal wastes.

(6) Better guidelines for rating erodibility of soils and subsoils, including fragipans.

(7) Rating of soils in relation to land slippage.

(8) Minimum criteria for classification as a fragipan.

(9) Significance of soil mottles and soil color as evidence of wetness in soil interpretations.

(10) Better interpretation of percolation rates. Sanitarians are reluctant to use permeability rates because they cannot always relate them to percolation rates.

(11) Range in depth of water table during months of the year.

(12) Rating of soils as an index of land value for food or fiber productivity.

(13) Range in depth of expected frost penetration of soils.

(14) Rating of stoniness classes in relation to suburban development.

New interpretations require policies and procedures to correlate within a state and across state lines.

## Charge 2 - (Contd.)

### Recommendation 5

The procedure for developing guidelines for new interpretation start at the state level. These guides would be approved at the regional level for interstate use. If used nationally, the guides would receive Washington approval. National use would be issued in appropriate memoranda and become a part of the soil survey interpretation handbook.

### Charge 3

All members of the committee agreed that a soil survey interpretation handbook is a step forward in efficient and consistent use of soil survey data.

Suggestions for improvement of the current guides were:

1. A statement added to part 5 or 6 concerning precautions on use of soil interpretations.
2. The metric system be added in the handbook.
3. Sanitary facilities section expanded to include:
  - (1) Spray irrigation of sewage effluent.
  - (2) Disposal of sewage treatment plant sludge, septic tank pumpings, and industrial sludge.
  - (3) Mine waste disposal and fly-ash disposal sites.
  - (4) Hazardous wastes.
  - (5) Animal manures.
4. An additional section added for alternate uses for overcoming soil limitations.
5. Suggestions for displays to illustrate different kinds of soil interpretations.

### Other suggestions:

Although the committee spent most of its time on the 3 charges given to the committee, another item was discussed. This item was the criteria in the current guide for rating soil limitation when used for septic tank adsorption fields. The criteria in question is the limits to depth of water table without regard to the moisture regime of the soil. The committee agreed that soil limitations might differ depending on the soil being in an udic or aquic moisture regime. As an example, the guide could reflect water table conditions as follows:

Other suggestion - (Contd.)

<u>Depth to Water Table</u>	- <u>Slight</u>	<u>Moderate</u>	<u>Severe</u>
Udic moisture regime	- > 36"	18 - 36"	< 18"
Aquic moisture regime	- None	None	All

#### Recommendation 6

An ad hoc committee be appointed by John Rourke to study this approach and if it is useful, prepare a guide for trial use in the northeast.

#### COMMITTEE MEMBERS

R. L. Marshall, Chairman  
R. V. Kourke, Vice Chairman

F. W. Cleveland  
R.L. Cunningham  
S. Ekart  
R. Farrington  
W. Kirkham  
F. G. Loughry  
N. K. Peterson

C. A. Reynolds  
E. J. Rubin  
E. H. Sautter  
K. D. Schmude  
R. Shields  
Roy Smith  
W. A. van Eck  
F. Veiera  
J. W. Warner, Jr.  
S. J. Zayach

NATIONAL COOPERATIVE SOIL SURVEY  
NESSWPC - NYC - January 7-11, 1974

**COMMITTEE 5 - SOIL MOISTURE REGIMES**

- Charges:**
1. Coordinate soil survey connected water table and soil moisture studies in the region including the development, if possible, of standard methods of measuring water tables and soil moisture status. Could the Soil Survey Lab at Beltsville develop such methods and assist field soil scientists in installing wells, etc., or wouldn't this be practical or worthwhile?
  2. Summarize water table studies underway or completed in the Northeast.
  3. Evaluate the usefulness and possible implementation of the soil water table classification scheme developed by the soil moisture committee of the 1968 NE Conference and consider the alternative of developing water table classification schemes for individual survey areas.
  4. Update the Northeast Soil Survey group on how water tables and soil water flux through soils (percolation, permeability) will be handled in the revised Soil Survey Manual.

**Committee Members:**

G. J. Latshaw, Chairman	D. E. Hill
R. D. Yeck, Vice-Chairman	M. Markley
D. S. Fanning	M. Meyer
R. Farrington	G. W. Petersen
J. A. Ferwerda	O. W. Rice
J. E. Foss	R. M. Weaver
R. L. Googins	

**Recommendations of the Committee:**

1. The Northeast Soil Survey Investigations Unit evaluates the feasibility of the use of the neutron probe in moisture regime studies.

2. Emphasis will be placed on monitoring water movement in a sequence of soils on a landscape.
3. Water table classifications should be based on depth and duration of water tables on a yearly basis. Water table data will be displayed graphically rather than placing in water table classes as suggested by the 1968 NE Conference Committee.
4. The state experimental stations coordinate a program to obtain more data on water tables and the movement of water in soils.
5. A NE regional project be initiated to obtain water table data for selected soils.

Committee Report:

CHARGE 1

The committee feels that water table studies are of continuing importance and that more water table data are needed. Where perched water tables may occur, piezometer tubes should be used in preference to perforated casings. No single method of measurement was preferred. Previous work has shown that cased holes should be greater than one inch in diameter to avoid clogging. Careful recording of morphological data at each site is a must in order to compare water table data to inferred drainage.

It was suggested that the Northeast Soil Survey Investigations Unit at Beltsville, Maryland, evaluate the feasibility of the use of the neutron probe in moisture regime studies. Neutron probe studies would monitor water tables in addition to assessing the nonsaturated moisture regime. Neutron probe studies could provide data on lateral flow, fate of water, and fate of water soluble materials. Such data are necessary for environmental interpretations. Emphasis will be placed on monitoring water movement in a sequence of soils on a landscape.

Conference discussion:

D. Fanning - Is the lab willing to develop methods?

S. Holzhey - Will assist, but will need help.

D. Arnold - Neutron probes are feasible.

R. Yeck - Special problems have occurred with installation and sealing around pipes.

R. Rourke - It is important to have a standard method.

J. Witty - The water table studies should be started early in the survey so several years of recordings can be made. SCS <sup>should</sup> participate with the experimental stations on <sup>the</sup> 1974

J. Foss - There has not been financial support in the past.

*See Charge 2*

F. Cleveland - Water table studies should

*Long Beltsville?*

## CHARGE 2

### Summary of Water Table Studies

FANNING, D. S., HALL, R. L., and FOSS, J.

Soil morphology, water tables, and soils of the Sassafras drainage cat Pseudogley and Gley, Transactions of Science, Weinheim/Bergstr., West Ge

FANNING, D. S. and REYBOLD, W. V., III  
1968. Water table fluctuations in Plain soils. *Mt. Agri. Exp. Sta.*

FOSS, J. E., MILLER, F. P., and MUNFORD  
1970. Ground water table investigation Plain soils. *Crops and Soils Research, New York*  
Progress report 4: 208-212.

FRITTDN, D. D., OLSON, GERALD W  
March 1972. Depth to the Apparent Water Table in 17 New York Soils from 1963 to 1970; *New York's Food and Life Sciences Bulletin No. 13*, Cornell U. Agr. Ext. Sta., Ithaca, New York, 40 pp., illus.

GILE, L. H., Jr.  
1958. Fragipan and water table relationships of some brown podzolic and low humic gley soils. *Soil Sci. Soc. Amer. Proc.* 22: 560-565.

LYFDRD, W. H.  
1964. Water table fluctuations in periodically wet soils of Central New England; *Harvard Forest Paper No. 8*, Harvard University, Petersham, Mass., 15 p., illus.

LATSHAW, G. J., and THOMPSON, ROBERT F.  
1971. Water table study for selected soils in Montgomery County, Pennsylvania. *USDA, Soil Conservation Service*, 14 p., illus.

LATSHAW G. J., and THOMPSON, ROBERT F.

Water table study verifies soil interpretations, *Journal of Soil and Water Conservation*, Volume 23, No. 2, March-April, 1968, p. 65-67, illus.

MILLER, F. P. and FOSS, J. E.

1969. Ground water table investigations at the Wye Institute. *Crops and Soils Research, Md. Agr. Exp. Sta., Progress Report 2: 243-246.*

PALKOVICS, WILLIAM E.

1973. The Pennsylvania State University, University Park, Pennsylvania, Comparisons, mottling and quantifications of stream flow and perched water table relationship above a fragipan, PhD. Thesis 131 pp., illus.

WRIGHT, W R.

1972. PhD. Thesis, Pedogenic and Geomorphic Relationships of Associated Paleodults in Southern Maryland, 151 pp.

#### Data Not Published

New Jersey - Cooperative study between Exp. Sta. and SCS in 1959, 1960, and 1961. One-Inch pipes were used for water table study and problems were encountered in plugging.

Records were made on some wells for several years.

#### Current Studies

LIEBHARDT, C.

Making some observations on water tables in a study on N losses with heavy manuring. Soils are Evesboro and Plummer.

LYFORD, W H., Harvard Forest, Petersham Mass.

Water table study on two small drainage basins. (Four years of data.)

#### MARYLAND

Measuring water tables on silty Coastal Plain soils in Queen Annes County, Maryland.

Measuring water tables in Wicomico County, Lower Eastern Shore of Maryland.

#### USDA-FS

Work on measurement of water tables in Pennsylvania and West Virginia by graduate student at the University of Georgia.

VIRGINIA - VPI - Data is being processed from the completed study in Loudoun and Prince William Counties. The study measured water table fluctuations over a two to three year period in some 20 soil series. Pedons at each measuring site were characterized. The data should be published this spring.

Conference discussion:

S. Holzhey - Need to look at data available from U. S. Geological Survey.

D. Fanning - Some state geological survey groups have water table data.

CHARGE 3:

The soil survey water table classification proposed by the 1968 committee relates depth of winter water tables (December 1 - April 30) to annual fluctuation below the bottom of the apparent winter water table depth classes. The committee members responding to this proposal were generally opposed to this system

Committee members mentioned the following weaknesses or limitations to the proposed water table classification system

1. Winter water tables are not valid for all climatic zones.
2. The soil is frozen in the winter in some climatic zones and most of the water is in the form of snow. Therefore, the water tables may be higher in fall and spring months.
3. In colder climates this period is essentially biological zero; therefore, question the validity of using this as a base period.
4. Does not provide information on the amount of time the water table is within the rooting zone of plants for the growing season.

The committee was opposed to developing water table level classifications for individual soil surveys. This system would result in many different systems which would be difficult to coordinate interpretations for given soil series or phases across survey areas and state boundaries. It is doubtful if adequate data would be available in most soil surveys to develop individual water table classifications.

Water table classifications should be based on depth and duration of water tables on a yearly basis. Water table data will be displayed graphically rather than placing in water table classes as suggested by the 1968 NE Conference Committee. This graphical

display will provide data to assist in preparing soil interpretations or placing soils in the moisture regimes of Soil Taxonomy or the moisture states as outlined in the revised Soil Survey Manual.

The drainage classes should continue to be used in the northeastern states as shown in the Appendix of the revised Soil Survey Manual. The committee realized the moisture states, as shown in the drafts of the revised chapters, may replace the drainage classes.

The committee proposes that the state experimental stations coordinate a program to obtain more research data on the soil water tables and that a northeast regional project be initiated to obtain water table data for selected soils.

Conference discussion:

(Water Table Classification)

D. Fanning - Water table classification may be simplified and classification could be made from only a couple observations per year, one in the winter and one in the summer.

S. Holzhey - What is the objection of having a water table classification?

G. Latshaw - Moisture regimes (Soil Taxonomy) and moisture states of the revised manual should be adequate for classes. Not sure an additional water table classification at this time is needed.

D. Fanning - Taxonomy is based on morphology where the water table scheme would place soil on actual wetness.

J. Witty - Agreed the water table classes could be useful and stated that the national conference suggested the scheme should be tested.

J. Foss - Data is needed for classifying and there is not enough - available at the present time.

O. Rice - Can we classify by preparing curves? (Graphic display of water table data.)

G. Latshaw - The curves can be used directly in making soil interpretations or relating water tables to moisture states or moisture regimes rather than using a class system

J. Witty - Water table data is more real than inferences from soil morphology.

D. Fanning - Can classify with fewer observations than with curve.

J. Foss - Need data to support any drainage concepts.

D. Fanning - So far, data shows good correlation of water tables to soil morphology, but a few do not. Soil wetness needs to be stated along with morphological characteristics.

G. Latshaw - Water states, as outlined in draft of the revised manual, may serve this need.

S. Holzhey - Get the same information in the end regardless of whether, or not, we classify the water tables. We are not at a stage to classify water tables for all purposes.

G. Latshaw - S. Holzhey's comment summarizes the committee's thoughts.

(Northeast Soil Survey Regional Project)

D. Googins - How do we set up a northeast project?

D. Arnold - Goes through Northeast Soil Research Committee. Little has been done in soil survey but this may have a good chance. May approve with or without funds.

J. Witty - Do we need someone to take the initiative?

D. Arnold - We should support the proposal and follow up with a written proposal. There are eight program areas in research committees.

B. Rourke - They have to have money.

J. Foss - With pollution and waste disposal, this should have a lot of application.

S. Holzhey - We note, as a federal agency, what the research needs are. I reported to the research committee meeting this morning about the need for water table data.

D. Smith - If it has broad appeal, it may be accepted.

J. Kobata - Afraid the proposal will not be submitted.

D. Fanning - If we want to make a proposal, we have to appoint someone to do it. Maybe, wait for S. Holzhey's research committee.

S. Holzhey - Should wait until after the conference so several proposals can fit together.

**CHARGE 4:**

The committee members reviewed Chapter 4 (III Draft), Chapter 11 (II Draft), and Appendix 8 (III Draft) of the Soil Survey Manual.

Chapter 4, Describing Polypedons - The term perviousness is used in place of what was called permeability in the 1951 manual. Perviousness is considered to be a qualitative judgement of the water transmitting potential made in soil surveys. Slowly pervious, moderately pervious, and rapidly pervious are the suggested classes.

Definitions of soil water states include the definitions of moist, dry, and wet essentially as used in Soil Taxonomy, plus other moisture states such as air dry and over dry.

Also defined are sequences of soil water states which correspond to a considerable degree to the peraquic, aquic, perudic, udic, ustic, and aridic moisture regimes of Soil Taxonomy. However, more popular terminology (e. G. continuously wet instead of peraquic) is used. There are eight classes and some classes are subdivided. The classes are continuously wet, usually wet, commonly wet, continuously moist, usually moist, commonly moist, dry moist, and usually dry. Drainage class definitions ( e. g. well drained) will be included in the Appendix.

Also included is a discussion of available water, including water retention difference. Terms that are defined that refer to water tables include apparent water table, perched water table, artesian water table, and ground water. These are defined as they have appeared in soil survey work planning conference reports.

Soil water movement terms such as runoff, run on, infiltration, hydraulic conductivity, and saturated and unsaturated hydraulic conductivity are defined and discussed.

Classes of runoff, as in the 1951 manual, are not used. Percolation rate is defined as the rate at which water moves from an uncased borehole into the surrounding soil under constant head in both vertical and horizontal directions.

Chapter 8, Investigations in Support of Soil Surveys - Contains a detailed discussion on hydraulic conductivity and methods of measuring the amount of water in the soil.

Chapter 11, Interpretations of Soil Surveys discusses: Susceptibility to flooding in terms of frequency, duration, and time of the year.

<u>Frequency</u>	<u>Duration</u>
None	Very brief
Rare	Brief
Common	Long
Occasional	
Frequent	

Soil water tables in relationship to soil interpretations.

Hydrologic soil groups are defined (A, B, C, D) and a discussion on their use in predicting runoff.

Appendix 8 - The soil drainage classes of the 1951 manual will be given in an Appendix 8 of the new manual. It is thought that these will be useful mainly in humid regions. The classes are basically unchanged although terminology was changed to reflect Soil Taxonomy rather than the 1938 yearbook system

Conference discussion:

D. Fanning - Perviousness same as permeability but with no numbers.

D. Googins - What happens to permeability on form SCS-Soils-5?

G. Latshaw - I assume the form will be revised to reflect the change.

S. Holzhey - Will perviousness be qualitative and percolation rate be quantitative?

G. Latshaw - Yes

B. Rourke - Is flooding separated from ponding?

G. Latshaw - Yes, surface ponding is excluded from the flooding definition

J. Foss - Why all the drainage classes in the appendix?

G. Latshaw - Other regions do not want to use them

J. Foss - What percent of the states will be using them?

O. Rice - Eventually they will not be used.

D. Fanning - The soil moisture states will probably supersede them

K. Schmide - This will provide cross reference to the two systems.

J. Witty - After we get accustomed to it, moisture states will be more useful.

G. Latshaw - Will read the definition of commonly moist from the definition of moist states in the draft chapter to give you a better understanding of the classes.

B. Kick - Must know when the soil is wet and dry to apply.

NATIONAL COOPERATIVE SOIL SURVEY  
NORTHEAST SOIL SURVEY WORK PLANNING CONFERENCE

January 7-11, 1974

REPORT OF COMMITTEE ON HIGHLY DISTURBED SOILS

Committee 6

Chairman: R. M. Smith  
Vice-Chairman: J. E. Witty  
R. W. Arnold            J. C. Patterson  
E. J. Ciolkosz        L. H. Rivera  
D. S. Fanning         E. J. Rubins  
D. G. Grice            K. O. Schmude  
C. S. Holzhey         R. Shields  
G. L. Latshaw         K. G. Stratton  
                         S. J. Zayack

The charges to this committee were as follows:

1. Determine the morphology (collect soil descriptions) and suggest soil classification schemes on materials highly disturbed by man (strip mine soils, urban soils, soils at sanitary land fills, etc.).
2. Attempt to estimate the area of these kinds of soils in the Northeast.
3. Suggest criteria for building soils in areas to be disturbed.
4. Collect ordinances and legislation dealing with disturbed land.
5. Determine research needed on these kinds of soils and communicate these needs to the NCSMPC committee on research needs.

Response to Charges:

Charge 1. Five soil profile descriptions and data for urban soils in fill materials, prepared for the Initial Soil Survey Field Review of the Washington metropolitan area, were provided. (Cooperatively by the University of Maryland, the Soil Conservation Service, and the National Park Service).

Each pedon was classified tentatively within the Comprehensive System, Soil Taxonomy.

Three pedon descriptions and laboratory data were provided by the Pennsylvania State University and the Soil Conservation Service, for minesoils studied in Clearfield County, Pennsylvania.

A scheme from West Virginia University entitled "Proposed Classification, Mapping, Use and Management of Minesoils" was provided by John C. Sencindiver, Graduate Student in Soils. This scheme includes suggestions for definition of a new Suborder of Spolents and several Subgroups under the Great Group, Udapolents, the Subgroups being defined in terms of character of the coarse fragments which constitute a significant part of these young soils. The emphasis on coarse fragments at a high level of classification is believed justified by the fact that minesoils are created from more or less fractured and disintegrated rocks which automatically assume a major role in determining genetic processes as well as use potentials and management requirements of these soils.

Since such properties as profile color, texture throughout the proposed control section, and plant nutrient levels tend to vary more than in most soil series, it is proposed that soils be named at the family level with location-related names, the same as series, regardless of whether a series of that name is fully defined and used. For example, the Canyon family has been defined in Monongalia County, West Virginia as a useful basis for a mapping unit that can aid management and land use planning as well as scientific study of properties and processes.

The West Virginia scheme is attached as Appendix A.

In order to exclude minesoils from certain high level classification categories and to assure their placement under the more meaningful proposed Suborder of Spolents, it appears necessary to make some minor changes in the definitions of several Suborders of Entisols and perhaps in the minimum requirements for a cambic horizon, as follows:

1. Arenets should require at least 20% by volume of fragments of diagnostic horizons in the soil below any A horizon.
2. Aquents should include an insert that the period of saturation during the year should be 30 days or longer (or some other extended minimum period of wetness).
3. Fluvents should include stratification within one meter of the surface as an essential part of the definition. Also, irregular carbon content with depth should be associated with observable stratification, at least in some part of the profile.

4. Orthents should include an insert that they have less than 20% (volume) of fragments of diagnostic horizons, etc. as written in item 2 of the definition. In addition, the definition should include a statement as follows: "do not include more than 2 of the 6 properties listed for definition of Spolents in addition to the 4 items used to define Orthents."
5. Cambic horizons should require some property in addition to weak structure. As suggested by Dr. John E. Witty, in his response to Subcommittee 3 of Committee 7, a satisfactory criterion might be, "peds distinct enough that crushing them results in a perceptible change of color". In this connection, it should be emphasized that the crushing should exclude all rock fragments, some of which may be weak enough to crush readily with the fingers.

Charge 2. The best estimate for Pennsylvania is believed to be a 1965 total of 498,524 acres. A lower "made land" estimate in 1967 apparently excludes highly disturbed soils that are well-vegetated. Presumably, land disturbance since 1965 would increase the Pennsylvania total to an acreage well over 500,000.

The West Virginia total of highly disturbed soils has been estimated as 300,000 acres. An official estimate of land disturbed by mining, by Benjamin C. Given, Chief, Reclamation Division, West Virginia Department of Natural Resources is 279,900 acres, through 1973.

No firm estimates are available for other states in the Northeastern Region, but it is known that significant acreages occur in each State and that the acreages are increasing. Disturbed soils, including landfills are of increasing interest and importance in Washington, D. C. and other metropolitan areas.

The economic value of highly disturbed soils is difficult to estimate. In some parts of Washington, D. C., such as the National Park Service lands across from the Capitol, no-one would estimate what the valuation would be, except that it is extremely high.

In Pennsylvania it was agreed that minesoils being created and reclaimed under 1970 legislation are more valuable for agriculture or forestry than older minesoils that received less attention.

In West Virginia, minesoils being created under 1971 legislation are believed to be generally superior for forage or tree growth,

especially when preplanned following appropriate study of the properties of the overburden. However, some areas of mine-soils in West Virginia are valued more because of their gentle slopes (on benches) and consequent suitability for specialized uses than for their forage or timber productivity.

Detailed estimates of acreages of highly disturbed soils throughout the Appalachian Region are being developed by Mr. George C. Evans, U. S. Bureau of Mines, 4800 Forbes Avenue, Pittsburgh, Pennsylvania 15213. His estimates provide data for Pennsylvania on a county basis. He has assured that the estimates for Pennsylvania and other Northeastern States will be published soon.

Charge 3. Criteria for Building Soils in Areas to be Disturbed.  
Prepared for Committee 6 by Andrew A. Sobek, West Virginia University.

Surface mining of coal and other rock or mineral resources exposes earth materials that can be selectively placed and manipulate to produce new soils of possibly higher quality than the original natural soils of the area. Both chemical and physical properties of the new soils often can be realized that will be most appropriate for any anticipated future land use. Until recently, the concern of most soils scientists has been the use and management of soils on disturbed land areas after random placement of excavated earth materials by mining. Now, we have an opportunity to study the overburden intensively before mining begins, and to select the most desirable materials as the genetic material for new soils.

#### Previous Investigations

In Germany, pre-planning of mining operations began in the early 1950's (Knabe, 1964), and the land reclamation was made synonymous with mining. Knabe suggested 4 stages of reclamation: "(1) Pre-planning future land use. (2) Soil management and restoration of the surface. (3) Afforestation or agricultural cultivation. (4) Permanent use for agriculture, forestry or recreation." The chief reasons for success or failure of the reclamation was considered dependent upon the properties of the geologic materials, mining methods, amelioration methods and the intensity of future land management. To succeed with their reclamation plans, all the overburden materials were analyzed before mining. The analyses (Koller and Knabe, 1962) evaluated overburden materials for agricultural crops, forestry, and toxicity. With the types of overburden materials found in Germany, the reclamation practices were successful.

The future soils of the surface mining area in Western Germany will be derived either from loess (agricultural cropland) or a combination of loess with alluvial gravel and sand (forest lands). There are probably other types of parent materials used for new soils, but these will be the main types since the brown coal deposits are found in sediments of the Tertiary Period and the overburden materials are unconsolidated sediments of the Tertiary and the Quaternary Periods. (Heide (Heide, 1969) found that four new soils reclaimed for agricultural crops were leading in their development toward the Parabraunerde soils. Working with a localized area in Germany, it would be possible to cover all the unfavorable material with a layer of loess or loess-gravel mixture but in the Appalachian Region sedimentary rocks of variable consolidation are involved.

#### Recent Investigations

In West Virginia the coal is found in sediments of the Pennsylvanian Period. The rock types commonly found are sandstones, limestones and shales, with carbonates present in some of the shales, and pyrites in all major rock types. When these materials are mined and regraded without separation of the potentially toxic materials a situation exists which increases the cost of reclamation, but reclamation is possible (Byer and Smith, 1948). Olak (Olak, 1967) found that, under the most acid conditions, proper liming and fertilization could insure successful revegetation. If the only objective of reclamation is to revegetate the disturbed areas, then the problem can be solved since agronomy, forestry, and mining literature contains numerous articles of successful methods of revegetation. This, however, is strictly an "after the fact" soil management problem and the economics can be costly not only in terms of money but also in terms of low productivity of the new soil. Land for agriculture, recreation, commercial development and housing is becoming scarce; therefore, when areas are to be disturbed, preplanning the resulting new soil is increasingly important.

#### Evaluation of Overburden Materials

Samples of the overburden materials should be obtained from exploratory cores taken before the area is mined. Each sample should be analyzed for available plant nutrients, pH, neutralization potential (bases), physical weathering potential, mineralogy, texture, water retention of weathered material, and porosity of weathered coarse fragments (West Virginia, 1973). Methods appropriate for freshly exposed unweathered rock strata have been adapted from standard soil procedures.

Analyses can provide an acid-base account for each stratum to determine which materials are potentially toxic from mineral

acidity. The available nutrients, pH, and lime requirement data will aid correction of any nutrient deficiencies with fertilizers. The physical weathering rate of the rock fragments is most important, but is difficult to predict. Texture and coarse fragment proportions are important in making a soil with good water relations. In addition, compaction during the grading and leveling of the excavated material may drastically change the physical properties of certain rock types if placed on or near the land surface.

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- Charge 4. Ordinances, and interpretation developed by the enforcement agencies were obtained for Pennsylvania and West Virginia. The most recent ordinances for these States are 1970 for Pennsylvania and 1971 for West Virginia. In both cases these ordinances replace earlier legislation. Although differing in detail, both Pennsylvania and West Virginia require burial

of toxic materials, forbid offsite dumpages (as defined) and specify satisfactory reclamation in terms of shaping of the spoil (or minesoil) and establishment of vegetative cover.

Legislation of Ohio and Kentucky as well as pending National legislation was cited and discussed. So far as is known, only the Ohio legislation requires specifically that overburden be sampled and studied prior to mining, although such study may be implied by requirements that toxic materials must be buried and regraded surfaces reclaimed. If regulatory officials in U. Va. consider that materials involved will be difficult to reclaim they can require a higher bond from the applicant or can deny the required permit altogether.

George S. Research needs were discussed with members and Chairman Steve Golzhey of the Research Needs Committee.

It was discussed that objects of minesoil classification were to provide classes appropriate for characterization, identification of major genetic processes, and needs for treatment and management under anticipated land use.

Research on urban soils has been initiated in Maryland and Washington, D. C., and on minesoils in Pennsylvania and West Virginia. At these 3 locations, as well as in several other States, research on selected categories of made soils is believed to be a high priority need. Virginia indicated that some 100 year old minesoils have been observed which probably would be useful for studying minesoil properties and probable rates of change.

In Western Pennsylvania a number of soil profile descriptions and laboratory characterizations representing overburdens of major coals along a transect are planned.

In West Virginia, properties being suggested for classification of highly disturbed soils at the family and higher levels are being tested and refined by field and laboratory measurements. Also, overburdens and associated minesoil profiles are being studied to establish improved criteria not only for preventing acid and pollution but also for building soil physical and chemical properties according to plan.

Some specific research needs suggested were as follows:

1. In landfills, how do we predict subsidence; how do we compromise between need for rapid diffusivity at the top and

low leaching of pollutants at the bottom; what is adequate burial of organics?

2. With mine soils, sulfides, physical stability, and basic fertility questions need to be enlightened.
3. With mine soils, how deep must pyrites be covered to prevent sulfuric acid formation?
4. Dynamics of the soil moisture regime relative to undisturbed soils.
5. When or where should the rebuilt soil be better than the original? And how can superior soils for each anticipated use be planned and created?

APPENDIX A

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## APPENDIX A

### Proposed Classification, Mapping, Use and Management of Minesoils

Prior to the development of the new comprehensive soil classification system by the National Cooperative Soil Survey, Mine-spoil was not considered to be soil. It was **identified** in mapping legends as a miscellaneous land type and was delineated and named as "Strip **Mine.**" Mine Spoil was not examined and studied in the detail required to enable one to make meaningful statements in regards to its use and management.

In the new soil classification system, Soil Taxonomy, Soil Conservation Service, U.S.D.A., soil is defined as "the collection of natural bodies on the earth's surface, in places modified or even made by man of earthy materials containing living matter and supporting or capable of supporting plants **out-of-doors.**" In this system, soils are classified on the basis of characteristics which can be observed or **measured** in the field and in the laboratory. The system is hierarchical and from the highest category to the **lowest** is comprised of: Orders, Suborders, Great Groups, Subgroups, Families, and Series.

The comprehensive system is broad and **flexible** enough to permit the definition of categories as necessary to **accomodate** diverse mine-soils and to further their **scientific** study as well as their effective use and management. We suggested previously (West Virginia University, 1971) that spoils and coal wastes from mining can be **studied** and classified on the basis of soil profile properties, the same as other soils and can then be **incorporated** into the comprehensive **system** of soil **classification**. This does not mean that categories have already been formally **defined** that are adequate to include all mine-soils.

In our proposal, minesoils would be classified at the Order level as Entisols. Entisols are recent soils that have little or no evidence of development of pedogenic horizons.

Presently, there are five Suborders in the Order of Entisols. These are as follows:

- (a) Aquents - soils which, if they are not **artificially** drained are wet most of the year;

- (b) **Arents** - soils which **have fragments** of diagnostic horizons;
- (c) **Psanments** - soils which are sandy;
- (d) **Fluvents** - soils which have formed in recent water deposited sediments; and
- (e) **Orthents** - soils which occur **on** recent erosional surfaces.

We **are** of the opinion that none of **these** suborders would adequately accommodate ~~these~~ \_\_\_\_\_

4. **Coarse** fragments bridging across voids as a result of placement of materials, leaving discontinuous irregular pores larger than texture porosity. Such voids are present consistently but vary in frequency, prominence, and size.
5. A thin surface horizon or horizon immediately below a surface

6.

Great Group - Udspotents - Spotents in the udic or humid moisture regime.

Subgroups -

1.

2.

3.

4.

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5. Typic Udspolents - Udspolents that are not dominated by any one rock type within the control section, and does not qualify for any other subgroup.
6. **Several** subgroups in addition to the ones listed may be needed. For minesoils with less than 10% coarse fragments, it would seem that a subgroup **Matric** Udspolents might be appropriate. For minesoils that have a high percentage of limestone or other **calcareous materials**, **Kalkig** Udspolents might be suggested. **Lithic** could be used as an additional modifier for any other subgroup in which the depth to bedrock is less than 20 inches (50 cm). No mappable expanse of these suggested subgroups has been found in West Virginia to date, but it is likely that such will be found in other regions.

Family -

1. Particle Size - The particle size of W. Va. minesoils is dominantly loamy-skeletal with a few sandy-skeletal and clayey-skeletal. However, non-skeletal minesoils are known to occur.
2. Mineralogy - The mineralogy of minesoils is assumed to be siliceous for the Platic and Regolithic Platic Udspolents and mixed for the other subgroups until proven otherwise. New mineraology classes are likely to be needed for the Carbolithic Udspolents because of the dominance of coal and other high carbon fragments.
3. Reaction -
  - A. Extremely acid - pH < 4.0
  - B. Acid - pH 4.0 - 5.5, inclusive
  - C. Neutral - pH 5.6 - 8.0, inclusive
  - D. Alkaline - pH > 8.0
4. Soil Temperature Class - Mesic in West Virginia. r classes probably occur as defined for other soils.

Suggested Minesoil Families that May Occur as Mappable Units in West Virginia

1. Regolithic Platic Udspolents; sandy-skeletal, siliceous, acid, mesic. Name: Cuzzart family (May be loamy-skeletal).
2. Platic Udspolents; sandy-skeletal, siliceous, extremely acid, mesic. Name: not assigned (May be loamy-skeletal).

3. **Plattic** Udspolents; sandy-skeletal, **siliceous**, acid, mesic. Name: Birdcreek family (May be **loamy-skeletal**).
4. Fissile Udspolents; loamy-skeletal, mixed, extremely acid, mesic. Name: Albright family (May be **acid** and not extremely acid).
5. Fissile Udspolents; clayey-skeletal, mixed, neutral, mesic. Name Bridgeport family
6. Fissile Udspolents; loamy-skeletal, mixed, acid, **mesic**. Name: Brandonville family.
7. Carbolithic Udspolents; loamy-skeletal, mixed, extremely acid, **mesic**. Name: Century
8. Carbolithic **Udspolents**; loamy-skeletal, mixed, neutral, mesic. Name: not assigned.
9. Carbolithic Udspolents; loamy-skeletal, mixed, acid, mesic. Name: **not assigned**.
10. Typic Udspolents; loamy-skeletal, mixed, **extremely acid, mesic**. Name: **not assigned** (May not occur in West Virginia as a mappable unit).
11. Typic **Udspolents**; loamy-skeletal, mixed, acid, mesic. Name: Canyon family.
12. **Typic** Udspolents; clayey-skeletal, mixed, neutral, mesic. Name: not assigned (May be loamy-skeletal).
13. Schlickig Udspolents; fine-loamy, mixed, neutral, mesic. Name: Mark Twain family (Mo.) (May occur also in West Virginia where calcareous, non-fissile (Schlickstone) mudrocks are abundant).
14. **Regolithic** Fissile Udspolents; loamy-skeletal, mixed, acid, mesic. Name: **not assigned**.

Note that these tentative names may not all occur in West Virginia in mappable units. It is estimated that 10 soil family names may cover the mappable units that are important in the State.

All characteristics for classification of mine soils would be determined within a control section of 10 to 40 inches (25 to

100 cm.) from the surface. Present evidence indicates that pH at the top of the control section, i.e. at 10 inches (25 cm.) would probably be a satisfactory indication for family definition. This has been true in profile studies to date, which however, have not included very many profiles in carbolithic or coaly minesoils. In such cases, however, it is considered that extreme acidity, the major concern in carbolithic minesoils, would be unlikely unless the pH at 10 inches was below 4.0. This is expected because of the dependence of rapid pyritic oxidation on high oxygen concentrations and on thiobacillus micro-organisms that are inactive at pH levels above 5.5 and at low oxygen concentrations. Thus, even if we should define the acid categories of soil families in terms of the dominant pH within the control section, we are suggesting that pH at 10 inches (25 cm.) is likely to be a generally satisfactory criterium for pH status of the entire control section.

Minesoils could be classified at the Series level, the lowest category in the system, by defining all other significant soil profile properties, such as details of texture, color, mottling, structure, horizons, and pocket inclusions. Since some of these properties, however, are changing rapidly in young minesoils it is judged satisfactory, at present, to delay classification at the series level until the rate of change of minor properties has become relatively slow, or at least 10 years following establishment of vegetation. Such delay does not appear necessary however, for useful classification and mapping at the family level. ~~Name~~

Management and land use implications by families are imperfectly tested at present, but several generalizations seem likely to apply. With extremely acid families, for example, covering with at least six inches of favorable material, probably would be a standard recommendation, whereas with acid families liming would be feasible for forage seedings; and with neutral families no liming would be needed.

From the standpoint of available soil water and fertility, the sandy skeletal, siliceous families would be generally unfavorable for forage production, but would be favorable for roadways, camping, and certain specialty crops. On the other hand, clayey-skeletal and schlickig, neutral families would be most productive as meadowlands, but would lack stability for roadways or stability on steep slopes.

**COMMITTEE NO. 7 - Criteria for Classifying Families and Series**

Throughout the years this committee has reviewed all of the family criteria used in the Northeast and offered suggestions to the corresponding national committee. A listing of series criteria was previously evaluated and confirmed that nationally we use about 180 criteria. The conference this time also looked at other soil features that may be potential (or actual) problems in classification.

To assist us in deliberations about soil families the following quotes from Soil Taxonomy were used.

Page 65- The intent of the family category has been to group the soils within a subgroup having similar physical and chemical properties that affect their responses to management and manipulation for use. Soil properties are used in this category without regard to their significance as marks of processes or lack of them.

Page 65 - The properties used (particle size distribution in horizons of major biologic activity below plow depth, mineralogy, temperature, thickness of the soil penetrable by roots, and several others) are important to the movement and retention of water and to aeration both of which affect soil use for production of plants or for engineering purposes.

Page 323- The intent of setting up classes of strongly contrasting particle sizes is to identify changes in pore size distribution that seriously affect movement and retention of water and that have not been identified in higher categories.

## CHARGE NO. 1

Consider family and series criteria and record information as to faults of present family criteria based on experience in developing SCS Form 5 for the soil series of the region.

Chairman: Francis Cleveland

a) Our deliberations emphasized that present family criteria, such as particle size, do not adequately permit meaningful interpretations of available water capacity, shrink-swell potential, and several other quantitative interpretations of soil behavior. The estimates for the Unified classification are not always useful for detailed interpretations. The lack of correspondence between the desired interpretation of soil behavior and the family criteria appears to result from the inability to utilize soil structure and consistence as additional features at this categorical level. This in turn relates to the general inability to consistently apply standards of measurement and description of structure and consistence.

b) We discussed the use of a moderately deep (So-100 cm) class at the family level which would emphasize the thickness of soil penetrable by roots. In the Northeast this would apply to the depth of restrictive layers such as lithic and paralithic materials and fragipans. At present this is handled at the series level and we wondered if users would find it more helpful to apply at the family level. This could be tested.

c) At the series level there are still a number of soils in reasonably well defined landscapes that have textures and other properties crossing family boundaries. In some instances the class boundary is that of a subgroup or suborder. In the last 40 correlations in the Northeast there have been 160 taxadjuncts. Although this seems to disturb the "purists" when trying to apply soil taxonomy it is resolvable when one keeps in mind the objective of providing soil information about which a large number of meaningful and useful statements can be made. The current guides followed in determining whether or not soils in a mapping unit are taxadjuncts are:

1. The deviating property must be outside but marginal to the limits of the series in question.
2. There must be reasonable evidence that the deviation is more than an "error of observation."
3. The nature of the deviation is such that it is not practical nor feasible to expand the range of the series. For example, if the limit crossed is one used at a higher category the series cannot be expanded.

4. The soil in question does not fit within the limits of any other defined series.
5. The deviating property does not significantly change the use, management or behavior of the named series to which it is a taxadjunct.

d) It was noted that the use of phases or series modifiers are essential in preparing SCS Form 5. Although rock outcrop is "not soil" it is important to include as a modifier in the Northeast. A "flooded" phase would be a useful caution in trying to separate some of the high and low terrace units of certain soils. The term "seepage" for lateral flow over pans might be useful. The above items probably need to be tested or evaluated rather than being directives.

#### CHARGE NO. 2

Suggest ways that the format for soil series descriptions may be improved, particularly the section on Range in Characteristics.

Chairman: John Ferwerda

a) To emphasize the importance of the range in characteristics of a series, Gerald Latshaw summarized the recent use of taxadjuncts in Pennsylvania. He noted taxadjuncts based on the following series criteria: more silt, higher pH, thicker solum, higher color values, chromas too high, higher clay content, fragipan too deep, too shallow to bedrock, and less coarse fragments. The present practice in the Northeast is to expand the series concept and range whenever possible as a means of reducing the number of taxadjuncts.

b) There were many suggestions about modifications of the description of a soil series. We **rejected** for the present time the following items: use a composite profile; eliminate typifying pedon and have only range in characteristics; delete solum thickness and horizon thickness; place horizon thickness in range in characteristics; add a paragraph that interprets pedon for diagnostic horizons; provide more detailed description of parent material; and develop a new form combining series description and SCS Form 5.

c) The committee w-affirmed that ranges for soil color should be specified by hue, value, and chroma. For example, **B2** horizons have hues ranging from 7.5 YR to 2.5 Y, values ranging from 4 to 6, and chroma of 2 to 4. The sense of the word "to" means "through" or "to include" but is shortened for convenience.

d) It was the consensus that we could not offer valid suggestions for improving soil series descriptions until we have evaluated such suggestions. It was agreed that such an evaluation could be undertaken during the next two years for one family that contains a modest number of series. A major concern was how to emphasize those properties that are definitive rather than merely descriptive. For some series, structure, consistence and some colors are not definitive but useful information about the concept.

The evaluation would be related to the official series format and not that of survey reports. Each test or trial should probably be evaluated for: (1) ease of locating definitive or differentiating criteria; (2) ease of locating descriptive information; (3) ease of deciding whether another pedon is within the described or defined range; (4) effort involved to develop and use the proposed format; and (5) possible economic impact of such a change (professional time, paper, typing, computer compatibility, etc.).

There were three kinds of formats suggested for testing, not necessarily in order of preference.

- A. Include range in characteristics in the block description of the typifying pedon. The features would follow the description of the typifying pedon. The features would follow the description of the horizon and could be for major horizons or subhorizons depending on the need.
- B. Use of paragraph format similar to present practice. The first paragraph to include general soil properties such as surface stoniness, slope, coarse fragments, lithology, solum, and so forth that apply to series. The following paragraphs would provide for the ranges within horizons such as color, structure, thickness, and so forth. The problems of designating definitive versus descriptive features needs to be considered, but was not resolved in our discussions.
- C. Use of tables to provide the necessary information. Although all information could be placed in tables it seemed that a combination of written and tabled information might be a more satisfactory solution. The problem of separating definitive and descriptive information should be faced and a tentative solution proposed. Two types of tables were provided for the committee and each has merit. One table uses soil features for column headings with soil horizons as lines; the other uses soil horizons as column headings and soil features as lines. Both are amenable to emphasizing definitive versus descriptive information.

CHARGE NO. 3

Communicate needs for improvements in Soil Taxonomy seen by the Northeast Conference to the standing regional taxonomy committee (to be established) and assist if needed in setting up this committee.

Chairman: Richard W. Arnold

The regional committee was established and is reported in the minutes of the business meeting of the 1974 conference.

Members of this subcommittee prepared some background information and questions related to the following items: potential problems with taxadjuncts, **application** of criteria for cambic horizons, concepts of fragipans in the Northeast, difficulties of spodic horizon definition, complications of using base saturation, **recognition of argillic** horizons without clay skins, variations of wetness criteria among orders, and several other problems. An evening discussion session covered the cambic and fragipan horizon problems and the remaining items were not discussed. The information and concerns will be made available to the regional taxonomy committee.

a) Cambic horizon criteria reviewed by John Witty.

1. The current definition excludes sands from being cambic. Consensus of opinion that we should look at what effect would there be in the N.E. if we include sands in cambic and use the same limits of recognition of cambic as currently used to recognize Alfic, Spodic, and Ultic subgroups of Psamments.
2. Can a material with more than 50% rock fragments be part of a cambic? We suggest changing the word "includes" with its implication of excludes, to the slightly more positive "is".
3. A regular decrease of GM in wet cambic horizons does not seem to be much of a problem. Even if sands are included as being cambic it is not anticipated to be much of a problem in the Northeast.
4. The recognition of carbonate removal as evidence of cambic is not considered to be much of a problem in the Northeast. If it is unclear, then will need lab data.
5. What constitutes soil structure in better drained alluvium and strip mine material? If we define or restrict rock structure to unconsolidated material then strip mine spoils are not much of a problem.

6. What if soil structure is the only evidence of alteration? We do not favor using a moderate grade as a criterion because of the concept of the cambic horizon. We think a regular decrease of OM may be useful but do not have adequate data. We suggest the need to develop some better quantitative guidelines on sampling increments (how thick) and measures of acceptable regularity. Although perceptible change of color when peds are crushed may be useful we do not have enough evidence and it was suggested that we try to get samples from different situations for evaluation.
7. There is a potential conflict with the depth and location of the cambic horizon if arenic subgroups are permitted in Inceptisols. John Rourke agreed to follow up on this.

b) Fragipan concepts in the Northeast.

An informative discussion about the features of layers called fragipans from Maine through New York and Pennsylvania and into Maryland indicated a divergence of opinion as to what constitutes a fragipan. R. V. Rourke noted from his data on Maine pans that many of them could be considered as firm basal till which was in contrast to the patterned features and evidence of translocated clay in fragipans farther south. It was thought that a symposium and possibly a field trip might be means of better understanding the diversity that seems to exist.

RECOMMENDATIONS TO THE NESSWPC

1. That the committee on criteria for soil families and series continue to be active in the interim before the 1976 conference.
2. That the committee should undertake evaluations and propose recommendations on the following items:
  - a) Use of a moderately deep (50-100 cm) class of soil penetrable by roots at the family level.
  - b) Use of series modifiers that are not necessarily soil properties to improve ease or usefulness of interpretations on SCS Form 5.
  - c) Use of different format styles for the official series description (using one family having a modest number of series) including (1) ranges within the block description; (2) paragraphs segregating pedon and horizon features; and (3) tables as a means of highlighting information.



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NATIONAL COOPERATIVE SOIL SURVEY  
NORTHEAST SOIL SURVEY WORK PLANNING CONFERENCE

JANUARY 7-11, 1974

Report

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3. Determine the intensity of mapping in tidal marsh areas of the Northeast.

The working material for this subcommittee is largely provided in the attachment - "Soil Survey of New Hampshire Tidal Marshes - A Progress Report" - and in the publication, "Tidal Marshes of Connecticut and Rhode Island," 1970. Hill and Shearin.

Recommendations:

1. Experience to date in the Northeast is that plant species cannot be used as an indicator of properties of tidal marsh soils except for the property of salinity.
2. Reference is made to the progress report, or: mapping New Hampshire tidal marshes for methods and procedures used, sampling tools, base maps, etc., for this specific project. As other states become involved in similar projects, they are encouraged to document methods, procedures, base maps used, etc., to assist in formulating operational procedures for conducting surveys on these areas.
3. Experience to date is that mapping units consisting of subgroups or phases of subgroups appear to be adequate to meet the needs of users.

## Subcommittee 2

### Members:

J. E. Witty, Chairman  
R. W. Arnold  
C. S. Holzhey

### Subcommittee Charges,:

1. Make recommendations to the Regional Committee on Soil Classification concerning changes (if any are needed) in Soil Taxonomy as it relates to Histosols, Hydraquents and Sulfaquents.
2. List the Northeast studies (proposed, active or completed) on Hydraquents and Sulfaquents. Give the objectives of the studies that have not been completed and summarize the results of the studies that have been completed.

