

NATIONAL COOPERATIVE SOIL SURVEY
Northeast Regional Conference Proceedings
Orono, Maine
June 12-17, 1988

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PROCEEDINGS OF THE

**Northeast
Cooperative
Soil
Survey
Conference**



University of Maine

Orono, Maine

June 12-17, 1988

Proceedings of the

1988 NORTHEAST COOPERATIVE SOIL SURVEY CONFERENCE

held on June 12 - 17, 1988 at

University of Maine
Orono, **Maine**

sponsors

Maine Agricultural Experiment Station
USDA - Soil Conservation Service

Assembled by

Dennis J. Lytle, State Soil Scientist, USDA Office Building,
University of Maine
Orono, Maine 04473

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Newark, Delaware)

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Soil Survey Program in the Northeast, William F.
Hatfield - Chairman)

committee 2. **Soil-Water** contamination (**Peter Veneman** -
Chairman)

Committee 3. T Factor (Fred Gilbert - Chairman)

Task Force 1. Soils of the Northeastern States
(Edward Ciolkosz, Chairman)

Task Force 2. State Soil Survey Database (**G.**
Schellentraeger, Chairman)

Committee Report - 1986

Committee 3. Final Report "Role of the Experiment
Stations in the Future" (John **C.** Sencindiver,
Chairman)

Committee 4. Final Report "Soil Woodland Interpretations"
(D.G. Van **Houten**, Chairman)

1988 Northeast Cooperative Soil Survey Conference

NEC-50 (Russell Rebertus, University of Delaware, **Newark**,
Delaware)

Business Meeting, John **Sencindiver**

Conference By-Laws

Instructions for NECSSC Proceedings

List of Participants

DRAFT
 AGENDA
 NORTHEAST COOPERATIVE SOIL SURVEY CONFERENCE
 UNIVERSITY OF MAINE
 ORONO, MAINE
 JUNE 12-17, 1988

Sunday - June 12

4:00 - 7:00 pm Registration - Penobscot Hall
 5:30 - 6:30 pm Dinner - York Hall Commons
 6:00 - 8:00 pm Social - Penobscot Hall Lounge (cash bar)

Monday - June 13

Moderator: Dennis Lytle

GENERAL SESSION - 100 Nutting Hall

7:00 - 8:00 am	Breakfast - York Hall Commons	
8:00 - 8:15 am	Opening Remarks	James Baker Conference Chairman
8:15 - 8:30 am	Welcome to Maine	Charles Whitmore scs state conservationist
8:30 - 9:00 am	Northeast Activities	Rich Duesterhaus Assistant Chief SCS Nat'l Office
9:00 - 9:30 am	National Cooperative Soil survey	Maurice Mausbach SCS Nat'l Office
9:30 - 10:00 am	COFFEE BREAK	
10:00 - 10:20 am	NE Soil Survey Steering Committee	Karl Langlois Head, Soil Interp Staff
10:20 - 10:40 am	Nat'l Soil Survey Lab	Robert Grossman scs, Liason to the N.E.
10:40 - 11:10 am	Soil Data Bases	Maurice Mausbach SCS Nat'l Office
11:10 - 11:40 am	Geographic Information Systems - SCS Status	Lee Sikes Ft worth, TX
11:40 - 11:50 am	Silver Spade Award	Ed Sautter SCS, CT
11:50 - 1:15 pm	LUNCH - York Hall Commons	

Monday - June 13 (afternoon session)

Moderator: Ken ~~LaPrade~~

Tuesday - June 14

Moderator: Sid Pilgram

7:00 - 9:00 am

Breakout for Breakfast
N.E.C. 50 Marty Rabenhorst
(York Private Dining Room)

scs Karl Langlois
(York Dining Room)

9:00 - 11:45 am

Committee 2 - Peter Veneman, Chair.
Soil-Water
Contamination (212 Nutting Hall)

Task Force 1 - Soils Ed Ciolkosz, Chair.
of the Northeastern
States (255 Nutting Hall)

Task Force 2 - State Gregg Schellentrager,
Soil Survey Database Chair.
(257 Nutting Hall)

11:45 - 1:15 pm

LUNCH - York Commons

General Session - 100 Nutting Hall

1:15 - 2:00 pm

Technology Transfer to Mike White
Farmers (Potato Shed scs -
Workshops) Presque Isle

2:00 - 2:30 pm

Groundwater John Williams
Contamination State of Maine

2:30 - 3:00 pm

COFFEE BREAK

3:00 - 4:50 pm

Final Reports From
1986 Committees - (30 minutes each)

1. Use of Soil Bill Waltman
Characterization Data
for Other than Soil
Classification Purposes

2. Criteria for Limits Marty Rabenhorst
of Properties for
Soil Series

3. Role of the John Sencindiver
Experiment Station in
the Future

4. Soil-Woodland Dave Van Houten

4:50 - 5:00 pm

Field Trip Information Kenneth

5:15 - 6:00 pm

6:00 - 7:00 pm

Wednesday - June 15

Moderator: Ken **LaFlamme**

Tour Coastal Maine

7:00 - 7:30	Breakfast - York Hall Commons
7:30 am	Leave York Hall
9:00 am	Basal till
10:00 am	Ablation till - talk by Kathy Nitschke RC&D Forester, Maine Forest Service
11:00 am	Organic soil - talk by Pete Grant on present and potential uses of peat
12:00 noon	Lunch (provided) - Blueberry barrens
12:30 pm	Blueberry management and research Fred C. Olday - Jasper Wyman & Son
	Glaciofluvial deposits - Bruce Champeon Geologist SCS Durham N.H.
1:30 - 5:00	Coastal Maine
5:00 pm	Arrive - York Hall
6:00 - 7:00 pm	Social - Memorial Union - Dam" Yankee (cash ba
7:00 - 9:00 pm	Banquet - Memorial Union - Damn Yankee

Thursday - June 16

Moderator: Dick Hall

General Session - 101 Neville Hall

7:00 - 8:00 am

Breakfast - York Hall Commons

8:00 - 9:45 am

Experiment Station Reports
(15 minutes each)

Connecticut -----

Harvey Luce

Ma_ine -----

Robert Rourke

Massachusetts ---

Peter **Veneman**

Maryland -----

Martin Rabenhorat

New Hampshire----

Christine Evans

New Jersey -----

Douglas Wysocki

New York -----

Ray Bryant

9:45 - 10:15 am

COFFEE BREAK

10:15 - 11:30 am
(15 minutes each)

Experiment station Reports

Pennsylvania-----

Robert Cunningham

Rhode Island ----

William Wright

Vermont ~-----

William **Jokela**

W. Virginia -----

John **Seneindiver**

Virginia ~-----

James Baker

11:30 - 11:45 am

OPEN

11:45 - 1:15 pm

LUNCH - York Hall Commons

Thursday - June 16 (afternoon session)

General Session - 101 Neville Hall

1:15 - 1:30 pm	Report from the National Soil Survey Conference	Bill Edmonds VP1
1:30 - 2:00 pm	Remote Sensing and National Aerial Photography	Lee Sikes SCS Nat'l Office
2:00 - 2:15 pm	N.E.C. 50 Committee Report	Marty Rabenhorst
2:15 - 2:45 pm	Acid Rain Research	Duane Lammers EPA - Corvallis Or.
2:45 - 3:00 pm	BREAK	
3:00 - 3:30 pm	Acid Rain Research in Maine	Ivan Fernandez Assoc. Prof. Forest Soils, UMO
3:30 - 5:00 pm	Final Committee and Task Force Work	
	committee 1 - Impact of the 1985 Food Security Act to the Soil Survey Program in the Northeast 102 Nutting Hall	Bill Hatfield, Chair.
	Committee 2 - Soil-Water Contamination 212 Nutting Hal	Peter Veneman, Chair.
	Committee 3 - T Factor 255 Nutting Hall	Fred Gilbert, Chair.
	Task Force 1 - Soils of the Northeastern States 257 Nutting Hall	Ed Ciolkosz, Chair.
	Task Force 2 - State Soil Survey Database USDA Conference Room	Gregg Schellentrager, Chair.
5:15 - 6:00 pm	Social - Penobscot lounge	
6:00 - 7:00 pm	Dinner - York Hall Commons	

Friday - June 17

Moderator: Ron Taylor

General Session - 101 Neville Hall

7:00 - 8:00 am

Breakfast - York Hall Commons

8:00 - 10:00 am

Final Committee Reports

Committee 1 - Impact Bill Hatfield, Chair.
of the 1985 Food Security
Act to the Soil Survey
Program in the Northeast

Committee 2 - Peter Veneman, Chair.
Soil-Water
Contamination

Committee 3 - T Factor Fred Gilbert, Chair.

Task Force 1 - Soils Ed Ciolkosz, Chair.
of the Northeastern
states

Task Force 2 - State Gregg Schellentrager,
Soil Survey Database Chair.

10:00 - 10:15 am

COFFEE BREAK

10:15 - 12:00

Business Meeting

James Bakes
Conference Chairman

- **Plans** for 1989
Conference

- **Conference** wrap up

- Adjourn

12:00 - 1:00 pm

Lunch - York Hall Commons

Soil Conservation Service
Office of the Assistant Chief
for the Northeast

The National Cooperative Soil Survey remains one of the finest technical efforts by a federal, state, and local partnership. We should be proud of our achievements, and we should be aware that the importance of this effort is growing.

Right now, there's an extraordinary demand for soil survey mapping, given the continued land use changes in the Northeast and the SCS responsibilities under the Food Security Act of 1985 (**FSA**). In addition, improvements in Soil Survey Program delivery are underway, and we're preparing for an exciting and demanding future.