### Recommendations:

1. Only limited information is available on Hydraquents and Sulfaquents in the Northeast. Additional study is needed to more fully characterize these soils. Until such data is available, significant contributions cannot be made to more fully develop the definitions of these subgroups in Soil Taxonomy.

2. On-going studies of tidal marshes in which either or both **Hydraquents** and **Sulfaquents** have been identified are being made in Delaware, Maryland and New Hampshire. A copy of the project **work** plan for Maryland is attached. A progress report for the New Hampshire study is also attached.

Connecticut tidal marshes have been mapped at three different scales over the past four years. Each study had different objectives.

a. Reconnaissance Survey of Tidal Marshes in Connecticut and Rhode Island was published in 1970.

b. Current mapping of tidal marshes as part of the National Cooperative Soil Survey at scale **1:15,840**.

c. Mapping by **Connecticut** Department of Environmental Protection is currently in progress. Surface vegetation only is being used in the identification and delineation of the tidal marsh. The maps are used in the administration of the Tidal Wetlands Act **which** provides **protection** for these area.

3. The **committee** endorses the proposals outlined on pages

Subcommittee 3

Members:

R. L. Googins, Chairman  
L. J. Cotnoir  
R. P. Matelski  
De Von Nelson  
L. Kick  
M. I. Markley

Subcommittee Charges:

1. Review assumptions concerning the "Suitability Grouping of Organic Soils for Agriculture" to determine if the assumptions are meaningful and complete.
2. Test "Suitability Grouping of Organic Soils" by using it to group Northeast Histosols to determine if the groupings are realistic and suggest changes as needed. This may require additions or deletions of certain considered soil features, adjusting penalty factors, etc.
3. Test "Development Difficulty Rating" for the unreclaimed Histosols.
4. Test usefulness and accuracy of "Guide Sheets" and determine if practical to prepare "Guide Sheets" for other crops.
5. Test "Use Potential Groups for Forestry."
6. Test the "penalty value approach" for rating soils for engineering uses.

Charges 1, 2, and 6 were examined in some detail by the members of this subcommittee. The following comments are offered with regard to each charge:

Charge 1. It was noted that the assumptions given attempt to cover the rating table for "Suitability for Agriculture" and also the rating table for "Development Difficulty." Both ratings are considered under the general heading of "A Suitability Grouping of Organic Soils for Agriculture." The seven assumptions given do appear to apply to both rating systems. For example, assumptions 2, 5, 6, and 7 seem to apply to both rating systems. Assumptions 1, 3, and 4 appear to be applicable only to the "Suitability Grouping" rating system.

Charge 2. Six Northeast organic soils were rated using the proposed "Suitability for Agriculture" rating system. (See Attachment No. 3). It should be noted that water control was not rated. Assumption 3 states that good soil management including drainage, etc., is assumed. If this is true, the water control factor in this system is not needed. The following comments are offered with regard to some of the other soil factors:

- a. Coarse fragments - change ratings of 0-20-50 to 0-5-10 and add a fourth class for 20% with a penalty of 25.

- b. The mineral or limnic layer factor should be combined with the underlying material factor. The following is suggested:

less than 2" of either mineral or limnic (within 51")  
rates 0.2-12" of either rates as follows:

b-1 loamy, sandy or marl - 10

b-2 clayey, diatomaceous earth, coprogenous earth - 30

b-3 skeletal, rock or fragmental - 50

One member of the committee recommended b-2 as also having a penalty factor of 50.

- c. With the exception of folists, the slope category does not seem applicable to the Northeast as most of the potentially suited soils are nearly level. It was suggested that an assumption could be added to those already given to eliminate folists from consideration for suitability for agriculture.

The subcommittee feels that the proposed 7 suitability groups are too many. A suggested alternative is 3 groups defined as follows:

a. (75-100) These soils have few or no features that seriously restrict their use for crops.

b. (40-75) These soils have features that require special management for crops or that restrict the choice of crops.

c. (0-40) These soils have features that impose such severe limitations for crops that other uses should be considered.

With regard to the rating system for "Development Difficulty" - it is noted that the "difficulty of achieving artificial drainage" is not considered. We believe this to be a serious omission in rating "Development Difficulty."

Charge 6. Six Northeast organic soils were rated according to the guide provided for rating soils for small buildings and basements. (See Attachment No. 4). All of the soils rated would have very severe limitations for small buildings using the groupings suggested. The following comments are noted for discussion and consideration by the National Committee:

- a. Should those organic soils rating very severe be changed to "unsuited?" How much more "severe" for small buildings is an organic soil rated at 400 then one rated at 250?
- b. Shrink-swell. in the guide is noted for mineral layers only. Does this imply thin mineral layers within organic soils, underlying mineral material or mineral soils?
- c. Slope - A penalty factor of 0 for organic soils with slope in excess of 2 or 3 percent seems questionable.

Subcommittee 3 recognizes that the soils tested in response to Charges 2 and 6 are too few to adequately test the groupings. Few members of the subcommittee have had extensive experience rating organic soils for engineering purposes. There was general agreement that the ratings proposed would have merit and usefulness if some revisions were made with regard to the enclosed comments and recommendations.

It is recommended that the National

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Attachments:

1. Soil Survey of New Hampshire Tidal Marshes - A Progress Report
2. Project Work Plan - Study of Tidal Marsh Soils in Chesapeake Bay Area
3. Ratings for Six Northeast Histosols for Suitability for Agriculture
4. Ratings for Six Northeast Histosols for Small Buildings and Basements

"Soil Survey of New Hampshire Tidal Marshes - A Progress Report"

Distribution of this report was made to participants attending the New York City conference. A copy of this report is attached to others not attending the conference. A few additional copies of the report are available from the committee chairman.

Primary Problem Area: Wetlands

Project Title: Study of Tidal Marsh Soils in the Chesapeake Bay Area

Principal Investigators: John E. Foss, Delvin S. Fanning, Agronomy

Areas of Investigation

1. Reconnaissance soil survey

Basic to any study of tidal marshes is a classification of the major soils. In the published county soil survey reports the tidal areas are delineated only as "tidal marshes" with no further description or breakdown. However, preliminary investigations of these areas have indicated a great deal of variation in soil depth, texture, organic matter, chemical properties, and other characteristics. These soil variations appear to be mappable. A soil classification system specifically designed to marsh areas needs to be developed. With the aid of aerial photographs and field and laboratory investigations, it is possible to develop criteria for mapping soil **types** within the tidal marsh areas. The soil survey, coupled with the biological and geological classifications, would provide a comprehensive inventory of this important natural resource. This information can provide a basis for subsequent environmental studies relating to estuaries and coastal area.

2. Properties of soils

The physical, chemical, and mineralogical properties of the soil units are an integral part of the soil classification scheme. The specific

analyses to be included are: soil pH, organic matter, particle size distribution, bulk density, cation exchange capacity, exchangeable cations, salt content, sulfur content, available nutrients, and clay mineralogy. The strength of the classification system lies in correlating soil morphology with the above properties.

Recognizing the various soil types and their properties will permit further interpretation of factors contributing to variations in the salt content of these soils such as leaching, texture, vegetation, slope, and elevation. Those geographic areas of high sulfur content can also be delineated. The source of the sediment in tidal marshes can be studied using mineralogical properties. By knowing the available nutrients, salt content, and presence of toxic elements, the potential of these soils for growing additional food for wildlife can also be evaluated.

The research efforts in this project will be coordinated with other projects in the Wetlands Research Program area-

RATINGS FOR SIX NORTHEAST HISTOSOLS  
FOR SUITABILITY FOR AGRICULTURE

<u>Series</u>	Adrian	Carlisle	Pawcatuck	Sebago	Vassalboro	Westbrook
<u>Classification</u>	Terric Medi- seprists, sandy or sandy- skeletal, mixed, euic	Typic Medi- saprists, euic	Terric Medi- fibrists, euic, sandy mixed- sulfurous	Fibric Boro- hemists, dysic	Typic Boro- fibrists, dysic	Terric Medi- fibrists, euic, loamy, mixed, sulfurous
<u>Factor</u>						
Soil Temperature	Messic-0	Messic-0	Mesic-0	Frigid-25	Frigid-25	Mesic-0
Water Control	?	?	?	?	?	?
Coarse Fragments	None-0	< 1%-0	< 1%-0	None-0	1-5%-20	None-0
Mineral or limnic	None-0	None-0	None-0	None-0	None-0	None-0
Salinity	None-0	None-0	?	None-0	None-0	> 16?-75
Wood layers	None-0	None-0	None-0	None-0	None-0	None-0
Thickness	< 36-40	> 51"-0	< 46"-20	> 51"-0	> 51"-0	48"-20
Underlying material	Sal-IQ-20	-0	vfsl,ls-20	-0	-0	sil-0
Sulphur	None-0	None-0	10,000- 30,000-75	None-0	None-0	None-0
Slope	< 2%-0	< 2%-0	< 2%-0	< 2%-0	< 2%-0	< 2%-0
Total	60	0	115	25	45	95
-100	40	100	0	75	65	5
Suitability group	4	1	7	2	3	7

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RATINGS FOR SIX NORTHEAST HISTOSOLS  
FOR SMALL BUILDINGS AND BASEMENTS

<u>Series Factor</u>	Adrian	Carlisle	Pawcatuck	Sebago	Vassalboro	Westbrook
Depth	130	180	100	?	?	110
Soil Drainage	80	80	80	80	80	80
Flooding	200	200	200?	200	200	200?
Frost Action <sup>1/</sup>	10?	10	10	10	10	10
Permafrost	0	0	0	0	0	0
Rockiness	0	0	0	0	0	0
Stoniness	0	0	0	0	0	0
Slope	0	0	0	0	0	0
Shrink-swell	0	0	0	0	0	c
unified	0	0	0	0	0	0
wood	0	0	0	0	0	0
		470	390	290	290	390

&/Organic soils with Pt classification were rated 10 for frost action

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NATIONAL COOPERATIVE SOIL SURVEY  
NORTHEAST SOIL SURVEY WORK **PLANNING** CONFERENCE

9.1

January 7-11, 1974

REPORT OF COMMITTEE ON SOIL SURVEY RESEARCH **NEEDS** AND PRIORITIES

Charges include some of the responsibilities of the Committee on Benchmark Soils from previous years, plus broader evaluation of needs and priorities as follows:

1. Determine regional soil survey research needs and communicate them internally and also to ~~the Experiment Stations~~ and ARS (by means of the NE Soil Research Committee which meets in New York during the same week as our conference). This should include determination of research needed to support and prepare soil survey interpretations.
2. Summarize the availability of facilities and personnel for conducting and supervising soil survey research in the region including field studies (e.g. water tables, **geomorphology**, etc.). How will the transfer of the SCS Soil Survey Lab from **Beltsville** to Lincoln, Nebraska (as proposed) effect our programs?
3. Study and make recommendations as to how to handle benchmark soil programs including, a) present status of data on file, b) coordination of research programs (by soil survey personnel and others) to direct studies toward benchmark soils, and c) suggestions for procedures to accumulate data on benchmark soils in one place.

Charge 1.

Committee responses were reviewed during the Conference and communicated to the NE Soil Research Committee of the ~~NE Experiment Stations~~ through the SCS liaison to that group. Responses heavily emphasize non-agricultural and environment oriented concerns. Some concern was voiced during the Conference that we could fail to properly structure long term efforts unless ramifications of the energy situation, changing demands for farm and forest products, and shifting urban land **uses** are carefully evaluated. Nevertheless, the overwhelming body of expressed concerns revolves around the kinds of question: bombarding soil scientists and land use planners today. The list that follow! incorporates some of the thoughts and priorities expressed by other committee. relative to research needs. General topic areas given high priority include:

- 1) soils as receptacles for wastes, especially sewage effluent sewage sludge septic tank effluent and sanitary landfill material
- 2) soils as building materials
- 3) soils as features on which to **build**
- 4) stabilities of embankments and natural slopes, including tendencies for massive physical failure and methods of predicting and estimating erosion
- 5) interactions of landscapes systems as influencing the above

- 6) chemical and physical properties of coastal marshland soils affecting potential properties if drained
- 7) attributes and remedial treatment of made land, mine spoils, and highly disturbed soils
- 8) relating soils and climates to tree and shrub growth; especially as influenced by moisture and fertility relations
- 9) development of techniques for better evaluating moisture regimes, moisture retention, and moisture movement as related to the above and to such emerging agricultural practices as trickle irrigation
- 10) continued gathering and rapid dissemination of standard soil characterization data and engineering test data as basis for uniform soil classification, improved understanding of processes, and improved interpretations
- 11) investigations such as geomorphology studies to establish the nature, distributions, and import of deeper materials relative to the above topic areas

The following expands somewhat upon each of the (11) topic areas.

#### Soils as receptacles for wastes

Concern is with the capacity of various northeastern soils and special features, such as fragipans and compact till, 1) to react with applied materials on a temporary or sustained basis, 2) as they influence pathways of solutes from point of application through the biologically

Soils as building materials

Needs include: (1) more **rheological** data, (2) development of more precise devices for treatment of corrosion potentials, (3) more and better correlations of soil characterization data with engineering test data, (4) better documentation of ranges within mapping units, and (5) more data from below 60 inches.

Soils as features on which to build

Needs are essentially similar to "soils as building materials", plus information about water tables, appropriate effluent disposal research. Influence of features such as fragipans, research into sulfide-sulphate reactions, and potential subsidence is needed in coastal marshes.

Stabilities of embankments and natural slopes

There is increasing pressure for use of soil loss formulas in estimates of erosion during construction operations. There is also need for relating rheological properties, soil texture and clay mineralogy data, field moisture regimes, and freeze-thaw patterns.

Interactions of landscape systems

This is listed separately to emphasize the recurring theme that people use landscapes and that moisture related studies in particular may be more meaningful if done by landscape and on associated groups of soils rather than just by soil series. For example, how do vegetative patterns or urban **developments influence** moisture movement in soils over compact till, and what is the **downslope** influence of that movement?

Chemical and physical properties of coastal marshland soils

Needs include: (1) further laboratory characterization of marsh soils, (2) **further** testing of acidifying effects of sulfide oxidation, (3) gathering of information about potential subsidence, (4) cooperation to get more regional use from the locales of more intense study.

Attributes and remedial treatments of made land

Physical and chemical properties of soils before and after changes by man, dynamic pedologic processes which change the nature of the made soils and **release** solutes into the soil moisture system require more study. Questions include magnitudes of protracted decomposition, subsidence and leaching of pollutants in landfills, stability and **revegetation** acidity in mine spoils. Records on nature of fill material would be helpful. Stability questions as above in the moisture-temperature regimes of the Northeast.

Relating soil and climates to tree and shrub growth

Tree and shrub growth as related **to soils**, moisture regimes and fertility is of concern in forestry, waste **disposal**, and environmental impact considerations.

#### Development of techniques for better evaluating moisture regimes

Aforementioned topic areas all involve moisture relationships in some **way**. Newly introduced trickle irrigation of high return crops imposes new interpretive moisture regime questions. Techniques for field evaluation of moisture regimes, moisture retention, and moisture movement, and for more precise integration of field and laboratory data need to be sharpened, in some cases improved and standardized.

#### Continued gathering and rapid dissemination of standard soil characterization and engineering test data

There is continuing need for standard data in support of both soil classification and interpretations. The former, while-not mentioned under other topics, is the key to adequate extension of information from study areas and merits continued major analytical support. It is also critical to develop and maintain an efficient information dissemination system that gets data to users quickly and in usable form. Whereas data collection is important, dissemination in generally available and usable form also merits considerable attention. Regional cooperation to get experiment station data across staff lines and to summarize important kinds of data is important.

#### Investigations such as geomorphology studies

.. Many soil surveys encompass landscapes in which urban and **environmental** questions require more than standard observation of nature, stratigraphy, and continuity of materials below 5 foot depths. Supplemental geomorphology studies are needed, particularly to aid in evaluation of kinds, topographic distributions of, and hydrologic effects of deeper materials with which certain soils are regularly associated. Major geomorphology studies of the type conducted by the SCS in the South Region would be valuable. Considerably more abbreviated investigations utilizing similar techniques could be applied to selected landscapes with large return in terms of new information per unit effort. Moisture studies would be useful in conjunction with such studies. The need in this general area is on the increase as one tool in evaluating soils for the various aforementioned uses.

#### Discussion

One persistent response is about the need for research into mapping unit variability; particularly as relating to urban land use. Sampling and study patterns should be designed to establish reliability of data when extended by mapping unit,

There is also some feeling that emphasis in pressing land use and environment-oriented problems may take away from the long term input into research relating to, as one respondent stated, "... understanding of soils and development of principles that govern soil **behavior**".

Charge 2.

The foregoing are beyond the capabilities of the research facilities normally providing direct support to the soil survey program. Some of the deficit could be neutralized by improved sharing of research findings, and by improved regional summarization of existing data.

Some experiment station respondents indicate that facilities are available at their respective institutions for considerably higher levels of activity if financial support were increased. Some of the manpower could be provided by more liberal SCS investment in training of soil scientists at universities or Soil Survey Investigations Units. This might require some shift in emphasis from mapping to other forms of investigations.

Also helpful would be greater effort toward dialogue with, and transmittance of needs to ARS and greater effort toward monitoring research findings of other research groups, as the USGS geologists and hydrologists.

Appendix I has a list of institutions, compiled by pre-conference questionnaire circulated to the NE states. Included are institutions directly supplying research and/or data to ~~the Soil Survey~~ in the Northeast.

The closing of the existing soil survey laboratories and consolidation in a new facility at Lincoln, **Nebraska is** planned to yield a larger volume of soil characterization data, and to increase the research time of Soil Survey Investigations scientists.

Charge 3.

Consensus from the 1973 National Technical Work Planning Conference favors **deemphasizing the** publication portion of the benchmark program. Preference was also expressed for gathering more information about fewer soil series, and in working harder to **find locations** accessible to researchers. **This latter** point apparently stems from the very marginal success of the present program in focusing problem-oriented researchers toward soils, landscapes and experimental designs of maximum utility for soil survey interpretations.

The companion **question** of how to best utilize field and laboratory resources by no means receives a unanimous answer.

Pre-conference responses this year range as follows: (1) we should drop the benchmark program, (2) the current benchmark list is too long and a new list should be developed with one or more series per family depending upon range in thickness of series control section within the family, (3) researchers should be encouraged to use benchmark soils as

a basis for planning research, (4) lists of important soils should be accompanied by locations of potential study sites and the lists readily available to the Agricultural Research Service and others, (5) there should be an updated list but mold sampling patterns more to land resource areas, (6) reports with more emphasis on uses of the data would be more useful, (7) Soil Conservation Service soil scientists might be detailed to or given educational leave to lead in studies of this sort, (8) it is **time** to compile a **summary** of existing published and unpublished data about the benchmark soils, and (9) studies should be in terms of interactions among soils on landscapes.

### Recommendations

1. Item a under charge 3 was not carried out because time was too limiting between committee formation and the Work Planning Conference. **It is** recommended that this committee be continued and that it function between conferences for the time necessary to inventory published and unpublished benchmark soil data in the Northeast, and for **purpose** of preparing carefully studied responses to **charge 3**. The 1972 **Benchmark Soils Committee** proposed a form for this purpose, but follow-up was curtailed by the period of inactivity between conferences. A **form similar to** the 1972 proposed form (Appendix II) would be distributed and compilations made during 1974. Intent would be to learn the **extent** and location of data rather than to compile the data itself.
2. It is recommended that the conference support the **recommendations** for **regional** cooperation in soil moisture studies as outlined by the Soil Moisture **Committee**.

Committee Members

Chairman: C. S. **Holzhey**

Vice Chairman: R. P. **Matelski**

R. J. Bartlett

L. J. **Cotnoir**

D. E. Hill

J. **Kubota**

F. P. Miller

D. Nelson

R. Pennock

N. K. Peterson

D. E. **Petry**

C. A. Reynolds

J. D. Rourke

R. V. Rourke

R. **M.** Smith

M. E. Weeks

W. R. Wright

Appendix I. Institutions Providing Research and/or  
Data in the Soil Survey Program - Compilation  
from Pre-Conference **Questionnaires**

- The Commonwealth Department of Transportation and Public Works -  
engineering test data (Caribbean Area, San Juan, **Puerto Rico**)
- Connecticut Agricultural Experiment Station - characterization data  
and research (New Haven, including substation at Windsor, **Conn.**)
- Storrs Agricultural Experiment Station - characterization data **and**  
research (University of Connecticut, Storrs)
- Department of Transportation, State of Connecticut - engineering  
test data (Wethersfield, **Conn.**)
- Materials and Research Division, Maine State Highway, Department  
of Transportation - characterization data and research (Bangor,  
Maine)
- Maine Agricultural Experiment Station, University of Maine -  
characterization data and research (Orono, Maine)
- Plant and Soil Sciences Department, University of Maine - characterization  
data and research (Orono, Maine)
- Agricultural Research Service, University of Maine - characterization  
data and research (Orono, Maine)
- Department of Agronomy, University of Maryland - research (College  
Park, Maryland)
- NE TSC, Soil Survey Investigations Unit, Soil Conservation Service -  
characterization data and research (Beltsville, Maryland)
- New Hampshire Agricultural Experiment Station, University of New  
Hampshire - characterization data and research (Durham, N. H.)
- Soil Testing Laboratory, New Hampshire Department of Public Works  
and Highways - engineering test data (Concord Heights, N. H.)

U.S. Army Terrestrial Sciences Center and Engineering Laboratory -  
research (Hanover, New Hampshire)

Forest Sciences Laboratory, Northeast Forest Experiment Station, U.S.  
Forest Service - research (Durham, New Hampshire)

Soils and Crops Department, Rutgers University - research (New  
Brunswick, New Jersey)

Engineering Department, Rutgers University - inactive since publication  
of engineering report for each county (New Brunswick, New Jersey)

Agronomy Department, Cornell University - characterization data and  
research (Ithaca, New York)

U.S. Plant, Soil, and Nutrition Laboratory, Agricultural Research  
Service with Soil Conservation Service Soil Scientist - research  
(Ithaca, New York)

Agronomy Department, Pennsylvania State University - characterization  
data and research (University Park, Pennsylvania)

Pennsylvania Department of Transportation - engineering test data  
and research (Pennsylvania)

College of Resource Development; Department of Plant and Soil Science  
Univ. of R. I. - characterization data and research (Kingston, R. I.)

Engineering Department, University of Rhode Island - engineering test  
data (Kingston, R. I.)

Vermont Agricultural Experiment Station - characterization data and  
research (Burlington, Vermont)

Vermont Highway Department -

Appendix II. Form Proposed by 1972 Committee 3.

Benchmark Soil Characterization Inventory

Benchmark Soil Series	Family Placement	Complete characterization data available <sup>a/</sup>			Partial characterization data available			Type identification characterized yes or no	Suggested sampling level
		Soil Sur. Laboratory	Experiment Station (No. of pedons)	Other (specify)	Soil Sur. Laboratory	Experiment Station (No. of pedons)	Other data needed to complete char. (see code)		

<sup>a/</sup> Complete characterization data includes P.S.D.A., pH, organic carbon, linear extensibility, 15 and 1/3 bar water, cation exchange data, mineralogy, and all data needed to classify soils down to family level.

Analysis code

1. P.S.D.A.
2. pH
3. Organic carbon
4. Linear extensibility
5. 15 bar water

Analysis code

6. 1/3 bar
7. Ext. A1 (KCl)
8. Ext. Fe C-D
9. Ext. cations
10. CEC(NH<sub>4</sub>) pH 7

Analysis code

11. Min. clay
12. ill. sand
13. Thin sections
14. Spodic horizon
15. Other specify

Analysis code

16. Other specify
17. Other specify
18. Other specify
19. Other specify
20. Other specify

1974

NORTHEASTERN SOIL SURVEY WORK PLANNING CONFERENCE

JANUARY 10, 1974

Report of Committee No.10, Forest Soils

Members of the Committee were as follows:

F. Viera, USDA SCS, Federal Bldg., Durham, N.H. 03024  
J.A. Ferwerda, USDA SCS, Fldg., Univ. of Me., Orono, Me. 04473  
R.V. Rourke, Dept. of Plants and Soils, Univ. of Me., Orono, Me.  
W. H. Lyford, Harvard Forest, Petersham, Mass. 01366  
C.A. Reynolds, USDA SCS, Agricultural Center, Wallingford, Conn.  
L. Kick, USDA SCS, Midtown Plaza, 700 E. Water St., Syracuse, N.Y.  
F. W. Cleveland, USDA SCS, 7600 West Chester Pike, Upper Darby, Pa.  
D.G. Grice, USDA SCS, Box 985, Federal Square Station, Harrisburg, Pa.  
R. Pennock, Dept. of Agronomy, Penn State Univ., Univ. Park, Pa.  
D.O. Nelson, U.S. Forest Service, 633 W. Wisconsin Av., Milwaukee, WI  
William A. Wertz, Northeastern Area State and Private Forestry,  
6216 Market Street, Upper Darby, Pennsylvania 19082

The committee was charged by the general chairman as follows:

The Forest Service has been placing less emphasis on detailed soil survey and more emphasis on soil resource inventories that are apparently more reconnaissance surveys. For a discussion of this see the USDA Forest Service Statement by O. C. Olson in the Proceedings of the National Soil Survey Work Planning Conference. In regard to this trend:

1. Collect and make available to the Northeast Conference examples of one or more of these inventories if such are available.
2. Consider whether similar approaches are needed on other forested land not directly under Forest Service control.
3. Assuming that different intensity soil surveys are needed for forested than for other lands, suggest definitions for what should constitute forested lands and/or forest soils.
4. Consider other problems in the area of forest soils as deemed appropriate. The report of the 1972 NE forest soils committee should be examined to prevent duplication of effort.

The Committee convened on Tuesday, January 3, 1974 and after considerable lively discussion and conference present the following report.

The statement given by O. C. Olson, at the January 1972 Planning Conference in South Carolina reflects the thought that the National Cooperative Soils Survey Program (NCSSP) is not adequately *responsive* to U.S. Forest Service soil information needs. The U.S. Forest Service feels that it remains involved in the NCSSP, but that its soil information needs are being met through its "Soil Resource Inventory" (SRI) Program. This approach is designed to compile soil information for planning purposes on large areas of land within a certain time as individually needed or planned. It uses a reconnaissance approach and stresses the land managers perspective in its reports; yet in some cases this approach cannot be readily identified with the NCSSP. The NCSSP on the other hand must produce a map and report detailed enough to satisfy a variety of uses by many divergent interests which in turn are becoming progressively more demanding and broader in their uses.

Seven U.S. Forest Service soils reports have been circulated to the Committee Members. The inputs from this committee to the chairman indicate that the SRI approaches are flexible enough to produce seven different kinds of reports with varying identification with the National Soil Survey. The Monongahela National Forest report can be readily identified with the taxonomy of standard soil surveys. Each report appears to have been sufficient for its expected use. It is noteworthy that these reports emphasize road locations, source of road building material and erosion (consequent stream contamination) rather than wood-producing potentials.

#### Committee Charges

1. The first charge to the committee was to collect examples of soil inventories made by the U.S. Forest Service for exhibit at the Planning Meeting. This, thanks to DeVon Nelson, has been done.

The reviewers made the following observations:

1A. The level of survey intensity was selected for the purpose which the inventory (survey) was made. The individual reports may not be adequate for more intensive uses and were not intended for more intensive uses.

1.8. Taxonomy as recognized and used in the NCSSP is one of the best common bases for soil surveys. People other than soil scientists should not remain ignorant of the standard system of soils classification. Taxonomic units broader than the series level may be appropriate to use in general surveys.

1C. Intensive survey mapping standards may be made more applicable

to troader uses by combining slope classes into classes meaningful to the user and by combining two or three soils into so-called complexes. Many short-cuts may be used.

1D. The seven example reports differ considerably. This makes it difficult to compare reports or to relate to the NCSSP. The SRI might be considered to be a special kind of a survey and in many ways not meant to be directly identifiable and comparable with the NCSSP.

2. The second charge, to consider whether similar approaches are needed or desirable on lands not under U.S. Forest Service control, produced the following for consideration:

2A. The State of Maine and other states, as well as large companies, have large areas to survey, usually at a cost which will stay within modest budgets. Such lands usually involve areas in which the soil scientist has difficulty in keeping himself oriented with land forms, drainages and other physical features. The U.S. Forest Service system is unsatisfactory on their large acreages, it might also work on other large survey areas. Just as importantly, abbreviating and combining NCSSP Mapping legends or using a higher level of taxonomic nomenclature might produce as good results. In any event, surveys designed to produce a specialized type of result will generally do just that. Further information often requires a new survey.

2B. Private ownerships, large and small, present a variety of needs and desires in soil survey coverage. A detailed survey may be necessary to some while others wanting a broader base may combine descriptions or soil names.

Surveys similar to the SRI are acceptable if one can predict future needs and in any event will give a preliminary assessment for any project.

3. The third change involves terminology. The committee felt that woodland does not generally require as intensive a survey as row crops. For discussion purposes the following ideas are presented:

3A. Land cover generally should not be the chief parameter in the selection of a soils survey, nor should a large area denote, "forested land," any more than a 10-acre woodlot.

3e. The term forest soil might denote a soil developed under a forest or tree cover. Such a situation involves a long time-frame. If the land was cut off yesterday is it a forest soil or not? Any soil that will grow any kind of crop will grow trees. It is not

only how trees presently on the area will grow but what is the potential for tree growth. Can we ignore range land or other open land? Designating a soil by its forest or past cover is not necessary but may be expedient in some situations.

3c. Presently the Forest Survey (USFS Research Division) recognizes, "forestland" as being, "at least 10 percent stocked with trees of any size and not developed or restricted for other uses, to a minimum of one acre."

"Commercial forest land," is covered in the above definition and in addition includes any land capable of producing a minimum of 20 cubic feet of wood per acre per year whether or not it is accessible or operable. Under these definitions present cropland or pasture-land are potential forest land. It was pointed out that often these definitions are not valid outside these narrow contexts.

3D. The Majority of the committee members who reviewed the reports believe that National Forest lands should be mapped in a manner allowing comparisons between Forests and in harmony with surrounding lands. Many Eastern National Forests have a "checkerboard"

ingerodibility, absorption of septic tank effluents, road cost and stability, use of fragile environments so-called (as over 2500 feet in Vt. and Maine) and other factors affecting control of our environmental use. With many new plans for land use and development those responsible for reviewing these plans, whether implementing new legislation or otherwise, should be familiar with soil surveys, their interpretations and reliability.

#### COMMENTS ON REPORT OF COMMITTEE 10 - FOREST SOILS

Von Nelson - Integrated inventory used by the Forest Service suits one objective or a group of objectives for forest managers. The reports are not considered publications. they are mainly for in service use. Copies are available as examples of what kinds of surveys the Forest Service is making.

Rice - Can you afford to be that introspective as a service to the tax payer?

Von Nelson - Yes one can buy more sound management decisions when needed.

J. Rourke - Both the SCS and FS are charged with making natural resource inventories. What level of abstraction can the Forest Service use? Could explore the minimum amount of soil information needed to classify the soils into Soil Taxonomy.

Alvis - Forest Service looks at soils as a system - look at soils differently than the SCS, ie, a system. They stratify and classify soils as a part of a subsystem, and therefore look at soils in different ways.

Farrington - In Addison County, Vermont the National Forest used detailed soil survey.

Watson - SCS is charged with mapping every acre of private land.

Schmude - West Virginia the SCS is planning to map National Forest land in Randolph County. According to SCS policy all 7 million acres in West Virginia will have to be mapped before the SCS can map National Forest land unless the SCS is reimbursed by the FS.

Von Nelson - There are lots of ways to do this. Can make separate survey areas; can do it cooperatively; can be reimbursed by the FS but the FS has not done this yet. It

is up to the Forest Manager to decide,

Schmude - Most FS land will be mapped with broadly defined units.

Holzey - Not a more Integrated survey. The FS has one objective and the NCSS more than one objective therefore the priorities are different.

Van Eck and Fanning - The Forest Service is not in touch with SCS, University and other people who do the training for soil survey.

Foster - We need have a broader look at Soil Surveys. There is a tremendous vacuum for an integrated look,

Arnold - We in pedology must remember that pedons are a part of the landscape and fit the landscape are part of the environment.

Googins - Within the Forest Service do you keep up with advances and changes in Soil Taxonomy - how do you do this without correlation?

Von Nelson - Fifty percent of Forest Service soilscientists get involved in a correlation. The rest receive National Cooperative Soil Survey Publications and also participate in SCS training and progress reviews.

J. Rourke - We need an individual at the Washington level as an arbitrator between correlation regions.

NATIONAL COOPERATIVE SOIL SURVEY  
NORTHEAST SOIL SURVEY WORK PLANNING CONFERENCE

January 7-11, 1974  
REPORT OF COMMITTEE ON  
REMOTE SENSING IN  
SOIL SURVEYS

The Remote Sensing in Soil Surveys Committee was given the following charges :

1. Determine the feasibility (including costs) and utility of remote sensing (other than standard black and white aerial photography) in soil surveys.
2. Report on research that has been and is being conducted on remote sensing for soil surveys.

Each participant of the 1972 Northeast Soil Survey Work Planning Conference was queried regarding these two charges. Only a small number of those queried actually replied. This probably indicates that remote sensing technology, with the exception of black and white photography, is not presently being used by the bulk of the participants.

The comments of those responding are summarized as follows:

1. A challenge exists to apply remote sensing to our day-to-day operations that involves three phases of effort. The first will be the monitoring of remote sensing techniques for an operational rather than a research mode. The second is an implementation phase in which the technology will be used in the field. The last phase will be the continual updating necessary due to changes and advances in remote sensing technology.
2. Remote sensing technology is highly dependent upon communication, computers and data analysis.
3. Improvements can be made in the use of black and white aerial photographs by increasing the photointerpretation training of our soil scientists.
4. Photointerpretation can be done much faster with multispectral photography than black and white photography with a net savings of approximately 3 to 15 percent.
5. Comparison studies should be made between radar imagery and conventional vertical photography to determine if additional information can be obtained from the radar imagery.

6. **The most promising area of remote sensing appears to be the collection of data by**

1.

**8.**

9.

**10.**

**11.**

**12.**

**13.**

charge of the Committee should also be expanded to include more than soil surveys. For example, the use of remote sensing in soil survey related activities, such as land use mapping, could also be included for Committee concern.

Committee Members:

Chairman - G. W. Peterseo  
Vice-chainuao - D. E. Pettry  
Member ship - R. L. Cunningham  
                  J. E. Foes  
                  W. H. Lyford  
                  O. W. Rice

REPORT OF THE CONNECTICUT AGRICULTURAL  
EXPERIMENT STATION REPRESENTATIVE

David E. Hill

Many projects in the Department of Soil and Water are devoted to studies of environmental quality that may be used for soil survey interpretations. I'd like to summarize 3 of these for you. The most concentrated efforts concern on-lot waste disposal by septic tanks. In the mid 1960's we studied site and seasonal variations in percolation testing and the principles of water flow from the test hole. But the percolation test has limitations. It is an imperfect measure of septic tank drainfield performance and is usually used for design purposes. It will not predict the rate of clogging of soil interfaces in the leaching field and thus estimate the longevity of the system. Do soils really make a difference? Our interpretations of septic tank performance say that, slope, shallow bedrock and water tables, hardpan and other slowly permeable horizons make a difference and we rate soil mapping units as having slight, moderate, or severe limitations.

To assess what is really going on in the backyards of America, we began a study of septic tank longevity in the town of Glastonbury, Connecticut. We are in the process of analysing 2700 septic tanks installed in 37 soil types. Of these, 490 or 18% have failed since 1960. The median age of failing systems in soils developed on hardpan is only 5.5 years; that for systems installed in loose till and stratified sandy gravelly terraces is 13 to 14 years. This is a dramatic difference. But one must gauge rates of failure against the successfully operating systems to get a time measure of probability of failure and longevity. The rate of failure in hardpan soils is 25% less than in systems installed in loose till or terraces. Further, in all mapping units rated as having severe limitations for septic tank drainage fields, 15% of those systems have failed; of those rated moderate, 19% have failed; and of those rated slight, 20% have failed. We interpret this as being due to greater design capacities in systems installed in hardpan and other soils rated severe than those in soils with slight or moderate limitations. One is tempted to conclude as others have suggested that design of the systems should not be based on percolation tests but anticipated permeability of the biochemical mat that clogs the soil interface for it develops as the limiting factor and appears independent of soil type.

In Connecticut the soil survey is now used to regulate development activities in inland wetlands. The wetlands have been defined as land classified as poorly drained, very poorly drained and alluvial by the National Cooperative Soil Survey. Since the soil survey is now used for regulatory purposes, great emphasis is now placed on mapping unit boundaries. Since the map lines are interpretative lines, we attempted to determine the degree of accuracy

by selecting 3 study **areas** in which all surveyors In Connecticut mapped independently at scales of **1:2400 and 1:12,000**. After superimposing the soil boundaries of all six surveyors we produced a composite map that delineated **areas** of undisputed wetland, undisputed upland and a disputed zone between the two. In open land the average disputed area was **12%** of the **13 acres** mapped. In wooded land the average was **14%** but the range in variability was greater. Where sharp breaks occurred in slopes, map **lines varied as** little as 10 feet. Where slopes were more gradual, **boundary** lines in both wooded and open terrain varied from 70 to **260** feet. In mapping along a transect at a scale of **1:12,000** the disputed zone was **21%** of the **total** distance of the transect. At a scale of **1:2400**, a five-fold increase in scale, the disputed zone was **20%** of the transect. The disputed zones were cumulative since 3 separate wetland areas were traversed. **Mapping** at the larger **scale** did not significantly improve accuracy of boundary placement. If great accuracy is required for **boundary** placement for regulatory purposes, it appears that boundaries must be established on the **ground** and then **transferred** to a map of appropriate scale by conventional **land** surveying techniques.

One **final** study deserves mention. Wastes are added to soil in ever increasing volumes. The biological properties of soils relative to degradation of wastes has long been ignored in soil survey interpretations. We have concluded a study that inventories **many** soil types for specific enzyme activity. As anticipated, very broad **generalization** is possible relating soil type with ability to degrade cellulose, fats, pectin, and hydrocarbon. **Drainage and pH** are somewhat correlated. **Land use** was highly correlated with **enzymatic** activity rather than soil type. As an example corn fields would provide a better medium for degradation of incorporated cellulose wastes than potato fields or pasture. Degradation of certain kinds of wastes incorporated in soil **may** be delayed if natural populations of certain enzyme producers **are** low. We are now testing to find out how long it takes for **enzyme** activity to increase to **optimum levels** once a new substrate is introduced into the soil.

REPORT OF THE CORNELL UNIVERSITY AGRICULTURAL  
EXPERIMENT STATION REPRESENTATIVE

R. W. Arnold

During the last hiennum our activities in international agriculture have increased and we are learning more about problems of other areas. Within the State the focus is shifting toward concerns of the environment as it is throughout the Northeast.

The following thesis research is annotated briefly and we would be glad to supply more information if it is of interest to you.

Daugherty, L. A. and Hanna, W. E. 1972. Landscape evolution of a glaciated upland valley in south-central New York. A joint Master's thesis, Cornell University. 247 p.

This study of a first order stream valley provides in great detail the procedures and interpretations of field surveys and samples required to establish a sequence of events affecting the evolution of the landscape. This upland valley reflects events in major through valleys including glaciation, valley filling by **solifluction**, valley cutting in progressive stages influenced by changing base levels, and minor cuts, fills and surficial erosion in the recent past.

Soil profiles related to hillslope elements and geomorphic events aid in understanding the degree of mapping unit complexity in similar areas. It was concluded that past glacial landscape unstability associated with a periglacial environment accounts for most of the soil variations in the uplands. The details of deposition and erosion of alluvial sediments are extremely complicated as indicated by more than 100 terrace **remnants** in the half-mile of stream channel. A basis for evaluating soil differences has been established which should aid in **unravelling** the landscape units in the glaciated portions of the Appalachian Plateau.

Jansen, I. J. 1972. A study of the relationship between classes of **soil** properties and soil bodies. Doctoral Thesis, Cornell University. 102 p.

A review of concepts of soil, mapping unit purity, factors determining geographic orderliness, and ways of defining soil individuals. A detailed grid sampling of a small landscape with lacustrine sediments was used to develop computer models for evaluating various class limits as they affect soil landscape units.

It was concluded that a tolerance interval procedure could be used to help characterize soil series in terms of the effects of identifiable soil forming factors and to gain insight into inclusions that occur in soil landscape units.

Kling, G. F. 1973. Relationships among soils, land use and phosphorus losses In a drainage basin in east-central New York State. Master's Thesis, Cornell University. 89 p.

Estimated phosphorus losses in the Canadarago Lake basin were compared to present cropland, cropland in capability classes 3 through 8, estimated extent of prior cropland, and prior cropland estimates for capability classes 3 through 8. It was concluded that present agriculture is not associated with mineral P loss relative to other factors, that shifts from cropland to brush may increase P losses, and that lime status of some soils may offset land use. The methodology of the study provides the basis for developing a computer model and evaluation of sediment transport which is being explored in his doctoral research.

Vann, J. R. 1973. The estimated temperatures of soil series of New York as classified in 1967. Master's Professional Paper, Cornell University. 122 p.

Develops procedures for estimating soil temperatures from climatological data and for estimating the areas of soil series by elevations using the Conservation Needs Inventory. Four soil temperature areas were established with ranges of 45-46.9 F, 47-48.9 F, 49-50.9 F, and 51-52.9 F. Within each area, temperature differences can be related to elevation. Conclusions were (1) that 20 series classified by other states but as used in New York are outside of defined temperature ranges; (2) the predominant part of 16 series classified by New York are outside of the defined range; (3) somewhat less than half of the tabulated acreage of another 35 series are possibly outside the defined temperature range; and (4) a lesser but significant acreage of 34 other series are outside of the defined range. Specific recommendations are not made, however, the study indicates concern for consideration of improved understanding of the significance of soil temperature as a taxonomic criterion and aid in soil interpretation.

Roach, J. T. 1973. Application of the Land Use Natural Resources Inventory System for water resources planning and management in the Susquehanna River basin. Master's Professional Paper, Cornell University. 141 p .

A review of the LUNR system, an evaluation of the feasibility of applying it to the river basin, and some examples of use in the basin. It is concluded that such a working inventory can assist in recording and locating resource data and is useful in developing environmental impact statements.

Abreu, R. E. 1973. Considerations for a cooperative soil survey in Venezuela. Master's Professional Paper, Cornell University. 162 p.

A review of soil survey objectives, basic concepts in pedology, soil classification, technical groupings, soil mapping and maps, interpretation, correlation, and soil surveys in relation to other surveys. This forms the basis for assessing objectives and procedures for developing a cooperative soil survey program to fit the situation in Venezuela.

Dumith M., D.A. 1973. Taxonomic considerations of some clayey soils of Venezuela. Master's Thesis, Cornell University. 139 p.

A discussion of the general characteristics of clayey soils, and the geography and soil forming factors of clayey soils in Venezuela with detailed analyses of six representative pedons. It is estimated that there are more than 5 million hectares of such soils in Venezuela. All pedons studied had lithologic **discontinuities** and despite different sediment sources have similar mineralogy including a high proportion of kaolinite that presumably is a weathering product of mica. Chromusterts occur on older geomorphic surfaces and Tropaquepts on younger surfaces.

Gonzalez \I., R. A., R. Schargel, and R. W. Arnold. 1973. Norms and specifications for soil studies of the Division of Edaphology. 35 P. A report in Spanish detailing the kinds of surveys and their requirements for soil surveys of the Ministry of Public Works in Venezuela.

Soils Related Research  
Maine Agricultural Experiment Station  
January, 1974

Soil Characterization - Chemical and Mineralogical - Erik Lotse

Activities include the following areas:

1. Spodic horizon identification
2. Semiquantitative evaluation of the mineralogy of the clay and coarse fraction
3. Thermodynamics of soil-soil solution as related to nutrient balance for potato growth
4. A quantitative description of nitrate and phosphate movement or sorption as related to soil texture

Soil Climatology - Stewart M. Goltz

This project is to evaluate soil temperature as well as other climatological features and includes:

1. Soil temperature measurements at 2, 4, 8, 20 and 40 inches
2. Soil moisture levels up to 5 bar values

Land Reclamation - Cecil Brown

A study to develop techniques of establishing a ground cover on mining spoils high in zinc, copper and manganese.

Nitrate Movement from Poultry Manures Applied to the Soil - Rupert Stafford

An evaluation of the movement of nitrates into the soil solution that includes:

1. Several rates of manure application
2. Monitor soil solution nitrate contents vertically and horizontally
3. Soils include a deep outwash and a glacial till

Forest Soils - Roland Struchtemeyer

During the summer of 1973 a study of the soils on Sugarloaf Mountain was conducted. Forty pits were

**Characterization of Maine Soil Mapping Units - Robert V. Rourke**

Characterization data is complete for the Caribou, **Conant, Perham, Daigle,** Bangor and **Dixmont** mapping units. Soil presently being characterized include the Plaisted, Croghan and **Scantic** mapping units.

A study of soil temperature in Buxton soils at a 20 inch depth is in progress.

**Nitrate Movement in Soil Solution as Influenced by a Spodic and Argillic Soil Layer - Robert V. Rourke**

This study is to evaluate the movement of nitrate from fertilizers applied to potatoes growing on a Caribou loam. Samples of the soil solution are removed from the lower spodic and in the argillic **layers.**

Report to Northeast Soil Survey Work  
Planning Conference : 1974

J. E. Foss, Dept. of Agronomy  
Md. Agricultural Exp. Station

This report summarizes the progress in various research projects that support the National Cooperative Soil Survey Program. Essentially all projects are cooperative with the Soil Conservation Service, U. S. D. A.

The following projects have been completed:

1. Site Analysis of Soils and Crops at Power Plant Sites

This was a land-use study in a 10-mile radius near two proposed power plant sites in Maryland. Aerial photographs and field investigations were used to determine present land use. Background data on soils near the sites were also obtained.

2. Tidal Marsh Soils of the Patuxent River Valley (J.C. Baxter, N.S. Program)

A study was made of the chemical, physical, and mineralogic properties of several tidal marsh soils along the Patuxent River.

3. Archeological Investigations

A study has been completed on soils occurring at the Thunderbird Archeological Site near Front Royal, Virginia. With the aid of  $^{14}\text{C}$  and archeological dating, soil development has been evaluated on soils ranging in age from 60 to 9300 years.

4. Water Table Measurements on Bertie and Mattapox Soils

Measurements of water table depth have been made on Bertie and Mattapox soils for about 6 years. These data point out the need for long-term measurements of water tables to predict their occurrence during a given year.

The following projects are in progress:

1. Yield Study of Selected Maryland Soils (C. Robinette, M.S. Program)

This study was designed to gather data on actual yields in farmer-operated fields to improve on yield predictions in soil survey reports. The data are currently being analyzed.

2. Tidal Marsh Soils of Chesapeake Bay (R. Darmody, M.S. Program)

This is a 'reconnaissance study of major tidal marsh soils in the Day area.

3. Origin of Silty Soils on the Eastern Shore of Maryland

This study has shown some evidence of loess in the Upper Eastern Shore of Maryland.

4. Computerization of Land Resource Data

A system is being developed to place soil survey information into a computer system. This system will provide rapid retrieval of soils data.'

5. Soil Survey of Washington, D.C.  
(Cooperation with National Park Service and S.C.C.)

A soil survey will be initiated of Washington, D.C. Research on methods for mapping urban areas will be conducted during the survey.

REPORT OF THE PENNSYLVANIA STATE UNIVERSITY EXPERIMENT  
STATION REPRESENTATIVE

The **present staff** in **Pennsylvania's** Basic Soils **Inventory** are --

**Dr. Roy P. Matelski**, Prof. of Soil Genesis and Morphology  
Dt. Robert L. Cunningham. **Assoc.** Prof. of Soil Genesis and **Morphology**  
Dr. Roget **Pennock**, Jr.. **Assoc. Prof.** of Soil Genesis and Morphology  
Dr. Gary W. **Petersen**, **Assoc.** Prof. of Soil Genesis and Morphology  
Dr. **Edward J. Ciolkosz**, **Asst. Prof.** of Soil Genesis and **Morphology**  
Mr. Richard M. **Pletcher**, Scientific Aide  
Hr. Albert G. Cooper, Technician  
Mrs. Beth Stover, Secretary  
Dr. Raymond **F. Shipp**, **Asst.** Prof. in Agronomy **Extension** is bringing  
the **soil** survey word to the people of Pennsylvania.

Presently there are four **M.S.** and six Ph.D. graduate assistants. Dr. Pennock returned in September 1972 after five years on the **PSU-USAID team** in India.

Since reporting in 1972 the **most** significant increase in our activities has been in remote sensing under the direction of Dr. Gary W. **Petersen**. Aircraft and spacecraft collected data is being used to make resource **inventories**, to map land use and to delineate **soil** units. **Drs. Robert L. Cunningham**, Harold L. **Mathews** and Gary W. Petersen and Purdue University associates have used multispectral remote sensing and computer techniques to map bare **soils**. This technique still needs considerable study on **soils** with different cover; Spectral reflectance curves of selected soil characterization **samples** and standard clay minerals were studied **over** the wavelength interval 0.5 to 2.6  $\mu\text{m}$ . Reflectance data indicated that clay type and **amount** of organic matter, free iron oxides, and silt influence the intensity of energy reflected by soils in this wavelength interval.

Field percolation studies in four counties in 1973 continue to **emphasize** that few Pennsylvania soils are presently suitable for septic tank drainage fields. Percolation **rates** during 1960-72 on 121 soil series varied significantly at any one site but could be explained by detailed **soil** examination. Rates **were** less than 2.5 **cm/hr.** (1.0 **in./hr.**) for **soils** other than well-drained; **more** rapid in dry summers; less in winter; slightly increased **when lime** was added.

During 1973 the participation in progress and comprehensive soil survey reviews with SCS in **28** counties indicated a need for more detailed soil information for planning and construction, and pit examination of moderately deep soils. In a mapping unit variability study of the deep well drained **Murrill** soils only 90% were well drained and 78% deep. Sampling parts of 45 series in 1973 for particle size, base saturation and epodic horizons **will** upgrade U.S. soil classification. Profiles of eight series and five strip mine spoils are being evaluated. Computer techniques **are** being developed for the storage and retrieval of soil maps and interpretive data.

Trickle irrigation greenhouse studies of a Gatesburg sand produced lower quality plants than coarser textured Incinerated anthracite refuse because of a lower oxygen supply to plant roots in the soil material. Sorting coefficients, homogeneity tests, and settling velocities of mineral grains indicated the silty soil materials of Bucks and Montgomery counties were **deposited** from air rather than water. Laboratory studies indicated that soils possess substantial but different **capabilities** to renovate acid mine drainage water. **On** a seasonal basis, perched water above a **fragipan** fluctuated with streamflow and **contributed** significantly to **streamflow** throughout the year. **Fragipan** materials can be modified (broken) and stabilized with **organic** aggregating agents with resultant increased permeability;

High clay content and a **high** proportion of expandable clay minerals in the clay are prime factors in landscape instability (landslides) in southwestern Pennsylvania. Patterned ground is extensive in the **Appalachians** and appears to be stable at the present time.

**Research** publications since the 1972 **NESSWPC** report include:

Ciolkosz, **E. J.**, R. W. Ranney, G. W. Petersen, R. L. Cunningham, R. P. **Matelski**. 1972. Characteristics, interpretations, and uses of Pennsylvania soils: Bedford County. Pa. Agr. **Exp. Sta., Prog. Rept. 323:46 pp.**

Cunningham, R. L., G. W. Petersen, E. J. Ciolkosz, R. W. Ranney, R. P. **Matelski**. 1972; Characteristics, interpretations, and uses of Pennsylvania soils: **Butler** county. Pa. **Agr. Exp. Sta., Prog. Rept. 326:57 pp.**

Cunningham, R. L., G. W. Petersen, **R. P. Matelski**, R. W. Ranney and E. J. Ciolkosa. 1972. Laboratory characterization data and field descriptions of selected Pennsylvania soils. Agronomy Series **25**. The Pennsylvania State University. 805 pp.

Petersen, **G. W.**, R. W. Ranney, E. J. Ciolkosz, R. L. Cunningham, R. P. **Matelski**. 1972. Characteristics, interpretations, and uses of Pennsylvania soils: Bucks County. Pa. Agr. Exp. Sta., Prog. Rept. **324:58 pp.**

Ranney, R. W., G. W. Petersen, R. P. **Matelski**, R. L. Cunningham, E. J. Ciolkosa. 1972. Characteristics, interpretations, and uses of Pennsylvania soils: Bradford County. Pa. Agr. **Exp. Sta., Prog. Rept. 320:65 pp.**

**Matelski**, R. P., R. L. Cunningham, G. W. Petersen and staff. 1972. Characterization data. Soil survey Dauphin County, Pennsylvania. **USDA-SCS, U.S. Govt. Printing Office.** pp. 93-100.

**Matelski**, R. P. 1973. Soils influence septic tank drainage. Invitational paper ASAE. Paper no. 73-258. Lexington, Ky. 12 PP.

**Matelski**, R. P., R. L. Cunningham, R. W. Ranney, L. J. Johnson and staff. 1973. Characterization data. **Soil** survey Fayette County, Pennsylvania. **USDA-SCS, U.S. Govt. Printing Office.** pp. **96-102.**

**Matelski, B. P., C. F. Engle, E. C. Mason** et al. 1973. Laboratory data. Soil survey Susquehanna County, Pennsylvania. USDA-SCS. U.S. Govt. Printing Office. pp. **77-84**.

Mathews, **H. L.**, R. L. Cunningham, **J. E. Cipra**, and T. R. West. 1973. Application of multispectral remote sensing to soil survey research in southeastern Pennsylvania. Soil Sci. **Soc. Amer. Proc. 37:88-93**.

Mathews, **H. L.**, R. L. Cunningham, and G. W. Petersen. 1973. Spectral reflectance of selected Pennsylvania soils. Soil Sci. **Soc. Amer. Proc. 37:421-424**.

PUBLICATIONS IN-PRESS:

Ciolkosz, E. J., G. W. Petersen, R. P. Matelski, and R. L. Cunningham. 1974. **Colluvial soils** of the unglaciated Ridge and Valley Area of Pennsylvania. Proceedings of the 1973 International Geobotany **Conference**, Univ. **Tenn.** Press.

Stout, W. L. and E. J. Ciolkosz. 1974. VAMA stabilization of fragipan material. Soil sci.

Raney, R. W., E. J. Ciolkosz, G. W. Petersen, R. P. Matelski, L. J. Johnson, and R. L. Cunningham. 1974. The **pH** base-saturation relationships in B and C horizons of Pennsylvania soils. Soil sci.

PUBLICATIONS ACCEPTED:

Ciolkosz, E. **J.**, G. W. Petersen, R. L. Cunningham, R. P. **Matelski**, and R. Pennock, Jr. 1974. Characteristics, interpretations and uses of Pennsylvania soils developed from **cherty** limestone materials. Pa. Agr. Exp. Sta., Prog. Rept.

Ciolkosz, E. J., R. L. Cunningham, G. W. Petersen, R. P. **Matelski**, and R. Pennock, Jr. 1974. Soil associations of Pennsylvania. Pa. Agr. **Exp. Sta.**, Prog. Rept.

In addition fifty informational and popular **articles** have been published. Ten research proposals have been submitted to outside funding agencies. Four have been funded.

Submitted by -- R. P. Matelski

REPORT OF THE RHODE ISLAND AGRICULTURAL  
EXPERIMENT STATION REPRESENTATIVE

W. R. Wright

This report summarizes the progress on various research projects for 1972-73 in support of the National Cooperative Soil Survey Program. Projects currently underway include:

1. Suitability of Various Taxonomic Units for Industrial Waste Disposal.

This study is designed to determine the maximum rates of Industrial organic wastes allowable on various soil types without endangering environmental quality. Preliminary experiments indicate that rates up to 50 tons per acre on deep, well-drained, silty soils are acceptable.

2. Water Table Measurements

This is a continuing study with observations currently being made on 10 different soil series. Several access pipes have been installed at each location and both solid pipes and perforated pipes have responded similarly. In addition, pipes located both in and above fragipan horizons have yielded the same data.

3. Soil Characterization Studies of Major Soil Series in Rhode Island.

Morphological, chemical, and physical analyses have been completed on 12 different soil series.

4. Genesis and Geomorphic Relationships of Fine-Textured Outwash Plain Soils.  
(T. Boylan: M.S. Program)

This study has just been initiated.

5. Soils Interpretation for Land Use Planning.

Soil overlay maps are being used to delineate zoning districts, primarily for intensity of use. This is a pilot study using South Kingstown, R.I. as a model in order to establish needs and costs of municipal sewage treatment systems.

REPORT TO NORTHEAST SOIL SURVEY WORK PLANNING CONFERENCE, 1974

R. J. Bartlett, Vermont Agricultural Experiment Station

1. Analyses of heavy metals in the **500-plus** samples collected in Vermont were continued. Copper, **zinc**, lead, manganese, iron, chromium, lithium, barium, cadmium, magnesium, calcium, and potassium were determined in hydrochloric acid and **pH 4.8 ammonium** acetate extracts. Data are being punched onto cards for statistical analysis. The objectives of this study are to determine background levels and forms of toxic elements in representative **Vermont** soils and to study chemical, physical, and biological factors that effect the nobilities of these elements in soils and their availabilities to plants; **Vermont** SCS soil scientists are helping with the sampling for the initial survey work **in** this project.

Chromium **was** singled out for more detailed study because of its apparent accumulation in spodic **horizons**, potential toxicity to plants, and its essentiality in human and animal nutrition. Plant growth studies showed the **oxidized** form to be toxic at neutral **pH's** but not in acid soils. Reduced forms were toxic only at extremely low **pH's**. Chemical transformations (oxidation-reduction and amphoteric behavior) are being studied by means of equilibration-adsorption techniques.

2. The chemical field method for identification of spodic horizons is being tested on field samples collected by SCS soil scientists. The separation of a spodic from a **cambic** horizon depends on removal of phosphorus by the soil from the solution as indicated by the absence or presence of blue-colored molybdophosphate in the filtrate.

Work is continuing on the characterization of the spodic horizon as a model or prototype of a northern acid agricultural soil. The spodic horizon expresses in extreme or **idealized** form many of the chemical properties of the later such as, **pH-dependent** cation exchange capacity, and **pH-dependent** adsorption of phosphorus, boron, and potassium.

3. Hearths or **firepits** were observed in a **2000-year-old** Indian burial ground to have colors and sequences of horizons typical of Spodosols. The **hearth** that we studied and sampled displayed Spodosol colors **in** horizons that were bowl-shaped. A light gray-colored bowl surrounded a black bowl in the center. Outside of that was a thicker yellowish-red bowl (5 **YR 4/6**) fading in color with distance to olive brown (10 **YR 5/8**) and then to the olive color of the parent material surrounding the hearth and underneath it. **Incredibly**, analyses showed that, while the **pseudo-spodic** horizon would not pass our spodic horizon test, it had many of the chemical characteristics of an **insipient** spodic horizon. (i.e., alluvial humus soluble in both acid and base, high levels of extractable aluminum and iron, release of hydroxyl by **fluoride**, and a high capacity to adsorb phosphorus.) The hearth site is on a glacial **alluvial** terrace in **Swanton**, Vermont.

4. Publications.

Field test for spodic character based on **pH-dependent** phosphorus adsorption.

R. J. Bartlett. Soil Sci. Soc. Amer. Proc. **36:642-644**, 1972.

Rapid field determination of nitrate in natural waters. T. A. Ranney and

R. J. Bartlett. Comm. in Soil Sci. and Plant Anal. **3:183-186**, 1972.

REPORT OF THE VIRGINIA

During the past year physical, chemical, and mineralogical characterization studies were greatly accelerated to establish these basic parameters for dominant soils. Specific studies are underway to determine those soils with **oxidic** mineralogy; geomorphic relationships to weatherable minerals and base exchange; distribution of soil plinthite; water table fluctuations of selected soils; soil temperature ranges.

Detailed investigations are continuing on the following projects:

1. Use of Remote Sensing in Agriculture.
2. Suitability of Soils for Septic Tanks.
3. Suitability of Soils for Sanitary Landfills.

## CONUCOS AND TATUCOS IN VENEZUELA

Richard W. Arnold, Cornell University

The landscapes of Venezuela vary from snow covered peaks to sun drenched desert dunes to dripping rainforests. Two new landscape concepts that I was introduced to while on sabbatic leave in 1972 are the title above.

Flying along the Orinoco River where it forms the boundary between Venezuela and Colombia may be "old hat" to the bush pilots but I was like a sore neck tourist. The vegetative cover is a patchwork of savannahs and dense forest with nearly bare granite knolls popping up here and there. Most villages are near the river and its many tributary streams, and always there is a quilt-patch pattern adjacent to the thatched houses. Some patches have bananas, maize, and yucca (cassava), some have scattered trees and brush, and others an older age stand of trees. Wisps of smoke bring to mind the phrases of "slash and burn" or "shifting cultivation." Here in Venezuela this system of agriculture, or at least the hand-cleared plots (often circular) are referred to as "conucos."

In our brief and very limited exposure (this forms the basis of my expertise) the soils under the rainforest near the rivers were generally Tropudults and some Haplorthoxs. The savannahs appeared to be of several kinds: (a) short grass, often wet areas with Quartzipsamments, Tropopsamments and Psammaquents; (b) anthropic or burned grasslands with scattered small trees with various plinthic subgroups of Paleudults; and (c) areas of frequent flooding with Plinthaquepts and various subgroups of Tropaquepts. The ecological balance seems to be finely attuned and a challenge for proper understanding and wise utilization.

South of Maracaibo Lake in western Venezuela is another area of humid tropics. The relief is low, flooding common, and drainage difficult and slow. Throughout much of the lower landscape there is a strange micro-relief pattern; nearly level surfaces dissected by a polygonal pattern of channels. The Inter-channel features are called "tatucos" and are outlined with channels ranging in depth from a few tens of centimeters to more than a meter. A continuum exists from areas where the channels are of minor area1 extent to where they make up most of a small landscape. Even when levelled by bulldozer and pastures are established, the "tatucos" may reform after a period of years. The initial reclamation and maintainance costs can be quite high.

Tatucos are a challenge to the pedon concept. Several that I observed may be Aeric Tropaquepts with or without vertic substrata. It is postulated that the subsoil liquifies when saturated and flows along a low gradient distributary system like tidal mud flats. The higher surface is protected by vegetation more than the developing channel. The solving of genetic hypotheses may have to await your imaginative instrumentation of this phenomenon.

Here are two concepts associated with two words. With two eyes to see, two ears to hear, and a mind to inquire; there are places to be, both far and near, to halt provincialism's quagmire.

Report on Sabbatical to University of California, Davis 1972-73

Fred P. Miller - Univ. of Maryland

Topic: Soil and Land Use Problems in California

There is no way one can generalize about California. **It** is unique in every way. Within its land mass of 100 million acres, it contains the highest (14,495 ft.) and lowest (-282 ft.) points in the **conterminous** 48 states. Its 900 mile length and 200 mile width contain **a** variety of physiographic and vegetative zones; from the desert in the south to the fog-shrouded redwood coast in the north with more than 100 inches of annual precipitation.

California is envisioned by many as an urban state. Actually, most of its land area is sparsely populated. Most of its more than 21 million people live in the L.A. - San Francisco area and the urban centers in the Great Central Valley where Sacramento, **Fresno**, and Bakersfield are major agricultural service and processing centers.

California has about 75,000 farms comprising **approximately** 35 million acres. With California's **xeric** moisture regime, irrigation is necessary for her principle high income crops where more than 7 million irrigated acres are harvested annually. It is this potential for water movement from the Sierra and Coast Range watersheds that has enabled California to open new lands and maintain its agricultural **prominence** despite large conversions of **cropland** to urbanization in the L.A. basin, Santa Clara Valley south of S.F. Bay, and Central Valley.

But this shift in land use is coming at the expense of agriculture's better soils. Many of the prime lands in the L.A. area, San Fernando and Santa Clara Valleys have been urbanized, forcing agriculture to expand into the undeveloped southwestern portion of the Central Valley. These soils commonly contain duripans and have high salt contents, often with boron concentrations above 10-50 ppm. In developing these soils for agriculture, much more energy is required for their management even though profitable yields are possible. Water must be pumped and transported further, more water is necessary to flush the soil of salts, the land must be graded and leveled, and the duripans are ripped or slip-plowed for better root penetration which requires large energy expenditures.

Furthermore, the ecosystems in which agriculture has operated are unique for the crops grown. California is the leading and/or sole producer of more than two dozen crops and agricultural products. Not only is agriculture losing some of its best soils, but also the unique ecosystems required for some crops. The Santa Clara apricot is a case in point. This particular variety had good canning qualities, but when it was grown in other ecosystems with slightly different thermal and moisture regimes, this quality and therefore, this segment of the industry was lost.

California has all but one of the orders represented in its soil resource base. One of the State's crucial environmental problems

for the future is to determine whether the State wants to or can allocate certain of these resources exclusively to agriculture. Continuous erosion of the State's soil resource base will mean greater energy, environmental, and economic costs to the consumer. In **terms** of total agricultural acreage, the census data for California shows very little change since WWII. But the shifts of agricultural acreage within the state have been tremendous costly. These changes are not reflected in this type of data. Slides were shown illustrating these and other land use problems involving the soil resource.

SOILS AND LAND USE IN IRAN:  
AN FAO/UNDP-SOIL INSTITUTE PERSPECTIVE

Gerald W. Olson\*

This paper, with selected slides (Olson, 1973). outlines the program of FAO/UNDP technical assistance in soils work in Iran, and gives some characteristics of the country. Iran, the world's oldest country, offers some **historial** perspectives which can well serve to illustrate principles of land management. As in other countries of the Middle East (Clawson, 1971). Iran has the capacity to at least triple its agricultural output in a generation--except for the severe social and institutional obstacles. Many parts of Iran supported denser populations thousands of years ago than at present; concepts of the "tragedy of the commons" are illustrated at many of the 250,000 archaeological sites (Matheson, 1973) in the country.

Much of Iran can be characterized by systems of mountains and enclosed basins (**endoreic** basins) in a " arid environment, illustrated by Figure 1. Soils are finer in texture as one moves downslope. Calcium, magnesium, and sodium chlorides predominate in the basins (Fisher, 1968); on the next higher level, sulfates of those three elements tend to accumulate; and carbonates (especially calcium carbonate) concentrate on tablelands and plateaus. Most soils are classified Fluvents, Camborthids, Haplargids, **Rendolls**, Salorthids. Natrargids, Haplaquepts, Eutrochrepts. Dystrochrepts, and Haploxerafals.

Iranians have been involved with technical assistance at least from the time of Darius (about 500 BC). When Darius built his palace at **Persepolis**, for example, workers and materials were imported from Babylonia, Lebanon, **Bactria**, Egypt, Ethiopia, **Elam**, and **Ionia**. Much traffic and ideas have spread between Europe and Asia, **down** from Russia and up from Africa, across Iran--in ancient as well as in modern times. Agriculture probably had its origins in the **Zagros** mountain areas of western Iran. In 1953, soil survey was started in Iran in irrigation project areas. For soils work, the UNDP allocation was **\$1,920,000**, with **\$1,571,230** in **cash** and **\$4,267,200** as counter-part contribution in kind from the Government of Iran. Subsequent to the initial plans of operation, large additional sums were invested in the soils programs by the government. At present, most of the soils work in Iran is done by the Soil Institute in the Ministry of Agriculture.

Work of the Soil Institute and the Food and Agriculture Organization under the United Nations Development Program is excellently summarized in the FAO terminal report and in reports on (1) soil survey, classification, and evaluation, (2) soil fertility and management, (3) water management and **soil** reclamation, and (4) laboratory services. Most of the soils work has concentrated on soil fertility research and building of physical facilities, with smaller efforts in soil survey, reclamation, conservation, and **exten-sion**. In 1970, personnel of the Soil Institute numbered **488:(1)124** technical experts, (2) 176 technicians, (3) 58 **admi s rators** and accountants, (4) 75 drivers, and (5) 55 caretakers (Soil Institute, 1971). Experiment stations and substations have **been** built in Rezayieh, Mahabad, Marageh, Tabriz, Rasht, Shahsavar, **Ghazvin**, Sanandaj, **Hamadan**, **Kermanshah**, Borojerd, Tehran, **Babol**, **Gorgan**, Mashed, **Neyshaboor**, Torbat-Heydarish, Isfahan. Abadeh. Marvdasht, **Shiraz**, Fassa, **Kerman**, Bam, and Jiroft.

Soil maps are made on air photos at **1:20,000 scale** and reduced to **1:50,000 scale** on a **planimetric** base for printing (with mimeographed reports) in editions of 50 copies, including a land **classification** map patterned after those of the U. S. Bureau of Reclamation. About five **field** parties are maintained in the different regions of Iran for periods ranging from several weeks to several months; some areas are surveyed by private consultants. Some land evaluation reports have been published at a scale of **1:250,000**, giving brief descriptions of geomorphology, climate, soils, vegetation, land use, recommended improvements, and present and potential land capability. At current stage of the work major problems are in correlation of soils and analysis (Interpretation) of data. Major opportunities for future work are in the area of soil survey Interpretations and in research relating to soil genesis and geomorphology. **Much** work will be needed in the future to coordinate soils programs of the Soil Institute with those of the universities and the extension service.

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**\*1972** Sabbatical Soils Consultant to the Food and Agriculture Organization of the United Nations and the Soil Institute of Iran; Associate Professor of Soil Science in Resource Development at Cornell University, Ithaca, New York 14850. This material was prepared upon invitation for presentation to the 1974 Northeast USA Soil Survey Work Planning Conference in New York City, 7-11 January 1974.

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**Clawson, M.** 1971. The agricultural potential of the **Middle East**. Elsevier;  
**Fisher, W. B.** 1968. The Cambridge History of Iran. Cambridge University Press;  
**Natheson, S. A.** 1973. Persia: an archaeological guide. **Noyes** Press; **Olson, C.W.** 1973. A soils consultant's photographs from Iran. FAO; Soil Institute. Bulletin 262.

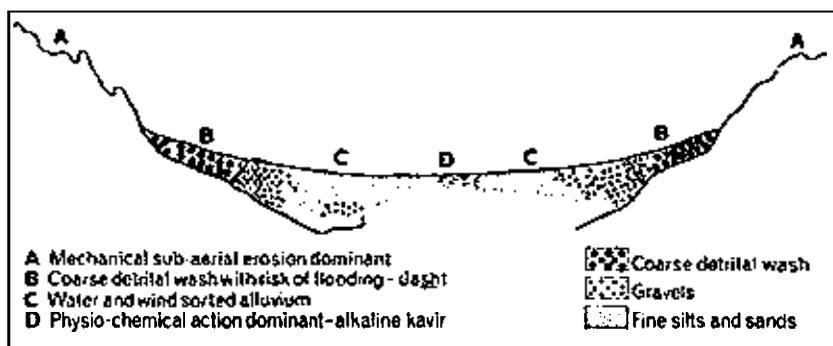


Figure 1. Cross section of endoreic basin typical of the **geomorphology** of Iran (Fisher, 1968).

ASSIGNMENT AT THE UPPER DARBY REGIONAL SOILS UNIT

R. V. ROURKR, UNIVERSITY OF MAINE

From November 1, 1972 until April 30, 1973, I was assigned to the Technical Service Center of the Soil Conservation Service at Upper Darby, Pa. During this period I was engaged in developing and utilizing existing techniques for soils interpretations, particularly as they are applied to Maine soils.

After a period of becoming acquainted with the facilities at Upper Darby, I began work to develop a method of estimating liquid limit from textural data. It is necessary to predict liquid limit values for use in Soils Form-5 when there are no values available. There is a large amount of soils data on file at the center. Some of these data presented soils texture and Atterberg Limits for the same horizon thus textural analyses using pipet and hydrometer could be compared.

Using the paired data, prediction equations for liquid limit were developed for New England and New York based upon clay values over 35% end from 18 to 34%. Other equations using clay data were developed to predict plasticity indexes. These techniques were published in: Research in the Life Sciences, Vol. 20, No 22 June 1973, University of Maine at Orono as "Predicting ranges in liquid limit and plasticity index from soils laboratory data on New England and New York soils,"

The opportunity to attend the various workshops at the Center provided considerable training and assistance in the areas of soils taxonomy, environmental evaluation and soil interpretation. All personnel at the Service Center were most helpful and made my stay pleasant and useful. It was a pleasure to work with the members of the soils unit and their assistance and constructive criticism were valuable.

I strongly recommend that further attempts be made to exchange personnel between federal and state agencies. This type of exchange leads to an appreciation of the problems of both agencies and an understanding that helps to cooperatively solve these problems.

NATIONAL COOPERATIVE SOIL SURVEY  
NORTHEAST SOIL SURVEY WORK PLANNING CONFERENCE

JANUARY 7-11, 1974

Report of Committee 8 -- Histosols and Tidal Marsh Soils

The work of this committee was divided into three subcommittees. Subcommittee 1 was concerned with various aspects of mapping tidal marshes. Subcommittee 2 explored current studies on Hydraquents and Sulfaquents in the Northeast and changes, if needed, in Soil Taxonomy. Subcommittee 3 was charged with testing of proposals presented in "Report of the National Task Force on Organic Soils," - attachment No. 2, Proceedings of 1973 National Technical Work Planning

*Identify the*  
2. *Mechanics of mapping tidal marsh areas. - problems in transportation, sampling, need for special photography (color, IR, time of the year, etc.).*

- (3.) Determine the intensity of mapping in tidal marsh areas of the Northeast.

The working material for this subcommittee is largely provided in the attachment - "Soil Survey of New Hampshire Tidal Marshes - A Progress Report" - and in the publication, "Tidal Marshes of Connecticut and Rhode Island," 1970. Hill and Shearin.

Recommendations:

1. Experience to date in the Northeast is that plant species cannot be used as an indicator of properties of tidal marsh soils except for the property of salinity.
2. Reference is made to the progress report on mapping New Hampshire tidal marshes for methods and procedures used, sampling tools, base maps, etc., for this specific project. As other states become involved in similar projects, they are encouraged to document methods, procedures, base maps used, etc., to assist in formulating operational procedures for conducting surveys on these areas.
3. Experience to date is that mapping units consisting of subgroups or phases of subgroups appear to be adequate to meet the needs of users.

Subcommittee 2

Members:

J. E. Witty, Chairman  
R. W. Arnold  
C. S. Holzhey

Subcommittee Charges:

1. Make recommendations to the Regional Committee on Soil Classification concerning changes 44X--~~needed~~ in<sup>4&</sup> Soil Taxonomy ~~as it relates to~~ Histosols, Hydraquents and Sulfaquents.
2. <sup>Review</sup> ~~List the~~ Northeast studies (~~proposed, active or completed~~) on Hydraquents and Sulfaquents. ~~Give the objectives of the studies that have not been completed and summarize the results of the studies that have been completed.~~

Recommendations:

1. Only limited information is available on Hydraquents and Sulfaquents in the Northeast. Additional study is needed to more fully characterize these soils. Until such data is available, significant contributions cannot be made to more fully develop the definitions of these subgroups in Soil Taxonomy.

2. On-going studies of tidal **marshes** in which either or both **Hydraquents** and **Sulfaquents** have been identified are being made in Delaware, Maryland and New Hampshire. A **copy** of the project work plan for Maryland is attached. A progress report for ~~the~~ New Hampshire study is also attached.

Connecticut tidal **marshes** have been **mapped** at three different scales over the past four years. Each study had different objectives.

- a. **Reconnaissance** Survey of Tidal Marshes in Connecticut and Rhode Island was published in 1970.
  - b. **Current** mapping of tidal marshes as part of the National cooperative **Soil Survey** at scale 1:15,840.
  - c. Mapping by Connecticut Department of **Environmental Protection** is currently in **progress**. Surface vegetation only is being used in the identification and delineation of the tidal marsh. The maps are used in the administration of the Tidal **Wetlands** Act **which** provides **protection** for these area.
3. The committee endorses the proposals outlined on pages 35-39 of the report of the National Task Force on Organic Soils - appendix to Proceedings of the 1973 National Technical **Work-Planning** Conference.

Subcommittee 3

Members:

R. L. Googins, Chairman  
L. J. Cotnoir  
R. P. Matelski  
De Von Nelson  
L. Kick  
M. Markley

Subcommittee Charges:

1. Review assumptions concerning the "Suitability Grouping of Organic Soils for Agriculture" to determine if the assumptions are meaningful and complete.
2. <sup>and evaluate</sup> Test <sup>and evaluate</sup> "Suitability Grouping of Organic Soils", ~~by using it to group to Northeast Histosols to determine if the groupings are realistic and suggest changes as needed. This may require additions or deletions of certain considered soil features, adjusting penalty factors, etc.~~
3. Test "Development Difficulty Rating" for the unreclaimed Histosols.
4. Test usefulness and accuracy of "Guide Sheets" and determine if practical to prepare "Guide Sheets" for other crops.
5. Test "Use Potential Groups for Forestry."
6. Test the "penalty value approach" for rating soils for engineering uses.

NATIONAL COOPERATIVE SOIL SURVEY

Northeast Regional Conference Proceedings

New York City, New York  
January 17-20, 1972

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**PROCEEDINGS OF THE  
NORTHEAST COOPERATIVE  
SOIL SURVEY  
WORK-PLANNING CONFERENCE**

U. S. DEPARTMENT OF AGRICULTURE

NEW YORK CITY

JAN. 17-20, 1972

UNITED STATES DEPARTMENT OF AGRICULTURE  
Soil Conservation Service  
Federal Building, Room 300, San Francisco, California 94104

March 24, 1972

RE: 1972 Northeast Soil Survey and  
Planning Conference

TO: Recipients of Proceedings

The enclosed is a report of the proceedings, January 17, 1972, at the Hotel New Yorker.

The Executive Committee warmly thanks to the invited speakers, and staff, from participating programs, the members of the participating State Soil Survey Agencies, U. S. Geological Survey, Mr. Jerome A. Beckwith, SSS, and Dr. Donald H. Johnson, Penn State University. Mr. Seldon L. Cline made a fine presentation on the subject "A Framework Plan for Soil and Water Conservation for a Better America," and the soil survey related to the plan. Mr. William K. Cressman was unable to be with us due to last minute travel problems.

Committee chairman and members are commended for their efforts and contributions in developing some excellent meeting reports. Dr. Gerry D. Hanson's committee report on "Environmental Soil Science" is so valuable that only a brief summary is provided in these proceedings.

The 1972 program provided the brief reports from representatives of Agricultural Experiment Stations and other organizations. These reports are intended to serve as a basis for forwarding all cooperation of current soil science work in the region. Written reports received as of this date are included in these proceedings.

Elected to the position of Vice-Chairman for the 1976 Conference are Mr. Bruce D. Watson, SSS, Washington, Vermont, and Dr. D. L. Gardner, Department of Agronomy,



NATIONAL COOPERATIVE SOIL SURVEY  
NORTHEAST SOIL SURVEY WORK PLANNING CONFERENCE  
January 17 - 20, 1972  
New York City

C O N T E N T S

Agenda

Participants

Minutes of Business Meeting

Committee Reports

1. Environmental Soil Science
2. Soil Survey Interpretations
3. Handling Soil Survey Data by Use of Electronic Equipment
4. Forest Soils
5. Miscellaneous Land Types and Soil Materials
6. Climate in Relation to Soil Classification and Interpretations
7. Soil Family Criteria
8. Histosols and Tidal Marsh Soils
9. Benchmark Soils, Technical Soil Monographs, and Soil Survey Laboratory Investigations

Other Reports

Agricultural Experiment Station Representatives

Maine Soil and Water Conservation Commission

Agenda

NORTHEAST SOIL SURVEY WORK PLANNING CONFERENCE  
January 17 - 20, 1972  
New York City

Monday - January 17

1.00 - 1.30 p.m.	Announcements and Opening Business
1.30 - 2.00 p.m.	A Progress Report of Soil Survey ADP Projects in Washington and Other Current Topics William M. Johnson
2.00 - 3.30 p.m.	Meeting of Committees 1, 2, 3, 4
3.30 - 5.00 p.m.	Meeting of Committees 5, 6, 7, 8, 3

Tuesday - January 18

8.30 - 9.00 a.m.	Business Meeting Report of Nominating Committee
9.00 - 10.00 a.m.	Report of National Committee Meeting Dr. John Foss
10.00 - 12.00 M	Reports of Committees 1, 2
1.00 - 5.00 p.m.	Reports of Committees 3, 4, 5

Wednesday - January 19

8.30 - 12.00 M	Reports of Committees 6, 7, 8, 9
1.00 - 1.30 p.m.	Report of Soil Mineralogy Group Leon J. Johnson
1.30 - 2.30 p.m.	Urban Geology Program Dr. John Hack
2.30 - 3.30 p.m.	Waste Water Renovation Potential of Connecticut Soils Dr. David Hill
3.30 - 5.00 p.m.	Use of High Altitude Photography and Report of Development of the Advanced Mapping System (AMS) by the Cartographic Division Jerome A. Gockowski

Thursday - January 20

8.30 - 9.30 a.m.	<b>Experiment Station Representatives'</b> Progress Report on Soil Survey <b>Research</b>
9.30 - 10.30 a.m.	<b>Group Discussion</b> <b>Subjects of Regional Interest</b>
10.30 - 11.00 a.m.	<b>Management Looks at Soil Survey</b> Selden L. Tinsley
11.00 - 12.00 M	<b>Experiment Station Representatives'</b> Progress Report on Soil Survey <b>Research - (Continued)</b> (To include reports by Walter H. Lyford and Joe Kubota)
1.00 - 2.00 p.m.	Progress <b>Report (Continued)</b>
2.00 - 2.15 p.m.	<b>Report of Soil Research Committee</b>
2.15 - 2.30 p.m.	<b>Concluding Statements</b> John D. Rourke

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New York City January 17 - 20, 1972

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\* Not present for conference

**NORTHEAST SOIL SURVEY WORK PLANNING CONFERENCE**  
**January 17 - 20, 1972**

**Business Meeting Notes**

Tuesday, January 18, 1972

The meeting was called to order at 8.30 a.m by Chairman

REPORT OF COMMITTEE 1  
ON ENVIRONMENTAL SOIL SCIENCE  
TO THE NORTHEAST SOIL SURVEY WORK PLANNING CONFERENCE  
OF THE COOPERATIVE SOIL SURVEY  
JANUARY 17-20, 1972  
NEW YORK CITY

A response  
to charges including pedological aspects of  
environmental quality, herbicides,  
hydrology, organic waste breakdown,  
and pesticides

R. Berdanier	G. W. Olson (Chairman)
E. J. Ciolkosz	G. G. Pohlman
D. S. Fanning	c. A. Reynolds
D. E. Hill	L. Rivera
N. Holowaychuk	J. D. Rourke
J. Kubota	E. J. Rubins
F. W. Loughry	R. Shields (Vice Chairman)
M. Markley	R. M. Weaver
R. P. Matelski	M.E. Weeks
F. P. Miller	

This introduction and summary deals briefly with the contents of the 271 pages of Cornell Agronomy Mimeo 72-1, which brings together responses of individual members of Committee 1 on Environmental Soil Science to the following charges:

1. Prepare a literature review on information as to how degradation rates of pesticides and herbicides may be affected by the various soil properties that are used to define soils in the cooperative soil survey.
2. Survey the research work involving environmental quality at each institution (Land-Grant) within the region and summarize those activities that are related to pedology.
3. The regional committee is encouraged to isolate soil properties that influence soil behavior in organic waste breakdown. Preliminary guidelines for rating soil behavior may be attempted .
4. Survey research in hydrology and integrate this work with soil survey activities
5. In addition, the committee is encouraged to participate with the Northeast regional work group (Cooperative State Research Service). The committee report should include studies and findings of that group that are useful in soil survey work.

## REPORT OF COMMITTEE 1 (CONTINUED)

Each committee member was asked to respond to these charges from the point-of-view of his own interest and geographic area. Neither the chairman nor the committee members had any input into the preparation of the charges. In view of the overwhelming magnitude of the charges outlined, member response was remarkably constructive. Very little duplication in lists of references was observed in the responses received. Committee member responses and lists of references are reproduced on pages 5-68 of Cornell Agronomy Mimeo 72-1. The contents of the entire 271 pages of Cornell Agronomy Mimeo 72-1 can be considered to be a first approximation of a survey of work in progress in the areas outlined.

The Current Research Information System of the Cooperative State Research Service was employed to give computer printouts of progress reports and selected references. The information requested was narrowed down to a review of work in progress on degradation rates of pesticides and herbicide!; in specific ~~pesticides~~

NATIONAL COOPERATIVE SOIL SURVEY  
NORTHEAST SOIL SURVEY WORK PLANNING CONFERENCE  
JANUARY 17-20, 1972  
REPORT OF COMMITTEE ON SOIL SURVEY INTERPRETATIONS

INTRODUCTION

In an attempt to reduce the committee's workload to a more manageable level from the ten original charges, charges 2a, 2b, 2d, 2f, and 2g were eliminated for the following reasons:

Charge 2a (permeability) - this has been reviewed over the years by the regional and national soil moisture committees. Classes and possible combinations of classes will be indicated in the new revision of the Soil Survey Manual.

Charge 2b (potential frost action) and Charge 2g (sanitary landfill) - we cover these estimates in connection with a review of Charge No. 1 concerning the "Guides for Engineering Uses of Soils".

Charge 2d (subsidence) and Charge 2f (dispersion); criteria for these two properties, while interesting to work on, will probably not have the same degree of importance in the Northeast as in other areas of the country.

Charge 1 - Review and Test the Revised "Guide for Interpreting Engineering Uses of Soils."

The subcommittee assigned to this charge expressed a basic philosophy of concern over the depth requirements of many land use problems which are being interpreted from soil surveys. The non-agricultural interpretations and the land use decisions based upon them, involve essentially information related to a depth of approximately five to six feet. This is appropriate since soil scientists generally do not investigate below this depth in the normal soil survey. However, the subcommittee felt that soil scientists must come to grips with the many soil-related problems within and below the five to six foot depth if soil survey interpretations are to be instrumental in upgrading land use decisions and environmental quality.

While respecting that these deeper land use problems are often germane to other disciplines, the fact remains that many of these land use decisions are made without prior inquiry or on-site investigations. Furthermore, soil survey interpretations have been and are being used beyond their depth capability, thus reducing the degree of confidence associated with such interpretations. Of course, there are the appropriate disclaimer clauses and warnings in the written material, but these are often ignored except when they are pointed out in a court case. It is recognized that soil surveys are substituted for on-site investigations for specific purposes despite the clearly written forward which restricts the use to which the surveys can be put. For many non-agricultural land-use decisions, the truly limiting factors are below the zone where soil scientists concentrate their efforts in soil classification. This raises the question of extending the soil series control section to include more of the underlying or parent material to increase the capability to properly interpret the different kinds of soil. For soil conditions well below present investigative depths, a coordinated effort between soil scientists and geologists could result in probability statements that would strengthen the credibility of interpretations based upon the soil survey (see Charge No. 4)

Recommendation: The subcommittee members involved in the charge stated above were essentially unanimous in their opinion that the "Guide for Interpreting Engineering Uses of Soils", unedited revised draft, February 1971, should be reproduced as soon as possible in sufficient quantity for optimum trial and field use.

It was recognized that this guide was actually begun in 1965 and that the current draft already represented a series of approximations. Many of the committee members have had an integral part in the development and review at different stages. It was further recognized that criteria for a national guide of this nature, for a country with as diverse conditions as the U.S., would be difficult to develop that would satisfy everyone in all respects.

The following comments on specific parts of the guide were made with constructive criticism in mind for future revisions as the criteria involved in this final draft receives extensive field use and testing. A summary of the substantive comments are as follows:

1. The general instructions should be clarified to point out more specifically that the typifying (or representative) profile of the official series description is used to select depth ranges (or layers) for column 4 of Table A - Estimated Engineering Properties of Soils. Columns 5 through 13 particularly, would indicate ranges of properties for the taxonomic unit, and in no case would the ranges indicated overlap the parameters of the current series concept. In a specific soil survey area, the representative profile and ranges should reflect the concept in that area.
2. There was a definite consensus that the "depth to (seasonal high) water table" criteria used in Tables 3, 4, and 7 involving septic tank absorption fields, sewage lagoons, and sanitary landfills (trench type) were not compatible with soil drainage classes. Further, there was agreement that attempting to use the "high water table" criteria without relating it to drainage classes was an unrealistic procedure in the humid eastern part of the country. It is recognized that the criteria for slight limitations for a seasonal water table of no higher than four feet below the tile trench at all times for absorption fields refers to standards set up in the Manual of Septic Tank Practice of the Department of Health, Education and Welfare. While this depth would certainly be desirable in all cases, it just is not practical to relate all soils, as mapped, to this criteria. Except for a very few soils that are essentially excessively or somewhat excessively drained, most of the humid soils (well drained or otherwise) will have a seasonal water table within 40 - 48" of the surface for a long enough time to be a problem. This would mean that practically all of the soils in the Northeast would have severe limitations for septic tank absorption systems, sewage lagoons, and sanitary landfills (trench type). While the fact is not questioned that a seasonal water table within six feet of the surface is detrimental, the wisdom of assigning most of these soils to a severe class with no distinction in regard to the degree of the problem is questioned. The implication that soils rated as having a slight limitation have high water tables below 5 - 6 feet is just not correct. There is no point in having criteria that indicates a reliability unattainable in rating our soils.

The criteria of "depth to water table" and "soil drainage class" are just not compatible under sanitary landfills (trench type). Either one or the other should be used, not both.

Recommendation: It is recommended that soil drainage classes for the Northeast as noted on page 19 for septic tank absorption fields be adopted.

3. The slope ranges indicated for criteria for sanitary landfills (trench type) seem too high (15-25%) in regard to the moderate limitations. A practical trench width for filling on slopes approaching 25% would result in excessive depth on the upper side and a shallow berm on the lower side. Slope ranges of 8 to 15% are used for the moderate limitation in the Northeast.
4. There is some difficulty with the criteria for permeability as it is expressed in the guide for sanitary landfills (trench type). As defined, the limiting permeability would be for the most permeable layer below the A horizon. This could result in a severe rating for soils with moderately rapid permeability in the subsoil and slow permeability in the underlying material where the trench floor would be assumed to occur.
5. Some committee members pointed out a few errors in USDA textures and Unified symbols in Table A in relation to the estimates of particle size passing sieves. If these points have not already been corrected, it is assumed that, since the guide will be released in loose-leaf form, it can be done at a later date.
6. One of the subcommittee members pointed out that the format of Table B - Interpretations of Engineering Properties - was not necessarily fixed as indicated by the footnote on the table itself.

The narrative concerning Table B indicated an alternative placement for columns 2 through 7 in a table related to community development or town and country planning. This footnote on the table should be cross-referenced to the narrative to bring out this fact since many people prefer this type of organization over the sample in Table B in the guide.

Charge 2c - Allowable Soil Pressure:

The committee agreed that quantitative estimates of allowable soil pressure should not be used due to the paucity of data which is essential to a basic understanding of the factors influencing this soil property, but it was agreed that we must improve our interpretations regarding this soil property.

It was suggested that a high level seminar or workshop of engineers and soil scientists be convened for the purpose of discussing soil properties and devising methods of accumulating data that would allow soil scientists to interpret soil pressure tolerances. Reference was made to the split barrel tube method of data acquisition used in Ohio, which is a modification of the B. K. Houghs method. It was also suggested that there should be some direction at the national level to direct the accumulation of data that could be used to make usable observations or interpretations.

In an attempt to make an interpretation of this soil property, several members attempted to generalize a rating system from the AASHO and Unified systems. The Unified system was chosen because it was easier to get clean breaks between classes. Three categories, or ratings, of allowable soil pressure were proposed. The ratings are listed in Table 1 of the Appendix, relating the three categories to the Unified classification groups and the California Bearing Ratio ranges.

There was some comment on the term "T0 585.84 Td (sona)Tj n60132 Tw 03Tr ( c-8424 Td (sy

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prepared for the "General Soil Map of the U.S." compiled to a scale of 1:1x10<sup>6</sup>. Most units of this map are associations of phases of subgroups. Soil properties used to differentiate phases are slope, texture, and stoniness. Suitability ratings are given for tilled crops, pasture, tree fruits, and wood crops. Degrees of limitations are stated for foundations, shallow excavations, and septic tank filter fields. The general soil map and Interpretations may prove useful for broad planning at a state, regional, or national level, but are limited for planning at lower levels because of the scale of the map and the generality of the interpretations.

The recently published soil survey of Addison county, Vermont, has an

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who are involved in resource planning and development. watersheds, river basins, etc. Workshops of this type have been conducted in the Western and Southern regions and there is definitely a need in the Northeast for such training. Perhaps the Regional Technical Service Centers could designate one person to provide assistance to soil scientists in the preparation of maps, legends, and interpretations.

A handbook for soil survey interpretations is presently being developed by S.C.S. personnel in Washington. The outline suggested by this committee in 1970 and included in Appendix 1 of the 1971 National Conference proceedings provided for a chapter dealing with soil survey interpretations for small-scale maps.

Recommendation: The committee again recommends that such a chapter provide the guidelines needed by soil scientists and others.

#### Charge 4 - Promoting Cooperation with Geologists:

The subcommittee assigned to this charge also discussed the problem of making soil survey interpretations beyond the depth of the soil and beyond the depth of the data contained in the soil survey. This is the same concern expressed by the subcommittee assigned to charge No. 1, i.e., if soil scientists are to be helpful in this arena, their cooperation with other disciplines, such as geology, is necessary.