This is a good time to take stock of where we are and where we're going in the NCSS. I'd like to give you the SCS perspective.

FSA will continue to be the number one priority for our soil survey program over the next year and a half. Our people have been under the gun to complete the determinations of highly erodible **cropland** and wetlands by the end of 1989.

We've had to temporarily assign soil scientists from the Northeast to states with high FSA workloads. This has been a lifesaver for the states receiving the help. Of course, it put you behind schedule with some of your surveys. I recognize the inconvenience, but I encourage you to keep on sending this help...because I'm convinced that, down the road, this FSA effort will pay dividends. It will be worth the tradeoffs we're making now in terms of ongoing program work. Keep in mind that our success in implementing FSA has a lot to do with support in Congress and the White House.

I believe we've fared real well considering the tough budgeting this country has to do. Again, I think that the people who control our budget recognize the enormous team effort to implement the FSA conservation **provisions...and** the demand for ongoing SCS programs. That's clear if you've taken a look at the White House proposal for the SCS 1989 budget.

Out of the FSA workload demands and the budget **constraints...and** out of planning we've been doing for some **time...have** cone efficiencies in soil survey operations and program delivery that will take us into the future.

By adopting the latest technology in fieldwork and in the office, we're gearing up to meet present and future needs more efficiently. Computers in our soil survey offices and in our conservation district offices, for example, provide greater flexibility in updating soils data and in meeting user's needs.

We are very anxious to bring digitizing capability to our state and field offices. Our hope is to make it part of the ongoing soil survey process; that is, to build it into the field mapping procedure. Most likely, we'll start by setting up digitizing centers in state offices, and eventually in field offices.

We want digitizing to become an integral part of our soil survey updating process. Currently, the SCS National Office is not funding digitizing. That's up to our state offices or to any organization that wants digitizing badly enough to pay for it. We will cooperate with any organization and provide digitizing standards.

We're trying to get additional funds built into the 1990 budget so that the National office can help fund the digitizing effort. If we get that money, we'll then set the criteria for our priorities in digitizing.

This discussion of updating brings me to what I want to say about the future of our soil survey program.

Maintaining or updating existing surveys is a priority. In updating, we don't want just the same old thing. We want digitized surveys that provide --

- o Consistency within their major land resource area.
- o Map unit descriptions that do a better job of characterizing the map unit in relation to the entire natural landscape. This will be especially helpful as more conservation planning is done on a hydrologic unit basis.

- o And we want those digitized surveys to provide any new information required by users.

Our biggest job for the future is meeting the many diversified needs of soil survey users. Here are a few examples:

- o Water quality, a top priority in the USDA's National Conservation Program increases the need to understand, for example, how various insecticides, herbicides, fertilizers, municipal wastes, and other substances move through different kinds of soils. We'll have to make sure our data are technically sound for water quality uses.

- o Land evaluation and site assessment for urban as well as rural clients will be in demand. Knowing soil potential for various uses becomes critical as local communities look at farmland and wetlands preservation and other land use policies.

- o Other environmental concerns, such as understanding the effects of acid rain will draw on our soils knowledge.

- o Using advances in remote sensing will be critical to specialists who correlate soils and vegetation.

To meet the needs of the future, we have to adopt--

- o A multidisciplinary approach in our operations,
- o Interagency sharing of data and know-how, and
- o Computerized geographic information systems.

A multidisciplinary approach is absolutely essential if you consider the complex problems soil survey users have to **solve...and** the interpretations we need to make with our data.

Geomorphology is one of the areas in which we'll be seeing more

interdisciplinary work. SCS is now hiring for the position of national geomorphologist. That's a position I know many of you have wanted to see filled for some time.

Interdisciplinary effort means drawing on the talents and data of other federal and state agencies, and our university cooperators. It also means greater coordination between our **soil** scientists and our specialists in conservation planning, resource conservation, and watershed planning.

Soon, geographic information systems (**GISs**) will help this interdisciplinary effort. Linked with our field office computer systems, they will provide more flexibility and more options in conservation planning. **GISs** will use modeling and applications programs; and they'll enable us to access data from SCS, the U.S. Geological Survey, and other agencies to produce base maps of topography, hydrography, soils, geology, cultural resources, and transportation.

SCS is proud that the Office of Management and Budget has given us the responsibility for national coordination of digital soils data. We've earned that responsibility, with the help of our cooperators, but there's a lot we still have to do to keep on the forefront of this technology. For one thing, we should continue to pursue our **1:250,000-scale STATSGO** mapping. We're somewhat behind schedule, largely because of our FSA priority, but we must continue building this data base. It is designed to provide consistent soils information at a scale practical for statewide and multi-county applications. Agencies with GIS capability have found this compatibility useful.

Taking into the account all the diversified needs for expertise in soil science and other disciplines brings up the subject of staffing. Right now, SCS staffing assignments are primarily controlled by FSA priorities, at least through 1989. As to 1990, we're now polling our state offices on their needs.

I can tell you right now, the need for soil scientists is increasing, not declining. In fact, I'm encouraging SCS state conservationists to maintain or improve the soils staff they have. Soil science students and graduates are getting harder to come by. That's because fewer are going into the **profession...and** many of those who do are attracted by the private sector's higher salaries.

SCS supports every effort by our university cooperators to update their curriculum to attract more students. We also encourage you to guide your students in the multidisciplinary studies useful to natural resource agencies like SCS. Broad, multidisciplinary training is important in the SCS ranks as we continue to increase our domestic and international activities.

The continuing support of all our NCSS cooperators is vital to the SCS soil survey program. As we deal with our staffing, budget, and technical needs, SCS knows that the single most important factor in our work is the strong NCSS partnership. We thank you for your ideas and support.

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National Cooperative Soil Survey
Maurice J. Mausbach
Soil Conservation Service, Washington, D.C.
June 1988

I am pleased to be able to participate in the Northeast Soil Survey Conference and look forward to visiting with you during the course of the conference.

This presentation will be a report on current activities including Food Security Act of 1985 (FSA), soil survey evaluation, and water quality and a discussion of some future activities.

FSA Activities

The FSA requires individuals that produce commodity crops on Highly Erodible Land (HEL) to have a conservation plan by 1990 and necessary conservation systems in place by 1995. An exception is made when a soil survey is not available.

Political and internal pressures have dictated that a soil survey will be available for all cropland by 1990 so that the necessary plans can be developed and systems installed. Therefore, we have given top priority to mapping of all cropland in the United States by 1990. As many of you know we have embarked on a volunteer program for detailing soil scientists to accomplish the task. We appreciate the cooperation that we have received from our states, state cooperators and field soil scientists. We have one more season after the current season to accomplish the task and hope to be able to finish via the voluntary effort.

At the end of 1987 a total of about 44 million acres or 10 % of the cropland remained to be mapped. We have a goal to map 18.3 million acres of cropland this year thus the goal for next year will be about 25.5 million acres. Sixteen states will have all cropland mapped by the end of this year.

Soil Survey Evaluations

Within this decade the soil survey program has had 3 separate evaluations: the Grace Commission, an internal program evaluation, and a productivity improvement study.

The Grace Commission Report Indicated:

- o CASPUSS is not a good management tool
- o Soil surveys should be staffed to finish within 5 years
- o Manuscripts are over-edited

CASPUSS will be replaced by the Soil Survey Scheduling software/database that is being developed by Dick Hunter in Maine. This software is developed to be a management tool for

SCS state office operations. A small part of the database will be uploaded to the National Headquarters.

We have substantially reduced the editing effort. The technical edit is now a responsibility of the states. The editors at the National Soil Survey Center (NSSC) review and do an English edit. The NSSC will use desk top publishing software to edit documents and to do the final formatting of the manuscript for printing at GPO.

We are making an effort to fully staff and equip survey parties to complete a survey within a 5 year period.

The Soil Survey Program Evaluation

This evaluation was based on user needs. Many of you may remember filling out questionnaires with respect to how well the products of a soil survey met your needs. As a result of this evaluation we rewrote our mission statement:

To assist mankind in understanding and wisely using soil resources to achieve and sustain a desirable quality of life by--

- o maintaining a strong scientific basis for defining and describing soil relationships important to decision about the use and management of soils
- o providing scientific expertise to identify, classify, map and interpret soils
- o making field and laboratory information and its interpretation readily available through texts, maps and other forms of data bases, and assisting people in using the information.

Other suggestions in the evaluation published in October, 1987, have been implemented.

Soil Survey Productivity Improvement Study

The productivity improvement study (PIP) was conducted to:

" . . . find the most effective and efficient organization for accomplishing the agency objectives for the soil survey program and to identify those activities in this program that are inherently governmental and activities that can be considered commercial in nature."

The PIP task group developed mission statements for the recommended organizational levels: and recommended:

- o reorganization of the NHQ and NTC staffs

- o establishment of a National Soil Survey Center (NSSC) of soils technical expertise
- o assignment of that technical staff responsibilities by major land resource areas rather than by political boundaries
- o quality control be a state function
- o quality assurance be a function of the National Soil Survey Center.

We are in the process of implementing recommendations of the PIP study by:

- o realignment of quality control functions to states, closer to the action
- o consolidating technical staffs located at NHP and NTCs to the NSSC located in the Midwest National Technical Center, Lincoln, NE (Fig. 1)
- o redefining functions of National Technical Center Staffs to include soil interpretations, and soil services.