In analyzing those areas where geologists and soil scientists have, or should have, mutual interest, the committee suggested the following activities which could enhance cooperation between the two disciplines:

#### Activities of Mutual Interest

1. Statewide forum of earth scientists to better coordinate and understand each other's work.
2. Work together on educational activities and courses for the public and officials, as well as college and secondary level students.
3. Develop informational bulletins, manuals, and the like on "How to do it ---". These could be related to environmental problems and could tie in with state and federal agencies and colleges.
4. Cooperate on related research such as water regimes, percolation studies that are correlated with soil series, erosion and sediment studies, etc.
5. Joint publications of mutual interest.
6. Contributions by geologists to manuscripts for published soil surveys.
7. Team efforts on interpretations that go beyond the depth to which we ordinarily classify the soils. This would involve sanitary landfill and similar uses.

The committee suggested meetings and field trips of mutual interest to the two disciplines.

1. Committee members stressed the need to have geologists and other technical people in related fields participate in the annual soil survey work planning conference. They should be encouraged to make an input into the annual plan of operations.
2. Field soil scientists should contact local geologists who work in their area to inform them of available soil surveys and solicit their participation in soil tours and conferences. They should be made a part of the planning committee and program where appropriate.
3. Soil scientists should attend regional meetings of the geological society such as Northeast Intercollegiate Geology Conference. Geologists should also be encouraged and personally invited to attend regional soil science society functions.
4. Geologists should be invited to attend initial and final field reviews and also progress reviews where they can make an input on the geology and geomorphic relationships. All participants will profit from this type of nose-to-nose relationship.
5. Soil scientists and geologists should co-sponsor seminars on topics of mutual interest to key people and officials of governmental units.
6. Soil scientists and geologists should present papers of mutual interest at each other's professional meetings.

The following societies and organizations were suggested as potential cooperating personnel:

1. Geological Society of America (N.E. Section)
2. Friends of the Pleistocene
3. American Geographers
4. U.S. Geological Survey
5. State Geological Survey
6. Department of Transportation, Bureau of Soil Mechanics
7. American Quaternary Association
8. State highway departments (most have geologists on their staff).
9. State and Federal agencies whose staffs include geologists.
10. Consulting engineering firms and their societies.

In addition to the aforementioned suggestions and recommendations, the committee further suggests that:

1. Geologists should be consulted when planning soil characterization studies so as to assure a coordinated effort in the study of soil and geology. Geologists can contribute substantially to geomorphic studies.

2. Soil scientists should encourage geology students to use soil survey information in their studies and investigations. Many of them will pass the word along after they have a favorable experience and realize the value of detailed soil survey data in surficial geology studies and the like.

Recommendation: It is recommended that the committee be continued.

**COMMITTEE MEMBERSHIP:**

R. Arnold  
H. H. Bailey  
F. W. Cleveland  
R. L. Cunningham  
R. E. Daniell, Advisor  
R. L. Gogins, Advisor  
G. J. Latshaw  
H. I. Peterson  
R. W. Ranney  
C. A. Reynolds  
R. M. Smith  
W. A. van Eck  
B. Watson  
L. E. Garland, Vice-Chairman  
F. P. Miller, Chairman

APPENDIX

-Table 1-

Rating of Allowable Soil Pressures for Soils

<u>RATING FOR ALLOWABLE SOIL PRESSURE</u> <u>(Load Supporting Capacity)*</u>	<u>CALIFORNIA</u> <u>BEARING</u> <u>RATIO</u>	<u>UNIFIED SOIL</u> <u>CLASSIFICATION</u> <u>GROUPS</u>
High (will likely provide good support for roads and structures.)	> 20	GW GP GM GC SW SM (if relatively low in fines and well-graded sands)
Medium (special precautions in con- struction may be necessary to insure good support for roads and structures)	8-20	SM (if relatively high in fine and/or poorly- graded sands)  SP SC ML } CL } 70% passing No. 200 sieve
Low (will likely provide poor support for roads and struc- tures unless expensive coun- termeasures are taken)	< 8	ML } CL } < 70% passing No. 200 sieve OH OL CH MH

\* If the soil is poorly drained, the allowable soil pressure rating should be placed one class lower than indicated by the Unified soil classification group.

## Reference No. 2

### Background Information on Landslides and Soil Movement

A landslide is the perceptible downward sliding or falling of a relatively dry mass of earth, rock, or mixture of the two. Sharpe speaks about five classes: slump, debris slide, debris fall, rockslide, and rockfall. Flows, in contrast to slides, have more water and are often referred to as earthflow, mudflow, and debris avalanche. Major concern for soil survey in the Northeast involves mostly the earthy materials although some areas have rockslides.

#### 1. Basic or passive conditions favoring landslides and some earthflow:

- A. Lithologic - presence of inherently weak formations such as leached and decomposed clayey rocks or shales, combustible materials, unconsolidated materials such as sands, silts, clays, etc.
- B. Stratigraphic - alteration of permeable and impermeable layers or presence of silty or clayey layers or impermeable rock.
- C. Structural - beds dipping at angles up to angle of repose of materials, fractured or jointed material (rock or soil permitting entrance of water).
- D. Topographic - geomorphic or landscape position such as cliffs or steep slopes, terrace faces, gullied land--caused by erosion, faulting, folding, artificially steepened, previous slides.
- E. Organic - absence of good vegetative cover, deforestation, overgrazed, cultivation, fires.

#### II. Active or initiating causes.

- A. Removal of support - (1) Natural - including erosion to oversteepen, previous overflow of materials, softening of layers, solution or weathering. (2) Human - oversteepen or undermine by excavation for various reasons: i.e., quarries, roads, etc.
- B. Overloading - (1) Natural - other landslides or flow, saturation with water. (2) Human - dump of waste material or filling - quarries, roadfills, etc., building houses, roads, etc., upslope.
- C. Reduction of friction - (1) Natural - water, lubrication of slip planes by floods, storms, removal of vegetation, etc.; softening of unconsolidated material or weak rock by percolation. (2) Human - interruption of drainage, leakage from impoundments, removal of vegetation.
- D. Reduction of cohesion - desiccation and disturbance of "set" of clays.

- E. Earth vibrations - natural, earthquakes or human activities -- blasting, trains.
- F. Prying or wedging action - (1) Natural - mostly physical weathering or events. (2) Human - addition of water.

III. Same factors affecting susceptibility to sliding or flowing are:

- A. Texture of earthy material - In general silts tend to be more susceptible; they hold and transmit water which decreases internal friction.
- B. Stratification of materials of differing permeability - often a judgment not included in description of soil profile but of general geologic knowledge of the area.
  - 1) unconsolidated materials - many glacial deposits
  - 2) unconsolidated over less permeable bedrock therefore includes depth of soil
- C. Permeability of soil or earthy materials - includes also concept of infiltration of surficial soil and possibly erosiveness.
- D. Slope of area - related to angle of repose or susceptibility to removal of support -- perhaps need to indicate different slope values for kinds of deposits.
- E. Shrink-swell potentials - 254-si Tc 25tec
- F.
- G.
- H.

KEY FOR SUSCEPTIBILITY OF LANDSCAPE AREAS TO MASS MOVEMENT

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	<u>Landscape slope<sup>1</sup></u>	<u>Permeability<sup>2</sup> contrast</u>	<u>Texture (below 1 meter)</u>	<u>Shrink-swell potential</u>	<u>Susceptibility</u>	
Map unit	Nearly level (0-8%)				LOW	
				Coarse	Low	
		Weak	Medium		Low	
	Sloping (8-15%) (15-25%)	Weak		Fine	Low-Moderate	Moderate
					High	High
			Medium			Moderate
		Strong				Moderate
					Coarse	Low
			Weak	Medium		Moderate
	Steep (>25%) (includes shoulder area)	Weak		Fine	Low-Moderate	High
					High	Very High
			Medium			High
Strong					High	

<sup>1</sup> Length of slope (natural or as result of cutting) appears to be important in deciding potential damage or hindrance due to mass movements. Should probably be handled on an individual basis.

<sup>2</sup> If permeability contrast can be adequately defined so that thickness of deposits, internally or overlying bedrock, can be itemized, then this type of approach might work. Special cases likely will have to be footnoted or described in more detail where not included as part of setting of a soil.



Parameters used in key for "susceptibility of landscape areas to mass movement."

Landscape slope. All soil materials are subject to movement and all soils are subject to accelerated movement if they occur on slopes greater than their angle of repose, and water often runs off or is subject to lateral movement which may affect lubrication, et cetera, of soil materials. The length of slope, whether in a natural state or resulting from manipulation, such as cutting, is probably important in assessing potential damage or hindrance due to mass movements as they relate to associated land use. This aspect should be evaluated on an individual need basis.

Nearly level and gently sloping (0-8%) - slope limits assigned to mapping units may differ slightly from these.

Sloping (8-15% (15-25%)) size of area and complexity of slopes vary but likely can be handled together. For some soils or in some areas it may be important to subdivide this class for improved interpretation.

Steep (>25%) the shoulder associated with a marked increase of slope is included in all cases but is probably more important with the steeper slopes.

Permeability contrast (primarily below depth of 1 meter). The concept of moisture regimes or movement is often difficult to evaluate. The geologic and geomorphic setting of a soil may assist in making sense of these judgments.

Weak - stratification of materials within 1 to 6 meters does not differ by more than one permeability class. Relatively homogeneous material such as sands, gravels, silts, tills, alluvium, some residuum.

Medium - stratified materials within 1 to 6 meters

National Cooperative Soil Survey  
Northeast Regional-Soil Survey Work **Planning**  
Conference, January 17-20, 1972

Report Of **Committee 3**, Handling Soil Survey Data  
by Use of Electronic Equipment

As directed by the Handling of Soil Survey Data **Committee** of the 1971 National Technical Work Planning Conference, the Northeast Regional Executive **Committee** gave the following charges to **Committee 3**:

1. Survey the "se of ADP at state and regional levels.
2. Evaluate the coding system for **pedon** data and evaluate other parts of the soil data system as they are developed.
3. Suggest additional practical uses of ADP in the handling of soil survey data,

The survey contained in the first charge was conducted by sending requests for information to each experiment station and Soil Conservation Service state office in the Northeast Region and to all members of the **committee**. Information received is **summarized** in Appendix I.

Several states stated interest and intent to cooperate in the "se of the Pedon Data and other systems when operable but could not evaluate the systems at this time. **Comments** received relating to the second charge are given in Appendix II.

Comments received concerning additional uses of ADP in handling soil survey data are given in Appendix III.

The **committee** made the following **recommendations**:

1. That current progress in Pedon Data and other systems be made available to states and cooperating agencies.
2. That more effort and resources be expended to create operational programs.
3. That the **committee** be continued.

**Committee Members**

**Chairman** - J. M. Allen \*

Vice-Chairman - G. W. Peterson

Membership - M. G. **Cline**

L. J. Cotnoir

J. E. Foss \*

R. Hutchins \*

J. Kubota

R. L. Marshall \*

D. E. **Petry**

J. F. **Tedrow**

\* Present at **committee** session

APPENDIX I - Survey of the States of the Northeast Region on their Progress Using Electronic Equipment

State or Agency

Use of Electronic Equipment in:

Soil Survey Activities

Other Activities in Soil Science

Connecticut

Electronic representation of soil map permitting subdivision of the base map into study areas. System provides for storage of one other resource map to give overlay potential. Interpretive information stored in data bank to allow presentation of requested information in tabular or map form. All mapping units used in state with some interpretations in storage. Input sheets for most interpretive material for technical guides on input forms. Soil map for one tom in storage.

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Delaware

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Kentucky

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Some use of Woodland Data System-Site Index.

Maine

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Maryland

Cooperative project initiated to place land resource information in a computer system. Will provide rapid retrieval of information on acreage and characteristics of soil mapping units on a county or state-wide basis. Baltimore County Planning Board is active in the above project.

Using ADP systems in research projects for statistical analysis, i.e. using environmental variable to obtain yield predictions for various soils.

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Massachusetts

Interpretations for recreational land use  
stored for 1600 map units. Input data  
sheets completed for other non-farm and  
for agronomic interpretations completed  
for the above units. Anticipate tabular  
material for technical guides.

New Hampshire

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New **Jersey**

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planning reports based on soil map data stored in data bank. Being used by Bucks County Planning board. Optical scanning work by University of Pennsylvania in cooperation with AEC.

Rhode island	Preparing input sheets relating soil interpretations to mapping units, anticipating tabular material for technical guides, special reports and resource planning reports based on stored soil map. Interested in map overlay potential for analysis of problem areas.	-- -- --
<b>Vermont</b>	— — —	-- -- --
Virginia	No present use. Preliminary plans to digitize soil lab data and environmental data.	-- -- --
West Virginia	-- -- --	-- -- --
Regional SCS Office	ADP center and Soil Survey Unit progressing with completion of <b>programming</b> to enable relation and recall of stored soil survey information (soil map and soil <b>interpretations</b> ) to provide printouts of tabular or map material for resource planning, special reports, and technical guides (SPIT). Using ADP to provide printouts of soil series classification and status of soil series descriptions. Bell Research Laboratories of Union, N.J., preparing input of soil and geologic data for selecting <b>communication</b> equipment (wave guide) right-of-way.	-- -- --

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## APPENDIX II

### Evaluation of ADP Subsystems

#### Virginia

There is **considerable** concern by research workers on the laboratory data (SL) coding inputs **currently** being utilized. These concerns might be broken down as follows:

- a) Clearly designating between estimated values and actual laboratory data and the number of **pedons** tested. Providing method to remove estimated data values as laboratory data are obtained.
- b) Referral to type of analytical procedures employed should be made. For example, in Particle Size Distribution was the hydrometer or pipette system used? Many areas still use the hydrometer method **and** have good data, but the type of method should be designated in order to **integrate results** of different systems. A similar analogy is applicable for chemical analyses.
- c) There should be an open input in the program as new data are obtained. Updated compilations and actual changes in series name resulting from laboratory data inputs should be adequately **provided** for. Systems to relate previous series or variant names **and** the related previously accumulated data with the names should be provided in the system.
- d) Attention might be directed towards a compatible pedon description format that could be easily and directly coded for ADP. Otherwise, significant **meaning** in the soil description may be discarded or misinterpreted by a coder.

#### Soil Conservation Service Regional Center

SCD coding system evaluation

- A. "Proposed Coding System for the **Pedon** Data (PD) for the National Cooperative Soil Survey" dated December 1968:
  1. Appears to be complete and detailed (excellent guide for systems analyst work).
  2. The proposed coding formats (Figures 1 through 4) are of poor design (very error prone to code and process).
  3. Proposed National Form for "single sheet" soil interpretation by series.
    - a. Advantages
      1. Standardized format
      2. Promotes coordinated data
      3. Handles most (about 95 percent?) needs of user
      4. "Eliminates" coding of data by user
      5. Speeds reproduction of current coordinated data for **taxonomic** concepts
      6. Source of coordinated data for other computer programs.
    - b. Disadvantages
      1. Time consuming to submit data
      2. Inefficient to keypunch and verify input data
      3. **Increases** the likelihood of keypunch errors

4. Allows for inconsistencies in filling out input data
5. Repetition of data entries
6. Limited space for filling in data for complexed soil conditions.

B. Soil Series Classification (SC) Subsystem and Status of Series.

1. National (SCS, Washington, D.C.). The Soil Classification (SC) subsystem has met primary needs. However, regionally it was necessary to develop the Status of Series file to provide the additional information essential to operations below the national level.

The National SC subsystem provides data on soil series as follows: series name, responsible region and state, status of series (i.e. established, tentative, inactive, etc.), placement of series to the family level, and status of placement.

2. The Northeast Regional Soil Classification and Status of Series files, in addition to that provided by the SC subsystem, also provides the following: Northeastern states using series (including the soils that are the responsibility of other regions and states), and the **current status of descriptions** including the type or stage (eg. "Blue," "Yellow," "Revised--HYCA," "initial," or "Old Format") and date.

## APPENDIX III

### Additional **Uses** of **ADP** in the Handling of Soil survey **Data**

#### Connecticut

Use of Army "**Toposcan**" system to generate plates for printing of colored maps for soil interpretations.

#### Kentucky

Formulate a program to allow for a cross-matching between the USDA textural, the Unified, and the AASHO, as to textures and the several engineering interpretations derived from them.

#### Pennsylvania

The **subsystems** of soil interpretations (SI) and cartographic soil data (SSP) need to be programed so soil interpretive maps can be printed.

#### Virginia

**Initiate** a basic information program for field soil scientists on ADF.

#### Soil Conservation Service Regional Center

Correlation Work. Develop computer capabilities to select soils with similarities to assist during review and updating of standard survey descriptions and their **differentiae** for closely related and competing soils.

Greater accomplishments could be made if state, regional, and national resources were better evaluated and pooled. Equipment ("hardware") needs are far less critical than programming ("software") needs. The past and present efforts have been poorly coordinated and as a result fragmentation in the initial application of computers in the field of soil science has not advanced as rapidly as needed.

More potential users should be involved in the brain-storming, and planning in the future uses of ADP at local, state, regional and national levels to improve coordination and reduce inefficient and fragmented applications of ADP. At that point, we could all appreciate the tremendous asset of having operational, user orientated programs in stimulating other uses of the computer in our field.

#### COMMITTEE 4 - FOREST SOILS

**This** report is submitted in three sections:

- (1) Discussion at the general session
- (2) **Recommendations**
- (3) Committee working report

#### GENERAL DISCUSSION

About 60 percent of the Northeast is forested, and about three-fourths of the privately owned forested land in the United **States are** located in the East. **Thus**, forested areas rate much attention from soil scientists on the basis of size alone.

**The** inventory of the kinds of soil surveys being conducted on extensive forested areas of the Northeast showed that there is little difference in legend **design** between forested areas and open land.

For detailed soil surveys, a scale of **1:20,000** is favored. **This** scale allows use of mapping units which are dominantly phases of series. Thus, the mapping units can be interpreted with a good degree of precision for several uses in addition to, but including, woodland management.

From the discussion, it was evident that in some areas the "agricultural bias" still prevails among soil scientists. **There** is the attitude that a forested area is going to remain as forested land, and a lower degree of precision than that used in **open** land is good enough. Part of this attitude is the opinion that the degree of precision attained in mapping open land is not attainable in forested land. **The committee** assumes that somewhat different techniques need to be applied in mapping in forest. Once proper techniques, such as leaf-off photography, stereoscopic study before, during, and after the field work, and good control of direction and distance during traverses are adopted, precision in establishing soil boundaries and in describing mapping units will be equal regardless of kind of cover.

Some discussion involved the idea that mapping units in forest areas may need to reflect surface conditions even more precisely than in open areas. **Thus**, surface organic accumulation, surface structure, and consistence may be parameters that would not be needed in mapping open land. These features could well be mapped at a scale of **1:20,000**, and would be of value to forest managers.

Use of general soil maps was not discussed. **They** would have the same application in forest that they have in open areas in that they can be of value as tools in broad planning. Such a general soil map has been **made** of the White Mountain National Forest of New Hampshire at a scale of about **1:253,400**. Mapping units are broad associations of series

stratified by depositional units and soil depth. A general soil map of the Adirondacks is being constructed using fifteen minute quadrangle **USGS** maps, scale **1:62,500**. Units are broad associations of series stratified in much the same way as the White Mountain map, with depositional units and soil depths the main parameters. **This** map is a stop-gap measure, and will be used as a tool by the Adirondack Park Agency.

These **general** maps do not permit interpretation in the degree of precision needed by managers of individual holdings or operating units. **They** have some use in helping set broad priorities within large areas.

The properties of soils in forested areas which affect structures such as buildings and roads, and waste disposal, are the same as in open land. Interpretations should therefore follow the guidelines now being used in published reports. Forested areas are being considered as sites for disposal of organic wastes such as sewage sludge and for sewage effluent as a cheaper substitute for tertiary treatment.

#### RECOMMENDATIONS

1. Examine and key out forested areas that can justify inventory or publishing at a scale of **1:20,000**. The decision of scale should preferably be made at the initial stages of legend design.
2. Provide guidelines for the design of mapping units that meet the needs of extensive vs. intensive forested areas.
3. The Committee should continue examining the development of interpretative guidelines that fit the map units.
4. **The Committee** should ~~concentrate~~

COMMITTEE WORKING REPORT

Charge 1 - Make an inventory of the kinds of soil surveys being conducted on extensive forested areas of the Northeast.

**This** was accomplished.

The best conclusion that can be drawn from this phase of the Committee's work was made by Ohio. "In Ohio, **we** have used the same intensity of soil surveys in the extensive forested areas (mostly Southern and Eastern Ohio) as in areas that are not forested. We have discussed this question at length when the legends were developed, and concluded that although much of the area was not intensively managed at that time, quite likely much of it would be at some time during the useful life of the survey. Such intensive management in the future is likely to include forestry management, as well as other kinds of land uses".

Charge 2 - Provide guidelines for the design and map scale of soil surveys in extensive forested areas that meet the needs of land managers.

The **summary** of the results from a questionnaire answering eleven questions is attached.

It will take about 19 years to complete the **28,550,000** acres of forested land remaining to be inventoried. It is obvious that some inventory procedures, other than that being used on agricultural land, must be considered. Although there is no conclusive **consensus** on best procedures there is foundation to say that procedures used on agricultural land are not the best to use on forested land. For example, the majority of map scales reported being used is **1:15,840**, but in answer to what is the best scale, the answer is **1:20,000**.

Therefore, the conclusion from the data collected for Charge #1 is not substantiated by questions and answers for Charge #2. It is concluded that guidelines for the design and map scale, different from agricultural land, **are needed** for forested areas.

Charge 3 - Provide guides for the format and kinds of soil interpretations to accompany the soil maps.

This **charge** was not examined in detail, we did explore the kinds of **interpretations** needed.

**FOREST LAND AREAS IN NORTHEAST UNITED STATES**

STATE	TOTAL AREA (1,000 acres)	FOREST LAND (1,000 acres)	PERCENT FOREST LAND
<b>Elaine</b>	21,258	17,425	82
New Hampshire	5,955	5,019	84
Vermont	6,150	3,730	61
Massachusetts	5,284	3,288	62
<b>Connecticut</b>	3 , 2 0 6	1,990	62
Rhode Island	<b>777</b>	434	56
New York	31,729	14,450	45
Pennsylvania	29,013	15,186	53
New Jersey	5,015	2,229	44
Maryland	8,769	2,920	43
Delaware	1,316	392	29

Over  $\frac{3}{4}$  of private forest land is in the East.

The results of our questionnaire concerning forest soil inventories are, as **expected**, most interesting and throw a good deal of light on some dark corners. **These** findings are presented below with apparent influences and conclusions.

1. How many acres of forested land remain to be inventoried in your State?

The total (no data from Rhode Island, Connecticut, New Jersey, and New York) acreage is 28,550,000. This is indicative of the great size and importance of the job ahead and reason enough for the existence of this Committee.

2. With present way of doing inventories, how long will it take to finish these acres?

This question is based on A staffing, as is, projection. With A high of 33 years and a low of 7 years of States responding, there is an Average of about 19 years. The new attention being given to comprehensive Regional planning, based on A consideration of land facts, puts this comfortably slow Approach in new perspective.

3. Are procedures used on agricultural land the best to use on forested land?

Of the eleven States responding, eight considered these procedures not the best And three believe them still the best. There are more than 2 to 1 against a one technique Approach to survey.

4. What are the best procedures?

While there is no consensus in particular procedures, there is common direction in the State offerings as listed below.

A. Design legend and mapping procedures to fit needs of survey. Mapping procedures to include strong reliance on photo interpretation, transects, and correlating soil patterns to landscape.

b. Leaf-off photography.

c. Recent air photos, ATV equipment, transects, and strong photo interpretations.

d. Develop efficient, well coordinated survey program.

There are then sound suggestions for accomplishing this large job in a timely manner.

5. What is the best scale and intensity?

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7. If answer is no to "5, what do you suggest as a substitute?

Pew answered no. one suggested no change from usage. Another suggested that simplified maps be made from more detailed maps or that interpretation maps be made from detailed maps. This is predicated on the presence of detailed surveys, a condition not existing in most situations.

8. What are critical Forest interpretations in the Northeast?

- a. Species adaptation to specific soil conditions; especially of species not now present.
- b. Relating site index to volume yield and to quality of yield (productivity).
- c. Effects of TM harvest practices on soils.
- d. Effects of spraying sewage effluent on growth and soils.
- e. Erosion hazard - as related to road construction.
- f. Equipment limitation - as related to road construction.
- g. Seedling mortality.
- h. Quantitative interpretations for soil-water relations - all needed for watershed evaluation, recreation, engineering (sewage) and timber management.
- i. Recreation.
- j. Wind throw, hazard.

9. What present interpretations are least critical?

Replies were scattered all over the target. Those given are:

Windthrow hazard  
 Planting  
 Wildlife  
 Erosion hazard  
 Seedling mortality  
 Plant competition

With no consensus on any item at this point, the question needs discussion and possibly should be stricken.

10. What new interpretations are needed in the Northeast?

- a. Trees- and shrubs for shade and **ornamentals** by series.
- b. Pest and disease hazards.
- c. Those which would **relate to** recreation development involving wildlife and water for recreation purposes.
- d. For renovating sewage effluent from secondary treatment plants.
- e. Soil **compaction** in recreation areas as **it** affects run-off and water quality in a watershed.
- f. Soil - Water.
- g. **Site** index or productivity by species by soils.

11. Considering everything, what is needed to get useful soils information to best use?

- a. State **forestry** organizations need to utilize available soils data.
- b. **Closer liaison between** forestry research and soil scientists. **Research plans need** to use soils data in all stages so that results are most **useful** to soils and foresters.
- c. Accelerate soil mapping and public involvement so that our work is fully used.
- d. **Need** quality surveys of forested lands and more **meaningful** interpretations for **multiple** uses. **This** can only be done through research and rapport among SS, foresters, and others.
- e. Go for as much detail in maps and interpretations as is possible.
- f. **Better communications between** soils people and landowners, college administrators (**policy makers**), to **sell** real soil-tree relationships, as **the demand** for soils **information** is small.
- g. **Money** to hire more soil scientists to do the **job** to meet **potential use**.
- h. Efficient, well coordinated **effort** of all agencies and groups **gain**

i. Interpretations for sewage handling; timber management (clear-cutting); recreation use, especially recreational complexes relating to sewage disposal, water quality, camp and picnic sites.

j. A detailed soil survey supplemented with general soil maps of about 1" per mile.

KINDS OF FOREST SOIL SURVEYS MADE IN NORTHEAST

State	Map Scale	Indicated Intensity (High, Low, etc.)	Legend Design	Kind of Interpretations	Years(s) Conducted	How Many Of This Kind?
Connecticut	1:15,840	Medium	Series, types and phases. Based on soil and topography - not cover rough & less valuable lands often mapped with complexes.	Land capability, woodland suitability, recreation, wildlife and engineering.	20	70% of State mapped.
Delaware	1:15,840	Medium	Series, types, phases	Land capability, woodland suitability, recreation, wildlife and engineering	World War II to the present	25 (part of these are in Maryland)
Maine	1:15,840 1:20,000	Medium	Series, types, phases - similar to non-forested	L.U.C., woodland suit, Recreation, Wildlife, Engineering	1961 1969	8 1
Maryland (Garrett Co.)	1:15,840	Militarian Conservation (SCS)	<ol style="list-style-type: none"> <li>1. Series and types recognized.</li> <li>2. Similar materials mapped as a group and designated by a single number.</li> <li>3. 17 groups (12 tillable and 5 non-tillable (too stony)).</li> </ol>	Land capability	1944-1950	1
Garrett Co.	1:15,840	Medium, converted to Soil Conservation Survey	<ol style="list-style-type: none"> <li>1. Series, types, phases</li> <li>2. Considerable remapping and field checking for complexes, etc.</li> <li>3. More detail added in many places.</li> </ol>	Land capability, woodland suitability, recreation, wildlife and engineering	1950 to the present	1
Counties other than Garrett	1:15,840	Medium	<ol style="list-style-type: none"> <li>1. Series, types, phases</li> </ol>	Land capability, woodland suitability, recreation, wildlife and engineering	World War II to the present	25 (part of these are in Delaware)
Massachusetts	1:15,840	Medium	Series, types, phases - same as in cleared land	All kinds	Since 1947	All 2 Pub. SGI of State mapped

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KINDS OF FOREST SOIL SURVEYS MADE IN NORTHEAST

State	Map Scale	Indicated Intensity (High, Low, etc.)	Legend Design	Kind of Interpretations	Years(s) Conducted	How Many Of This Kind?
New Hampshire (White Mountain National Forest)	1:253,440	General (Prepared by USFS)	Association of soil series and miscellaneous land types	Recreation, wildlife, engineering, water, and woodland productivity	1	1
	1:15,840	Low (Prepared jointly by USFS, N.H. Agricultural Experiment Station and SCS)	Mapping units consisting dominantly of associations (single taxa), undifferentiated groups, and miscellaneous land types	Not developed as yet but legend designed to provide interpretations for forestry uses.	2	1
	1:15,840	Medium (Prepared by N.H. Agricultural Experiment Station and SCS)	Mapping units consisting dominantly of phases of soil types, complexes, undifferentiated groups, variants and miscellaneous land types.	Recreation, wildlife, engineering, woodland productivity, woodland management and runoff potential	23	1
New Jersey		(ABOUT THE SAME AS PENNSYLVANIA)				
New York	1:15,840 & 20,000	Medium and low  (See attached writeup of Cattaraugus, Ulster, and Warren Counties.)	1. Series and phases (medium) 2. Associations, etc. (low)		7	3
Ohio	1:15,840	Medium	Consistent with non-forested areas	Complete forest and non-forest and farm interpretations	7	6
Pennsylvania	1:15,840 (1:20,000 in Cameron and Elk Counties)	Medium	1. Series, phase, slope 2. Uses same mapping techniques as in cleared areas	Engineering, community development, recreation, cropland, wildlife and woodland	7	Entire State (75% complete)
Rhode Island		(NO INFORMATION)				

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KINDS OF FOREST SOIL SURVEYS MADE IN NORTHEAST

State	Scale (High, Low, etc.)	Legend Design	Kind of Interpretations	Years(s) Conducted	For Many Of This Kind?
Vermont	1:15,840	Standard, detailed legend by soil series and mapping units.	By mapping units. (See attached example soil interpretation sheet)	In progress	Entire State in progress. One county published and two counties completed.
	1:63,360 1"=1 mile or 1:126,720	Series and associations of series	See attached, table on back side of Chittenden County map. By series.	State map in progress	Completed for all 14 counties. One done for K&D project.

NATIONAL COOPERATIVE SOIL SURVEY  
NORTHEAST SOIL SURVEY WORK PLANNING CONFERENCE  
REPORT OF COMMITTEE ON MISCELLANEOUS LAND TYPES AND SOIL MATERIALS

The charges to this committee were: (1) to obtain more soil descriptions before and after mechanical alteration, (2) to continue studying the classification and naming of soils that have been altered or placed into a miscellaneous land type, and (3) to develop a check list that might be used in preparing specifications for particular uses of topsoil. Additional soil descriptions before and after mechanical alteration have not been made in the Northeast since 1970. A number of descriptions and laboratory data from ~~1964-68~~

would be required to include characteristics such as texture, drainage, slope, stoniness, etc. It seems doubtful that the time and effort to further delineate some of these soils is justified, and the further classification of a variable unit would be of questionable value. It was also pointed out in the discussion, that it would seem inadvisable to unnecessarily complicate the terminology of such land types as borrow pits, tidal marsh, etc. to the user of soil surveys.

The purpose of having miscellaneous land types was to map those areas that (1) had been altered, (2) no natural soil existed, or (3) were too inaccessible to be mapped in detail. For example, soils of the tidal marsh have not been mapped in any great detail, but the unit "tidal marsh" has been mapped quite accurately and is informative for a variety of interpretations. If these areas were mapped into the classification system as (1) fine silty, mixed, mesic or (2) Aqualfs, this further classification might not provide as much information as simply designating these areas as "Tidal Marsh". This same argument can be used for some undifferentiated alluvial soils. The landscape position, as indicated in the miscellaneous land types such as alluvial or tidal marsh, is probably more informative than texture, mineralogy, or temperature regime.

It seems, therefore, that further classification of present miscellaneous land types should be evaluated on an individual basis, rather than making a blanket deletion of 50% of these land types. The criteria for deciding on a miscellaneous land type or soil unit should be (1) select the most informative unit (2) insure accuracy of classification, and (3) select the unit which can be best evaluated for interpretations of potential use.

In a vote of 29 to 1, the participants suggested that in naming miscellaneous land types, terms above the series level (e.g. family, great group. or order) should not be used. It was generally felt that some miscellaneous land types like tidal marsh and borrow pit would be more meaningful and useful to the users than would classifying them into the higher categories. Thus, more study seems to be in order before accepting the definition of miscellaneous land types and eliminating some useful mapping units.

The committee made a listing of criteria for the evaluation of topsoil. The criteria included the following:

Texture	Source Areas
Coarse fragment	Thickness of suitable material
Organic matter	Nature of underlying material
Exch. Na.	Slope
Total Salts	Wetness
Available Nutrients	Danger of pollution

The extreme variability of topsoil throughout the country will probably preclude the development of a standardized listing for all areas.

#### COMMITTEE MEMBERS

J.E. Foss, Chairman	R.P. Matelski
R.C. Hutchins, Vice Chairman	J.J. Noll
R.L. Googins, Advisor	E.J. Rubins
W. Holowaychuk	R.M. Smith
F.G. Loughry, Advisor	M. Stevens
M.L. Markley	S.J. Zayach

NATIONAL COOPERATIVE SOIL SURVEY  
NORTHEAST SOIL SURVEY WORK PLANNING CONFERENCE

January 17-20, 1972

New York City

REPORT OF COMMITTEE 6  
CLIMATE IN RELATION TO  
SOIL CLASSIFICATION AND INTERPRETATIONS

The charges to this committee were:

1. Develop a soil temperature form for the Northeast and coordinate soil temperature studies in the region.
2. Develop prescribed procedures for temperature measurements as well as minimum frequency of measurements. Also, determine the most suitable and economical methods of measuring soil temperature.
3. Review the Appendix to the 1971 Report of National Committee 9.
4. Develop proposals for the kinds of soil moisture data that are most needed for soil survey purposes in the Northeast and consider developing standardized methods for obtaining these data including water table data.

Each member of this committee was assigned to work on a specific charge and the following individuals were chairmen of the different subcommittees.

Charge 1 - Gary Petersen  
Charge 2 - Harry Bailey  
Charge 4 - Walter Lyford

All members of the committee were to respond to charge 3 as they wished.

CHARGE 1

Gary Petersen and his subcommittee developed a soil temperature form and it is a part of this report. The committee recommends that the states that have some yearly records should test the form to determine its suitability. Kentucky has about four years of records of soil temperature at 20 inches at their weather stations. Their use and testing of the form would be greatly appreciated. One member of this subcommittee proposed that a regional publication be prepared on soil temperature data and the methodology. This suggestion should be discussed and an evaluation be made of the usefulness and expense of this type of publication.

Each state in the Northeast Region was solicited for an approximation of the Frigid, Mesic, and Thermic soil temperature lines within their state. The enclosed map illustrates the approximate zones or boundaries of the Frigid, Mesic, and Thermic classes. The lines are generalized from a larger scale state map, but provide a general picture of the location of these classes. The states with more than one soil temperature class undoubtedly will need to give more attention to initiating appropriate soil temperature studies. In some states soil series have been correlated outside of their family temperature class. These correlation problems need to be considered along with proposed locations of soil temperature stations.

### CHARGE 2

Harry Bailey and his subcommittee evaluated the procedures for soil temperature measurements and the frequency of measurements and their conclusions follow.

In overall summary it appears that daily readings from fixed thermometers are desired. This provides a continuous record for a specific soil site. An additional advantage exists if the soil thermometers can be installed at weather stations, provided the site is acceptable and representative. In this situation the climatic data enhances the soil temperature study and permits additional predictions and interpretations. The Palmer Number B26824 thermo-probe has been used effectively in permanent soil temperature sites, but other instrumentation also could be substituted.

The experience in Kentucky has been with Max-Min thermometers at both 4" and 20" depth read on a once-a-day basis. The 4" depth is being used for crop protection type services and is apparently a valuable daily reading. The 20" depth seems to be quite acceptable where seasonal values are concerned.

In many soil survey areas an expensive and time-consuming project may not be justified. The following quote from the 1970 Committee 6 report seems appropriate once again.

"If a soil temperature project is undertaken it should be designed so that it is not so sophisticated and detailed that it will be excessively costly and time consuming. Relatively simple instrumentation is essential in order for a large number of sites to be installed and easily measured. Insofar as possible, people outside of soil survey should be involved such as weather observers and private citizens.

The frequency of readings needed to accomplish the objectives of a soil temperature project should be tested as yearly records become available. Initial studies and comparisons in one state indicate that determination of the mean annual temperature on the basis of only four readings a year gives a significantly higher reading than when the mean annual temperature is determined from monthly, weekly, or daily readings. The 4 readings a year gave a higher reading by 3 degrees than did daily readings."

Where permanent expensive installations are not justified then an ordinary bucket auger and an inexpensive soil thermometer (\$6.00 - \$9.00) are adequate during the normal course of a soil *survey* for a selected array of soils at slated intervals. The minimum frequency of measurements is difficult to standardize because of variable soil moisture regimes and other soil-related factors. One committee member observed on the basis of some of his work that (1) for excessively and well drained soils the readings should be at intervals closer than once-a-month, and (2) on poorly and very poorly drained soils the once-a-month readings apparently are satisfactory. This also has been confirmed to some extent in Vermont where several years records indicate that the mean annual soil temperature based on once-a-month readings varied as much as 3 degrees from the once-a-day or once-a-week.

Obviously additional work needs to be done in different states to determine the minimum frequency of readings, but the material provided by Franklin Newhall may provide a new insight into the desired frequency of readings. His discussion and findings are included in this report on the page titled "Estimated Mean Annual Soil Temperature From Selected Daily Observations—Ames, Iowa." The author states that the table titled "Guidance for Standard Deviation of Mean Annual Soil Temperature" is a start toward answering the question of how frequently soil temperatures should be sampled. Consideration should be given to how well the Ames variance will match the location sample variance for an area such as the Northeast Region.

In addition to auger borings for obtaining soil temperature readings, a small hole can be opened to 20 inches with a trowel spade and the thermometer can be inserted into the side of the hole at 20 inches. This also can be done during the preparation of field profile descriptions. Although a continuous record is not provided for a specific site a large collection of data can be obtained during a field season or during a soil survey for a county. The soil temperature can be compared as can other parameters of the soil from one part of a county or state to another part for different periods of the year. This can help establish soil temperature zones and the temperature regime for different soils within a county or state. This data along with other observations on texture, moisture regime, and other factors can provide a better basis for interpretations of soils for crops and other uses.

Other means of estimating the mean annual soil temperature are provided in the Soil Taxonomy of the National Cooperative Soil Survey and the publication SCS TP-144, Soil Temperature Regimes - Their Characteristics and Predictability; and, therefore, will not be repeated here.

In conclusion, the procedures and the minimum number of soil temperature readings will depend on the resources available, the soils involved, and the precision that is needed.

Recommendation: Kentucky should analyze their long term soil temperature data to determine the variance in NAST within Kentucky and other areas of similar climate.

### CHARGE 3

A number of the members of this committee responded regarding the Appendix to the 1971 Report of the National Committee 9. They felt the material contained therein was complete, but that additional emphasis needed to be given to relationships between soils and the landscape configuration. Also, the 1971 report recommended dropping the soil drainage classes. Some members of this committee would disagree with that recommendation, and they are pleased that the outline for this chapter in the new soil survey manual defines seven soil drainage classes based partly on soil color patterns.

An outline of the proposed chapter on soil moisture for the soil survey manual was provided to each member of the committee prior to the conference to provide a basis for discussion and suggestions on content.

### CHARGE 4

A lengthy discussion was held regarding this charge and the following recommendations were proposed,

Recommendation 1 - Laboratory measurements for soil moisture parameters are well standardized and should be continued wherever possible. Laboratory measurements provide no quantitative data about seasonal changes in soil moisture or depth to water table. These are the parameters that we need more of to adequately predict soil water status and to interpret soil surveys.

Recommendation 2 - Methods to obtain the seasonal march of soil moisture on different landscapes and the depth to water table are needed, and they should be standardized insofar as possible. Recommend that additional information be collected on duration, frequency, and seasonal change in soil moisture status. Models of seasonal fluctuation of soil moisture status and depth to water table should be developed based perhaps on rainfall and air temperature. Research projects may be needed to provide additional data.

2a - Suggested that seasonal march of soil moisture be obtained by use of a neutron probe, perhaps at depths of 12, 24, 36, 48 and 60 inches; and that measurements be made at weekly intervals. Particular attention should be paid to those times of the year when the soil is at or near field capacity and wilting point so that field and laboratory measurements can be related.

2b - Suggested on the basis of several past studies that water table be measured only by use of tubes open at lower end (piezometer) and that adjacent tubes be used at depths of 1.5, 3.0, 5.0, and 7.5 feet.

Recommendation 3 - Future soil moisture status and water table studies should consider the total landscape and geographic

Committee Members

\* B.G. Watson, Chairman  
D.S. Fanning, V. Chairman  
\* H.H. Bailey, Advisor  
\* L.E. Garland  
\* W. Lyford  
\* F.P. Miller  
F. Newhall, Advisor  
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D.E. Pettry, Advisor  
S. Pilgrim  
L. Rivera  
\* R.V. Rourke  
\* R.M. Smith  
W. van Eck  
M.E. Weeks

\* Present at committee meeting

## Estimating Mean Annual Soil Temperature

From Selected Daily Observations - Ames, Iowa

In a permanent installation where soil temperature is read continuously or daily it is usual to determine the average annual soil temperature by averaging all the readings. The mean of a series of average annual soil temperature then becomes the mean annual soil temperature (MAST). For other places it has been suggested that MAST could be estimated by analyzing a few (two or more per year) equally spaced observations of the soil temperature at 50 cm depth taken over one or several years. What follows is a quantification, for Ames, Iowa, of the above suggestion.

The best, one-site published record of Ames daily soil temperature at 50 cm depth, runs from mid-1949 to mid-1964 for readings made at noon. This gives 14 full calendar years, 1950 through 1963, which were used. Values were read for 3 dates, the 5th, 15th and 25th for each month of record giving 504 daily values. Also for each month the average of all the daily values was read.

In the analysis, the entire set of daily values was examined eight times. For the 14 years of record estimates of MAST were made, 1 per year, using 36 (all) equally spaced dates, 2 per year each using 18 equally spaced dates and so on, down to 18 per year each using 2 equally spaced dates. The sample standard deviations (SD) about the overall mean were

While the SD's and examples above show the rather low variability of MAST, they do not provide a very good method for determining the value of MAST. It would be better to not assume that population SD is known and to sample over two or more years. Guidance for such sampling could be provided by a table based on the Ames variances, see below. The argument in the left column is N, the number of years to be sampled. The argument in the top row is K, the number of equally spaced dates used to get a sample average annual soil temperature for each year. The entries in the table are the SD's of MAST corresponding to each combination of N and K.

Guidance for Standard Deviation of Mean Annual Soil Temperature

<u>K</u>	365	36	18	12	9	6	4	3	2
N									
2	.96	.97	.98	1.05	1.13	1.26	1.52	1.78	2.04
3	.66	.68	.69	.74	.80	.89	1.08	1.26	1.44
4	.55	.56	.57	.60	.65	.73	.88	1.03	1.17
6	.43	.43	.44	.47	.51	.56	.68	.80	.91
8	.36	.36	.37	.40	.43	.48	.58	.67	.77
10	.32	.32	.33	.35	.38	.42	.51	.59	.68
15	.26	.26	.26	.28	.30	.34	.41	.48	.54
20	.22	.22	.23	.24	.26	.29	.35	.41	.47

To use this table select the precision with which MAST is to be determined, then choose which combination of N and K gives the most feasible program of sampling. Example: Suppose MAST is to be determined within  $\pm 1.5^{\circ}\text{F}$ , with a probability of .90. Then SD of MAST must be  $.91^{\circ}\text{F}$ . Read the following combinations: 3 years sampling of 6 or more dates per year; 4 years of 4 dates, 5 years of 3 dates, 6 years of 2 dates.

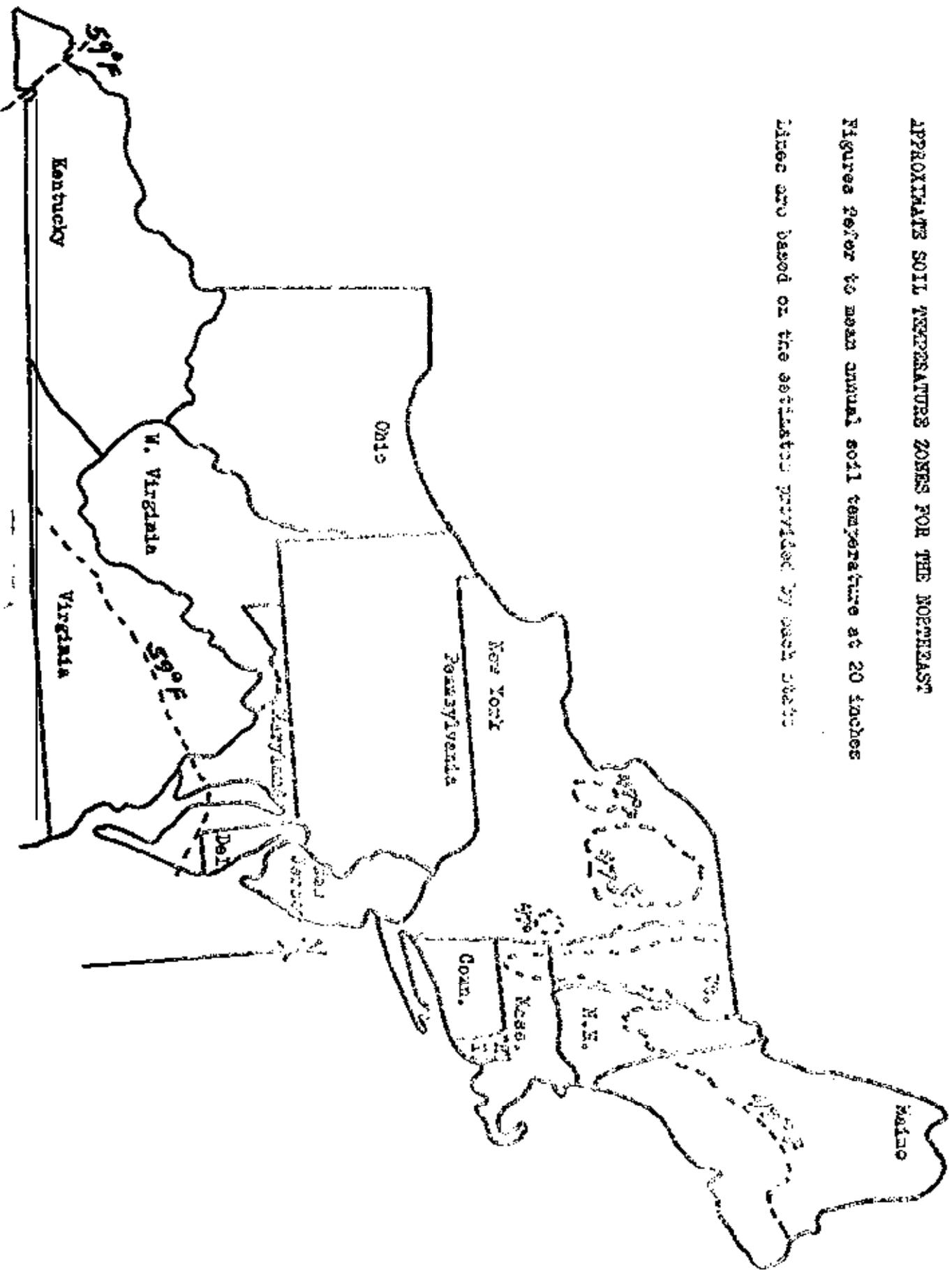
The actual results of sampling will depend on how well the given Ames variance matches the location sample variance. Probably in the Northeast Region the variance would be less than in the Midwest and the precision of estimated MAST



APPROXIMATE SOIL TEMPERATURE ZONES FOR THE NORTHEAST

Figures refer to mean annual soil temperature at 20 inches

lines are based on the altitudes provided by each state



NATIONAL COOPERATIVE SOIL SURVEY  
NORTHEAST SOIL SURVEY WORK PLANNING CONFERENCE

JANUARY 17-20, 1972

Report of the Committee on Soil Family Criteria

The national committee believed that any attempt to develop **major** changes  
**in** soil family criteria at this stage in the development of **Soi**



COMPARISON OF SOILS FROM TILL AND OIJTWASH

Typic Dystrochrepts; loamy-skeletal, mixed, mesic (from New York guide sheets and Broome County Report)

	<u>Rooting depth</u>	Avail. water	<u>Filter field A slopes</u>	<u>Low bldgs.</u>	<u>B level corn 0-5% 5-15%</u>	<u>Gravel source</u>
<b>Outwash</b>						
Chenango	48"+	3.8"	slight	slight	100 90	good
Tunkhannock	48"+	4.2"	slight	slight	- -	good
<b>Drift or till</b>						
Oquaga	26"	3.4"	severe	severe	75 75	unsuitable
Manlius	28"	2.1"	severe	severe	- -	unsuitable

(from Genesee County Report)

	<u>B level corn</u>	cap. class	<u>Woodland</u>	<u>Highway location</u>	<u>Homesites and properties</u>
Chenango 0-3%	90	Is	6	No adverse	slight
3-8%	90	IIe2	6	cond.	slight
8-15%	70	IIIe2	6	"	slight
Manlius -					
3-8%	75	IIIs1	11	Shallow to	moderate
8-15%	60	IIIe7	11	rock	moderate

Typic Dystrochrepts; coarse-loamy, mixed, mesic (from Broome County Report)

	<u>Cap.</u>	<u>Woodland</u>	<u>B level corn</u>	<u>Granular material</u>
Braceville (outwash)	IIw1	1	100	good
Bath (till)	IIe2	2	80	unsuitable
Culvers (till)	IIe2	2	80	unsuitable

59

Following is a listing of families with members having a wide range of properties making interpretations as a unit, a problem.

1. Families with wide drainage class ranges
  - a. **Aeric** Haplaquepts; coarse-loamy, mixed, **nonacid**, mesic  
Massena - somewhat poorly drained  
Sun - poorly and very poorly drained
  - b. **Aeric** Haplaquepts; fine-loamy, mixed, **nonacid**, mesic  
Kendaia - somewhat poorly drained  
Atherton - poorly and very poorly drained
  - c. **Aeric** Haplaquepts; fine, **illitic**, acid, mesic  
Hornell - somewhat poor to moderately well drained  
Allis - poorly to somewhat poorly drained
  - d. Typic Fragiocrepts; coarse-loamy, **mixed**, **mesic**  
Sodus - well drained  
Ira - moderately well drained
  - e. Udollic Ochraqualfs; fine-loamy, mixed, mesic  
Manheim - somewhat poorly drained  
Ilion - poorly drained
  - f. **Glossoboric** Hapludalfs; fine-loamy, mixed, mesic  
Honeoye - well drained  
Lima - moderately well drained
  - g. Typic Fragiudults; fine-loamy, mixed, mesic  
Annandale - well drained  
Califon - moderately well and somewhat poorly drained
  - h. **Arenic** Hapludults; loamy, mixed, mesic  
Pemberton - moderately well drained  
Tinton - well drained to excessively drained
2. Families containing till, **outwash** and residual material
  - a. Typic Dystrochrepts; loamy-skeletal, mixed, mesic  
Chenango - outwash  
Manlius - till  
Berks - weathered from shale  
Parker - weathered from **granitic gneiss**

2. b. Typic Dystrochrepts; coarse-loamy, mixed, mesic  
Riverhead - **outwash** or lacustrine  
Lordstown - moderately deep till  
Valois - deep till
  - c. Typic Haplorthods; sandy-skeletal, mixed, frigid  
Colton - **outwash**  
Hermon - till
  - d. Entic Haplorthods; sandy-skeletal, mixed, mesic  
Hinckley - **outwash**  
Gloucester - till
  - a. Glossoboric Hapludalfs; fine-loamy, mixed, mesic  
Wampsvi 1 le - **outwash**  
Honeoye - deep till  
Wassaic - moderately deep till
3. Families containing lacustrine and till
  - a. **Aeric** Haplaqueptsj coarse-loamy, mixed, mesic  
Lamson - lacustrine  
Sun - till
  - b. Typic Fragiochrepts; coarse-silty, mixed, mesic  
Williamson - lacustrine  
Canaseraga - silts **over** till
  - c. **Aeric** Ochraqualfs; fine, illitic, mesic  
Odessa - lacustrine  
Remsen - till  
Churchville - lacustrine **over** till  
Brockport - moderately deep till
  - d.

4. Families with deep and moderately shallow soils
  - a. Typic Dystrachrepts; coarse-loamy, mixed, mesic  
Lordstown - moderately shallow  
Valois - deep  
Berks - moderately shallow to shale  
Parker - deep to granitic gneiss
  - b. Typic Eutrochrepts; coarse-loamy, mixed, mesic  
Galway - moderately shallow  
Nellis - deep
  - c. Aeric Ochraqualfs; fine-loamy, mixed, mesic  
Angola - moderately shallow  
Appleton - deep
  - d. Aeric Ochraqualfs; fine, illitic, mesic  
Brockport - moderately shallow  
Remsen - deep
  - e. Mollic Ochraqualfs; fine-loamy, mixed, mesic  
Varick - moderately shallow  
Ilion - deep
  - f. Glossaquic Hapludalfs; fine-loamy, mixed, mesic  
Aurora - moderately shallow  
Danley - deep
  - g. Glossoboric Hapludalfs; fine-loamy, mixed, mesic  
Wassaic - moderately shallow  
Honeoye - deep
5. Families with wide texture ranges
  - a. Typic and Aquic Fragiorthods; coarse-loamy, mixed, mesic  
Potsdam, Crary - silty mantles  
Worth, Empeyville - lacks silty mantle
  - b. Entic and Aquentic Haplorthods; sandy, mixed, mesic  
Carver, Deerfield - sandy throughout  
Merrimac, Ninigret - moderately coarse upper horizons
6. Families with wide permeability range
  - a. Aquic Hapludults; fine-loamy, siliceous, mesic  
Matawan - slowly permeable  
Woodstown - moderately permeable

1. c. Do they serve the needs intended?

Except for some instances where usable phases of families could not be devised (for example in coordinating K and T values), they have basically served their purpose, however, it is believed they would be more useful if additional criteria were used. In grouping the soils of the Northeast into interpretive groups, it was found that if the following criteria were added the families would serve the needs better: (1) Bedrock between depths of 20 and 40 inches; (2) Expand the textural control section of Paleudults and Paleudalfs to the upper 40 inches of the argillic horizon; (3) Use reaction classes in all Entisols and in Fragioglepts and Spodosols (the control section would require some modification in Fragioglepts and Spodosols to be useful); (4) Stratification in the solum or substratum. The control section to determine stratification may need to extend to at least 60 inches. Stratification would not be used in Fluventic families and soils in contrasting textural families.

Questions have been raised as to what the authors of Soil Taxonomy had in mind concerning the intent of soil families. This is discussed in Chapter 5 of Soil Taxonomy and because Chapter 5 has not been generally available, the part dealing with soil families is as follows (in unedited form):

#### The Families

In this category, the intent has been to group the soils within a subgroup having similar physical and chemical properties that affect their responses to management and manipulation for use. The responses of comparable phases, of all soils in a family, are nearly enough the same to meet most of the needs for productive interpretation of such responses. Soil properties are used in this category without regard to their significance as marks of processes or lack of them. About 4,200 families are currently recognized in the United States.

Families are defined primarily to provide groupings of soils with restricted ranges in:

1. particle-size distribution in horizons of major biological activity below plow depth in terms of particle-size classes that are defined later;
2. mineralogy of the same horizon that are considered in naming particle-size classes;
3. temperature regimes;

- 4, thickness of the soil penetrable by roots, and
5. a few of the properties that are used in defining some families to provide the needed homogeneity.

These properties are important to the movement and retention of water and to aeration; both of which affect soil use for production of plants or for engineering purposes. The *differentiae* are discussed in more detail in Chapter 18.

1. d. What families are not needed? Consider further the problem of single-series families.

There seems to be no compelling reason to say that any one family is not needed at this time. Testing criteria, however, should be developed so as to better evaluate possible proposed changes in family criteria which would either create or eliminate families.

Concerning the single series families, it is believed that they are just as valid as those families with many series. In all or nearly all natural classifications, examples can be found of unequal class sizes.

1. e. Try to Elucidate the practical significance of the family class limits (e.g. 18 percent clay, etc.)

The limits chosen will not be satisfactory for all interpretations because different properties and limits have different weight for the different uses. If phases of families can be devised that are useful in grouping soils in a variety of ways and are useful in making many kinds of interpretations then the family class limits have practical significance. Enough testing has not been done to verify that the present family class limits are the best.

2. Continue the testing of the validity of series within families. Excessive numbers of series in each family may suggest (weakness in the design of the family or (2) inadequate testing of validity of series.

This charge is tied in with charges 1a through 1e. Enough testing has not been made to adequately answer the questions of charge 1, and until they are answered we cannot fully appreciate why some families are so large. If further testing shows that the families serve their purpose and the class limits are indeed valid then we must assume that either the series

has **not** been adequately tested or **some** families **are** naturally large. **Any** attempt in changing or adding family limits to split large families would also split or fragment other small families if the limits are used universally as they now are. This creates the dilemma of creating additional single series families. **If** the family limits are valid then those series limits which are the same as the family limits, are also valid. If it is assumed that the family limits are valid then to test the validity of series within families, one must determine the validity of limits that differentiates one series from another. The question arises as to what is validity and what constitutes a reasonable measure or test of such validity. The family limits are spelled out in Soil Taxonomy so we can test their validity by use. Series limits within families are often vague and are not universally applied, hence, their validity is difficult to test. A concept should be developed that can be tested.

One member of the committee suggested that it would be easier to test the validity of a series if the ranges in characteristics **were** subdivided into two parts. The first part would be a listing of those properties that are definitive for the series, i.e. subdividing families; and the second part a listing of those properties that describe the series but are not definitive. They explain what the series is usually like but at a given point in time are not definitive.

#### Recommendations

1. This committee has no recommendations concerning charges for a continuing committee and the committee should be discontinued unless charges are received from the National Committee on soil family criteria.
2. The National Committee devise guidelines to be used for changing, adding, or deleting family limits.

#### Committee Members

John **E.** Witty, Chairman  
R. W. Arnold, Vice-chairman  
R. J. Bartlett  
E. J. Ciolkosz  
F. W. Cleveland  
M. G. Cline  
R. E. Daniell, Advisor  
D. S. Fanning  
W. C. Kirkham  
R. L. Marshall  
D. E. McCormack, Advisor  
R. M. Weaver

Notes on Comments Made After the Report was Given

- witty:** There appears to be **overlap** in charges **between committee 7** and charge 3, Soil Interpretations at Higher Categories, of committee 2.
- Garland:** Committee 2 is not the correct vehicle hence committee 7 should be continued.
- Rourke:** Suggest committee be continued.
- McCormack:** Concerning criteria, the committee report suggests a need for continuing the committee.
- witty:** It is assumed the new committee that will be set up to consider changes in criteria etc. of Soil Taxonomy will be **responsible** for considering changes in family criteria.
- Zayach:** Are families useful?
- Olson:** View families differently - currently not useful.
- Schmude:** West Virginia considers both subgroup and family in grouping soils for interpretive work.
- Hollowaychuk:** Need to reconsider criteria so as to reduce size of large families.
- witty:** Criteria are used universally, if criteria are added to split large families the same criteria would also split some small families and adding to the single series family problem.
- Hollowaychuk:** Large families are a problem in writing series descriptions.
- Googins:** What is the resistance to adding new criteria for new families?
- Witty:** Naming is a problem if we keep the current convention for naming families. The names become unwieldy.
- Zayach:** Why use the family for interpretations? It is useful for classification.

- McCormack:** Families do not fit our needs - not in the precision needed for interpretations.
- Holowaychuk:** Currently **we** have more interpretive information than the family provides in this country. There are some **sountries** that would be very happy to have the information provided by family groupings.
- witty:** Are useful for low **intensitive** surveys in some range and forested areas.
- Googins:** To make interpretive groups based on the family requires large number of subphases of families.
- Garland:** Some interpretive units will combine orders.
- Zayach:** Eventually will subdivide to the **series** level.,
- Garland:** Basic groups will provide usefulness for most interpretations.

NATIONAL COOPERATIVE SOIL SURVEY  
NORTHEAST SOIL SURVEY WORK PLANNING CONFERENCE  
January 17-20, 1972

REPORT OF COMMITTEE ON HISTOSOLS  
AND TIDAL MARSH SOILS

The charges to this committee are given on page 143 of the report of the National Work Planning Conference, 1971. Among the specific charges are:

1. Develop taxonomic keys for the histosols of the region.
2. Evaluate test data and recommend if the rubbed fiber percentage for sapric materials should remain at 10% or be raised to 15 or 20%.

Additional charges from regional chairman:

3. Evaluate test data to determine if the expression of sulfidic and sulfuric materials now confined to the Hemist suborder should be expanded to Fibrist and Saprist suborders.

To carry out the charges set forth by the national committee, individual members of the regional committee were given specific tasks of sample and data collection. The chairman gratefully acknowledges their efforts.

KEY TO THE HISTOSOLS OF THE NORTHEAST

The key compiled by Leslie W. Kick, SCS, New York, is found in Appendix A. It includes all dominant subgroups recognized to date in the Northeast. It was recognized that this list is probably not complete and others may be included as found. Most families contain only one series; only three contain two series. The key is based on the current classification system (in Soil Taxonomy) and does not anticipate changes in the system recommended by this committee regarding the sulfur-bearing Histosols.

Upper Limit of Rubbed Fiber in Sapric Materials. To evaluate the upper limit of rubbed fiber in Histosols, several members of the committee were asked to submit samples of sapric material to the Connecticut Agricultural Experiment Station for laboratory determination of pyrophosphate color and fiber tests.

Twenty samples were submitted from Connecticut, Maine, Maryland, and Pennsylvania. Three samples did not contain enough organic carbon to qualify as organic materials and were omitted from further study. The procedures followed those recommended by Lynn and McKenzie of the SCS, Soil Survey Laboratory, Lincoln, Nebraska, in the appendix of the Report of the Committee on Histosols, 1971 National Technical Work-Planning Conference.

The results of the tests are shown in Appendix B. Colors of pyrophosphate extracts indicate all samples, except Lackawanna Co., Pa., have colors consistent with sapric materials. Of the non-tidal Histosols, 3 of 12 samples contain rubbed fiber contents greater than 10%. Since present limits are expressed as fractions rather than percentages and acknowledging that 1/10 would encompass a narrow range of percentages, say 8 to 12%, all samples, except Warren Co., Pa., would conform to the 1/10 fraction. If volumes are based upon field estimates, then it seems unnecessary to change the present limits. If, however, fiber contents are determined by field test kits or in the laboratory and accurate volumes can be measured, it would be appropriate to raise the upper limit to 15%.

The same statements probably apply to tidal Histosols but the occurrence of sapric materials in Northeast tidal marshes appears to be limited. Only one sample from New London Co., Conn., was clearly sapric. The 4 samples from New Haven Co., Conn., are those from North Haven (See Appendix C) and illustrate a conflict between color of pyrophosphate extracts and fiber criteria. The colors are consistently 10YR 5/3 or 4/3 (sapric), but the rubbed fiber contents are within the range of hemic or fibric materials. The apparent conflict is probably a temporary one, however, and is due to rapid changes in materials as they transform from sulfidic to sulfuric materials. The organic sediments in this diked and drained area have oxidized for 7 months. They degrade quite rapidly as the pH lowers. The organic acids extractable in sodium pyrophosphate appear to be produced rapidly as the material decays, but the fiber contents remain well above the 1/10 limit for sapric materials. Note also the great difference between unrubbed and rubbed fiber contents. In time, oxidation will probably reduce the rubbed fibers to the 1/10 limit.

This pedon serves to illustrate that knowledge of past disturbance of organic materials can often explain anomalies which are seen in test data on pyrophosphate extract colors and fiber contents.

Evaluation of Fiber and Pyrophosphate Tests. It is appropriate here to comment on the determination of fiber contents in field tests outlined by Lynn and McKenzie. Followed in detail, they serve to standardize the measurement of rubbed and unrubbed fiber, and color of pyrophosphate extracts. To determine the variability among different individuals performing the same fiber test, a sample was given to each of 6 soil scientists at a recent workshop in Connecticut. Laboratory determinations of unrubbed and rubbed fiber had predetermined that the volumes were 48% and 20%, respectively. The ranges reported by all individuals were 44-54% unrubbed fiber and 20-26% rubbed fiber. Although packing produced some variability in the unrubbed fiber content, rubbing more likely produced the variability in rubbed condition because individuals reporting high unrubbed fiber contents did not necessarily report high rubbed fiber contents also. Half of the individuals matched the laboratory determinations.

Pyrophosphate colors determined by the individuals matched those determined in the laboratory or were off only one color chip.

Organic samples from tidal marshes create special problems in the determination of fiber contents. In samples that contain appreciable amounts of silt and clay, the egg-beater stirring time is insufficient to disperse all the clay. Increasing stirring time to 2 minutes improved dispersion. Also, the fact that the volumes of silt and clay in tidal sediments may account for 50% of the volume of the sample makes it imperative that fiber volumes must be corrected for the inorganic fraction. For determining the volume of mineral matter a bulk density of 1.5 is assumed.

In sediments containing less than 10% mineral matter, the correction factor is small and can be ignored.

Classification of Soils in Tidal Marshes of the Northeast. A notable characteristic of tidal marsh sediments is their sulfur content. It is concentrated from sea water by biological agents and is found in several forms, mostly under a reducing environment created by tidal flooding. E.H. Tyner, University of Illinois, (personal communication) found that in one of Rhode

Island's tidal marshes, half of the sulfur was in water soluble forms and slightly less than half in insoluble organic forms. Amounts of elemental sulfur, pyrites, and soluble organic forms were very small.

To determine the distribution of sulfur in tidal sediments of the Northeast and to test the placement of tidal Histosols in the New Classification System, samples were sent to the Connecticut Agricultural Experiment Station for analysis. Total sulfur was determined by standard fusion analysis with sodium carbonate and sodium nitrate (USDA Circular No. 139, p. 14). Total salts were determined by electrical conductivity methods. Unrubbed and rubbed fiber contents and pyrophosphate extract colors were from procedures outlined by Lynn and McKenzie in the appendix of the Report of the Committee on Histosols, 1971 National Technical Work Planning Conference. Organic matter was determined as loss on ignition.

Appendix C shows that total sulfur contents exceed 0.75% (the lower limit in sulfidic materials) in the brackish water environments of Old Orchard Beach, Maine; Rocky Neck and North Haven, Connecticut; and Bellport, N.Y., and the high salt environments of Kennebunk, Maine; Barn Island, Connecticut; Riverhead, N.Y.; and Dames Quarter, Maryland. In short, samples from virtually all organic tiers were found to be sulfidic, thus confirming that sulfur is probably concentrated in all tidal marsh environments and that the development of sulfur acidity upon draining or drying depends upon the presence or absence of biological agents which oxidize the sulfur.

To **recommend** changes in the classification system requires **some** justification. To answer the question, "Should both sulfur **and** fiber content be expressed in the classification of **tidal** marsh soils?", we **must** first answer the question, "Is fiber content relevant when weighted with sulfur and all that it implies?". In drained and dredged spoils, sulfur is very important because of sulfur acidity. **Witness** the fate of the North Raven pedon in a short **7** months. The sediments transformed **from** fibric, **sulfidic** (determined outside the **diked area**) to **hemic** (by fiber content) or sapric (pyrophosphate color) sulfuric. This rapid disintegration is not difficult to visualize when the **undecomposed** fibers are suddenly placed in a very acid environment. Here fiber content is relatively unimportant because it **will** soon decompose.

In the undrained condition, however, the sulfur content is a latent property relative to fiber. The **condition** of the fibers may tell something about the material as it lies in its natural **condition** and how it **may** react to external pressures. There are several questions that came to mind relative to fiber content. Do the bulk density differences between fibric and **sapric materials** have an effect on static loading? Many undrained marshes are merely "battered over" with **fill** and built upon rather **than** being removed and replaced. In some areas **development** succeeds, but failures due to settling are common.

Another question: Do fibric materials in exposed **areas** resist **natural** erosion during coastal storms more **than** **hemic** or sapric materials? These questions remain unanswered **largely** because tidal marshes **are unmanaged** and little attention has been given their physical **characteristics**. A classification system should be based on **as** many differentiating characteristics **as** are significant and practical to measure. Fiber content **may** be significant, **and** it is certainly measured with increasing accuracy.

#### RECOMMENDATIONS

1. If fiber contents are to be expressed as percentages rather than **fractions** in view of improved field tests, the upper limit of fiber in sapric materials should be raised to **15%**.
2. If colors of pyrophosphate extracts continue to **take** precedence over fiber tests because they are more reliable, **Sulfifibrists** should be recognized **as** an **additional** great group of the suborder Fibrists.
3. Extragrades should be added **as** needed at the subgroup level. At present, the **Terric extragrade** is needed in the Northeast.
4. The **Committee** should be continued to develop consistency and moisture terminology for describing organic soils. (These subjects were not completely developed during the conference).

#### COMMITTEE MEMBERSHIP

D.E. Hill, Chairman\*  
L.W. Kick, Vice Chairman\*  
J.M. Allen\*  
L.J. Cotnoir  
R.L. Cunningham  
J.E. Foss"  
G.J. Latshaw

\*

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The key is related to the lettered element8 of the key used in Chapter II of the unedited text of SOIL TAXONOMY, with family and series **placements** made where possible.

JA FOLISTS

No series of **Folists** are **recognized** at present. They can be **found** at high elevation8 in the northern states of the region.

JB FIBRISTS

JBA Sphagnofibrists

Cryic Sphagnofibrists; dysic	(Unnamed--Me.)
Hemic Sphagnofibrists; dysic, frigid	(Lobo)
Hemic Sphagnofibrists; dysic, mesic	(Unnamed--Me.)
Typic Sphagnofibrists; dysic	

JBC

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JBE \_\_\_\_\_

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{  
(Unnamed--Conn.)  
(Pawcatuck)  
(Westbrook)  
(Hansboro)

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**Terric** Borohemists; **sandy**, mixed, **dysic** (Unnamed--Me.)  
**Limnic** Borohemists; **diatomaceous**, **euic** (Unnamed--Me.)  
**Limnic** Borohemists; **marly**, **euic** (Carlos)  
**Limnic** Borohemists; **coprogenous**, **euic** (Millerville)

JCG Medihemists

**Typic** Medihemists; **euic**, **mesic** (Unnamed--Me.)  
**Typic** Medihemists; **dysic**, **mesic** (Unnamed--Me.)  
**Fibric** Medihemists; **euic**, **mesic** (Unnamed--Me., Pa.)  
**Sapric Terric** Medihemists; **loamy-skeletal**, mixed, **euic**, **mesic** (Unnamed--Pa.)  
**Terric** Medihemists; **sandy**, mixed, **dysic**, **mesic** (Unnamed--Me.)  
**Limnic** Medihemists; **coprogenous**, **euic**, **mesic** (Caron) --,

JD SAPRISTS

JDB Dorosaprists

**Typic** Rorosaprists; **euic** (Iupton) (Seelyeville)  
**Hemic** Rorosaprists; **euic** (Carbondale)  
**Terric** Rorosaprists; **sandy** or **sandy-skeletal**, mixed, **euic** (Tawas) (Markey)  
**Terric** Borosaprists; **sandy** or **sandy-skeletal**, mixed, **dysic** (Dawson)  
**Terric** Rorosaprists; **loamy**, mixed, **euic** (Cathro)  
**Lithic** Rorosaprists; **euic** (Chippeny)  
**Limnic** Rorosaprists; **marly**, **euic** (Rondeau)

JDD Medisaprists

**Typic** Medisaprists; **euic**, **mesic** (Carlisle) (Houghton)  
**Typic** Medisaprists; **dysic**, **mesic** (Unnamed--Fe.)  
**Fibric** Medisaprists; **euic**, **mesic** (Unnamed--Pa.)  
**Hemic** Medisaprists; **euic**, **mesic** (Unnamed--Pa.)  
**Terric** Medisaprists; **sandy** or **sandy-skeletal**, mixed, **euic**, **mesic** (Adrian)  
**Terric** Medisaprists; **clayey**, **illitic**, **euic**, **mesic** (Willette)  
**Terric** Medisaprists; **loamy**, mixed, **euic**, **mesic** (Palms) (Linwood)  
**Terric**

APPENDIX B--PROPERTIES OF SOME SAPRIC HORIZONS  
IN HISTOSOLS OF THE NORTHEAST\*

LOCATION	INCHES DEPTH	pH 1:1 H <sub>2</sub> O	COLOR PYRO- PHOSPHATE EXTRACT
Crawford Co., Pa.	10-22	5.5	7.5YR 3/2
Lackawanna Co., Pa.	29-36	5.4	<u>7/3R</u>
Warren Co., Pa.	40-60	5.3	10YR 5/3
York Co., Me.	6-10	3.2	7.5YR 3/2
"	10-25	3.3	7.5YR 3/2
"	25-46	4.0	10YR 4/3
Oxford Co., &	7-22	4.3	10YR 5/3
Wicomico Co., Md.	0-8	3.1	7.5YR 4/2
Worcester Co., Md.	0-12	4.0	7.5YR 3/2
"	12-24	3.3	
Tolland Co., Ct. (1)	0-12	4.6	
Tolland Co., Ct. (2)	0-12	5.6	

APPENDIX C: PROPERTIES OF TIDAL MARSH SEDIMENTS OF THE NORTHEAST

LOCATION

%	%
58	52(F)
44	44(F)
46	32(H)
38	34(F)
42	36(F)
40	32(H)
24	20(H)
--	
52	42(F)
42	32(H)

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APPENDIX C: PROPERTIES OF TIDAL MARSH SEDIMENTS OF THE NORTHEAST

LOCATION	DEPTH INCHES	INITIAL pH 1:1 H <sub>2</sub> O	UNRUBBED FIBER* %	RUBBED FIBER* %	PYRO. COLOR	TOTAL SALTS PPM	MO. M. %	TOTAL SULFUR %	CLASSIFICATION	
									Present	Proposed
Kennebunk, Me.	0-9	6.4	66	34 (F)	10YR 7/2(F)	20,800	72.8	2.20	<u>Typic Sulfohemist, euic, frigid, OR Typic Sulfofibrist, euic, frigid</u>	
	9-19	6.4	40	24 (H)	10YR 7/2(F)	24,375	63.8	2.69		
	19-48	6.4	46	30 (H)	10YR 7/2(F)	24,375	59.9	2.96		
	48-60	6.5	54	38 (F)	10YR 8/2(F)	22,750	28.9	1.00		
	60-80	6.7	--	--	--	22,425	15.5	1.01		
Old Orchard Beach, Me.	0-6	5.3	88	40 (F)	10YR 8/1(F)	405	30.5	1.01	<u>Typic Sulfohemist, sandy, euic, frigid OR Terric Sulfofibrist, sandy, euic, frigid</u>	
	6-22	5.4	58	26 (H)	10YR 8/1(F)	455	56.4	2.31		
	22-53	5.4	--	--	-----	490	0.1	0.26		
Barn Island, Conn. (sand below 40")	0-3	6.6	68	30 (H)	10YR 7/2(F)	26,000	39.8	0.68	<u>Typic Sulfohemist, sandy, euic, mesic OR Terric Sulfofibrist, sandy, euic, mesic</u>	
	3-16	6.4	48	32 (H)	10YR 7/2(F)	26,000	33.6	1.63		
	16-30	6.2	40	26 (H)	10YR 7/2(F)	22,425	50.6	2.27		
	30-40	5.9	42	30 (H)	10YR 8/2(F)	22,100	58.8	2.24		
Rocky Neck, Conn.	0-6	6.2	46	30 (H)	10YR 8/2(F)	850	72.5	1.81	<u>Typic Sulfohemist, euic, mesic, OR Sapric Sulfofibrist, euic, mesic</u>	
	6-20	6.7	72	28 (H)	10YR 8/1(F)	1,410	84.4	3.41		
	20-29	6.6	56	24 (H)	10YR 8/1(F)	920	92.0	2.95		
	29-40	6.7	44	16 (H)	10YR 8/1(F)	920	91.5	2.77		
	40-55	6.1	24	4 (S)	10YR 4/2(S)	320	61.1	1.18		
North Haven, Conn. (Diked and drained clay pit; 5-7 feet of tidal marsh sedi- ments as overburden)	0-7	3.6	84	26 (H)	10YR 5/3(S)	730	41.2	1.10	<u>Typic Sulfohemist, loamy, dysic, mesic OR Terric Sulfofibrist, loamy, dysic, mesic</u>	
	7-15	2.8	70	24 (H)	7.5YR 4/2(S)	945	46.4	1.07		
	15-24	2.5	48	26 (H)	10YR 5/3(S)	2,160	29.2	1.09		
	24-39	2.6	--	-----	-----	1,750	16.3	0.92		
	39-42	2.6	74	38 (F)	10YR 5/3(S)	2,245	42.6	2.26		
	42-55	2.5	62**	14 (H)	10YR 5/3(S)	3,495	37.3	1.99		
55-78	2.4	74**	22 (H)	10YR 4/3(S)	3,025	22.8	1.37			

\* Corrected for volume of inorganic fraction

\*\* Incomplete dispersion--unrubbed fiber contained a small volume of clay pellets.

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NATIONAL COOPERATIVE SOIL SURVEY  
NORTHEAST SOIL SURVEY WORK PLANNING CONFERENCE

January 17-20, 1972

REPORT OF COMMITTEE ON BENCHMARK SOILS, TECHNICAL  
SOIL MONOGRAPHS, AND SOIL SURVEY LABORATORY INVESTIGATIONS

Two charges were outlined for the combined committee on soil monographs, benchmark soils and laboratory investigations as follows:

1. Prepare an updated summary of progress in the Northeast on benchmark soil reports, monographs and laboratory accomplishments and needs. This essentially involves an updating of this committee's 1970 report.
2. Review the benchmark soil characterization form provided as attachment 1 in the 1971 Report of National Committee 1 for possible use in the Northeast.

Thirteen states replied to the above two charges.

Regarding charge 1, each state was asked to review and update the 1970 report. In addition, it was suggested that committee members review the report of the National Committee on this subject in the proceedings of the 1971 National Committee that might be of interest to this committee were to be noted for inclusion in this report.

Benchmark Soils and Technical Monographs

Although some sampling analysis has been done, all states reported essentially no change in the status of benchmark soils and technical monographs as listed in the 1970 committee report. Some deletions have been made in the listing for Kentucky. (Appendix I attached). Several comments were made regarding technical monographs and benchmark soil studies in that they tend to be low priority in relation to "more important" studies or work. Consequently, these studies are at a virtual standstill at this time. This situation will likely continue unless adequate financial support is given to this activity.

Soil Survey Laboratory Investigations

Some progress has been reported on soil survey laboratory investigations. Appendix II (attached) has been updated to show this progress. This includes progress on studies listed in the estimates of the 10-year laboratory workload as well as some other laboratory accomplishments reported to this committee. The conference approved inclusion of other laboratory studies as reported even though it might duplicate information given in progress reports on soil survey research submitted to the conference by experiment station representatives.

### Laboratory Investigation Needs

Several states indicated that we should devote more attention to developing soil survey investigations to back up non-farm soil interpretations. This was also emphasized in the report of the National Committee 1 in 1971. Numerous field studies were suggested including gathering data on conditions such as water table fluctuations, percolation rates, ground water contamination and many other field conditions related to soil interpretations that cannot be duplicated in the laboratory. Suggestions were made to facilitate gathering more and better data to back up non-farm soil interpretations. Included were suggestions that joint projects be organized. For example, SCS might supply manpower to other agencies such as NIS or experiment stations in carrying out special field studies. Guidance from Beltsville and university personnel on how to design, install, monitor and sample systems to obtain more information would be helpful. Also, state health departments could work with interested soil scientists in correlating percolation rates with soil types. There is continued interest in satisfying the need to

be coordinated by the BELTSVILLE Laboratory could be set up with participation by interested states. Graduate students could be a part of such a program.

Charge 2 to this committee is repeated as follows:

Review the benchmark soil characterization form provided as attachment 1 in the 1971 Report of National Committee 1 for possible use in the Northeast.

In general, reviewers were in favor of the format and potential for use of the inventory form in the Northeast (Appendix III attached). More than one state replied that the form be designed so information could be put into a computer system. Suggestions were made for adding analysis codes including kinds of pH measurements, coarse fragment content, water movement rates, bulk density, and percolation rate data.

One state entered progress on benchmark soils on this form. This gives a good picture of the status of benchmark soils in the state. This could be done as a future activity of this committee in bi-annually summarizing progress on benchmark soils.

### Committee Recommendations

1. The National Committee should re-examine objectives regarding benchmark soil studies and technical monograph studies. In view of continued lack of accomplishments in getting these studies completed and published and because of increasing interest expressed by the states in the immediate need for soils data to back up non-farm interpretations, this committee recommends that the National Committee reconsider priorities by asking the states to concentrate on gathering soils data for non-farm interpretations. This could be done on the benchmark soils assigned to the states but would not be directed toward formal published benchmark reports at this time. Rather than publish formal reports, which delays processing, informal reports could be prepared, perhaps as computer printouts where the data is presented in a form that can be put into a computer.

2. There is a substantial lag in receiving analysis from soils laboratories. This activity needs speeding up to meet the demands in soil classification and interpretations. Therefore, this committee endorses the National Committee's efforts to get more financial support for laboratory work as outlined in their recommendations regarding soil survey laboratory investigations in their report in the 1971 Conference Proceedings.
3. After some discussion on the necessity of continuing this committee, it was decided to continue the committee primarily as a vehicle for encouraging gathering needed data for soil classification and interpretations and for bi-annually reporting progress on these activities. It was further recommended that the Northeast adopt the soil benchmark inventory form and that modifications be made on the form by adding items reported as needed. The form then could be used as a mechanism for the states to report progress to this committee on benchmark soils.

Additional Notes and Comments from the Conference

1. The next Northeast Committee on Benchmark Soils, Technical Monographs and Soil Survey Laboratory Investigations could evaluate existing benchmark reports and inquire as to whether they satisfy existing needs. This would include how they are used and what methods might be considered for updating them.
2. Technical monographs are not being developed. This is such a monumental task that it isn't likely such a monograph will ever be published. Perhaps the name Technical Monographs should be removed from the name of this committee.
3. Much laboratory information available on soils can be put into soil survey reports. However, due to emphasis on keeping the volume of published soil survey reports to a minimum, this information is best incorporated into benchmark soil reports. They should be continued for this purpose.
4. State soil scientists need to keep abreast of the correlation changes for benchmark soils listed for their states. This should be reported to this committee chairman bi-annually for updating the list. The Principal Soil Correlator at Upper Darby has agreed to assist on this.
5. A master list of soil series characterized was prepared in about 1967. This list needs to be updated.
6. A national list of the experiment station soil characterization laboratories should be prepared.

Committee Members:

Keith O. Schmude  
Chairman - Committee 9, Northeast Soil Survey Work Planning Conference,  
January, 1972 - Benchmark Soils, Technical Soil Monographs and Soil  
Survey Laboratory Investigations

John D. Rourke  
Vice-Chairman

All SCS State Soil Scientists in Northeast in cooperation with State  
Experiment Station Representatives, and E. J. Pedersen

APPENDIX Y

LIST OF BENCHMARK SOILS ASSIGNED  
TO THE NORTHEAST STATES

Type location for each series is in the state under which it is listed. Series followed by a state name were formerly claimed by the state thus identified. Example: Hollis - NH was formerly a benchmark soil for New Hampshire.

Connecticut and Rhode Island

Bridgwaterhampton 1/  
Charlton 1/  
Cheshire  
Enfield  
Hollis - NH  
Leicester - NH  
Ninigret - Mass  
Stockbridge  
Sutton - NH  
Walpole - Mass  
Windsor

Massachusetts

Acawan - NH  
Berkshire - Vt.  
Gloucester 2/  
Hadley - Vt.  
Hinckley  
Jayman - Vt.  
Merrimac  
Ridgebury  
Sudbury  
Whitman  
Winooski

Delaware and Maryland

Baile  
Beltsville  
Chester  
Christiana  
Elkton - NJ  
Fallsington - NJ  
Hagerstown 2/  
Iqore  
Leonardtoun  
Manor  
Matapeake  
Mittapox  
Montalto  
Ochello  
Pocunoke  
Sassafras  
Westphalia - NJ  
Woodstown - NJ

New Hampshire

Acton  
Becket  
Canaan  
Groveton  
Marlow  
Paxton 1/  
Peru  
Shapleigh  
Waumbek  
Woodbridge

Kentucky

Crider  
F&n  
Jefferson  
Lowell  
Maury  
Melvin - WVA  
Newark  
Nolin  
Shelocta  
Tilsit - WVA  
Whitley  
Zanesville

New Jersey

Adelphia  
Collington  
Croton - Pa.  
Evesboro  
Keyport

Maine

Bangor  
Biddeford  
Buxton  
Caribou 1/  
Elmwood  
Hermon 2/ - MI  
Plaisted  
Scarboro

New York

Adams  
Allis - Pa.  
Amenia  
Canandaigua  
Caneadea  
Chenango  
Collamer  
Colton - Vt.  
Mardin  
Middlebury - Pa.  
Oquaga - Pa.  
Papakating  
Phelps  
Red Hook

Appendix I -- Cont'd.

Ohio

(Blount - Ill) 3/	Hoytville 1/
(Brookston - Ind) 3/	Keene
Canfield 1/	Mahoning
Celina	Toledo
Clement	Tyler - WVa
(Crosby - Ind) 3/	Wellston - Ky.
Holly - NY	

Pennsylvania

Berks	Ellipton - WVa
Brinkerton	Gilpin - WVa 2/
Burgin	Glenville - Md.
Cavode	Penn - NY
Dekalb - WVa	Readington
Duffield	Weikert
Edgemoor	Westmoreland
	Wharton - WVa

Vermont

Limerick  
Livingston  
Panton  
Wergennes 1/

Virginia

Carbo  
Frederick  
Tatum

West Virginia

Cookport - Md.	Landside
Ernest - Pa.	Monongahela
Frankstown - Md.	Murrill
Huntington	Muskingum
Laidig	Upshur
	Wheeling

1/ Report published

2/ Report in progress

3/ Series in parentheses have site locations outside the Northeast States

## APPENDIX 11

### PROGRESS REPORT ON STUDIES LISTED IN THE ESTIMATES OF 10 YEAR LABORATORY WORK LOAD AND OTHER LABORATORY STUDIES

- Delaware Special study of tidal marsh areas to differentiate classes (reported previously).
- Kentucky Samples of G series in Eastern Kentucky were collected for coarse silt mineralogical determinations. In most cases mineralogy was mixed. Characterization samples were taken from the following benchmark soils in Kentucky: Crider - 4 profiles; Jefferson - 3 profiles; Newark - 2 profiles; Nolin - 9 profiles; Shelocta - 2 profiles; and Zanesville - 4 profiles.
- M-line 30 soil samples representing 10 soil series sent for spodic horizon identification, data not yet received from laboratory. 5 sites of Buxton series sampled and data obtained except for Fe in spodic horizon.
- Maryland Approximately 130 soil profiles representing 41 soil series, completely analyzed for physical and chemical properties. Clay mineral analysis has been done on at least 30 soil profiles.
- Massachusetts June, 1970 - Sampled 9 profiles of soils developed in coarse silty alluvium including 5 sites of the Hadley series, 2 sites of the Winmski series, and 2 sites of the Limerick series.
- New Hampshire 22 samples collected for tidal marsh soils study to determine potential sulphur acidity. Sites were selected for careful morphological study and for sampling to obtain needed data for classification and use interpretation. Two Gloucester pedons were sampled in May, 1969 for spodic horizon identification as previously reported.
- New Jersey Partial characterization completed on 2 of 4 profiles collected of the Collington series and one profile collected of the Evesboro series. The Croton and Keyport series have been sampled.
- New York Cossayuna, Bernardston, Nassau and Hartland cambic vs. entic spodic character. (Reported previously).

APPENDIX II CONTINUED

- Pennsylvania Bulk of laboratory work this past year on **problem** solving plus **specific** studies on **groups** of soils (shale and **limestone**). Reference to up-to-date lab data: "Soil Characterization", **The Pennsylvania State University Agricultural Experiment Station**, July, 1971.
- Vermont Nassau, Dutchess (**moderately** deep variant), Dutchess, **Bernardston, Pittstown**, Stissing, Mansfield (**all** reported previously), Windsor, **Agawan (variant)**, **Suncook**, Belgrade, **Hartland (Unadilla)**, and **Deerfield**.
- Virginia About 1,200 soil **samples** analyzed in the **Experiment Station** soilsurveylaboratory.
- West Virginia Sampled selected horizons of the Teas and **Rushtown** series. Samples **now** at Lincoln, Nebraska, for special study on determining percent and characteristics of **coarse fragments** in **shaly** soil materials (**intermediate** disaggregation procedure being developed by Dr. Grossman).



REPORT OF THE CONNECTICUT AGRICULTURAL EXPERIMENT  
STATION REPRESENTATIVE

David E. Hill

Activities in the Department of Soil and Water have been largely devoted to projects related to environmental quality. Many have been related to soil survey in the interpretative field. Four of these projects have been discussed in the report of Committee I on Environmental Soil Science. They are summarized here as follows:

1. Six Connecticut soils have been treated with synthetic sewage treatment plant effluent for two years to determine their renovation capacity. Analysis of leachates collected enabled us to predict the renovation Capacity of the soils in Litchfield County where new installations are being prepared for tertiary treatment of sewage effluents.

2. Studies have been conducted for two years to determine the "Safe" loading rates of liquid poultry manure applied to forest land. A complete systems analysis enables us to determine the fate of N losses to the air by volatilization, storage of N and P in the soil, utilization of N and P in white pine and deciduous forests, and leaching of N and P to ground water.

3. Another project has related the effect of drainage classes, drought, and defoliation on tree growth and mortality. Eight permanent plots are examined at 10-year intervals to determine ingrowth, rates of growth, and mortality of individual trees. The results show that forests with more diverse species are developing from the oak-hickory forests which developed from the great chestnut stands.

4. In hydrology studies, we have also studied the pattern of moisture flow in soils with textural discontinuities, especially those with fine textures overlying coarse textures. The wetting front becomes unstable at the textural interface and breaks into narrow wetting columns which move rapidly to the water table below. This instability provides a mechanism to allow smaller volumes of water to penetrate deeper than would have been possible had the wetting front remained stable and wetted the entire volume of coarse material.

5. As participants in the Connecticut Geology-Soils Task Force, represented by state and federal agencies who collect and publish earth science data, we have compiled 27 overlay maps for a quadrangle-size area in North-central Connecticut. The maps display soil, water, surficial, bedrock, and land use data and identify areas which have limitations for specific uses imposed by natural conditions. The Task Force is preparing a publication (Conn. Agr. Exp. Sta. Bull. Series) for regional and local planners to demonstrate how integrated data from the earth sciences can be effectively used in planning decisions.

6. Studies of the fate of phosphorus introduced into subsoils by septic tank systems are also being conducted. Phosphorus absorptive capacity of subsoils are being determined in the laboratory and compared with operating systems of known duration and use.

NATIONAL COOPERATIVE SOIL SURVEY

NORTHEAST SOIL SURVEY WORK PLANNING CONFERENCES  
January 17-20, 1972

Report of the Kentucky Agricultural Experiment Station Representative

The Kentucky Agricultural Experiment Station supports the cooperative Soil Survey mainly by laboratory analyses of representative profiles. The profiles are sampled jointly by USDA-SCS and Experiment Station personnel regardless of the agency initially initiating the project. Progressive mapping is performed by the USDA-SCS personnel.

Thirteen progressive detailed standard soil surveys are in progress (in 1971). Final field reviews were held in two survey areas that encompass five counties. One final soil survey, Nelson County, was received from GPO in FY 1971.

Fifteen profiles were sampled for characterization studies. Chemical characterization of 18 previously sampled alluvial soils were chemically and particle size characterized. Ten previously sampled alluvial soils were chemically and particle size characterized. mGPO

REPORT OF THE MAINE AGRICULTURAL EXPERIMENT STATION

Soil Mapping Unit Characterization Studies  
Department Plant and Soil Sciences  
University of Maine

Soil identification and characterization is concentrated on two mapping units each year. Sites are replicated five times and soils are sampled for laboratory analysis. Percolation tests are run at each site.

Soil characteristics measured in the laboratory include: texture, organic matter, stone volume, water retention, bulk density, cation retention, exchange ability, and soil reaction. Soil data is presented on a stone free basis. These data are published biennially in the form of bulletins by the Maine Agriculture Experiment Station.