Future Activities

Water Quality

We are actively developing procedures to integrate water quality into resource planning. A Water Quality Action Plan task force is developing the necessary tools and training materials. A crucial tool will be the soil interpretations related to the ability of soil to protect aquifers and surface waters from contamination of agricultural chemicals. Don Goss, research soil scientist at the National Soil Survey Laboratory, is developing interpretation criteria for rating soils. He will be looking to the NTC and NCSS cooperators for help in this task.

National Soils Handbook

The handbook is in need of a thorough revision, especially sections on operations, classification, and soil interpretations. The staff at the NSSC will be leading the effort but will need the assistance of everyone to accomplish the task.

For the soil interpretations section, we will develop task groups to evaluate both the estimated property and soil interpretation criteria on the soi-5 form. Concerns include the technical adequacy of the interpretation criteria and the types of data needed to make water quality interpretations and to support modelling activities.

Next Generation Soil Survey

We are rapidly approaching the completion of the present generation of the soil survey of the United States. In many areas this represents the second or third time that a soil survey

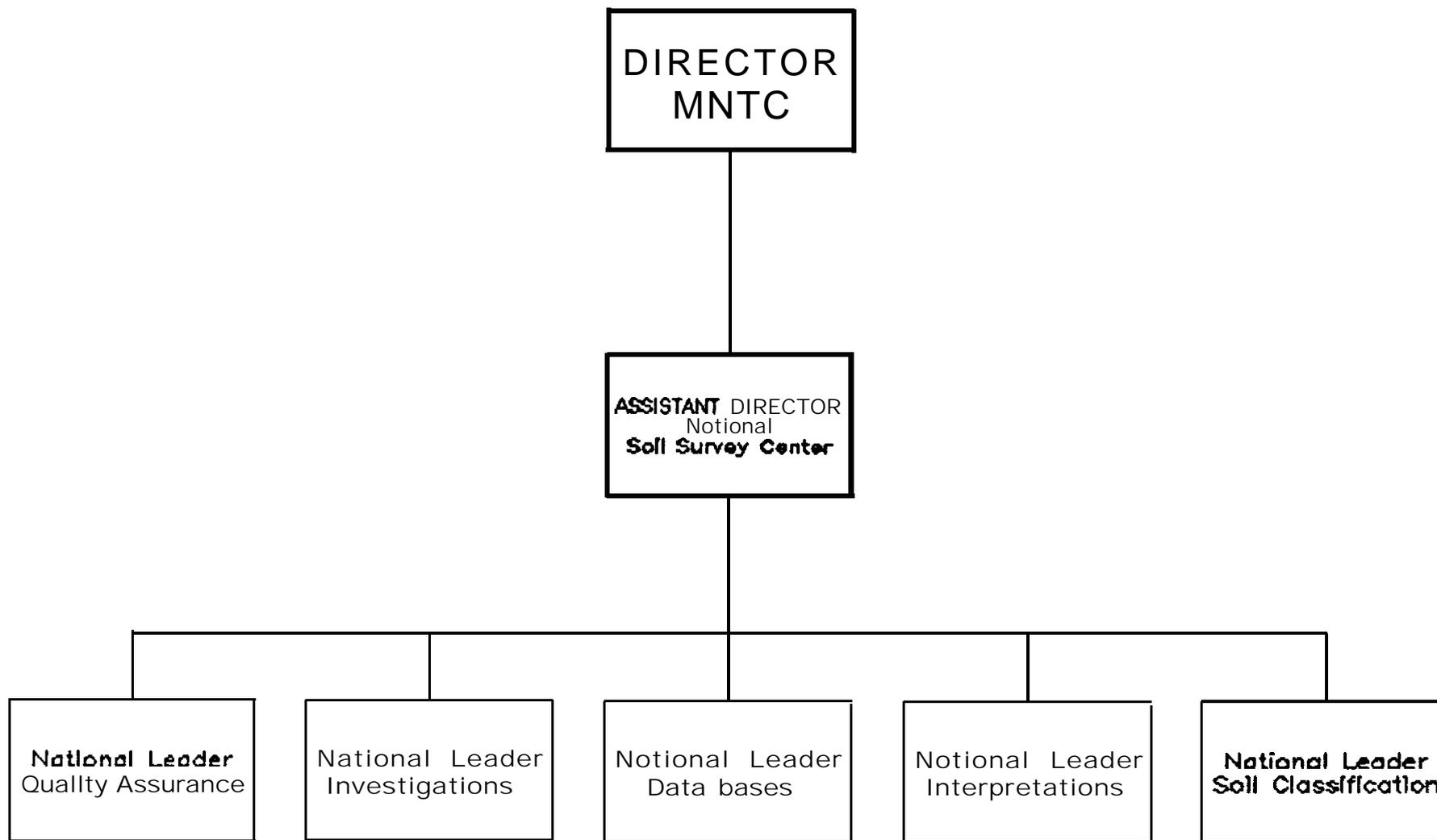
has been made of an area. However, with the new demands and uses of the soil survey we are finding areas of the present surveys that need to be supplemented or updated. This maintenance function of a soil survey is becoming an important function in many states. In some cases, we may decide that a new survey is needed, but before we embark on this 'Fourth Generation' survey, we must develop:

- o A strategy for updating surveys at the state and regional levels
- o A better method to describe map units that serves the electronic/quantitative era
- o Approaches to maintenance functions for servicing completed surveys
- o Methods for adding image processing of various types of photography to the knowledge base of a survey

Undoubtedly there are many more issues concerning the next generation of soil surveys. Some issues will require research and development while others will require round table discussions. I am looking forward to working with all of you in meeting the challenge of the NCSS in the twenty first century.