The data is also presented in the form of weighted means. The values for each horizontal category - A, B, C, etc. - are weighted, combined, averaged to present a single mean for the mapping unit. The pages are published to fit a loose-leaf notebook which allows for their addition as new soil units are studied.

Prepared by: Robert V. Rourke, 1/72

Forest Soil Research  
Department of Plant and Soil Sciences  
University of Maine

Plant and soil relationship studies are being conducted under greenhouse conditions using Spruce seedling. These seedlings are being grown in a typical forest soil and in a water culture.

Nine combinations of N, P, K, and lime were used on three year old Norway Spruce grown in pots containing forest soil. The trees were harvested after two growing seasons. There were no growth differences. Lime and K when added as a fertilizer did increase the N and P concentrations in the plant tissue.

A similar N, P, K, and lime study is now underway with Red Spruce. The seedlings are currently being subjected to the cold to break the rest period. Visible growth differences between treatments did exist in the Red Spruce at the end of one season. The nitrogen plus lime treatments looked very good.

White Spruce seedlings grown

minerals In the warm and semiarid climate with alternating dry and wet seasons, hydrolysis of the silicates in the alluvial soils occurs while the soil is wet, but because of poor drainage and high ground water table, release  $\text{SiO}_2$  and bases are prevented from being washed out of the soil. During the dry period the soil montmorillonite can be formed from a primarily illitic material. Kaolinites was found to be the predominant clay mineral in the red soils formed from granites and gneisses. It was suggested that the red soils have developed in material eroded from an old laterite layer covering southern India during the two latest epochs of the Tertiary period. The silt and clay fractions of black soils were in the black soils, silica and divalent cations are not leached to the same extent as in the red soils. The soil solution is therefore enriched with weathering products and has a Si/Al ratio conducive to the formation of montmorillonite minerals.

#### Manuscripts Prepared:

Lotse, E. G., N. P. Datta, K. P. Tomar, and M. R. Mtsara.  
1971. Mineralogical composition of some red and black soils of India.

Datta, N. P., E. G. Lotse, K. P. Tomar, and M. R. Mtsara.  
1971. Clay minerals in some lateritic and alluvial soils of India.

January 13, 1972  
Erik G. Lotse

#### Soil Research Data -- F. E. Hutchinson - 1970-71

When limed with varying rates the exchangeable aluminum content of an acid Caribou loam (pH 4.2) decreased 1.3 me/100 g. at 15% moisture. At 22% moisture content the corresponding Al decrease was 1.4 me/100 g. in the 0-6 inch layer. The decrease in exchangeable Al level in the 6-12 inch depth of this soil at 22% and 15% moisture contents was 0.9 and 0.7 me/100 g. respectively for each unit rise in pH.

The concentration of Al in the soil solution at the two moisture contents was unaffected by liming, but manganese (Mn) content of the solution decreased from 0.81 to 0.02 me/liter as lime rate increased.

The initial pH of a Hancock silt loam was lowered from 5.4 to values of 5.19, 5.06, 5.03, and 4.52 over a period of 4 years when seeded to timothy and fertilized with annual N rates of 100, 200, 300, and 400 pounds/acre. The corresponding levels of exchangeable Al in the 0-6 inch layer were 99, 160, 163, and 209 pounds/acre.

Environmentally Oriented Soil-Plant \_\_\_\_\_

C. S. Brown

1. Recent studies conducted with dairy fluid manure. Determination of nutrient content and macronutrient (N, P, K) recovery when applied to field plantings of timothy and sudangrass.
2. Studies relating to the establishment, and maintenance of vegetation on highway slopes constructed without **added** top-soil. **Timing** and frequency of N fertilization, and the recycling of N by unremoved grass vegetation are primary objectives.

SOIL SCIENTIST CERTIFICATION PROGRAM  
A REPORT TO NORTHEAST SOIL SURVEY  
WORK PLANNING CONFERENCE  
BY  
MAINE SOIL AND WATER CONSERVATION COMMISSION

The Maine Soil and Water Conservation Commission has developed legislation for a certification program for soil scientists, a program similar to the certification of professional engineers. This move was prompted by the number of requests for on-site investigations presently being received by our soil and water conservation districts. Maine is faced with a shortage of soil scientists whose time can be devoted to making these on-site investigations, and hopefully, a certification program may induce qualified individuals, including those not in state or federal employment, to perform soil investigations as a consulting service.

The proposed legislation for certification distinguishes, by means of definitions, an individual and investigations of a pedological nature from individuals and work in soil mechanics, a field of greater concern to the engineer. The program calls for a board of registration which would receive and verify the qualifications of an applicant for certification, and would handle the general business of the certification program,

A two-part examination, consisting of a four-hour written and a four-hour field examination, may be required of qualified applicants. An applicant's professional training and practical experience determine his qualification to take the examination. In the case of individuals with many years practical experience, certification may be made without examination. This exemption from exam would also be applicable to individuals with Soil Scientist Certification from the Soil Science Society of America and who are otherwise qualified,

Soil Scientist  
Certification Program  
Page 2.

Our objective is to create a means by which individuals qualified in the area of pedology may become recognized for their professional competence and to encourage such individuals to perform **soil investi-**gation services in Maine. Even though we **view this** program as a means of solving a manpower problem, we also realize that such recognition through certification could bring stature to the soil scientist profession.

Kenneth G. Stratton  
Soil Scientist

REPORT OF THE MARYLAND AGRICULTURAL EXPERIMENT  
STATION REPRESENTATIVE

This report summarizes the progress on various research projects for 1970-71 in support of the National Cooperative Soil Survey Program. Essentially all of the projects are cooperative ventures with the Soil Conservation Service, U.S.D.A.

Projects completed or those to be completed within six months include the following:

1. Pedogenic and Geomorphic Relationships of Associated Paleudults in Southern Maryland. (W. R. Wright: Ph.D. program)

This is a study of old (Yarmouth or older) soils in the Coastal Plain located on a landscape position with soils derived from late Wisconsin age material. Profile descriptions and laboratory analyses of samples 400 cm or deeper showed definite weathering trends in these soils. A hypothesis concerning the formation of reticulate mottling in certain Ultisols is also proposed.

2. Soil Characterization Studies of Major Soil Series in Maryland (part of W. R. Wright's M.S. program)

A study initiated in 1966 to investigate 20 important soil series in Maryland is complete. A preliminary draft copy of the field and laboratory data on 70 profiles has been circulated. A draft copy of field and laboratory data on another 62 profiles sampled from 1950-66 has also been circulated.

3. Accuracy of Field Textures

Accuracy of field textures is of vital concern to soil scientists; thus, a study was made to determine reliability of field textures as compared to the pipette method in the laboratory. The percentage agreement of field textures with laboratory results was about 50%, but allowing a 4% leeway around a particular textural class increased accuracy to 67%.

4. Vermiculite Determination on a Whole-Soil Basis as a Study of the Characteristics of Several Middletown Valley Soils. (C. B. Coffman: Ph.D. program)

A procedure has been developed for the determination of vermiculite on a whole-soil basis by cation-exchange measurements. This method has been used to study the mineralogical characteristics of vermiculite-rich upland soils from the Middletown Valley of Maryland, and has shown a large portion of the vermiculite to be in the silt and sand fractions of these soils.

**Projects currently underway include:**

1. Yield Study, (G.B. Robinette: M.S. program)

The purpose of this research is to improve yield predictions on certain key soils by collecting field data on farmer-operated plot areas and analyzing various yield factors. Observations have been made for 2 years, and the data are currently being analyzed. The effects of slope and landscape position are two of the parameters being evaluated.

2. Tidal Marsh Soils (J. C. Baxter: M.S. program)

A preliminary study of tidal marsh soils along the Patuxent River is currently underway. The objectives of this research are to (1) study the general field and laboratory characteristics of tidal marsh soils, and (2) study the relationships between soils and vegetation in tidal areas.

3. Water Table Measurements

This is a continuing study with observations currently being made at 2 locations. An example of data collected is attached.

4. Parent Material of Silty Soils of the Upper Eastern Shore

A study has been initiated to test the hypothesis that loess is a parent material in the Upper Eastern Shore.

5. Land-Quality Study in Howard County, Maryland

This is a pilot study to determine the distribution and possible zoning of Class 1 and 11 agricultural land in this country.

6. Computerization of Land Resource Data

With the soil survey nearing completion in Maryland, we have started placing information on our land resource in a computer system. This system will provide rapid retrieval of data on acreages, tax unit, and general characteristics of soils on a county or state-wide basis.

7. Archaeological Sites

This is a cooperative project with Catholic University on "Kitchen Middens" and Paleo-Indian sites in Virginia.

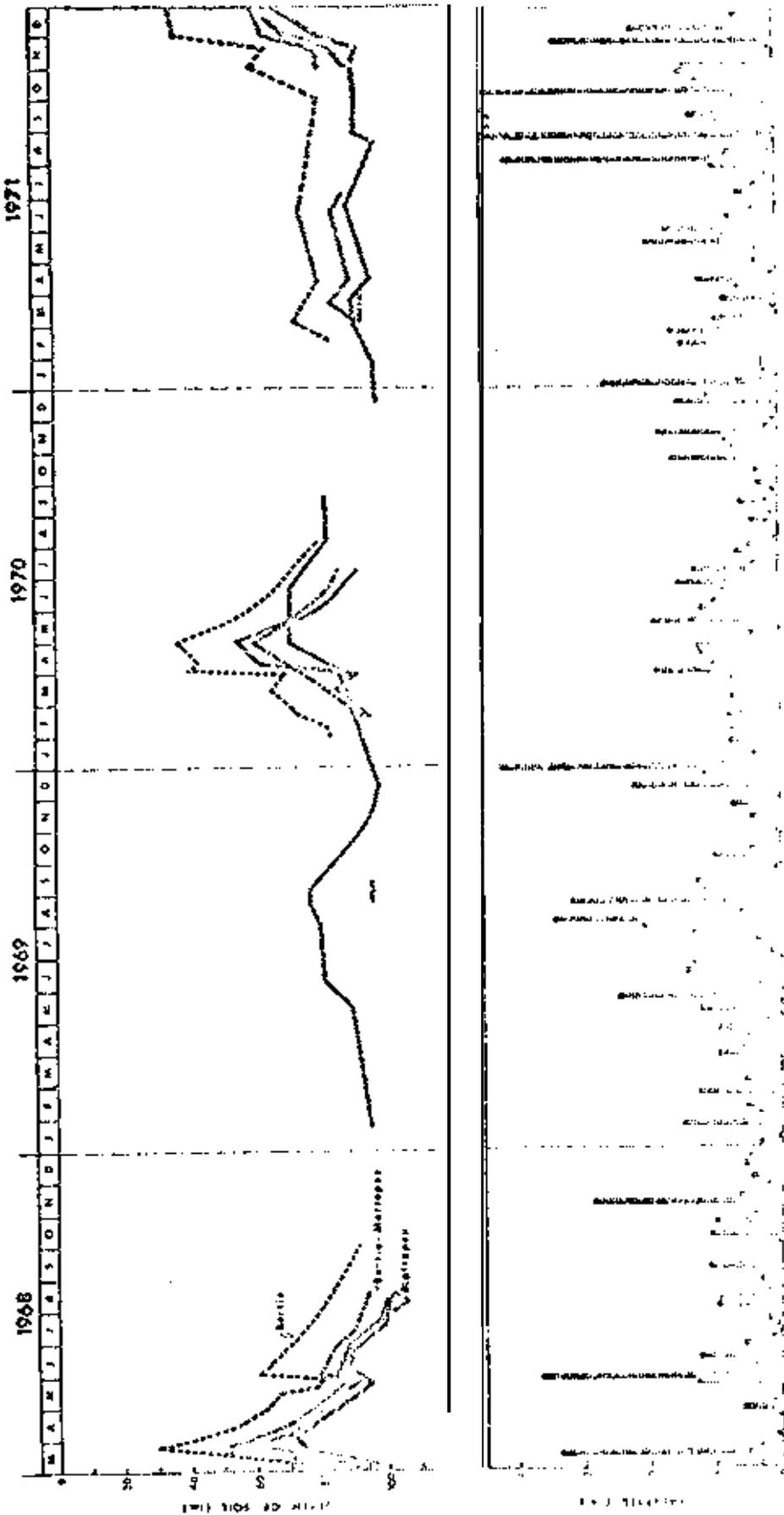


Fig. 1 Ground water levels and precipitation at 10-10, 10-11, and 10-12, 1968-1971. (Data from Miller, 1972)

Report of Activities from Cornell University Agricultural

Experiment Station Representative

The last biennium has been very enjoyable at the Cornell University Agricultural Experiment Station as we continued working on soil questions. Some of these questions have been:

A. How different is a Hapludalf from a nearby Fragiochrept? Mr. Chang Wang made genetic calculations for two till-derived soils. Carbonates restricted the Hapludalf solum to 90 cm whereas the Fragiochrept solum extended to 165 cm. Depth functions, based on 5 cm samples, indicated several discontinuities in each soil, the major one interpreted as a boundary between modes of deposition, namely ablation drift overlying lodgment till. Total weight changes and clay mineral suites were very similar; physical translocation of clay and accumulation of sesquioxides were the main processes. The Fragiochrept looks like a stretched-out Hapludalf and it is believed that these soils represent stages of development along a single genetic pathway.

B. When one is mapping fine textured lacustrine soils, how do you recognize changes from clay to more clay? Theories of structure formation permit predictions of ped sizes for some conditions. Robert van de Graaff tested a number of hypotheses relating the formation of subsoil structural units to soil parameters. Although our observations and analyses indicate that weighted mean ped diameter of subsoil peds increases with increasing wetness and/or depth in a solum, the differences are still within the "errors of field observation" suggesting that, at present, neither our fingers nor our eyes can make a consistent separation between fine and very fine textures in the field.

C. You believe in soil surveys and I believe in soil surveys but, really, how well does a soil survey relate with measures of farming? Ivan Jansen selected several soil associations where evaluations of economic viability for farming were quite variable. Using estimated yields from a published survey, several TDN measures of productivity, and soil proportions based on the maps he found that the soil survey information in most cases adequately supported or was related to independent measures of economic viability of farming. We still have a lot of confidence in the soil survey and its importance to farming.

D. Did you ever wonder what has happened in a small upland valley, and why you see what you do? Will Hanna and LeRoy Daugherty, like two mystery story sleuths have slowly unravelled the pieces, and then wound up a story for a glaciated valley in the northern edge of the Appalachian Plateau. The big story is that after glaciation, and during a periglacial period, materials on the hillslopes slumped and slid their way into the valley leaving a cirque-like upper basin, high level colluvial terraces, and a subsequent sequence of inset fluvial terraces. The cast of characters is long and somewhat involved but the outcome provides the background for the next book entitled, "The Case of the Questioning Pedologist."

E. How can one use soils and land use information to predict the quality of water in a watershed? Gerald Kling has been using a grid system to combine soils, land uses, population, and distance parameters to develop a dynamic model to predict phosphorus content of a lake. A daily phosphorus balance was developed by the N.Y.S. Department of Environmental Conservation and this is being used to regress the measured landscape parameters against. The Universal Soil Loss Equation provides the starting point for combining the soils and land use information within each 10 acre grid cell. The methodology has been developed, but the answers are still awaited.

F. What kind of mineralogy do some of the acid well drained highly weathered soils of Puerto Rico have? Dr. R. Mike Weaver has characterized 6 soils from Puerto Rico finding in general: that the sands are dominantly quartz; the silts are quartz, kaolinite, and gibbsite; and the clays mainly consist of kaolinite, amorphous material, and pedogenic chlorite. The most noticeable weathering trend within the profiles indicates a breakdown of silt-size kaolinite to clay-size kaolinite.

G. Within climatically acceptable areas how suitable are soils for commercial grape production in New York? A rating system based on soil drainage, rooting depth, profile texture, slope gradient, erosion, and topographic position was applied to some 800,000 acres in Western New York and an interpretive map at a scale of 1:24,000 prepared. About 42% of the soil area has slight or moderate limitations.

H. Will we ever get to use the 1966 Conservation Needs Inventory data? A final up-dated correlation of the soil units by SCS and the Station has unified the soil code and hopefully both agencies will have operational printouts in 1972. As a sidelight, we have assigned elevations to each CNI plot and intend to evaluate soil distributions by elevations to supplement series descriptions and to anticipate possible climatic phases.

I. What makes a boundary in a landscape and what does it enclose? Ivan Jensen is using a 60 X 60 m area gridded at 4 m to examine the geographical organization of soil properties and how they are related to potential segments of a landscape. What happens as you change class limits--both with regard to internal composition and with the boundary? We hope to gain some insights that enable us to better understand these problems and how to be more efficient in examining other landscapes.

J. Do you know the meaning of 'subsumers, comparative organizers, and meaningful reception learning? What do educational psychologists and soil scientists have in common? It turns out that both are concerned about teaching and learning. Fernando Couso has reviewed some learning concepts and shown how to apply them in teaching certain aspects of soil science. Once you sort it out in your mind it's simple: first things first, second things second, and so on--until soon you are teaching problem solving more efficiently and effectively.



CURRENT RESEARCH IN SOIL SURVEY AND RELATED AREAS  
The Pennsylvania

an unusual determination, after a two-inch rain and rapid rate of percolation (6 inches/hr.) on a Leetonia cobbly sandy loam (sandy skeletal.) was reduced for a short time reduced



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14. **Solid Wastes Systems and Impacts-Centre County**
15. **Land Use Change and Local Government Finance**
16. **The Economic Impact of Highway Improvement on Land Use, Land Value and Business Activity**
17. **Outdoor Recreation Site Analysis and Water Quality Study**

Publications -- 1971 -- Soil Survey Group, The Pennsylvania State University

1. Ciolkosz, E. J., G. J. Latshaw, R. L. Cunningham and W. D. Sevon. Parent material, topography and time as soil forming factors in eastcentral Pennsylvania. Guidebook-Division 55 Soil Sci. Soc. Amer. Soils Tour. 53 p.
2. Ciolkosz, E. J., G. M. Clark, J. T. Hack, R. S. Sigafos, and G. P. Williams. Slope stability and denudational processes: central Appalachians. Guidehook-Field Trip #10 Geological Soc. of Amer. 37 p. 1971.
3. Cunningham, R. L., E. J. Ciolkosz, R. P. Matelski, G. W. Petersen, R. W. Ranney. Characterization, Interpretations and Uses of Pennsylvania Soils: Armstrong County. Pa. Agr. Exp. Sta. Prog. Rept. 316:48 pp. 1971. In cooperation with the Inst. for Research on Land and Water Resources,
4. Matelski, R. P. Soils Influence Quality of Septic Tank Drainage. Science in Agriculture. 18(3):9. 1971, In cooperation with Dept. of Agronomy.
5. Matelski, R. P. Soil Series of Pennsylvania -- Catena Diagrams. 4th Ed. Agronomy Series 18. The Pennsylvania State University, Dept. of Agronomy. 78 pp. 1971. In cooperation with the Inst. for Research on Land and Water Resources.
6. Matelski, R. P. Soil Catena Diagrams for- Pennsylvania Counties. 2d Ed. Agronomy Series 17. The Pennsylvania State University, Dept. of Agronomy. 117 pp. 1971. In cooperation with the Inst. for Research on Land and Water Resources.
7. Matelski, R. P., R. L. Cunningham, G. F. Engle, G. W. Petersen. Characterization Data. Soil Survey Mercer County, Pennsylvania. pp. 64-69. USDA-SCS, U. S. Govt. Printing Office. 1971.
8. Petersen, G. W., R. L. Cunningham, R. P. Matelski, Moisture Characteristics of Pennsylvania Soils: III. Parent Material and Drainage Relationships. Soil Sci. Soc. Amer. Proc. 35:115-119. 1971.

REPORT TO NORTHEAST SOIL SURVEY WORK PLANNING CONFERENCE, 1972

R. J. Bartlett, Vermont Agricultural Experiment Station

1. Work has begun on a new project "Behavior in Soils of Elements Toxic to Man." The objectives are to determine background levels and forms of mercury, lead, cadmium, arsenic, chromium, barium, beryllium, and antimony in representative Vermont soils and to study chemical, physical, and biological factors that affect the mobility of these elements in soils and their availability to plants. Vermont SCS soil scientists are helping with the sampling for the initial survey work in this project. So far, they have sampled 64 profiles in seven counties.
2. Work is continuing in the characterization of the Spodic horizon as a model or prototype of a northern acid agricultural soil. The Spodic horizon is seen as expressing in extreme or idealized form many of the chemical properties of the latter such as pH-dependent cation exchange capacity and pH-dependent adsorption of phosphorus, boron, and potassium.

Field identification of soils with spodic character may be difficult when spodic properties such as color are weakly expressed or have been disturbed by plowing. A chemical field method for identification of a Spodic horizon was developed and tested in both the laboratory and field. The SCS staff helped by supplying a large number of soil samples for correlative purposes.

In the proposed field test, soils are initially screened for presence of reactive hydroxy Al by testing with  $\text{N NaF}$  and  $\square$  lizarin yellow. A sample of soil to be further tested then is equilibrated by shaking with a pH 9.1 phosphate solution. Separation of a spodic from a cambic horizon depends on removal of P by the soil from the solution as indicated by the  $\square$  bssncs or presence of blue-colored molybdophosphate in the filtrate. Phosphorus adsorbed by soil samples under the test conditions was found to closely relate to the Al chemistry of the soil. The test is seen as a practical field or simple laboratory method for quantifying spodic material present -- whether in a spodic horizon or in an Ap.

NATIONAL COOPERATIVE SOIL SURVEY

Northeast Regional Conference Proceedings

New York City  
January 19-20, 1970

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**PROCEEDINGS OF THE  
NORTHEAST COOPERATIVE  
SOIL SURVEY  
WORK-PLANNING CONFERENCE**

U. S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE

NEW YORK CITY

JAN. 19-22, 1970

NATIONAL COOPERATIVE SOIL SURVEY  
NORTHEAST SOIL SURVEY WORK PLANNING CONFERENCE  
January 19-22, 1970  
New York City

C O N T E N T S

Summary Statement

Agenda

Participants

Minutes of business Meeting

Committee Reports

1. Criteria for Soil Series and Phases
2. Promoting and Using Soil Survey Interpretations
3. Handling Soil Survey Data by Use of Electronic Equipment
4. Soil
- 5.
- 6.
- 7.
- 8.
- 9.

UNITED STATES DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE  
Durham, New Hampshire 03824

March 20, 1970

1970 Northeast Soil Survey Work Planning Conference--  
A Summary of Conference Actions

Receipts of Proceedings of Regional Soil  
Survey Conference

This memorandum serves as a summary of some important actions taken at the 1970 Conference as well as to record suggestions for planning the 1972 Conference. The Conference opened at 8:30 a.m. on January 19, 1970. The schedule for the 1970 Conference was somewhat different than that of previous years. Committee meeting time at the Conference was held to 1½ hours, thus allowing more time for Conference discussion of individual reports. The new arrangement stimulated good discussion on most reports. A majority of participants indicated approval to conduct the 1972 Conference in the fall of 1971.

The Executive Committee extends thanks to all invited speakers for their time and contribution to the program. A brief of these talks is included as part of these Proceedings. Thanks are also extended to each committee chairman and committee members for their efforts and contributions in preparing some excellent committee reports. We welcomed the attendance of Mr. T. McGourin, State Representative for Virginia, as the Administrator's representative at the Conference. The announcement of Dr. Arnold Barr's retirement for June 1970 was made shortly after the Conference was held. We would be remiss in not making mention of it in this summary. Arnold has provided the dedicated leadership to insure the success of the Northeast Regional Conferences for many years.

The 1970 Program provided time for a brief report from each representative of the Agricultural Experiment Stations. These reports were directed to current research activities in soil survey as well as other aspects of soil science. These reports were well received and fulfilled the objective of informing all operators of current research throughout the region. Six representatives provided written reports and these are included in these Proceedings.

Elected to the position of vice-chairman for the 1972 Conference was Dr. D.L. Fanning, Department of Agronomy, University of Maryland. Dr. Roland Stutchenseyer remains on the Executive Committee after serving as Chairman of the 1970 Conference.

### Committee Activities for Mont & Ahead

There is a need to establish new membership for two of the 1970 Committees at an early date so that work may be continued. Also, a preliminary Forest Soils for the Region was prepared and there is urgency to select committee members so that it may be activated.

#### Committee 5 - Miscellaneous Land Types and Soil Materials.

The following statements are excerpts from the 1970 Committee Report:

"It is anticipated that our report to the Conference will be more than sufficient on this subject. Much time consuming work needs to be done in the future to come up with acceptable definitions to cover the diverse land types and materials."

Completion of Committee action on new membership is to be complete by August 1, 1970.

#### Committee 6 - Update in Relation to Soil Classification and Interpretations.

The 1970 Conference approved the initiation of a soil temperature project for the Northeast. Committee 6 is to provide the coordination of the project and the chairmanship of Mr. Watson. The work of this committee will be directed as follows:

1. Develop a soil temperature form for the Northeast and coordinate with appropriate agencies in the region.
2. Develop prescribed procedures for temperature measurements as well as optimum frequency of measurements. Also, determine the most suitable and economical methods of measuring soil temperature.

The urging of the Committee members to assist Mr. Watson is to be complete by August 1, 1970.

#### Committee 7 - A new Committee for the Northeast.

In his concluding remarks he pointed out the need for this committee. Attention is needed to insure that soil surveys in extensive forested areas are meeting the needs of land managers. The initial work of this committee should include the following: scale of maps, design of soil survey legends and development of soil interpretations.

Executive committee action to activate this committee is to be complete by August 1, 1970.

### Request to Chairman of National Conference

The Chairman of the Chairman, National Conference is requested in making copies of other Regional Committee reports for use by Northeast Committees. This information has not been available until the release of the final of the Service Proceedings and often does not provide complete information. This information would be helpful to Northeast Committees.

### Suggestions for the 1972 Conference

The participants made several suggestions that need to be recorded for the 1972 Conference.

1. The agenda of the National Conference should be presented early in the year and preferably prior to the presentation of regional reports.

2. State committee chairman requested a greater time interval (if possible) between the short committee meetings and presentation of reports to the Conference.

3. The 1970 committee chairman had available adequate copies of the draft reports for distribution to all participants. This helped stimulate discussion of the reports at the time of report presentation. It is suggested that all future committee chairman bring sufficient draft copies of reports to the Conference so that distribution can be made.

4. Committee reports should clearly identify the following:

- a. Committee conclusions and recommendations.
- b. Items that need attention by a National Committee or the National Conference.

The Conference was adjourned at 11:45 a.m. January 22, 1970.



Sidney A. L. Pilgum  
Chairman  
1970 Regional Committee



1:15 - 2:00 PM  
 C.S. Min. Question  
 Period

New Photographic and Cartographic  
 Techniques for Improving the  
 Quality and Acceleration of Soil  
 Survey Operations - J. A. Gockowski

2:30 - 3:00 PM

Engineer Report on Classification  
 of Organic Soils in Northeast -  
 A. Kirk

Break

3:30 - 4:00 PM

RP Valve for b and c Horizons  
 for Determining Soil Erosion and  
 Sedimentation in Urban  
 Development - R. McCormick

4:00 - 5:00 PM

Soil Group for Farm Planning  
 Interpretations in Connecticut -  
 R. Henry

THURSDAY - JAN. 14, 1953

8:30 - 10:30 AM

Experiment Station Representatives'  
 Progress Report on Soil Survey  
 Research  
 (with scientific reports by W. Lyford  
 and Dr. J. F. Powers)

10:30 - 10:45 AM

Report of Northeast Soil Research  
 Committee - Dr. F. Strickleneyer

10:45 - 11:00 AM

Review Report on Revision of  
 Section Descriptions - L.E. Garland

11:00 - 11:45 AM

Concluding Statements -  
 Dr. A. C. Barr

ADJOURNMENT

Participants - Northeast Soil Survey Work Planning Conference  
New York City - January 19-22, 1970

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Participants - Northeast Soil Survey Work Planning Conference (continued)

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E.J. Pederson,

Northeast Soil Survey Work Planning Conference

January 19-22, 1970

Business Meeting Notes

Monday, January 19, 1970

The meeting was called to order at 8:38 a.m. by Dr. Struchtemeyer. Introduction of conferees was accomplished by self-introduction as to name and organization. Dr. Struchtemeyer passed a pad around and requested all conferees list their name and address. Dave Hill and Walt Steputis were appointed to the nominating committee and asked to nominate a vice chairman for the 1972 meeting. Dr. Struchtemeyer announced that he had received a memo from Roy Hockensmith which contained a suggested list of committee topics. Additions, deletions or corrections for this list were requested by Mr. Hockensmith. The memo also contained a request that all experiment station people who plan to attend the 1971 National Work Planning Conference, please let it be known to Mr. Hockensmith. Sid Pilgrim discussed briefly the new format for the committee meetings and their reports and announced the committee

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order

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NATIONAL COOPERATIVE SOIL SURVEY  
NORTHEAST SOIL SURVEY WORK PLANNING CONFERENCE

January 19 - 22, 1970

REPORT OF THE COMMITTEE ON CRITERIA FOR SOIL SERIES AND PHASES

A. Objectives

The committee was given the following charges:

1. **Evaluate** criteria for describing roots, pores, and clay films in Appendix IV of the National Technical Work Planning Conference Report, January 1969.
2. Alert conference on other significant problems in the Northeast relative to criteria for series and phases.

B. Committee Assignments

Committee **members were** asked to:

1. **Make** measurement of roots, pores, and clay films in selected horizons of soils in the Northeast, using the limitations set forth in Appendix IV in order to evaluate the criteria.
2. Review **criteria** for the description of skeletons and similar phenomenon and make suggestions for use in series descriptions.
3. Review series criteria and explore possibility for making differentiae for series and family the same, creating mono-series families,

C. Discussion

1. Roots, Pores, and Clay Films

Selected horizons of eight soil series were examined using high power hand lens. The samples for the most part were very dry Poly-con samples that were in storage for some time. Roots and pores were examined in respect to abundance, size, continuity, orientation, distribution, and location. Clay films were recorded in relation to frequency of occurrence, thickness, and location,

Roots and pores were easy to **describe** using criteria in Appendix IV. Most of the large roots were absent because of the small samples. The study revealed that the criteria proposed in the Appendix is **useable** for describing these features. The limits set for abundance classes, however, were questioned, As an example, why were 1 to 3 roots and **pores used** for-few and 4 to 14 used for **common**? The study revealed that it was not uncommon to observe as many as 50 to 200 pores in a 1 inch square surface.

Clay films were found to be more difficult to observe and measure than roots and pores. Color differences appeared to be the best clue in identifying clay films. The study indicated that a larger frequency of clay films were shown in series descriptions than were observed in examining the dry **Poly-cons.** The use of the criteria revealed that two individuals working **independently** on the same sample did not give altogether consistent results.

It also showed that more data is recorded about these features than occur in current series descriptions.

2. Skeletans and Similar Phenomenon

Skeletans and similar phenomenon are frequently found in soils in the Northeast need to be more uniformly described, particularly in series descriptions.

They consist of light colored grainy loosely aggregated material and appear as coats on the surface of peds. **When** the volume becomes greater than 10 percent the material is usually described in percentage as a part of A and B or B and A horizon.

The following criteria<sup>1/</sup> was reviewed for use in describing phenomenon such as prism streaks, **interfingering** and tonquing, when the material occurs as coating on **ped** faces:

I. Thickness

<u>Class</u>	<u>Name</u>	<u>Silt or very fine sand</u>	<u>Fine sand or coarser</u>
4	Thin	< 0.5 mm.	< 1.0 mm.
3	Moderately thick	0.5 - 1.0 mm.	1 - 2 mm.
2	Thick	1-3 mm.	2 - 6 mm.
1	Very thick		

II. Continuity

% Surface  
Class covered

---

III. Color contrast

High (a) When dry, a chroma of 2 or less and at least one unit less than chroma of dominant color of interior and value of 6 or more and at least one unit higher than value of dominant color of ped interior.

(b) When moist, a chroma of 3 or less and at least one unit less than chroma of dominant color of interior and a value of 5 or more and at least one unit greater than value of dominant color of interior.

Low All colors not meeting requirements above.

The following are examples of descriptions of skeletons using the above criteria:

- (1) Thick, continuous, high contrast, gray (10YR 6/1) silt coats, with brown (10YR 5/3) interiors.
- (2) Thin, spotty, high contrast, light brownish gray (10YR 6/3) fine sandy loam coats with yellowish brown (10YR 5/4) interiors.
- (3) Horizons having more than 10 percent by volume of light colored grainy material would be described with approximate percentage of degraded material such as 20 percent light yellowish brown (10YR 6/4) silt loam surrounding brown (10YR 5/3) heavy silt loam ped interiors. Ped coats would also be described if significant.

3. Review of series criteria and explore possibility of making series and family criteria the same, creating mono-series families. (One soil series in a family.)

An analysis was made of the number of soil series in the Northeast that occur in a soil family in the classification system. This revealed the following:

Soil families with 1 soil series - 60%  
Soil families with 2 soil series - 13%  
Soil families with 3 soil series - 11%  
Soil families with 4 soil series - 4%  
Soil families with 5-9 soil series - 9%  
Soil families with 10 or more soil series - 3%

A high percentage of soil series occur as mono-series families in the Northeast. It was found that the percentage of mono-series families differed by soil orders as follows:

Mollisols	-	80%
Inceptisols	-	69%
Spodosols	-	65%
Entisols	-	61%
Ultisols	-	56%
Alfisols	-	34%

The highest percent of mono-series families occurred in the Mollisols and the lowest percentage was found in the **Alfisols**. The family that contained the most series, however, was Typic Hapludults; fine-loamy, mixed, **mesic**, with 34 series,

Series criteria used in blue sheet description to separate series from **other** series in the same family is listed in Appendix II. The committee members differed on desirability of reducing the number of series in large families. They agreed, however, that series criteria needs study and efforts should be made to obtain uniformity of application.

#### D. Recommendations

##### Roots, pores and clay films

- (1) The National Committee establish a standing subcommittee to (1) review **available** literature for **information** useful in identifying and describing clay films, and (2) determine if there is research to show interpretive significance of classes of pores as set up in Appendix IV.
- (2) Criteria listed in Appendix IV for roots, pores and clay films be used as a guide only. It is not recommended as definition of these features in series descriptions, because of excessive detail.

##### Skeletans and similar phenomenon

- (1) The National Committee review proposed criteria for describing skeletans and make recommendations for revisions and testing,
- (2) More use be made of mixed horizon designations (**A&B**) and (**B&A**) in series descriptions to pinpoint zones of interfingering. Descriptions should include both volume and thickness of skeletans.
- (3) Frequency classes of clay films and silt films be the same.

##### Review of series criteria and explore possibility of making series and family criteria the same creating mono-series families.

- (1) The National Committee critically review series criteria to determine purposes of subdividing the family.

#### Committee Members:

R. L. Marshall (Chairman)	N. Holowaychuck (Advisor)
R. W. Arnold (Vice Chairman)	D. E. McCormack (Advisor)
R. L. Cunningham	R. V. Rourke
L. E. Garland	W. J. Steputis
	S. J. Zayach

Appendix I

SOIL SERIES, TYPES. AND PHASES

Amount or frequency, size or thickness of roots, pores and clay films described in selected horizons of series descriptions using criteria in Appendix IV, National Soil Survey Work Planning Conference, compared to description of these features in current soil series description.

Soil Series	Description Using Criteria in Appendix IV	Description in Series Description
<b>Beltsville</b>		
B2t	No roots; many very fine interstitial pores; very few clay films on ped faces and in pores	Few roots; discontinuous clay coats on ped faces and in pores
Bx1	No roots; many very fine interstitial pores; few thin clay films on peds and in pores	Continuous clay coats on ped faces and in pores
II Bx2	No roots; many very fine interstitial pores; few thin clay films on peds and in pores	Continuous clay coats on ped faces and in pores
<b>Elioak</b>		
B1t	No roots; many fine and very fine interstitial pores; few thin clay films on ped faces and in pores	Common fine roots; no clay films
B2t	No roots; many very fine interstitial pores; few thin clay films on ped faces and in pores	Few fine to medium roots; thin to medium clay skins on ped faces and in pores
B3t	No roots; many very fine interstitial pores; few thin clay films on ped faces and in pores	Few fine and medium roots; medium continuous clay films on ped faces and in pores
<b>Appleton</b>		
B & A	No roots; many very fine discontinuous random in peds simple open tubular pores and few fine continuous vertical tubular pores; few moderately thick clay films on peds and in pores	Few roots in upper part, common fine pores; patchy clay films on ped faces

Appendix I (Contd.)  
SOIL SERIES, TYPES, AND PHASES

Soil Series	Description Using Criteria in Appendix IV	Description in Series Description
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Appleton

<b>B2t</b>	Few, very fine, vertical exped roots; many very fine continuous, random, <b>inped</b> simple open tubular pores; common, thin to moderately thick clay films on peds and in pores	
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Churchvillem6 telmmon, tnoms on

Appendix I (Contd.)  
SOIL SERIES, TYPES. AND PHASES

Soil Series	Description Using Criteria in <b>Appendix IV</b>	<b>Description</b> in Series Description
Buxton <b>B12</b>	Very few random inped roots; few micro discontinuous, <b>vertical</b> simple, open tubular pores; very few thin clay films on ped faces	Thick continuous coatings on prism faces
<b>C</b>	Very few random <b>exped</b> roots; very few micro inped open interstitial pores; no clay films	Thin continuous films on ped faces and in some <b>pores</b>
Charlton <b>B21</b>	Abundant random roots; many micro random exped open interstitial pores; no clay films	Many fine and medium roots
B22	Plentiful random roots; many micro random exped open interstitial pores; no clay films	Common fine and medium roots
B23	Few random inped roots; many micro random exped open interstitial pores; no clay films	Few roots
<i>Wilmington 1/</i> Wayland A2	Plentiful fine fibrous roots; common very fine and few fine and medium random inped and exped vesicular and tubular pores	
<b>IIB22t</b>	Common fine and very fine and few medium random continuous inped and exped dendrix pores; thin clay films, <b>continuous</b> on ped faces	

1/ Initial draft, ~~1980~~

Appendix I (Contd.)  
SOIL SERIES, TYPES, AND PHASES

Soil Series	Description Using Criteria in Appendix IV	Description in Series Description
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Unknown soil - Berkshire County, Mass.	"Abundant fine roots; many fine continuous random tubular pores; no clay <b>films in pores</b> "  "Plentiful fine exped roots; very fine random tubular pores; no clay <b>films in pores</b> "  " <b>Few</b> fine exped roots; <b>many</b> very fine random tubular pores; continuous moderately thick clay films in pores and on vertical and horizontal ped faces"	
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## Appendix II

### Criteria Used in Blue Sheet Description to Separate Series Described From Other Series of the Same Family in Northeast and Midwest

thickness of horizons - A, B

stratification

depth to, or presence of carbonates

texture differences, sand size or amount, silts or clay; contrasting layers

colors of surface or subhorizons; hue, value and chroma

fragment content or composition

acidity

sediment - silt mantle, etc.

kind of horizons - lamella B

depth, presence or absence of mottles

Ethology of parent material

depth to bedrock

mineralogy

bulk density differences

thickness of solum

tonguing of albic into B

presence, absence, or depth to buried horizons

expression of fragipans, argillic

type of horizonation, degree of development, fragipan, argillic plinthite

free iron, magnesium, potassium or exchangeable aluminum, phosphorus content

weatherable minerals

drainage

degree of color horizonation

Appendix II (Contd.)

March, 1970

NORTHEAST SOIL SURVEY WORK PLANNING CONFERENCE

New York City - January 19-23, 1970

Report of  
Committee -2

PROMOTING AND USING SOIL SURVEY INTERPRETATIONS

The first four charges to this committee were set forth in the recommendations of the National Soil Survey Conference held in Charleston, South Carolina last January 27-30, 1969. The fifth item is a general charge which the committee was asked to consider.

The charges to this committee were forwarded to all committee members. Individuals were asked to consider specific charges and forward their comments to the chairman. The chairman edited the comments of each committee member into the following report.

1. Technical Handbook for Soil Survey Interpretations

The committee considered the format and content of a handbook and it was proposed that such a handbook would be useful and should be in a loose-leaf form in its' initial drafts to facilitate subsequent revision.

- Recommendations -

1. A table of contents should be developed and chapter outlines proposed. The format and chapter contents should be reviewed by the National Soil Survey Work Planning Conference Committee to determine if agreement can be accommodated on a national scale.

2. Both farm and nonfarm interpretations should contain standard criteria accommodating the discipline of soil

5. Contained in Appendix I is a first approximation of chapter listings for a proposed handbook on soil survey interpretations.

#### II. Development and testing of procedures for coordinating soil survey interpretations

The present procedures for coordinating soil survey interpretations were reviewed.

In the northeast region, this procedure consists of a series of workshops which have included a number of specialists. The Interpretations are based on the Major Land Resource Areas<sup>1/</sup> (MLRA) and the workshops are held to both coordinate and update the interpretations. The advantages of this system are listed in Appendix II. The interpretations are recorded in a tabular arrangement for each soil.

The committee reviewed the procedure followed in the Southern and Midwest regions. In these regions, all the interpretations for a soil series are placed on a single sheet. With this procedure, the state having responsibility for the official description of the soil series is assigned the responsibility for developing and coordinating the interpretations for the series. Thus, coordination is by correspondence with other states having the same soil series. Although these systems do have the advantage of having all interpretations on one sheet for a series, the committee found the review and coordination procedure to be inefficient, not comprehensive, lacking in uniform interpretive criteria, and generally ineffective.

A committee member expressed concern over duplication when separate interpretive tables are prepared for each MLRA. It was pointed out that this procedure has caused some delay in completing coordination work. Most interpretations for a soil are the same regardless of which MLRA the soil is located. Although interpretations may differ for cropland or woodland between MLRAs, it was pointed out that this is the exception rather than the rule and the other interpretations do not differ. It was suggested that the MLRAs containing the soil could be listed at the top of the interpretive sheet. If differences exist in the interpretations for a soil, a different sheet could be prepared for that MLRA. This would eliminate most of the duplicate typing of the same interpretations of a soil more than once on all interpretive tables.

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<sup>1/</sup> As defined and delineated in "Land Resource Regions and Major Land Resource Areas of United States", USDA Agr. Hdbk., 296. 82pp., 1965.

Several other problems in coordination procedures were noted:

1. Coordination of soil interpretations by MLRAs without prior standardization of guidelines is the cause of some problems. Guidelines are, however, gradually being prepared.
2. Coordination is attempted in some cases without having firmed up the estimated physical and chemical properties which support the interpretations.
3. Terminology is not always standardized for use in the coordinating process. Transferring values and interpretations from one state to another cannot always be done without reediting the interpretation to conform to the state's terms and phrases.

- Recommendations -

From the experience of several committee members, the following procedure was recommended:

1. The first item of importance should be a workshop of specialists from the four major sections of the U.S. to discuss and agree on criteria and terminology to be used in developing interpretations, particularly the criteria and terminology to be used in the MLRAs that extend from one region into another. (See recommendation number 2 under the first charge). These specialists would include soil scientists, agronomists, engineers, foresters, biologists, recreation specialists, and geologists. The table of estimated physical and chemical properties should be prepared first. Every effort should be made to solicit the opinion and data from University specialists and others outside USDA. The specialists should prepare tables of interpretations for major Benchmark Soils across the country using the kinds of features and terms which will be used in the MLRA tables. These tables prepared by the specialists should then be distributed for use at the MLRA workshops.
2. After agreement is reached by the specialists of these four sections of the country, a series of workshops (one for each MLRA) should be scheduled to develop tables of interpretations for all the mapping units that occur in more than one state within a MLRA.

3. The state having responsibility for the MLRA would see that the tables are reproduced and interpretations kept current within the MLRA. If the interpretations are changed for one series, this may have an effect on many other series. By having a table and/or interpretation sheets for each series showing all the soils within the MLRA, it would be easier to make all the needed changes at one time. The committee stressed the need for one individual or an office to coordinate the workshops and program the coordination between states.
4. The coordinated tables would be the basis for preparing single sheet interpretations and the interpretations used in published soil surveys, technical guides, soils handbooks, etc. They would be of much value to authors of published soil surveys in preparing the tables for their manuscripts. They are a great help for those who have to review the tables in manuscripts to see that the interpretations are not in conflict with the coordination.

### III. Information programs for specialists in other disciplines

Many types of information programs have been developed and used to promote soil survey interpretation utilization. These programs range from "one shot" group meetings to field trips, workshops and courses. Agreement is not easily reached on the "best" method of formulating an information program. Each audience is different and each discipline and problem must be approached in its own unique way. In addition, the method or program should be flexible enough to accommodate the individual(s) making the presentation.

Soil survey information is being solicited by many disciplines outside soil science. We find ourselves dealing more every day with professional specialists from these disciplines. In many cases, the most effective educational effort and solution to soil-related problems is through personal contact with key personnel in other disciplines. Once these people are aware of the value of soil survey information, they are commonly an automatic audience when more information and assistance is necessary.

In planning and holding meetings, workshops, courses, etc. for specialists in other disciplines, it should be mandatory to include at

At this time, the committee is making several broad recommendations in the hope that the future will allow the committee to formulate an informational program from the efforts and experience of the northeast states.

**- RECOMMENDATIONS -**

1. Each state should organize a permanent soil survey education and promotion committee to formulate an educational program, promote information programs and provide a vehicle to cover everything from setting up an educational program when new surveys are released to responding to large requests for information. This committee should consist of at least the State Soil Scientist, Experiment Station Representative, and Extension Service Specialist.
2. When problems are cited where soil survey information might be used, every effort should be made to contact those responsible for possible assistance. Public support for the soil survey must continue to be stimulated. If this were done successfully, the planners, officials, etc. who are the direct users would be free to, and in fact, obligated to use soil survey information.
3. When major requests for assistance are made by personnel from other disciplines, the person or agency (SCS, Soil Conservation Districts, Extension Service, University personnel, etc.) receiving the request should contact the aforementioned committee or at least the appropriate SCS, University and State personnel so that a coordinated response to the problem or a possible educational program can be formulated.
4. Where any interim reports are prepared, unless published to exacting standards, they should be distributed only to those personnel who can use and understand the detail and quality of the report.
5. For illustrative purposes, slides of soil-related problems are valuable. A set of these slides should be solicited from each state and made available. A slide set or narrative (other than description of the problem) is not necessary since other slide sets are available to introduce the subject.

#### IV. Testing the broad general ratings for specific land uses

One of the committee members was primary author of the McHenry County, Illinois project and has solicited torment from others familiar with this work.

The standard three color system was used except for the "Guide for Urbanizing Areas" which was expressed in an eight color interpretive system. In addition the limitations were expressed as specific potential problems rather than in terms of soil properties or features. In retrospect, it was felt that the three color code should be retained, even for this urbanizing area guide. The same interpretive format can be retained regardless of the number of colors.