Figure 1.

SOIL CONSERVATION SERVICE (National Soil Survey Center)



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Northeast Cooperative Soil Survey Conference
Karl H. Langlois, Jr.
Head, Soil Interpretations Staff
Northeast National Technical Center
Soil Conservation Service
Chester, Pennsylvania

In the last two years we have experienced many exciting changes in the the soil survey program. In the next few minutes I am going to talk about staffing changes, activities, concerns, and our program emphasis.

The staff at the **NENTC** has undergone a radical change in the last two year*. This was caused by several factors including the plan to consolidate **NTC's**, which never materialized, and the Soil Survey Program Evaluation which was a SCS study of the soil survey program that was released in October 1987. One of the results of the program evaluation is the National Soil Survey Center being established in Lincoln, Nebraska. The Center will be discussed later in the program but the major impact it has at the NTC is that all correlations and manuscripts are now being processed at Lincoln. The soils staff at the NTC will concentrate on soil interpretations, consequently, the name of the staff is the Soil Interpretations Staff.

The Soil Interpretations Staff will furnish technical assistance to the Northeast States and National Headquarters on the use of soil surveys, soil interpretations, **soil** database management, and Geographic Information Systems (**GIS**).

The staff will review and evaluate the adequacy of soils information in various reports and studies, such as soil potentials, **RC&D** plans, and watershed plans. The staff will coordinate soils data with other disciplines such as agronomy, biology, and forestry. It also will maintain a liaison with regional National Cooperative Soil Survey cooperators.

The Soil Interpretations Staff will conduct, or provide for, the training of soil scientists in the use of soil surveys, soil interpretations, soil related databases, and GIS.

Changes of personnel on the soils staff are many. Jim Ware, soil **correlator**, transferred from the NTC to the SCS state office in North Carolina, as a forester, in March 1987. In October 1987, Loyal Quandt, Jim Doolittle, Jim **Giuliano**, and Gabe **Hiza** were reassigned to various staffs in the National Soil Survey Center, although they will remain at the Chester office. Also in October 1987, I was assigned as Head, Soil Interpretations Staff. In April 1988, Oliver Rice returned to the NTC from a two year assignment in Temple, Texas.

Besides **Oliver** and me, the Soil Interpretations Staff has positions for two more soil scientists and a GIS specialist. One of the soil scientists positions was recently advertised and a selection should be made in the next few weeks. The other soil scientist position will hopefully be advertised during the next fiscal year. Advertisement for the GIS position should be made in the next few months.

Many changes have occurred on soil staffs in SCS state offices in the past two years. Bob **Joslin**, Assistant State Soil Scientist in Maine, retired and was replaced by Dennis Lytle. Dick Babcock, State Soil Scientist in Maine, transferred with a promotion to State Soil Scientist in Texas. The State Soil Scientist position in Maine is currently vacant. Henry Mount, Assistant State Soil Scientist in New Hampshire, transferred with promotion to the National Soil Survey Quality Assurance Staff in Lincoln, Nebraska. Bob **McLeese**, Assistant State Soil Scientist in Vermont, transferred to Illinois as Assistant State Soil Scientist and was replaced by Gregg Schellentragher from Florida. Kieth Wheeler, Soil Specialist, New York, resigned and that position is vacant. John Hudak was added to the Pennsylvania soils staff and will be located at Penn State. Ed White, Assistant State Soil Scientist in Maryland will transfer to Pennsylvania as Soil Specialist,

Gene **Grice**, State Soil Scientist, Massachusetts, retired and moved to Texas. Steve **Hundley**, Assistant State Soil Scientist, was promoted to State Soil Scientist and Dick **Scanu**, Massachusetts, was appointed to Assistant State Soil Scientist. Roy Shook, Assistant State Soil Scientist, Connecticut, resigned and is now a soil scientist consultant. Carl Eby, State Soil Scientist, New Jersey, retired and is doing consulting work in New Jersey. Bill Broderson accepted the position of State Soil Scientist, New Jersey, moving from Missouri. Ron Taylor, from West Virginia, was promoted to Assistant State Soil Scientist in New Jersey.

Within the past two years Berman Hudson became State Soil Scientist in Maryland and then was promoted to a position on the National Quality Assurance Staff in Lincoln, Nebraska. Berman was replaced by Carol Wettstein as State Soil Scientist in Maryland. Dave Jones, Soil Specialist in Virginia, was promoted to State Soil Scientist in Mississippi. Bruce **Stoneman** replaced Dave as Soil Specialist in Virginia. Lawson Spivey, Soil Specialist, West Virginia, transferred to the Soil Geography unit at National Headquarters in Washington. Lawson was replaced by Cameron Loerch as Soil Specialist in West Virginia.

Activities in the Northeast

The Food Security Act (**FSA**) has made a" impact on soil survey activities in the Northeast. SCS is required to have all **cropland** soil mapped by 1990. This deadline has caused some states to make drastic changes on placement of soil scientists in order to meet FSA needs. Soil scientists in some states were detailed to states in other regions to help them meet their FSA goals. **Activities** relating to the FSA have meant that **our** State Soil Scientists have had to manage at a very intense level to keep all the soil survey programs active. The **State** Soil Scientists have done a very good job in this respect because we anticipate that all the **cropland** will be mapped by the 1990 deadline.

Beside the FSA mapping, there are still a substantial number of field reviews and correlations being held each year. Completion of manuscripts has slowed somewhat but is expected to pick up after the PSA workload is completed. FSA and its impact on soil survey activities will be reviewed in more detail in Committee 1. Soil mapping in the region is approximately 80 percent complete.

About a year ago mapping and sampling started on a new set of watersheds and streams for the Environmental Protection Agency acid rain study. We will hear more about this study from speakers later in the program.

These are but a few of the activities we had in the Northeast. I want to briefly review some of the actions taken on recommendations made in our last (1986) conference committee reports.

Committee 1 - Use of Soil Characterization Data for Other than Soil Classification Purposes. **Recommendations** were to have standardization of a data base and have a regional database. This subject was discussed at last years NEC-50 Committee meeting. A national committee has met once to discuss characterization data and will meet again in the near future. Committee 1 was discontinued.

Committee 2 - Criteria for Limits of Properties for Soil Series. The committee stated that present guidelines for series criteria are adequate and that no action should be taken. The committee was discontinued.

Committee 3 - Role of the Experiment Stations in the Future. The committee was continued with recommendations that a list of job opportunities should be developed. Also a list should be developed of regulations and laws that require soil scientists to provide data at the local level. The actions of this committee will be discussed later during the conference.

Committee 4 - Soil-Woodland Interpretations. This committee **was** continued because more work was needed to determine the percent of stones and boulders on the surface that would affect interpretations for **uses**. Chairmanship was transferred from **Karl Langlois** to Dave **VanHouten**. A meeting was held in Vermont with soil scientists and foresters to discuss the stone and boulder percentages. A draft copy of these results **was** sent to all former committee members. Responses were incorporated into a report. The report will be discussed later in the conference.

Areas of Concern

During the past year there has been a tremendous opportunity for soil scientists in SCS to advance with promotions. This is great. My concern is that as we look at the lower grades, there is only a small reservoir of soil scientists left. There are many factors for this, of course, two of which are fewer soil science majors in universities and private industry pays more than SCS. I encourage all of the university people to keep looking for students in soil science and I encourage all SCS people to try every way we can to hire soil scientists, including using the student trainee program. I anticipate that this problem will not go away and we will continue to have an up-hill battle to attract new soil scientists for years to come.

For several years now, states have been working on **STATSGO** maps which **are general** soil maps of the state. Only a handful of states in the Northeast have sent their maps to the NTC for review. I know there is a tremendous workload, especially with FSA, but it is time when all states should be sending their maps in. We need time at the NTC to review the maps and make any correlation decisions that may be needed.

Program Emphasis in the Northeast

There is a strong soil survey program in the Northeast. With the many changes of personnel we have experienced in the NTC, and state offices, I anticipate a strong and exciting program for many **years** to come. With the many new soil scientists we have in the Northeast, managers must be aware of the new **talant** and "se it to the fullest.

The number one priority in SCS and consequently the highest emphasis we have in soils, is to complete **cropland** mapping for the Food Security Act Program. We must continue to place soil scientists where they will be most effective and we must continue to keep quality as high as we can, even though there is a high emphasis on quantity.

Water quality is becoming a very important issue in the country. Soils data will be extremely important in most water quality work. We need to make sure our soils data is as accurate as we can make it and we need to check our data for completeness of information, I am sure there will be many water quality questions that will need complex answers. Universities will have to do more research on soil and water relationships. water quality poses a challenge to all soil scientist for years to come.

Two years ago I talked about Ground Penetrating Radar and the potential it had in the Northeast. Several states are interested in the GPR but the emphasis they have had to place on the FSA has prevented them from obtaining a GPR unit. Massachusetts is the **first** state in the Northeast that has ordered a unit, and they should receive it in a few months. We will continue to emphasize the use of GPR in the Northeast and, with the help of Jim Doolittle, develop methods in which the data can be interpreted for a variety of uses.