The committee felt that the interpretive format (color bars, description of limitation classes in terms of soil features and problems, and the concise method of presenting potential problems with a number key) was useful and easily read. It is especially advantageous in that this type of format not only provides the degree of limitation but also the reason or soil properties responsible for the hazard or limitation.

The question which was raised is whether soil interpretations should be expressed in terms of potential problems' (i.e., wet basements, etc.) or expressed in terms of soil features (i.e., seasonal high water table, etc.). Since the clientele using the soil survey is requesting specific problem interpretations, it was felt that soil scientists should continue to provide them. If we do not, those not familiar with soils will attempt the conversion at our (soil scientists) expense and reputation. The committee does, however, recognize the pros and cons of this direct versus abstract expression of soil problems.

#### - RECOMMENDATIONS -

1. The three color code system (red, yellow, green) should be retained. For some interpretations, consideration should be given to only a two color system. Eliminating the middle category may be desirable.
2. Both the degree of limitation and soil properties responsible for the limitation should be included.
3. Specific problem interpretations should continue to be used in conjunction with the important soil properties affecting the indicated land use. In addition, a column or table could be prepared indicating for each mapping unit the soil properties which should be considered in any land use decision.

V. Engineering interpretations which have presented special problems.

A survey of committee members resulted in the many comments and suggestions on the following subjects.

1. Septic filter fields:

- a) It was pointed out that the potential of soils for septic tank filter systems has recently received much attention. Not only is more quantitative data on the potential of soils for this system needed but also studies on the types of systems that are needed for different kinds of soils.'
- b) Another concern is that many areas recommend or use (through tradition) dry wells in place of filter fields. These structures commonly extend to depths of 10 or 20 feet. Sanitarians, planners and others are asking for interpretations and consultation concerning this problem. Of course, interpretations at these depths are going beyond the capability of most soil surveys, although sound interpretations can be made from surveys where parent materials are uniform (with depth) and well known.
- c) There is a constant pressure to extend our recommendations to greater depths. This situation is of special concern in view of a greater emphasis on only the soil horizons or control section in the latest classification system and a tendency to ignore parent materials (or substrata).
- d) Some work is being done in drafting county ordinances on the basis of allowing percolation tests to be run only at certain times of the year, i.e., when the water table is at its peak. This points up the need for more water table and moisture regime studies.
- e) It was also pointed out that septic tank hazards are frequently interpreted as suitability and statements appear in reports which state that "this soil cannot be used for septic tank disposal systems".

2. Shrink-swell: Additional work on the shrink-swell potential is needed.

3. Corrosivity: Additional work and data are needed for this interpretation. SCS Soils Memorandum 72 (Dec., 1969) addressed itself to this problem. The question of whether this rating should be in our published soil survey reports was also raised.

4. **Depth to rock:** A problem in older reports was mentioned where either depth of solum or depth of root zone is designated as depth of soil and possibly construed to mean depth to rock.
- t. **Engineers:** In furnishing interpretation of soils to nonfarm users - particularly to engineers - we are less precise than they would like for certain properties. Engineers would like to have exact values for compaction characteristics, compressibility and stability. The Guide for Interpreting Engineering Uses of Soils does relate these to the Unified Classification. However, one thing that would probably help is better definitions of bearing strength, compressibility, stability, etc. Or, better criteria are needed to relate the usual stated soil characteristics to these terms.
6. **Sources of materials:** better guidelines are needed to indicate the degree that we should let wetness and flooding or steep slopes affect our ratings of soils as good, fair, or poor as sources of topsoil, sand, gravel and road fill.
7. **Frost action:** Too much emphasis has been placed on soil textures (susceptible) without due consideration of the morphology of the soil as a whole. On the basis of the Corps of Engineers Subcourse 360, Soils Engineering, we should be able to classify all soils as either high, moderate or low susceptibility to frost heave by synthesis of texture, water table, permeability, and landform.
8. **Sewage lagoon:** The question has been raised as to what extent should a seasonal high water table affect the rating of a soil for a sewage lagoon? Are there greater construction problems, greater contamination problems, or greater functioning problems? Answers varying from "no problem" to "stay away from them" are given. The present Engineering Guide (SCS) emphasizes the importance of a water table in interpreting for this use, but water table has never been a criterion in the rating chart.
9. **Deep trench landfill:** The question of whether the soil surveys provide sufficient information for making deep trench sanitary landfill interpretations has been raised in some areas. Should we restrict the answer to on-site interpreting? In addition, there are several land fill materials (e.g. incinerated ash, non-toxic materials, etc.) which can utilize sites and soils not considered under this interpretation.

10. Rating charts: An Item which is being brought before this committee is: "should copies of rating charts (criteria) be included with interpretations which are released to the public? There appear to be differences of opinion on this matter. Some professional people, literally demand these charts to know what basis is being used for the interpretation and to establish validity.
11. Interpretation of disturbed areas: An Increase has been noted in the number of requests for assistance in interpreting or predicting soil performance on disturbed areas. This has been particularly critical with landscape designers in trying to write final grading specifications into a contract to insure some degree of success for final landscape plantings. This and other areas dealing with disturbed areas are going to have to be given our consideration in the future.

VI. It is recommended that this committee be continued.

Committee Members:

F. P. Miller, Chairman  
 F. W. Cleveland, Vice-Chairman  
 R. J. Bartlett  
 H. H. Bailey  
 F. G. Loughry, Advisor  
 R. W. Ranney  
 R. L. Shields  
 N. K. Peterson  
 B. G. Watson  
 R. E. Daniell, Advisor'

**Appendix I**  
**~ First Approximation ~**

**HANDBOOK FOR SOIL SURVEY INTERPRETATIONS**

**Chapters to be Considered**

**Part I. Introduction**

**Chapter 1**

**Philosophy and Principles Involved In Soil Survey Interpretations**

(This chapter could consist of the paper written by Dr. Charles E. Kellogg issued in April 1961 or could be similar material prepared by someone else. Land use patterns and soil related problems could be reviewed and exemplified.)

**Chapter 2**

**Soil Survey Interpretations For Small Scale Maps**

(The book "Soil Surveys and Land Use Planning" published by SSSA and ASA in 1966 contains information about use of soil surveys in county and regional planning. There is a great deal of information which is now available to develop this chapter.)

**Part II. Farming Interpretations**

**Chapter 3**

**Soil Survey Interpretations For Cropland**

(This chapter could contain an explanation of the capability classification system, such as that in Agriculture Handbook 210, and guide sheets with criteria for classifying the land into capability classes and subclasses. Also, a discussion of yield estimates for defined levels of management should be included. The committee felt there is still a need to settle on a system for converting our Capability Classes into a three-color interpretive system for intensive cropping for use by planners.)

**Chapter 4**

**'Soil Survey Interpretations For Pastures and Range**

(There is no national classification system for classifying soils according to suitability for pastures.)

**Chapter 5****Soil Survey Interpretations For Woodland**

(This chapter could draw from revised Soils Memoranda 19 and 26 and other criteria developed by regions for making soils-woodland interpretations.)

**Chapter 6****Soil Survey Interpretations For Wildlife**

(The Northeast Region for several years has used a system for making wildlife interpretations. This chapter would contain an explanation of the system and provide guide sheets of criteria for rating soils for development of wildlife habitat elements and rating them according to suitability for classes of wildlife. The wildlife interpretive system still needs some work.)

**Part III Nonfarming Interpretations****Chapter 7****Soil Survey Interpretations For Recreation**

(This chapter would discuss some of the principles and assumptions involved and could draw from the guide sheets attached to Soils Memorandum 69.)

**Chapter 8****Soil Survey Interpretations For Town and Country Planning**

(This chapter would have a discussion and contain guide sheets for such uses as foundations for houses, streets and low cost roads, septic tank filter fields, sewage lagoons, sanitary landfills, excavations, trees for windbreaks, shade trees, plants for screening, ornamentals, etc.)

**Chapter 9****Soil Survey Interpretations For Engineering Uses**

(This would consist of a revision of our present guide. Mr. Orvedal, Assistant Director of Soil Survey Interpretations, is presently preparing a revision of the Guide for Interpreting Engineering Uses of Soils.)

**Chapter 10****Soil Survey Interpretations For Tax Assessment**

(Many areas are now basing tax assessment on soil surveys and several systems have been developed.)

**Part IV Coordination of Soil Survey Interpretations, their use in Legislation, and limitatlons.**

**Chapter 11**

**Coordination of Soil Survey Interpretations**

(Interpretations for comparable phases of soil series require coordination across state and regional boundaries. Methods for getting this job done might deserve discussion in the handbook. As we are getting into automatic data processing, we might want some discussion of using the computer to aid us in coordination,)

**Chapter 12**

**Legislative uses of soil survey interpretations**

(A discussion of how surveys can and have been used in developing zoning, ordinances, legislation, etc. may deserve attention.)

**Chapter 13**

**Interpretive techniques for special objectives**

(A number of special interpretive tables and example interpretive maps and overlays are available from various states. Perhaps this could be included in Chapters 1 or 8.

**Chapter 14**

**Interpretive and cartographic limitations**

(It should be pointed out that soil interpretations can only go so far. Also cartographic limitations on color work, scales, costs, etc. should be considered.)

## Appendix II

The advantages of the present Northeast Region interpretation coordination workshops are considered to be:

1. Participants at the workshops have included soil scientists, agronomists, foresters, state resource conservationists, engineers, geologists, and other specialists of the states involved in the MLRA's.
2. Criteria for making the interpretations could be discussed and mutually understood and agreed upon prior to developing and recording the interpretations in the tables.
3. When differences in concepts of soil series arose, there was opportunity for discussion by soil scientists of more than one state and differences were resolved much more easily than if it had to be done by correspondence.
4. By having various specialists at the workshop, the exchange of information and ideas was facilitated resulting in better technical quality and accuracy than could be achieved by correspondence.
5. Actual data were brought to the workshop by the participants to substantiate the interpretations that were developed.
6. When all these specialists are involved in developing the interpretations, they have more confidence in their reliability and are more likely to use the coordinated interpretations than if someone else developed the interpretations for them to use.
7. A tabular arrangement of the interpretations with soil series in alphabetical sequence permits easy comparison of interpretations for competing series or similar soils within the MLRA. This helps to have comparable interpretations for comparable phases of the similar soils. Other committee members felt that individual interpretation sheets for each series might be more convenient for comparison.
8. The interpretations in the tables for a large number of soils can serve as benchmarks for new series established in the states. The tables can aid in preparation of interpretations that go in published soil surveys, technical guides, interim or special reports, and the single interpretive sheets which some states have developed and are now using.

The advantages and disadvantages of the coordination procedure with single sheet interpretations for each series as used in the Southern Region were considered to be:

**Advantages:**

1. The single interpretive sheets for each description may be packaged rapidly into interim or special reports.
2. They can be given to individuals seeking information on only one or a few soils.
3. When a new series is proposed or when a series description is revised, the interpretations can be developed and circulated with the series description for review and approval.
4. They may be used in technical guides.

**Disadvantages**

1. When the sheets are sent out one or two at a time, the reviewer may not have interpretations for competing or similar series as a basis for comparison. There is more chance for wide differences in interpretations for similar soils.
2. In some instances, it has been found that the criteria used in one state differ from the criteria used in another or they may have different interpretations of the criteria.
3. The man who prepared the interpretations or the man reviewing the interpretations may be new in the state and unfamiliar with the series.
4. The priority of other work may not provide adequate time for a thorough review and check of the interpretations in the time allowed for return of comments.
5. At the time of review, other specialists such as engineers, agronomists, etc., may not be in the office for consultation.
6. The technical ability and experience of the men preparing or reviewing the interpretations is quite variable among the states. When a poor job of preparation is done, considerable valuable time is spent commenting on the obvious errors. Some of the errors may be due to poor typing and these could have been corrected if the sheets had been carefully checked before sending out for review.

7. There has not been agreement among specialists across regional boundaries on all of the criteria used for making the interpretations. Consequently, in those MLRA's that extend from one region into another, occasionally differences in interpretations cannot be resolved to the satisfaction of everyone.
8. In this piecemeal approach to coordination, it may require several years to complete the interpretations and coordination for all the series. In the meantime, some of the interpretations, such as crop-yield predictions, may be out of date. There is not a good method of knowing which series have interpretations that are current and which need revision.

NATIONAL COOPERATIVE SOIL SURVEY

NOR HEAST SOIL SURVEY WORK PLANNING CONFERENCE

January 19-22, 1970

REPORT OF COMMITTEE ON HANDLING  
SOIL SURVEY DATA BY USE OF  
ELECTRONIC EQUIPMENT

The handling soil survey data committee was given the following charges: (1) Make a survey of the States in the Northeast on their progress of using electronic equipment in soil science activities. (2) Report to the Northeast Soil Survey Work Planning Conference on progress at the national level on handling soil survey data by use of electronic equipment.

The survey requested under our first charge was conducted by sending to every participant of the 1968 Northeast Soil Survey Work Planning Conference a request as to how they or someone in their

During the committee report the following individuals enlarged upon the information outlined in Appendix I as to how they are using electronic equipment: John Allen (Connecticut), Kenneth Wilson (New Jersey), Richard Arnold (New York), Gary Petersen (Pennsylvania), Mary Stevens (Forest Service) and Arnold Orvedal (Soil Conservation Service).

We were fortunate to have Mr. Orvedal in attendance at our conference so he handled our second charge by reporting on the progress at the national level on handling soil survey data. He reported that not much progress has been made on the Pedon data file since the 1969 National Conference at Charleston, except that reviews have been received from experiment station and Soil Conservation Service personnel. Programming is nearly completed for the Soil Classification file, which will allow an alphabetical comma-ready listing of all the soil series in the United States giving their state (established or tentative) and their placement in the soil classification system. Work is underway to get some soil survey interpretations into a computer system so the computer can be used to coordinate interpretations and to test the soundness of the grouping of series into families.

The committee made the following recommendations:

soon as possible.

(2) More emphasis should be placed in this area of ADP and that it should be given a higher priority than it is presently receiving.

(3) We should all become more involved with using the computer in the hope that it will become a common tool.

It is recommended that the committee be continued.

Committee Members:

Chairman - G. W. Petersen\*

Vice-Chairman - J. J. Noll\*

Membership	- A. J. Baur*	E. J. Peterson*
	M. G. Cline	W. H. Lyford
	L. J. Cotnoir	K.P. Wilson*
	J. E. Foss*	M. Stevens*
	J. Kubota	J. F. Tedrou
	M. E. Weeks	D. E. Pettry, Advisor

\* Present at committee and report session

Other participants at the committee meeting

Arnold G. Orvedal  
John Allen

State of Michigan

State or AgencyUse of Electronic Equipment in:Soil Survey ActivitiesOther Activities in Soil Science

Pennsylvania	Perform almost all calculations for soil characterization laboratory procedures. Laboratory and some morphological data are stored on magnetic tapes for retrieval. Various plotting techniques are being used and programs are in preparation to classify soils. Camera-ready tables and figures are being outputted.	Soil testing program.
Rhode Island	---	---
Vermont	---	---
Virginia	---	---
West Virginia	---	Programming woodland soil-site data.
Cartographic Division - SCS	Preparation of soil maps.	---
Soil Correlation - SCS	To provide alphabetical printouts indicating the current placement of series in the New Classification System.	---
Forest Service	Data storage and retrieval of field data from soil profile descriptions and laboratory data.	---

\* Usage of the computer for routine statistical analyses was not included in this table.

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NATIONAL COOPERATIVE SOIL SURVEY  
NORTHEAST SOIL SURVEY WORK PLANNING CONFERENCE  
JANUARY 19-22, 1970  
REPORT OF THE COMMITTEE ON SOIL MOISTURE

During the 1960's, the National and Regional Soil Moisture Committees concentrated their efforts on water table regimes and rate of water movement through soil in an attempt to replace or supplement the drainage classes listed in the Soil Survey Manual. The Northeast Committee suggested a classification system of water tables based on depth and duration. The National Committee recommended that the regions test this scheme by field measurements.

Water table fluctuations and movement of soil water is especially important in humid temperate regions where precipitation exceeds losses by evaporation and transpiration. In areas where evapo-transpiration exceeds precipitation, evaluation of water tables is less important. Here, moisture regime of the unsaturated zone is of paramount importance. But even in the Northeast, the moisture regime of the unsaturated zone above the water table is important in the economic production of most crops. In this respect, we must not only consider the effect of moisture on yield but also its effect on crop quality especially fruit crops. This was dramatically emphasized during droughts in New England in 1957, 1965, and 1966. In fact, precipitation was below normal at many weather stations in New England during the 1960's and water tables fell to their lowest levels on record in many areas.

Several members of the Northeast Committee were concerned with the basic objective of using weather data to predict the soil moisture regime. The work of Cohen and Strickling<sup>1</sup> at Maryland was cited in which they found that forage plants wilted and growth ceased despite the fact that neutron probe measurements indicated that available water was present within the root zone. Of course, this doesn't preclude the possibility that the soil in immediate contact with adsorbing roots was incapable of supplying water even though water was present elsewhere within the zone and was measured by the neutron probe. The use of weather data would be inferior to actual measurement of soil moisture because of the many interrelated factors affecting (1) the capability of the soil to store water, (2) the capacity of mother nature to supply water, and (3) the capability of plants to utilize it. We agreed that actual field measurement of soil moisture by neutron sensing devices would provide the most accurate estimate of the moisture regime. Despite our cautious natures we felt that the Regional and National Committees should develop a classification of moisture regimes that could be used to quantify moisture in the unsaturated zone occupied by plant roots. A minimum goal would be to develop a system that could be used in making statements in Official Series Descriptions based on the capacity of the profile to a specified depth to store moisture between specified tensions,

Our first attempt was to quantify the moisture regime during the growing season in the Northeast; a period from May 15 to September 15. We attempted to quantify three time segments with moisture: (1) greater than field capacity, (2) field capacity to wilting point, and (3) below wilting point. These were rejected as being somewhat irrelevant, at least for the Northeast. We narrowed the segments to moisture contents at which (1) the plants were not under stress and (2) the plants were under stress. We were reluctant to place a value at the point of stress vs no stress in the soil because stress is often placed on the plant by atmospheric conditions (e.g. hot dry winds on a sunny day vs

1. Cohen, O.P. and E. Strickling (1968) Moisture use by selected forage crops. Agron. Jour. 60:587-591.

cool moist winds on a **cloudy day**). But, for the sake of argument, we tentatively accepted a tension of 10 atmospheres as the point on the moisture release curve where plants cease to develop normally and trigger defense mechanisms for mere survival. This of course **would vary among** plant species. The classification must include not only a description of the length of moisture stress periods but also when these periods occur during the growth cycle. For example, yields of corn are highly correlated with the number of days (not consecutively) that the corn plant is not under **stress** during the **9** week period from 6 weeks before silking to **3 weeks** after silking? Earlier drought would delay **silking** but would not necessarily affect yield. For grain corn, stress at silking severely limits grain production but stress in earlier vegetative phases affected grain production less severely. <sup>3</sup>

Three seasonal periods are proposed using corn as an index crop:

<b>Early</b>	May 15 to July 15	Vegetative growth
Middle	July 16 to August <b>31</b>	Seed production
Late	September 1 to October 1	Maturation

Three drought classes are proposed:

Slight	0-10 cumulative stress <b>days</b>
Moderate	<b>10-20</b> " " "
Severe	20+ " " "

With knowledge of moisture release and available moisture holding capacity in any soil to a given depth, one **could** estimate the moisture content of the soil at the stress point. A daily bookkeeping method can be developed using rainfall as a credit (adjusting for run-off and flowthrough in heavy rains) and using one-half pan evaporation as a debit (except in July and August when the full pan evaporation would be used). **In** the absence of pan evaporation records, **evapotranspiration** estimates can be 0.1 inches per day during May, June, and September and 0.2 inches per day during July and August. From summaries of long term weather records, one could predict the probability of drought **classes** in **any** segment of crop growth and could then make useful interpretations about any selected crop.

NATIONAL COMMITTEE CHARGES TO THE REGIONAL COMMITTEE

The National Committee on Soil Moisture **recommended** that the Regional Committees explore the following two topics related to climate and soil moisture regime:

1. Consider the kind of information about the weather for a period of measurement that should accompany soil moisture regime data.

The committee suggests that the kinds of weather information should reflect the elements of weather that enter into the hydrologic cycle and those that effect evapo-transpiration rates.

- 
2. Dale, R F. and R.H. Shaw (1965). Effect on corn yields of moisture stress and stand at two fertility levels. Agron. Jour. 57:475-479.
  3. Denmead, O.T. and R.H. Shaw (1960). The effects of soil moisture stress at different stages of growth on the development and yield of corn. Agron. Jour. 52:272-274.

- A. **General** description of regional weather **to** include variations in movement **of weather** systems and local **factors, such as orographic** variations due to elevation, aspect, and distance from oceans or large inland bodies of water. A description of the weather station and the reliability of its data should be included.
  - B. Precipitation including frequency and intensity of rain or snow. Condensation **may** also add appreciably to the water supply in some regions.
  - C. Temperature variations including seasonal and diurnal.
  - D. Pan evaporation or the single factors which effect it (solar radiation, relative humidity, and wind speed).
  - E. Characterization of regional drought including length **and frequency** **and** its effects on plants growing in soils of different textures **and** effective rooting depth.
2. Make recommendations on the organization and topics to include in a publication to evaluate the soil moisture regime that would be similar to SCS-TP-144 "Soil Temperature Regimes - Their Characteristics and Predictability",

The committee offers the following suggestions on the organization and topics to be included in a parallel publication on Soil Moisture Regimes.

- I. Introduction - definition and objectives of a report on the predictability of **soil** moisture regimes.
- II. Internal factors - soil moisture regime as affected by:
  - A. Soil. texture (including coarse fragments).
    - 1. Particle size distribution and moisture holding capacity.
    - 2. **Lithologic** discontinuity in texture.
  - B. Soil structure (including **f** regipans).
  - C. Water tables (true and perched).
  - D. Soil organic matter
- III. **External** factors - soil moisture regime as affected by:
  - A. Position on landscape.
  - B. Slope, run-off, and run-on.
  - C. Climate
    - 1. Precipitation (quantity **and** seasonal distribution)
    - 2. Temperature
    - 3.** Evaporation potential (relative humidity, wind speed, and net radiation).
  - D. Geography
    - 1. Elevation and aspect.
    - 2. Distance from oceans and large inland bodies of water.
- IV. Plant factors - soil moisture regime as affected by:
  - A. Cultivated row crops.
  - B. Pasture and range.
  - C. **Trees** (**through** fall and stem flow).
  - D. Rooting depth.

V. Computations and regional characterization of soil moisture **regimes.**

**RECOMMENDATION:**

1. The Northeast Soil Moisture Committee feels that the work of this committee and the **Committee** on Climate in Relation to Soil Classification overlaps and that a **joint** committee be formed at the national level to evaluate regional reports and explore predictability computations by ADP.

2. The Northeast Committee should be continued.

**COMMITTEE MEMBERSHIP:**

D. S. Fanning	E. J. <b>Rubins</b>
R. <b>S.</b> Boll	M. L. Markley
L. W. Kick	<b>R.</b> Smith
B. J. Patton	C. J. Koch
E. J. [REDACTED]	R. P. [REDACTED] -Vice Chairman
D. E. Hill -Chairman	

RATIONAL COOPERATIVE SOIL SURVEY

NORTHEAST SOIL SURVEY ~~WORK~~ PLANNING CONFERENCE

JANUARY 19-23, 1970

REPORT OF COMMITTEE ON MISCELLANEOUS LAND TYPES AND SOIL MATERIALS

The charges to our committee involved two main points. They were; (1) to conduct a survey of the Northeastern States to report the results of studies carried out in the past few years in describing soils before and after mechanical alteration, and (2) to develop an index of the miscellaneous land types that have been used in modern published soil surveys, and in current final correlations for as yet unpublished surveys within the Northeastern States.

Dr. John E. Foss conducted the survey to ascertain results of any studies carried out in the past few years where soils were described before and after mechanical alteration. The results of his survey indicate that very little work has been done on getting soil descriptions before and after disturbance. Cornell University sources in New York indicated that they were describing undisturbed sites (Erie County, New York) only since they felt that the rapid amount of land-use change in the area would date this type of information for disturbed sites. It was their feeling that the aerial photos would reveal the amount of disturbance in any particular area. Maryland may have a very limited study available early in 1970 with soil descriptions on an area of Coastal Plain undergoing development. The essentially negative response related to soil series descriptions before and after mechanical alteration seems to indicate that this subject has had a rather low priority.

The principal charge to our committee involved developing an index of the miscellaneous land types used in the Northeastern States in recent years. It was felt that simply developing an index of what was in use was not sufficient. Consequently, a voluminous draft was prepared that not only indicated the names of the miscellaneous land types in use, (227 units), but also indicated the definitions that had been used for these conditions in the respective survey areas, plus a Soil Survey Manual definition, if available.

Report of Committee on Miscellaneous Land Types and Soil Materials

Our original intent was to try to summarize the committee recommendations as to the need and definition for a specific miscellaneous land type. This would be done by presenting the various committee points of view throughout the index, where applicable. However, time proved to be too short to arrive at this stage in time for our January 1970 Northeast Conference. The attachment to this report simply presents an alphabetical index of the miscellaneous land types used in the Northeast. One copy of our more voluminous index with definitions indicated for specific survey areas in the Northeastern States, and Soil Survey Manual definitions, where available, has been sent to the Chairman of the National Committee on this subject.

It is not anticipated that our report to this conference will be more than an initial effort on this subject. Much time consuming work needs to be done in the future to come up with acceptable definitions to cover the diverse land type conditions. However, we do have a good start on the problem. We not only have a current index of what is in use, but we also have more voluminous background information developed by the committee that indicates the definitions used in different survey areas for the same named unit.

We propose that this committee be continued and that the main charges be to develop recommendations to the National Conference involving: (1) definitions for the significant miscellaneous land types and subdivisions, not now adequately defined, in order to achieve reasonable consistency in use and nomenclature between survey areas, and, (2) elimination of miscellaneous land types from the current Northeast index where there is obvious overlap or lack of need.

Committee Members

Lloyd E. Garland, <b>Chairman</b>	<b>F. G. Loughry</b> (Advisor)
John E. Foss, Vice-Chairman	K. P. Wilson
R. S. Bell	J. J. Noll
N. Holowaychuk (Advisor)	M. Stevens
C. J. Koch (Advisor)	S. J. Zayach
R. L. Cunningham	

**DISCUSSION BY CONFERENCE MEMBERS**  
(Notes by R. L. Cunningham)

Miller - Extrapolation of data for miscellaneous land types is difficult in the Coastal **Plain** areas. Have trouble in predicting use for depths greater than five feet.

Wilson - Some soils do have geologic data that helps in this area.

**Discussion** by Conference Members

- Foss** Red clay could be delineated geographically in the Coastal Plain area of Maryland according to geology but soils could not be related to the land types.
- Zayach Phase series to show these differences, but land types a problem.
- Baur Clay areas have varying soil profiles - presents a napping problem.
- Foss Really did not know what was underneath until the area was scalped off.
- Orvedal **Common** problem of interpretation, cannot overstep limits. Some areas lead to good interpretations at five to six feet depth, **sometimes** deeper. We need way to handle information, but not overstep bounds. For material below five feet maybe we can **use** soils map for geographic reference.
- Matelski** Remote sensors **say** they can predict this sort of thing for deeper layers - if they can do it **within** reliable limits, it may give us something we can use.
- McCormack** Objectives of soil survey different than deeper surveys. Plans are premised with above five feet in mind. General objective to examining 6-20 feet may not be necessary.
- Orvedal Should have a way to present information that upper five feet tells us about lower layers,
- Garland Interpretations of miscellaneous land types involve more and more acreage of poorly defined units. The voluminous material the committee prepared provides definition each survey area used for that condition. **Each** state and survey area seems to have own definition and you wonder if they **are** talking about the **same** thing. Most definitions are predicated on use rather than the properties involved. Tenor of thinking is reflected by the lack of progress in describing soil areas before and after mechanical disturbances. Very little has been done to increase our knowledge of the composition of units of miscellaneous land types.
- Marshall In the Erie County, New York survey the party toured the city to determine boundaries of mapping units. Few topographical differences. Lines were drawn by using vacant lots and old surveys.

Discussion by Conference Members

- Baur** Phases of series seem right direction where it can be done.
- Stevens** Really describing landscape condition. Good description of ecology instead of soils **information**. Many miscellaneous land type definitions do not do a good job, and many are not valid.
- Baur Some may need modification, but in writing the mapping units, additional information can be added. Must decide on separations and must define units before much mapping has been done. Complete landscape could be, and is, used or segments of it, in description.
- Garland Uniformity requires definition of limits and consistent nomenclature. Index is helpful to point up problems. Many land types and sub-types have not been defined, plus a number of the Manual definitions need revision. **Recommend** using series name in a complex with a land type where it can be done.
- Hill Information lacking to give series names.
- Garland Effort not made to find out what is really there. Time is a factor, but we must know more if we are to make more reliable **interpretations**.
- Smith We need to have more work on miscellaneous land types, particularly strip mines. Is more going to be done?
- Garland Information in committee report provides the basis for moving ahead on this problem. It also indicates that it is a serious problem and very little consistency is evident in describing many of the conditions involved.
- Smith We need to know for interpretations.
- Stevens** In 1966-1967 a good study on mines in U. S. was published by the Dept. of Interior with definitions of different conditions.
- Smith Volume of information does not help. We need more specific information.
- Patton Strip mines are extensive. Dick Smith has a project to study such **areas to see** if they can be classified. Suspects Entisols because these areas are so uniformly disturbed they may lend themselves to better classification. Need to know what they are for interpretations.

The committee report was accepted by the conference.

Index of Miscellaneous Land Types Used  
in the Northeastern States

ALLWIAL LAND

Soil **Survey** Manual Definition

Areas of unconsolidated alluvium, generally stratified and varying widely in texture, recently deposited by streams, and subject to frequent changes through stream overflow.

ALLUVIAL **LAND**,

## **BEACHES**

### Soil Survey Manual Definition (continued)

tides or stormy periods. Beaches support little or no vegetation and have no agricultural value although they may be sources of sand and gravel.

### **BEACHES, WET**

## **BLOWN-OUT LAND**

### Soil Survey Manual Definition

Blown-out land consists of areas from which all or most of the soil material has been removed by wind - a condition resulting from an extreme degree of soil blowing or wind erosion. The areas are shallow depressions that have flat or irregular floors formed by **some more** resistant layers, by an accumulation of pebbles or cobbles, or by exposure of the water table. Some areas have a small proportion of hummocks or small dunes. The land is barren, or nearly so, and generally useless for crops.

## **BORROW LAND**

BORROW LAND, LOAMY MATERIAL

BORROW LAND, SANDY AND GRAVELLY MATERIAL

## **BORROW AND FILL LAND**

BORROW PITS

## **BREAKS AND ALLUVIAL LAND**

### **CLAY PITS**

CLAYEY LAND, **KEYPORT** MATERIALS, **STEEP**

CLAYEY LAND, **MARLTON** MATERIALS, **STEEP**

COASTAL BEACH AND DUNE SAND

### **COASTAL BEACHES**

## **COLLUVIAL LAND**

### Soil Survey Manual Definition

**Colluvial** land includes areas of unconsolidated recent colluvium -

COLLUVIAL LAND

Soil Survey Manual Definition (continued)

a heterogeneous deposit of soil material, rock fragments or mixtures of the two - accumulated at the base of slopes primarily by gravity.

COLLUVIAL LAND, EXTREMELY STONY

COLLUVIAL LAND, VERY STONY

CUT AND FILL LAND

1969 Technical Work-Planning Conference report, Charleston, South Carolina, January 27, 1969: Cut and fill land consists of areas in **which** the soil or the soil and the underlying regolith has been greatly modified by appreciable removal in some places and comparable addition in others. Over the major part of an individual body, the cuts are deep enough to remove all or nearly all of the diagnostic horizons and the fills are thick enough to bury the original **solum** to depths of 20 inches or more. The pattern of cuts and fills is complex and the soil material is variable. Classifiable soils may be present in the proportions permissible as mapping inclusions. Modifiers to indicate the nature of the materials might follow the phrase "Cut and fill land." One example is "Cut and fill land, shale materials." The name of a series might be used in lieu of "shale" if that were **appropriate**. Example: Cut and fill land, Berks material.

CUT AND FILL LAND, CLAYEY **SUBSTRATUM**

**CUT** AND FILL LAND, GRAVELLY MATERIALS

CUT AND FILL LAND, LOAMY MATERIALS

CUT AND FILL LAND, ROCK SUBSTRATUM

CUT AND FILL LAND, SILTY MATERIALS

CUT AND FILL LAND, STRATIFIED SUBSTRATUM

DAM

DUMPS

Soil Survey Manual Definition

Dumps are areas of uneven accumulations or piles of waste rock.

DUNE LAND

Soil Survey Manual Definition

Dune land consists of hills or ridges of sand-sized particles drifted and piled up by the wind and either **actively** shifting or so recently fixed or

DUNE LAND AND COAST& BEACH

DUNE SAND

ERODED LAND

ERODED LAND, ROCKY

ERODED LAND, SLOPING - SHALE MATERIALS

ERODED **LAND**, STEEP

ERODED LAND, STEEP - SHALE MATERIALS

ESCARPMENTS

**EXTREMELY**

HILLY LAND, LOAMY AND GRAVELLY SEDIMENTS

LAKE BEACHES

**LIMESTONE ROCK LAND**

**LOAMY AND CLAYEY LAND**

MADE LAND

Soil Survey Manual Definition

Made land consists of **areas** filled artificially with earth, trash or both and smoothed. It occurs most commonly in and around urban **areas**.

MADE **LAND**, COARSE MATERIAL

MADE LAND, DREDGED COARSE MATERIAL

MADE LAND, DREDGED FINE MATERIAL

MADE LAND, DREDGED RIVER MATERIALS

MADE LAND, FINE MATERIALS

MADE **LAND**, GRANITE AND GNEISS MATERIALS

MADE LAND, LIMESTONE MATERIAL

MADE LAND, SANITARY FILL

MADE LAND, SANITARY **LAND** FILL

**MADE** LAND, SHALE AND SANDSTONE MATERIALS

MADE LAND, TILLABLE

1969 Technical Work-Planning Conference report, Charleston, South Carolina. January 27, 1969: Made land consists of areas filled or covered artificially with miscellaneous material **including** trash, stones and industrial waste. The miscellaneous material may or may not be covered by fine earthy material. Phases for recognition of thickness of earthy covering as well as the kind of miscellaneous material may be used if needed for interpretation purposes.

**MADE** LAND AND BORROW PITS

MADE LAND AND DUMPS

MADE LAND AND URBAN **LAND**

**MARL** PITS

**MARSH**

Soil Survey Manual Definition

**Marsh** consists of wet periodically flooded areas covered dominantly with grasses, cattails, rushes, or other **herbaceous** plants. Sub-classes include Tidal marsh, periodically inundated because of the tide; Fresh water marsh, which is influenced by fresh water and not by the tide; and Salt water marsh, which is influenced by salty water but not by the tide.

**MINE** DUMPS

~~MINE~~ WASH

**MIXED** ALLWIAL LAND

**MIXED** ALLWIAL LAND, WET

**MIXED** ALLWIUM

MIXED ALLWIUM, POORLY DRAINED

MIXED ALLWIUM, **WELL** DRAINED

MODERATELY WET LAND

MUCK

**MUCK,ACID** (Unclassified)

MUCK, DEEP

MUCK, SHALLOW

MUCK, SLIGHTLY ACID

MUCK AND PEAT

MUCK AND **PEAT**, STRONGLY ACID

MUCKY PEAT

~~PEAT~~

PSAT, COARSELY FIBROUS

PSAT, MODERATELY FIBROUS

PEAT, SHALLOW

**PEAT, SPHAGNUM**

PEAT AND MUCK

PEAT ~~AND~~ MUCK, SHALLOW

PITS

Soil Survey Manual Definition

Pits are open excavations from which soil and underlying material have been removed,

**PITS, CLAY AND MARL**

PITS, SAND AND GRAVEL

PIPS, DUMPS AND MADE LAND

PITS AND QUARRIES

QUARRIES

QUARRIES AND DUMPS

**RIVERWASH**

**RIVERWASH, COAL**

RIVERWASH, GRAVELLY

RIVERWASH, SANDY

ROCK LAND

Soil Survey Manual Definition

Rock land consists of areas having enough rock outcrop and very shallow soil to submerge other soil characteristics. The upper limit of rock outcrop is 90% of the mapped area and, unless the other features place the land in some other miscellaneous land type anyway, the lower limit is ordinarily 25%.

ROCK **LAND**, ACIDIC

ROCK **LAND**, BASIC

ROCK LAND, CANAAN MATERIAL

ROCK LAND, LIMESTONE

ROCK LAND, SANDSTONE

ROCK LAND, **THORNDIKE** MATERIAL

ROCK LAND, THORNDIKE AND LYMAN MATERIALS

ROCK OUTCROP

Soil Survey Manual Definition

Rock outcrop consists of exposures of bare bedrock.

ROCKY ERODED LAND

ROCKY LAND

ROLLING LAND, **LOAMY** AND GRAVELLY SEDIMENTS

ROUGH BROKBN LAND

Soil Survey Manual Definition

Rough broken **land** consists of very steep land, ordinarily not stony, broken by numerous intermittent drainage channels.

ROUGH BROKEN **LAND** (SHALE)

ROUGH BROKEN LAND (SILT AND CLAY)

ROUGH BROKEN **LAND** ( SILT AND SAND)

ROUGH GULLIED LAND

ROUGH STONY LAND

RUBBLE LAND

Soil Survey Manual Defintion

Rubble land includes areas with 90% **or** more of stones and boulders.

SAND PITS

**SAND** AND GRAVEL PITS

SANDED MUCK

SANDSTONE RUBBLE LAND

SANDY ALLUVIAL LAND

SANDY AND CLAYEY LAND

SANDY AND CLAYEY LAND, GLAUCONITIC MATERIALS

SANDY AND SILTY LAND

SANDY LAND

SANDY LAND, **DOWNER** AND SASSAFRAS MATERIALS

SANDY LAND, IRONSTONE

SILTY AND CLAYEY LAND

SLOPING ERODED **LAND, SHALE** MATERIAL

**SLOPING** LAND, ALLUVIAL MATERIAL

**SLOPING** SANDY LAND

STEEP BROKEN LAND

**STEEP** ERODED LAND, SHALE MATERIALS

**STEEP** LAND

STEEP LAND, ALLUVIAL MATERIALS

STEEP LAND, LOAMY

STEEP **LAND, LOAMY** AND GRAVELLY SEDIMENTS

STEEP LAND, SILTY AND CLAYEY

STEEP ROCK LAND

STEEP ROCK LAND, **THORNDIKE** MATERIALS

STEEP SANDY **LAND**

STEEP VERY STONY LAND

**STONE** QUARRIES

STONY COLLUVIAL LAND

STONY LAND

Soil **Survey** Manual Definition

Stony land includes areas having enough stones and boulders to submerge other soil characteristics. At the upper limit 90% of the exposed surface is stones; the lower limit is ordinarily 15% unless other features place the land in some other miscellaneous land type anyway.

STONY LAND (ACIDIC ROCKS)

**STONY LAND (BASIC ROCKS)**

STONY **LAND**, PORTERS MATERIALS

STONY LAND, STEEP

STONY ROCK LAND

STRIP MINE SPOIL

STRIP MINE SPOIL, ACID

STRIP MINE SPOIL, ACID CLAY SHALE MATERIALS

STRIP MINE SPOIL, GLACIAL MATERIALS

STRIP MINE SPOIL, **NONACID** MATERIALS

STRIP MINE SPOIL, SANDSTONE AND SHALE MATERIALS, **ROLLING**

STRIP MINE SPOIL, SANDSTONE AND SHALE MATERIALS, STEEP

STRIP MINE SPOIL, STEEP

STRIP MINE SPOIL, VERY ACID

STRIP MINES

STRIP MINES AND DUMPS

SWAMP

Soil Survey Manual Definition

Swamp consists of naturally wooded **areas**, all **or** most of which **are** covered with water much of the time.

TERRACE ESCARPMENTS

Soil, Survey Manual Definition

Terrace escarpments include sloping **or** steep relatively even fronts of terraces.

TIDAL FLATS

Soil Survey Manual Definition

Tidal flats include essentially barren, nearly flat areas of mud,

TIDAL FLATS

Soil Survey Manual Definition (continued)

periodically covered by tidal water. The lower parts of these areas are covered by water daily; the higher parts may be covered only at unusually high tides. The flats consist of silty and clayey material that in places, contains considerable very fine sand. Normally the material has an excess of soluble salts. When the surface dries, it cracks and may become hard enough to support a man.

TIDAL MARSH

TIDAL SWAMP

URBAN LAND

Soil Survey Manual Definition

Urban land is land so altered or obscured by urban works and structures that identification of soils is not feasible, Soil boundaries should be extended into urban areas wherever it is possible to do so with reasonable accuracy and the use of the miscellaneous land type is restricted to the closely built-up parts of the cities.

URBAN LAND, ALLUVIAL MATERIALS

URBAN LAND, CLAYEY

URBAN LAND, GALESTOWN MATERIAL

URBAN LAND, GRAVELLY MATERIAL

URBAN LAND, LIMESTONE MATERIALS

URBAN LAND, LOAMY MATERIAL

URBAN LAND, ROLLING

URBAN LAND, SANDY

URBAN LAND, SANDY OVER CLEYEY

URBAN LAND, SASSAFRAS MATERIAL

URBAN LAND, SHALE MATERIALS

VERY ROCKY LAND

VERY ROCKY LAND, ACIDIC, MODERATELY STEEP

VERY ROCKY LAND, ACIDIC ROCK PHASE

VERY ROCKY LAND, ACIDIC, STEEP

VERY ROCKY LAND, BASIC, MODERATELY STEEP

VERY ROCKY LAND, BASIC, ROCK PHASE

VERY ROCKY LAND, BASIC, STEEP

VERY ROCKY LAND, HILLY ACIDIC ROCK PHASE

VERY ROCKY LAND, ROLLING BASIC ROCK PHASE

VERY STONY LAND

Soil Survey Manual Definition

Very stony land includes areas having from 50 to 90 percent of the surface covered with stones and boulders.

**VERY STONY LAND (ACIDIC ROCKS)**

VERY STONY LAND (BASIC ROCKS)

VERY STONY LAND, MOUNT LUCAS AND NESHAMINY MATERIALS

VERY STONY LAND, **NESHAMINY**

VERY STONY LAND, SLOPING

VERY STONY LAND, STEEP

VERY STONY LAND, WATCHUNG MATERIALS

VOLCANIC ROCK LAND

**WET TERRACE LAND**

NATIONAL COOPERATIVE SOIL SURVEY  
NORTHEAST SOIL SURVEY WORK PLANNING CONFERENCE

January 19-22, 1970  
New York City

REPORT OF COMMITTEE 6 ON CLIMATE IN RELATION TO  
SOIL CLASSIFICATION AND INTERPRETATIONS

CHARGES AND OBJECTIVES OF COMMITTEE

The charges to this committee are outlined in the 1969 National Work Planning Conference Report, page 125, items 1-3. The charges are:

1. Solicit all available soil temperature data for the Northeast from sources such as SCS, Agricultural Experiment Stations, U. S. Forest Service, and others.
2. Assemble the data on a standard form (A proposed form is provided on page 127 of the 1969 National Report).
3. The Regional Committee have an initial report available by January 1970 or their next committee meeting.

This committee recognized that insufficient time would be available prior to the conference to locate and review all soil temperature data in the Northeast. Therefore, one objective has been to locate as much soil temperature research as time permitted, and to record this data, on the proposed soil temperature form. Another objective has been to poll the cooperators of the soil survey to determine their interest in a coordinated regional soil temperature project and to evaluate the proposed soil temperature form.

SUMMARY OF QUESTIONNAIRE

To accomplish these objectives and charges, in part, a questionnaire was sent to each state soil scientist and other cooperators of the soil survey. Copies of the proposed soil temperature form were provided for recording any soil temperature data that was available. The twenty-four respondents by state are:

Connecticut - D. Hill, J. Allen  
Kentucky - R. Daniell, H. Bailey  
Maine - W. Steputis  
Maryland - D. Fanning, R. Shields, J. Foss, F. Miller  
Massachusetts - W. Lyford  
New Hampshire - S. Pilgrim  
New Jersey - K. Wilson  
New York - R. Marshall, R. Arnold, J. Kubota, L. Kick  
Pennsylvania - J. Noll, G. Peterson  
Upper Darby - F. Cleveland  
Vermont - R. Bartlett, B. Watson  
Virginia - C. S. Koch, D. E. Pettry  
W. Virginia - B. Patton

A summary of response? to the questionnaire follows.

Question 1- Should cooperators of the soil survey undertake a coordinated soil temperature project?

Yes responses - 22

No responses - 2

All respondents except two favor a coordinated soil temperature project in the Northeast Region. One state indicated that they are solidly within the mesic zone and that studies should be done in states with more than one soil temperature class. Another state indicated that research is needed to relate changes in air and soil temperature with altitude.

Question 2 - If a soil temperature study is undertaken, is the proposed soil temperature form satisfactory?

Yes responses - 6

No responses - 18

The format of the soil temperature form is unsatisfactory to most reviewers. Kentucky intensively tested the temperature form when they recorded 2 year records of temperature data from 16 sites. They state that the form is satisfactory with some minor modifications.

Question 3 - Is it advisable to assign one person in each state to initiate and summarize the soil temperature research?  
If so, who do you recommend from your state?

Yes responses - 21

No responses - 3

Most states reported that soil temperature research should be organized and coordinated by one person. All cooperators and others will share in the study and will submit data to the state coordinator. The data should be summarized and submitted annually to the regional coordinator. The following states suggested names or agencies for consideration in their states.

Connecticut - David Hill

Kentucky - State Soil Scientist

Maryland - J. Foss

New York - D. Kick - R. W. Arnold

Pennsylvania - SCS

Vermont - State Soil Scientist

Question 4 - On the basis of present available data, do you think 8° C. (47° F.) is the appropriate dividing point between frigid and mesic temperature classes; and 15° C. (59° F.) the appropriate point between mesic and thermic temperature classes?

Yes responses - 11  
Uncertain or no opinion - 13  
No responses - 0

Most respondents felt that insufficient data is available to respond objectively to this question. However, 11 respondents were confident **enough to vote yes.**

Question 5 - If answer for number 4 is No, what are your proposals?

Proposals were not made since negative replies were not made to question 4.

Question 6 - In how many areas are soil temperature studies being conducted in your state?

The responses are summarized by states.

**Connecticut** - 1  
**Kentucky** - 16 (Mainly at weather stations with daily readings by weather observers.)  
**Maine** - 2, but not for 12 month period.  
**Maryland** - 1  
**Massachusetts** - 0  
**New Hampshire** - 2 Random data, but no special projects.  
**New Jersey** - 8  
**New York** - 8 (6 weather stations also record temperature at 8 inches.)  
**Ohio** - 3  
**Pennsylvania** - 3  
**Rhode Island** - 1  
**Vermont** - 14 (By soil scientists and others, with daily or weekly readings at 20 inches.)  
**W. Virginia** - 2  
**Virginia** - 8

Two states have undertaken intensive studies specifically for **determining mean** annual soil temperature at 20 inches. Therefore, only a **small amount** of soil temperature data is presently available at 20 inches. **Kentucky** has the most complete record, with two year records at 16 weather stations. 15 different soil series and 1 **miscellaneous land type** are represented. The 14 sites in Vermont are read daily or weekly, **depending on** the site. All sites were **initiated** during the past 1½ years. A one year record is available **for** 2 sites.

Additional soil temperature data undoubtedly is available. Additional time is needed to locate this data and appraise the usefulness for soil classification. Sources to pursue further are (1) research by graduate students or experiment stations; (2) climatological data from the U.S. Department of Commerce; (3) research data available from other agencies, both state and federal; and (4) projects by other university departments.

#### DISCUSSION

The proposed soil temperature form **needs** revision. Because of the variety of ideas from the reviewers this committee feels that additional time should be assigned to this work. A 5" by 7" card seems advisable at this time for easy comparison and filing. The data from these cards can be transferred to data processing cards at an appropriate time.

**Special** emphasis should be directed to soil temperature measurements in areas where additional information is needed to adequately classify and interpret the soils relationships of mean annual soil temperature, growing season soil temperatures, and summer soil temperatures to the growth and yield of crops. Experience and some research has shown that soil temperature has a pronounced influence on the germination of seeds, growth habits of plants, and kinds of plants within a geographic area, and mineral uptake by plants.

If a soil temperature project is undertaken it should be designed so that it is not so sophisticated and detailed that it will be excessively costly and time consuming. Relatively simple instrumentation is essential in order for a large number of sites to be installed and easily measured. Insofar as possible, people outside of soil survey should be involved such as weather observers and private citizens.

The frequency of readings needed to accomplish the objectives of a soil temperature project should be tested as yearly records become available. Initial studies and comparisons in one state indicate that determination of the mean annual temperature on the basis of only four readings a year gives a significantly higher reading than when the mean annual temperature is determined from monthly, weekly, or daily readings. The 4 readings a year gave a higher reading by 3 degrees than did daily readings.

Supplemental data can be obtained by measuring soil temperature during the preparation of field profile descriptions. Although a continuous record is not possible, the temperature can be compared at that given time to sites for which continuous data is available. In addition, measurements can be made at a specific site periodically without installation of thermocouples.

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NATIONAL, COOPERATIVE SOIL SURVEY  
NORTHEAST SOIL SURVEY WORK PLANNING CONFERENCE  
January 19-22, 1970  
REPORT OF COMMITTEE ON SOIL FAMILY CRITERIA

Objectives

This committee was initiated at the 1968 conference and has continued in view of the problems associated with establishing and applying family criteria,. The charges from the national committee were: (a) to review distinctions between family classes and the placement of series into family classes; (b) to continue study and testing of existing family criteria and make recommendations for

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The large membership families in the Northeast, in descending order are:

	<u>Approx. No.</u>
Typic Hapludults, fine loamy, mixed, mesic	36
Ultic Hapludalfs, fine, loamy, mixed, mesic	21
Typic Hapludalfs, fine, mixed, mesic	21
Typic Dystrichrepts, loamy-skeletal, mixed, mesic	17
Typic Fragicchrepts, coarse loamy, mixed, mesic	16
Aeric Ochraqualfs, fine, illitic, mesic	13
Typic Fragiudults, fine loamy, mixed, mesic	12
Aquic Fragiudults, fine loamy, mixed, mesic	11
Aeric Ochraqualfs, fine loamy, mixed, mesic	10
Typic	10
	10

section

a

b

c

a. In the Northeast there are 32 families of aquepts which have only one series, thus the addition of reaction does not affect placement within the system and indicates that **nonacid** and acid could easily be shifted to a series criteria.

b. If reaction class were dropped as a family criteria for Aquepts, eight families would be reduced to four as follows:

**Aeric Haplaquepts**

coarse loamy, mixed, mesic	1 acid; 3 nonacid
fine loamy, mixed, mesic	1 acid; 2 nonacid

**Aeric Fluventic Haplaquepts**

fine loamy, mixed, mesic	1 acid; 2 nonacid
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**Fluventic Haplaquepts**

fine loamy, mixed, mesic	2 acid; 2 nonacid
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c. A similar trend is noted for families using **calcareous** and **non-calcareous (Mollisols)**, however, because of limited extent in the Northeast we feel the Midwest should evaluate the utility of this fourth criteria.

Committee Findings

A. Properties useful for subdividing large families

The groups within families concentrate on the most common, or in some cases the most contrasting, series criteria of the family members. The 1966 committee on series criteria observed that for those families with 3 or more series the following properties were useful for comparing the family members: hue, texture within the control section, coarse fragments which often indicate kind of material, mineralogy, and consistence.

In attempting to subdivide large families for descriptive comparison the committee this year observed that kind of material, hue, depth to rock, and solum thickness were thought to be useful in more than 50% of the families tested (Table 1). Hue and kind of material were common to the two subgroups of **Ultisols**; depth to rock and solum thickness were suggested in 3 out of 4 subgroups of **Alfisols** and kind of material was used in 2 of the 4 subgroups.

a. Kind of material is an important series property and one of great utility within families, however, there does not seem to be enough uniformity of definition and use to recommend it as an additional family criteria at present. Because most field mapping relies on **landform** and kind of deposit or materials present there is a general feeling that properties associated with these landscapes should somehow appear in the classification scheme. In some areas it is a question of till versus **outwash** whereas in other places it may be the general composition of **colluvium** that is useful for recognition and interpretation.

- b. Hue and depth of solum appear to be very useful properties separating many families of **Ultisols**. For example, of the 35 series of fine-loamy, mixed, mesic Typic Hapludults, 26 of them have solum hues of **7.5YR** or yellower, and 12 of the 35 have sola less than 40 inches thick.
- c. Depth to rock, particularly a class of **20-40"**, appears to be a strong contender for splitting large families of **Alfisols** and **Inceptisols**. For example, of 26 series in the fine, mixed, mesic Typic Hapludalfs, 11 are less than 40" to rock.

#### B. Development of soil keys for large families

Although keys facilitate the comparison of series within large families there is little uniformity in the sequence of applying criteria and little uniformity in designating the limits or classes of the criteria used for subdivision. If two criteria are used to subdivide the series there are only two ways to order them: (1) A then B, or (2) B then A, but if three criteria are used there are six different ways of sequencing their use. It is possible that soils in one region might appear to be separated quite differently than in another region even though people employ the same properties. Three of the keys developed are shown below:

##### 1. Typic Hapludults; fine-loamy, mixed, mesic - 35 series

- A. Depth of solum  
(1) > 40"  
(2) < 40"  
This key provides 24 potential classes at the lowest level; 15 of the 24 have class membership for the series tested.
- B. Hue of upper Bt  
(1) 5YR or redder  
(2) 7.5YR or yellower
- C. Kind of material  
(1) Granite, gneiss, schist  
(2) Glauconite  
(3) Limestone  
(4) Sandy or gravelly  
(5) Sandstone or Quartsite  
(6) Shale (below)

##### 2. Typic Hapludalfs; fine, mixed, mesic - 12 series

- A. Depth to rock and solum thickness  
(1) < 40" to R  
(2) > 40" to R, solum < 40"  
(3) > 40" to R, solum > 40"  
This key provides 18 potential classes at the lowest level; 7 of the 18 have class membership for the series tested.
- B. Hue of Bt  
(1) 5YR or redder  
(2) 7.5YR or yellower
- C. Reaction of Bt  
(1) Calcareous  
(2) Mild alk to mod. acid  
(3) Strongly to extremely acid

Table 1. Properties suggested for grouping series within seven families and number of groups for each property.

Subgroup - No. series and family	Hue	Depth to rock	Kind of material	Solum thickness	Texture of fines	Coarse fragments	Reaction	Depth to mottles	Depth to pan	Landscape position	Sequm	Kinds of groups
Typic Dystrachrepts - 14 lo-skel, mixed, mesic	X 2	X 3	X 4		X 3							4
Typic Hapludalfs - 12 fine, mixed, mesic	X 2	X 2	X 5	X 2		2 X	X 3					6
Ultic Hapludalfs (21) fi-lo, mixed, mesic		X 2								X 4		2+
Typic Fragiudalfs - 4 fi-sil, mixed, mesic				X 2	X 2			X 2				3
Aeric Ochraqualfs - 13 fine, illitic, mesic		X 2	X 3	X 2								3
Typic Hapludalts - 35 fi-lo, mixed, mesic	X 2		X 6	X 2								3
Typic Fragiudalts - 4 fi-lo, mixed, mesic	X 2		X 3			X 2		X 2			X 2	5
No. times suggested	4	4	5	4	2	2	1	1	1	1	2	

3. Aeric Ochraqualfs; fine, illitic, mesic - 13 series

- |   |   |
|---|---|
| <p>A. Parent material<br/>         (1) Glacio-lacustrine<br/>         (2) Till and residual</p> <p>B. Depth to bedrock<br/>         (1) 20 to 40"<br/>         (2) &gt; 40"</p> <p>C. Solum thickness<br/>         (1) &lt; 20"<br/>         (2) &gt; 20"</p> | <p>This key provides 8 potential classes at the lowest level; 5 of the 8 have class membership for the series tested.</p> |
|---|---|

C. Coarse fragment analysis

Setting class limits for the skeletal family continues to be a problem of sizeable magnitude. Over the past years Pennsylvania has characterized 477 modal profiles and 83 of them (17.4%) fall within the present limits of skeletal families. These analyses indicate that many of the pedons with contents of coarse fragments near the proposed class limit are not classed as skeletal.

<u>Pedons</u>	<u>% C.F.</u>	<u>Misclassified</u>	<u>Summary</u>		
			<u>No.</u>	<u>% C.F.</u>	<u>Missed</u>
12	35-39	9	26	35-45	18
14	40-44	9	20	45-55	6
10	45-49	3	22	55-70	3
17	50-54	3	14	70-100	2
9	60-64 55-59	2			
		0			
6	65-69	1			
	70-79	2			
2	80-89	0			
3	90-99	0			

The data indicate that where the coarse fragment content is between 35 and 45% by volume that field estimates may result in judgment errors in as much as 70% of the cases. With between 45 and 55% coarse fragments, the error of placement may be about 30%, and where more than 55% coarse fragments the error is commonly less than 20%. These errors refer to placement into skeletal or non-skeletal families and does not indicate a difference between estimated % of coarse fragments (such as 45%) and measured amounts of coarse fragments in each percentage range.

The ranges for some series are also available such as:

<u>Series</u>	<u>No.</u>	<u>% Coarse fragments</u>		<u>No. with &gt; 55%</u>
		<u>Ave.</u>	<u>Range</u>	
Connotton	4	52	48-61	1
Oquaga	6	52	39-60	3
Dekalb	4	58	40-71	3
Klinesville	6	60	37-89	2
Berks	8	65	50-90	7
Weikert	6	73	45-94	5

It has been suggested from time to time that a "very" or "highly" skeletal family would improve understanding and interpretations at the family level. The above evidence indicates that the range of coarse fragment content is sufficiently wide so that many skeletal series would be divided by such a procedure.

Conference Recommendations

After rousing and stimulating yet somewhat nondirected discussion it appeared that the following general statements expressed the majority sentiment.

1. We would like additional clarification on the philosophy of the family category to assist us in evaluating whether current or proposed criteria will satisfy the objectives of this category. Combinations as well as subdivisions of current families can be made, but we are somewhat at a loss as to the "basis of differentiation" of the category for which additional criteria could be considered.
2. Large soil families do present problems and more effort should be made to either eliminate unneeded series or further justify the large number of series.
3. Until the basis for establishing families is more clearly understood, we favor using keys for subgrouping series in large families for the convenience of comparison.
4. Because of the numerous unresolved questions about family criteria it is recommended that the committee be continued.

Committee Members

J. M. Allen, V. Chr.  
R. W. Arnold, Chr.  
E. Ciolkosz  
R. E. Daniell  
L. W. Kick

R. P. Matelski  
F. P. Miller  
\*E. J. Rubins  
R. M. Smith  
W. J. Steputis

\*M. E. Weeks

Visitors

E. J. Pedersen  
R. V. Rourke  
G. M. Schafer

\* Unable to attend

NORTHEAST SOIL SURVEY WORK PLANNING CONFERENCE  
**January 19-23, 1970**  
New York City

Report of the Northeast Committee on  
Soil-interpretations at the **Higher** Categories  
of the New Soil Classification System

The principal charges to this committee are given in Items 1-3 on page 135 of the report of the National Work Planning **Conference** of 1969. An additional charge, regional in scope, was to report on the status of the Northeast regional general soil map. In this report, the topics from the National Committee will be dealt with first.

The committee agreed that the main focus this year should be on maps, legends and interpretations at the State level. The 1968 Northeast **Committee** Report concentrated on work at the county level. This committee did also include some study of maps at the county level. **Maps** and interpretations for areas larger than states were not studied in depth.

#### Map Scale

Discussion: scale of general soil maps is determined by the size of the area, the complexity of the soil pattern, the intensity of present and anticipated land use, and the objectives of the map.

For State maps, there was no disagreement with the general guidelines of the National Committee that scales of 1:500,000 for small states and 1:1,000,000 for average size states is good.

For county maps, some preference was expressed for general maps at a scale of 1 inch equals 1 mile. The **concensus** was that maps could be drafted at that scale and reduced to 1 inch equals 2 miles, without serious loss of legibility.

Discussion indicated that many of the **general** soil maps in published soil survey reports are not as useful as they should be. These maps are generally at a scale of **about** 1 inch equals 3 miles. This scale may be too small for **some** counties. Also, more attention **needs** to be given to the supporting material for the general map. Dr. **Orvedal** pointed out that the maps could be published at a larger scale if needed.

Recommendation: The conference endorses the recommendations of the National Conference (1969) regarding map scale, and the desirability of the use of standard scale maps.

#### Categorical Level of Legends for Small-Scale Maps

Discussion: For county maps, phases of series is generally the preferred level for construction of map legends. This is a reversal of the recommendation of the 1968 Northeast Conference, but was accepted by the 1970 Conference. It is recognized that the soil pattern in some counties may be such that a legend based on phases of associations of subgroups, or phases of families of subgroups, may be appropriate.

For State maps, the committee was about equally divided between preference for phases of subgroups and phases of series as the categorical level. This division appeared to reflect the size and complexity of the states represented by committee members. After discussion, the committee and conference agreed that either level is acceptable, depending on the nature and complexity of the soil pattern. None of the participants recommended a higher categorical level than the subgroup, except for "low intensity" parts of state maps (see "Mixed Categories" below).

For any small-scale map, the categorical level should not be predetermined, but trial delineations, legends and interpretations at different levels should be tested to arrive at the most effective kind of map and text.

At any level, phases are almost always necessary to provide an effective base for interpretations.

Recommendation: Legends for state maps should generally be at the level of phase!; of associations of subgroup or phases of associations of families. For "low intensity" areas within states, a higher level may be appropriate.

#### Legends at Mixed Categorical Level

Discussion: Initial reaction to this proposal was mostly negative, but discussion and study indicate that the adverse reaction was mainly soil scientist bias. The lay map user need not be concerned with the mechanics involved if the legend and interpretations are skillfully made. For some universes, such a legend could result in a simpler, more useable product. Examples of parts of state maps which might well have legends at higher categories than the base level are for the Adirondack's area of New York and the Cumberland Mountain area of West Virginia. Construction of legends with two categories would be more difficult for a mix of series and suborders than for, for examples, suborders and orders.

Time did not permit a thorough testing of this proposal.

Recommendation: The proposal for legends at more than one categorical level appears feasible and useful for some areas. Additional testing and examples are needed.

#### Interpretations for Small-Scale Maps

Discussion: Many small maps have been produced which lack sufficient information for non-soil scientist use. At the same time, the inherent limitations in small-scale maps must be clearly brought to the attention of the user. We now have a good number of examples of good legends and interpretations. Some, reviewed by the committee are: Map of Nebraska, part of legend in 1969 National Work Planning Conference, Page 136; The Rolling Plains, Texas area, in the 1968 Southern Regional Conference Report; "Soils and Their Use in the Five-county Area Around Syracuse" (no tables, but good narrative interpretations)} Orvedal's "Small Scale Maps for the Big Picture", Soil Conservation, November, 1968, and his article "A New Soil Man of the United States", in the November, 1969 issue of Soil Conservation.

Content of interpretative tables vary according to the expected uses of the map. Essentials include (1) map symbol, (2) map unit name, (3) extent or proportion of each map unit, and (4) physiographic setting or some similar heading. Use of two or three columns showing major soil properties such as depth, flood hazards, can reduce the number of phases needed. Suitability or limitations for a few of the major appropriate uses complete the column headings.

Recommendations: Examples cited in the 1969 National Committee Report are good. A statement as to the limitations in use of all small-scale maps should be included in a prominent place, both in the tables or text and on the map. This statement should include the point that the map is not to be used for detailed or operational planning, and reference should be made as to the availability of detailed soil surveys.

Additional Comments: Simple 1, 2, 3, 4 map symbols have definite advantages over connotative symbols. They are easier for the non-soil scientist to use; and they permit updating the text to reflect changes in series or other taxa without necessitating revision of the map.

Northeast General Soil Map: This map is being used as a reference source for the national map which Dr. Orvedal is working on. He showed and discussed two sections of this map covering a good portion of the Northeastern States. The scale is 1:1,000,000. The legend is at the subgroup level. It is designed primarily as a technical reference, rather than for popular use. This is the map discussed in the November, 1969 issue of Soil Conservation.

In **summary**, this report is **largely** an endorsement of the report of the **1969 National Committee**. Our committee and conference found no serious disagreements with that report.

The conference approved **the** recommendation that the committee be continued.

Committee **Members:**

- **Boyd J. Patton**, Chairman
- N. K. Peterson, Vice-Chairman
- \* Richard Arnold (for **Marlin Cline**)
- \* R. L. Marshall
- R. J. Bartlett
- Don **McCormack** (Advisor)
- L. J. Cotnoir
- \* **Marko L. Markley**
- \* Richard **Ranney**

Visitor:

- \* Arnold C. **Orvedal**

- Present at Conference

# NATIONAL COOPERATIVE SOIL SURVEY

## NORTHEAST SOIL SURVEY WORK **PLANNING** CONFERENCE

JANUARY 19-23, 1970

### REPORT OF COMMITTEE ON **BENCHMARK** SOILS, TECHNICAL SOIL MONOGRAPHS, AND SOIL SURVEY LABORATORY INVESTIGATIONS

This Committee was formed shortly before the 1970 Northeast Soil Survey Work Planning Conference to combine the efforts of what was formerly three interrelated individual committees. Because of its comprehensive nature, practically all participants at the Conference are either directly or indirectly represented on the Committee.

Suggestions for this Committee's work were made in R. D. **Hockensmith's** memo of August 13, 1969 to Chairmen of Regional Technical Work-Planning Conferences. This memo recognized that benchmark soils, technical soil monographs, and soil survey laboratory work have many objectives in common and should not be discussed independently of one another. Another reason for the change is that **our** 1968 Northeast Soil Survey Work-Planning Conference established the Benchmark Soils Committee and the Technical Soil Monograph Committee on a standby or continuing basis. Therefore, it seems fitting that these three major areas of concern be the responsibility of a single committee. With this approach, we should be able to utilize more efficiently our limited total resources for laboratory work.

#### SECTION I

Benchmark soils - Three charges were outlined for consideration under Benchmark soils. These are covered **in** the three numbered items below. Item 4 was added to cover progress on publication of benchmark reports and possible use of automatic data processing.

1. Each state was requested to review its list of benchmark soils and add or delete series as appropriate. Revised lists were received from all states except New Jersey, Virginia, and Connecticut-Rhode Island. Two new suggestions were received from the states. The first of these dealt with selection of benchmark soils, namely; each state should select its benchmark soils from the series for which it has the type location and responsibility for the series description.

Appendix I is arranged to show under each state the **benchmark** series with type **location** in the states. Included in the lists **are** series which were formerly claimed as benchmark soils by other states. **The** former claimant is shown for series that have been shifted to the "type location" state. Responsibility for developing benchmark data for a series should be carried by the state that has the responsibility for keeping the series description up to date.

The conference adopted the recommendation that each state select its benchmark soils from the series for which it has the type location.

The second suggestion concerned the relation of benchmark soils to classes in the new soil taxonomy. Selection could be at the subgroup level or ~~the~~ family level. Selection at the family level seemed appropriate because this would offer the possibility of including in the benchmark list the series **which** will be selected as the "common series" name for each family. For example, the sandy-skeletal, mixed, **mesic** family of **Entic** Haplorthods will be known as the Gloucester family, if we pick Gloucester as the common name for this family. This would tie in with benchmark soils because Gloucester is already listed as **a** benchmark soil.

This proposal was not accepted because the conference objected to the use of "common series" names for families. The three main arguments against "common series" names are:

- a. We should not present an additional connotation for soil series to soil scientists outside our area, of work and to non soil scientists, i.e. Extension Service personnel. At present many people understand the **meaning** of series. Confusion would result if we impose an additional concept by using the series name for a family of soils, example:

Ontario soils (series)  
Ontario family

- b. We should make full use of the family and subgroup names and encourage people to learn the connotative meanings. Introducing common series names for families will detract from the need for learning and using full family and subgroup names.
  - c. Some of the families contain series that are extensive and well known in one state but not in other states having series in this same family. A series name that would be helpful in New York State might have no **meaning as a common** family name in other states using this **same** family.
2. The states were requested to review available state and SCS laboratory data. All states have data on physical and chemical characteristics and also behavior data for most of their benchmark soils. This information varies from very little for some soils to substantial amounts for others. Responses from the states were inadequate to compile a complete catalog of available data. This kind of catalog would be useful as an inventory of available data. The inventory should include benchmark soils and **non-**benchmark soils.
  3. All of the responding states have plans for getting additional data for benchmark **soils**. Plans include work by the Agricultural Experiment stations, other cooperating agencies, and SCS laboratories. **Pedons** representing the central concept for the series should be selected for laboratory work.
  4. Plans for publication of benchmark reports:
    - a. The Charlton benchmark report was published by the Connecticut Agricultural Experiment Station as Bulletin No. 706, December 1969. The authors are Dr. David Hill and Arthur E. **Shearin**.

- b. Dr. Foss estimates June 1970 as a probable completion date for the **Hagerstown** benchmark report. All sections are completed except for some work on **genesis** and classification.
- c. No other reports are scheduled for completion.
- d. The states recommended use of automatic data processing for benchmark data storage and printouts. The SCS is beginning to develop systems and computer programs for storing pedon data including morphological information, characterization data, and interpretations values. These systems and programs **can** be used for storing and printing data for any soil including benchmark soils. The systems and programs are lengthy and complex. It will be a year or longer before they become operational.

## SECTION II

Technical Soil Monographs - Two charges to the Committee were outlined, as follows:

1. Each state report on progress, if any, on technical **soil** monographs.

Ten **states responded to** this charge, but all indicated no progress.

2. Plan ahead for obtaining data for use in technical soil monographs (this is closely related to supplementing existing data on benchmark soils).

This charge corresponds very closely with Charge No. 2 under Benchmark Soils, and the response was about the same. That is, all states are accumulating data, some of which could eventually be incorporated in technical soil monographs, but little of these data are being gathered specifically for technical monographs.

Some states indicated that it is difficult to know what additional data are needed until those data already available are pulled together. Some feel that automatic data processing consisting of a pedon data file may **serve our** needs in lieu of actual technical soil monographs.

General charge to the Committee - The Committee was asked to review the proposed monograph of soil **taxa** described on page 62 of the 1969 National Technical Work Planning Conference Proceedings.

All of the states responded favorably to the proposal for preparing monographs of soil **taxa**. However, there was considerable concern that this is one more job being suggested in addition to preparation of technical soil monographs for specific soil areas which have shown little progress because of lack of time and competent personnel to do the job. The Committee feels that the total resources of soil scientists, including automatic data processing, might be more efficiently utilized toward preparation of monographs of soil **taxa** than technical soil monographs for smaller soil areas. Monographs of soil **taxa** would require possibly 20 to 30 authors, whereas, technical soil monographs would require many more. Also, monograph of soil **taxa** could probably utilize information from automatic data processing somewhat better than could technical soil monographs for smaller geographical areas. However, the Committee feels that there is need for both kinds of monographs and the choice should be determined on the basis of geographical need for information and the backgrounds of personnel available to work on them.

Suggestions for the contents of monographs of soil **taxa** were general rather than specific. There is general feeling that outlines for technical soil monographs, with some adjustments, would be satisfactory. There **was** unanimous feeling among **members** that content can be easily determined once manpower to do the job is assured.

The Committee made the following suggestions for implementing monographs of soil **taxa**:

1. Assign monographs of soil **taxa** through the Washington Office of SCS after consultation with others involved in the National Cooperative Soil Survey.
2. Outline the **proposed** projects.
3. Let contracts through the National Cooperative Soil Survey to recent retirees from SCS and experiment stations.

#### RECOMMENDATION

- A. Direct efforts of available personnel towards preparation of monograph of soil **taxa** and benchmark soil reports. **Deemphasize** technical soil monographs for small areas but leave the option available where they seem to be appropriate.

#### SECTION III

Soil Survey Laboratory Investigations - Three charges were given the **Committee**:

1. Each state review the list of laboratory studies developed by the 1968 Committee 9.

Ten states responded to this charge. All indicated approval of the list. y s att(Eamented

2.

3.

## RECOMMENDATIONS

- A. The experiment stations and SCS of the Coastal Plain States in the Northeast intensify their studies of tidal marsh. The Committee recommends that the Principal Soil Correlator for the Northeast and the Head of the Beltsville Soil Survey Laboratory take leadership in working with the states in developing a project for characterizing the morphology and composition of tidal marsh, with the eventual objective of providing **guidelines** for mapping or remapping tidal marsh in more detail than has been done to date.
- B. The New England States take leadership in developing a project for studying the morphology and composition of fragipans. The Committee recommends that the state soil scientists of SCS cooperate with representatives of the experiment stations in outlining objectives of such a study and establish guidelines that would enable graduate students to assist in the study.

It is recommended that this Committee be continued primarily as a means of bi-annually summarizing progress on benchmark soil reports, monographs, and laboratory accomplishments and needs.

The Committee report was accepted by the Conference after discussion and inclusion of certain amendments herein included.

### Committee Members:

Chairman        • Robert L. Shields  
Vice-Chairman • Dr. A. J. Baur  
                  and  
all SCS State Soil Scientists in  
the Northeast in cooperation with  
State Experiment Station Representatives  
and E. J. **Pedersen**.

APPENDIX I

LIST OF BENCHMARK SOILS ASSIGNED  
TO THE NORTHEAST STATES

Type location for each **series** is in the state under which it is listed. Series followed by a state name were formerly claimed by the state thus identified. Example: **Hollis** - NH was formerly a benchmark soil for New Hampshire.

Connecticut and Rhode Island

Bridgehampton<sup>1/</sup>  
Charlton<sup>1/</sup>  
Cheshire  
Enfield  
Hollis - NH  
Leicester - NH  
Ninigret - Mass  
Stockbridge  
Sutton - NH  
Walpole - Mass  
Windsor

Massachusetts

Agawam - NH  
Berkshire - Vt  
Gloucester<sup>2/</sup>  
Hadley - Vt  
Hinckley  
Lyman - Vt  
Merrimac  
Ridgebury  
Sudbury  
Whitman  
Winooski

Delaware and Maryland

Baile  
Beltsville  
Chester  
Christiana  
Elkton - NJ  
Fallsington - NJ  
Hagerstown<sup>2/</sup>  
Legore  
Leonardtoun  
Manor  
Matapeake  
Mattapex  
Montalto  
Othello  
Pocomoke  
Sassafras  
Westphalia - NJ  
Woodstown - NJ

New Hampshire

Acton  
Becket  
Canaan  
Groveton  
Marlow  
Paxton<sup>1/</sup>  
Peru  
Scarboro - Mass  
Shapleigh  
Waumbek  
Woodbridge

Kentucky

Crider  
Dunning - Pa  
Eden  
(Grenada - Miss)<sup>3/</sup>  
Jefferson  
Lawrence - Pa  
Lowell  
Maury  
Melvin - Wa  
Newark  
Nolin  
Shelocta  
Tilsit - Wa  
Whitley  
Zanesville

New Jersey

Adelphia  
Collington  
Croton - Pa  
Evesboro  
Keyport

Maine

Bangor  
Biddeford  
Buxton  
Caribou<sup>1/</sup>  
Elmwood  
Hermon<sup>2/</sup> - NH  
Plaisted

New York

Adams  
Allis - Pa  
Amenia  
Canandaigua  
Caneadea  
Chenango  
Collamer  
Colton - Vt  
Mardi"  
Middlebury - Pa  
Morris - Pa  
Norwich - Pa  
Oquaga - Pa  
Panton - Vt  
Papakating  
Phelps  
Red Hook  
Tioga  
Unadilla  
Volusia

Appendix I -- Cont'd.

Ohio

(Blount - Ill) <u>3/</u>	Hoytville <u>1/</u>
(Brookston - Ind) <u>3/</u>	Keene
Canfield <u>1/</u>	Mahoning
Celina	Muskingum
Clermont	Toledo
(Crosby - Ind) <u>3/</u>	Tyler - WVa
Holly - NY	Wellston - Ky

Pennsylvania

Berks	Elliber - WVa
Brinkerton	Gilpin - WVa <u>2/</u>
Burgin	Glennville - Md
Cavode	Penn - NJ
Dekalb - WVa	Readington
Duffield	Weikert
Edgemont	Westmoreland
	Wharton - WVa

Vermont

Limerick  
Livingston  
Vergennes 1/

Virginia

Carbo  
Frederick  
Tatum

West Virginia

Cookport - Md	Lindsay
Ernest - Pa	Monongahela
Frankstown - Md	Murrill
Huntington	Upshur
Laidig	Wheeling

1/ Report published

2/ Report in progress

3/ Series in parentheses have site locations outside the Northeast States

## APPENDIX II

**Progress report** on studies listed in the Estimates of 10 Year Laboratory Workload:

- New York - Cosseyuna, Bernardstown, Nassau and **Hartland cambic vs. entic** spodic character.
- Vermont Nassau, Dutchess (mod. deep variant), Dutchess, Bernardstown, **Pittstown, Stissing**, Mansfield sampled, Will sample alluvial soils listed in the 10 Year Plan in 1970.
- Maine 30 soil samples representing 10 soil series sent for spodic horizon identification.
- Massachusetts - 18 profiles of coarse-silty and coarse-loamy alluvium to be sampled in June 1970 -- Hadley, Winooski, Limerick, **Ondawa**, and Podunk.
- New Hampshire - Two Gloucester pedons were sampled in May 1969 for spodic horizon identification.
- Pennsylvania - Some work on mineralogy of non-clay fraction of **some** soils.
- Kentucky - Samples of 6 series in Eastern Kentucky were collected for coarse stlt mineralogical determinations.
- Maryland - Cation exchange capacity and other related data for 20 soil series (60 profiles). Additional work on soils developed in **glaucconitic** material. Specific sites located for soil stability studies on **Christiana** soils. Complete sampling, including undisturbed cores, taken from one site. Other sites to be sampled in spring of 1970.
- Delaware - Special study of tidal marsh areas to differentiate classes.

Briefs of Other Conference Topics

Major Challenges for the Seventies - S.L. Tinsley

Mr. Tinsley presented the following challenges to the Conference.

1. Complete soil survey in high demand areas. Special attention is needed, in rapidly urbanizing areas.
2. Soil characterization work plans need to give additional attention to such items as corrositivity, clay mineralogy, etc.
3. Soil survey publications. A careful look has to be made of soil genesis sections in currant publications. Is there a duplication of effort and cost?
4. Series descriptions. Additional emphasis is needed on updating
- 5.
- 6.
- 7.

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Progress Report on Soil Survey ADP Work in Washington and Other  
General Topics - A. C. Orvedal

New Photographic and Cartographic Techniques for Improving the Quality and Interpretation of Soil Surveys - J. A. Gockowski.

Major items covered by Mr. Gockowski include the following:

1. High altitude photography.
2. Compiling soil map manuscripts in States.  
(SOILS MEMORANDUM - 70)
3. Advance mapping systems.
4. Orthophotographs.

Progress Report on Classification of Organic Soils in Northeast - L. Kick.

Mr. Kick reviewed a tentative key (January 1970) for Histosols in the Northeast. The key also provides a tentative assignment by States for responsibility in maintaining soil descriptions by subgroup and family. Mr. Kick also reported on two organic soils study trips conducted in New York and Maryland in 1969.

S. M. Springs for Zonal Planning Interpretations in Connecticut - R. Laramy.

The use of a "Natural Soil Group System" in Connecticut was presented by Mr. Laramy. Special attention was given to the procedure for developing the various groupings. This system is based upon mapping units of detailed soil surveys.

REPORT OF THE CONNECTICUT AGRICULTURAL EXPERIMENT  
STATION REPRESENTATIVE

We in the Connecticut Cooperative Soil Survey can cite 4 major accomplishments during the past biennium.

1. Connecticut is divided into 13 planning regions, most of which are now staffed with District Agencies. In an effort to supply the regional planning offices with the latest soil survey information, the cooperative survey undertook the task of providing interim reports on the soils in their respective regions. In many of the regions, the soils are being surveyed or have been completed but await publication. The interim report includes descriptions of the soils, the physical and chemical characteristics which affect their use, and interpretations for urban planning and engineering use. The reports provide interpretative material that regional and town planners can use as soon as soil maps are completed in their areas. They don't have to wait for county soil survey reports to be published. Reports have been prepared for:

Midstate Planning Region  
Southeastern Planning Region  
Central Naugatuck Planning Region  
Town of Redding, Fairfield County

2. A study of tidal marshes in Connecticut and Rhode Island was made to classify them according to the properties of their peaty and silty sediments. This study also assists the Connecticut Department of Agriculture and Natural Resources in making decisions about the preservation or modification of marshes under the new Tidal Wetlands Act. We classified each marsh that exceeded 15 acres into one of four types: three were segregated by depth and a fourth by low salt content. Surveyors can readily classify them by probing their depth and by noting the kinds of plants that grow on them. We examined the traditional elements of soil classification: acidity, salinity, organic matter, depth, particle size, and clay minerals. These properties are related to growth of plants, drainage, corrosion, strength and shrinkage of the sediment as well as classification. All properties have been described and a map compiled to show the location of each marsh. These will be published very soon in a Station Bulletin.

3. The Chariton benchmark soil report was prepared. Physical, chemical, and mineralogical properties were compiled from all New England states and New York with the cooperation of individual members of the Benchmark Soil Committee. Interpretations were included for agriculture, forestry, urban development, and engineering use. This report was recently published as an Experiment Station Bulletin.

4. In order to seek closer cooperation among state and federal agencies which produce and utilize earth science data within the state, a group of soil scientists, geologists, hydrologists, and engineers formed an informal group that call themselves the Geology-Soils Task Force. Initially the aim was to acquaint each other with their individual programs of research and interests. Since we became acquainted, we saw an opportunity to conduct such studies in various programs and to help other agencies who use the data we produce. We have had three activities this past year:

A. Special conference of map scale and interdisciplinary nomenclature. This conference ended with the adoption of two resolutions: one calling for a uniform map scale of 1:50,000 or multiples thereof; the other calling for the use of glossaries to accompany all technical publications produced by us within the state.

B. Conference in California for selection of sites for sanitary land fill. The State Health Department was in the process of writing new regulations for site selection and we shared the collective wisdom of soil scientists, surficial geologists, and ground water hydrologists with them.

C. We are now exploring the publication of pilot report that will encompass a four-quadrangle area that will give interpretations on soil, surficial deposits, bedrock, and ground water supply for total resource planning. ~~Interagency cooperation has already been shown by the various organizations.~~ This approach will eliminate the necessity of individuals and agencies to go to several sources to obtain resource data.

In addition to the four accomplishments already stated, the Experiment Station is examining the renovation capacity of several soils. Hopefully, this information will add a new dimension to the interpretations for urban use. Synthetic septic tank effluent has been leaching through large soil columns for about a year. Analysis of the leachate shows that some soils are more effective renovators than others for particular ions. At the conclusion, the cores will be broken open and the soils analysed for changes in ion distribution. Using thin sections and the electron microprobe we hope to learn more about the mechanisms of renovation and the distribution of ions within the soil with respect to particle size distribution, organic matter, and structure. We have already demonstrated that the electron microprobe will be a valuable tool in our investigations.

REPORT FROM THE CORNELL AGRICULTURAL EXPERIMENT  
STATION REPRESENTATIVE

Soil survey of Whiteface Mountain in the Adirondacks made use of soil associations which were mainly phases or subgroups. The Podzols, non-saturated Histosols, occupy significant portion of landscapes at higher elevation in association with Braads and Githods.

Clay mineral analyses in representative Spodosols reveal similar trend with depth regardless of location of pedon. Montmorillonite was dominant in the A2, vermiculite in the B2h, "chloritized" vermiculite in the B2ir, and poorly crystalline and amorphous material dominated C horizons. Various lines of evidence indicate that dust accretion may account for much of the similarity among pedons.

Soils in valleys in the Appalachian Plateau were evaluated as to suitability for commercial vegetable production. Although as much as 60% of soils were suitable only about 25% of the land was relatively free from urban pressure and occurred in tracts large enough to support commercial ventures.

Several kinds of photography were evaluated as interpretation base maps for soil survey in central New York. Three upland till sites and two valley sites with drift and mixed alluvial-lacustrine sediments were examined. Average accuracy of soil drainage estimates increased from 45 to 49 when using black-and-white, infrared (false color), and color and average accuracy of slopes increased from about 58 to 63% for the same sequence of photos.

In soil associations that are considered marginal in terms of agricultural potential there often is a wide range and inconsistent pattern of farm viability as interpreted by agricultural economists. Productivity measures such as crop yields and till practices and proportions of "good" and "poor" soils can be used to refine these associations and permits a more reliable prediction of viability from the soils information. Some ideas still need testing.

Detailed chemical and physical characterization of two closely associated soils, one with an argillic horizon, the other with a fragipan, is being carried out. It is hoped to develop a constituent budget which will provide information on the processes and events that have differentiated these two soils.

Multiple regression analyses of selected field and lab measured properties of soils of Puerto Rico are being made to evaluate the utility of developing interpretations based on field or easily measured parameters.

A soil association map of the Appalachian region of New York was prepared at a scale of 1:250,000. Descriptors and multiple interpretations were completed for the region.

REPORT OF THE MAINE AGRICULTURAL EXPERIMENT  
STATION REPRESENTATIVE

The Maine Agricultural Experiment Station continues to have a very modest program in soil survey. One man allocates most of his time to obtaining laboratory information on the soil series of Maine. Currently, two series are being analyzed per year. Each series is sampled at five different sites. The sites are located more than a mile apart. The data obtained is published in experiment station bulletins.

The state government has allocated enough new funds to hire one soil surveyor and one man to do soil interpretations.

The governor has expressed an interest in speeding up the soil survey of the Maine coastal area and has promised funds for a crash program.

REPORT FROM THE NEW HAMPSHIRE AGRICULTURAL EXPERIMENT  
STATION REPRESENTATIVE

Teaching:

The Soils and Community Planning Course, developed

Research:

In research, the Soil Conservation Service personnel contributed 70 man days to the sampling and description of 70 profiles in research project H-149. The efforts of the Soil Conservation Service represented a substantial contribution to the Agricultural Experiment Station. The efforts of Soil Conservation Service personnel will insure completion of the project at a much earlier date.

The Agricultural Experiment Station published Research Report No. 3, "Soils and Their Interpretations for Various Uses". Senior author on the publication is the State Soil Scientist.

Regrouping:

REPORT FROM THE PENNSYLVANIA STATE UNIVERSITY EXPERIMENT  
STATION REPRESENTATIVE

The soil characterization program in Pennsylvania has now sampled 3765 soil horizons from 515 profiles representing approximately 135 series. Each year about 30 sites are investigated in three survey areas and where possible, soils of drainage sequences are sampled so that genetic studies may be more complete. This summer, 6 sites will be sampled for each of 5 soil series related through similar parent material. All sampling is done in cooperation with the Soil Conservation Service, USDA.

Research compliments the characterization program in that the data forms the basis for more extensive studies. The following are some recent findings.

1. Soil permeation testing-- Soil and environmental factors significantly associated with permeation rates were: drainage classes, fragipans, subsoil texture, surface coarse fragments, subsoil consistence, structure grade, parent material, and slope classes. Data for Pennsylvania soil series are used by the Pennsylvania Health Department to determine suitability of soils for septic tank drainage fields or land fills.
2. Crop yield predictions-- Soil series are evaluated by measuring yields and specific soil properties. Preliminary analyses have been used for direction of further studies.
3. Soil moisture-- Relationships of texture, organic carbon and coarse fragment contents and other soil properties to soil moisture retention have been evaluated.
4. Organic carbon to organic matter conversion-- A single factor for all Pennsylvania soils is not valid. The equation "organic matter =  $0.35 + 1.80 \text{ O.C.}$ " was applicable to Pennsylvania surface soil horizons.
5. Fragipan characteristics-- Fragipan texture centers on loam-silt loam. Fragipans were lower in organic carbon, had lower Ca:Mg ratios, higher mean base saturations, and showed less alteration of illite to vermiculite than non-fragipan horizons.

The following projects are currently being investigated:

1. Hydrologic-fragipan relationships.
2. Application of the electromagnetic spectrum in the computerized separation of soil areas on the landscape.
3. Determination of better soil parameters for predicting crop yields.

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Presented at the 1970 Northeast Soil Survey Work Planning Conference,  
January 22, 1970.

4. Relationship of soil moisture to parent material and drainage.
5. Measurements of soil temperature and water table depths.
6. Soil percolation testing.
7. Soil mineralogy.
8. Soils association map of Pennsylvania.

Other research in the Agronomy Department related to soil genesis and classification include, (1) the use of sewage effluent for irrigation, (2) determination of pesticide residue in soils, (3) turf-soil modification relationships, and (4) crop response to fertilizer on certain soils.

Field soil scientists have been interested in research such as mapping unit variability, occurrence of poorly drained soils on moderate to steep slopes, age of soils on the floodplain, and the use of vegetation in separating soils.

Morphological and soil property data, collected since the beginning of Pennsylvania soil characterization in 1957 through the year 1966, have been edited and will be published in the near future-- probably in 4 volumes.

Research publications originating from the characterization group over the last few years include the following:

- Cunningham, R.L., R.P. Matelski. Bulk density measurements on certain soils high in coarse fragments. *Soil Sci. Soc. Am. Proc.* 32(1):109-111 1968.
- Cunningham, R.L., G.W. Petersen, R.P. Matelski, R.W. Ranney. Characterization, interpretations, and uses of Pennsylvania soils: Northampton County. *Pa. Agr. Exp. Sta. Prog. Rept.* 295:40 pp. May 1969.
- Derr, B.D., R.P. Matelski, G.W. Petersen. Soil factors influencing percolation test performance. *Soil Sci. Soc. Am. Proc.* (in press).
- Matelski, R. P., R.L. Cunningham. Laboratory data. Soil Survey of Pike County, Pa. In cooperation with USDA, SCS, and Pa. Dep. Agr. pp. 71-77. US Govt. Printing Office, Wash. D.C. 1969.
- Petersen, G.W., G.A. Hussey, R.P. Matelski. Processing and plotting of laboratory particle-size data by digital computer. *Soil Sci.* 108 (6):448-449. 1969.
- Petersen, G.W., R.L. Cunningham, R.P. Matelski. Moisture characteristics of Pennsylvania soils: I. Moisture retention as related to texture. *Soil Sci. Soc. Proc.* 32(2):271-275. 1968.

Petersen, G.W., P.L. Cunningham, R.P. Matelski. Moisture characteristics of Pennsylvania soils: II. Soil factors affecting moisture retention within a textural class-silt loam. Soil Sci. Soc. Am. Proc. 32(6): 866-870. 1968.

Petersen, G.W., P.L. Cunningham, R.P. Matelski. Characteristics, interpretations, and uses of Pennsylvania soils: Dauphin County, Prog. Rept. 290, Pa. Agr. Exp. Sta. Prog. Rept. 290(40 pp. 1968.

Petersen, G.W., R. W. Ranney, R.L. Cunningham, and R.P. Matelski. Frag-

Ranney, R.W. An organic carbon-organic matter conversion equation for Pennsylvania surface soils. Soil Sci. Soc. Am. Proc. 33(5):809-811.1969.

Terelak, H.K., R.P. Matelski. Comparison of results of organic matter content determinations in soils by Walkley-Black and dry combustion methods. Prace Instytutu Rolnictwa, Warszawa, Zeszyt 30:57-63. 1967.

REPORT OF THE VIRGINIA AGRICULTURAL EXPERIMENT  
STATION REPRESENTATIVE

The Virginia Agricultural Experiment Station is currently making detailed soil surveys in three counties and providing full-time soil specialists for follow-up interpretation in three counties. One soil scientist is attached to the State Health Department as a liason between soils and environmental health.

In 1969 over 1,100 soil samples were chemically analyzed and physical properties, including particle size distribution, were determined on 84 soil profiles. These analyses were performed on soil samples from counties being mapped by SCS, VPI, and the U.S. Forest Service.

During the past year studies were initiated to determine the chemical and mineralogical nature of the "plinthite like" material occurring in several Coastal Plain counties. Investigations were made to establish the physical, chemical, and mineralogical parameters of an extensive area of over-lay soils that occur near the fall line between the piedmont and coastal plain provinces. Extensive physical, chemical, and mineralogical studies were made on the Appling and Cecil soils. A five-year water table study of some thirty soils was culminated and the data are currently being analyzed.

Work is continuing to establish the proper mineralogical family of several soils and to determine the weatherable mineral content of the 20 to 200 micron fraction of a number of soils.

Thin section studies are being conducted to determine the amount of rock-controlled structure of several limestone valley soils.

A unique study is currently underway to establish the chemical parameters and domains of the bottom sediments and adjacent soils of a lake incriminated for harboring amoebic meningoencephalitis, a fatal disease.

Efforts are being made to get laboratory information back to the field men at an early stage of the survey in order to be of maximum use in soil classification. The utilization of soil survey information in both rural and, expanding urban areas continues to increase in Virginia.

Respectfully Submitted

s/David E. Pettry

David E. Pettry