As more soil scientists are added to the Soil Interpretations Staff at the NTC. we will spend more time working with other disciplines. Emphasis will be to more fully integrate soil survey into as many disciplines as we can. Also a large part of **our** program will be to transfer as much technology as we can between SCS offices and Universities.

Computers are becoming more and more integrated into SCS offices and **programs**. We need to strive to place a computer by the desk of all soil scientists in the region. With the computer programs now available, and those coming out in the next few years, it is imperative that all soil scientists learn how to **use** the computer. Not only is the "se of computers important but the use of data that is in computers needs to be expanded.

Emphasis will continue on the distribution, training, and "se of the State Soil Survey Database (**SSSD**), the Computer Assisted Planning and Management System (CAMPS). and the **pedon** description program. There will be many new programs that will be coming **out** in the next couple of years that will be useful to soil scientists in the field and it is important that these are utilized to the fullest.

Geographic Information Systems (**GIS**) are being used in increasing numbers by state agencies. SCS is becoming involved in **GIS** and this past year has had pilot test sites in several states throughout the country. The NTC is planning to have a GIS position filled in the "ear future. The person in this position will be responsible for keeping up to date with the latest developments in GIS, keeping states informed of GIS developments, and training SCS personnel in the states. A high emphasis will be placed on developing innovative ways to "se **GIS** in the Northeast.

Perhaps, one of the most important items we need to place program emphasis on is training of soil scientists. Many changes are taking place that will affect all soil scientists. As we finish the mapping phase of soil survey in the Northeast, soil scientist will be encountering more time spent on the use of soil surveys. Soil interpretations will be their number one workload. We must be sure they are fully trained to meet this **challenge**. Computers will also play a big role in the daily activities of soil scientists, Training to help soil scientists become familiar with computers will help them be more productive. We must identify all training needs of soil scientists and make sure they receive the best training we can provide.

National Soil Survey Quality Assurance

Jerry Post, Supervisory Soil Scientist, for Soil Classification and Mapping has responsibility for the Northeast and part of the South regions. Jerry wanted to come to the conference this week but could not make it due to a travel conflict. Jerry plans to be on the Spodosol tour this fall and hopes to meet many of you at that time.

Jerry asked me to hand out this paper (attached) explaining the organization of the NTC soil interpretations **staff** and the National soil survey center. Please note that the first two paragraphs are the only ones from the National Manual. The material below the dash line is an explanation of the responsibilities and functions of the National Soil Survey Quality Assurance Staff

SCS - GENERAL MANUAL

PART 404 - ORGANIZATION

SUBPART C - NATIONAL TECHNICAL CENTERS

§404.26 NTC soil interpretation staffs.

The soils staffs guide and assist other NTC staffs in the integration of soils information into technology development and transfer activities and furnish training and technical assistance to states in the application of soil technology. The soils staffs coordinate the national cooperative soil survey activities in the area.

§404.32 National soil survey center (Midwest NTC).

The national soil survey staff furnishes technical assistance on scientific phases of soil surveys, including mapping, classification, correlation, data bases, interpretation, investigation, editing, and publications. The services offered by this staff include soil analyses and research in soil classification, **morphology**, and interpretation and research in the physics and chemistry of soil genesis.

NATIONAL SOIL SURVEY QUALITY ASSURANCE STAFF

Responsibility and Function

It is the responsibility of the National Soil Survey Quality Assurance Staff to assure that quality control is being carried out by the **states**. Quality assurance is an oversight function. It will require a continual close working relationship with state staffs.

Quality assurance will be carried out through the following functions:

FUNCTION: Review memorandum of understanding.

Emphasis Items

- Purpose of the soil survey
- Guidance on soil survey procedures
- Average size of management unit
- Maximum size of contrasting inclusions
- Map scale
- Schedule for completion

FUNCTION: Participate in initial field review or early progress review.

Emphasis Items

- Design and description of map units

- **Naming** Of map units
- Classification and description of **taxonomic** units
- Documentation
- Map quality
- Quality control procedures
- Accuracy of interpretations
- Adequacy of special investigations and laboratory data
- Staffing and management
- Use of special symbols
- Matching of maps with adjoining soil surveys

FUNCTION: Review field review reports.

Emphasis Items

- Quality control procedures
- Staffing and management
- Legend control
- Naming **of** map units

FUNCTION: Participate in final field review.

Emphasis Items

- Description of map **units**
- Naming of map units
- Classification and description of **taxonomic** unite
- Documentation
- Detailed map quality
- General soil map quality
- Accuracy of interpretations
- Adequacy of special investigations
- Status of soil interpretation records
- Classification and use of laboratory data

- Status of manuscript
- Matching of maps with adjoining soil surveys

FUNCTION: Review of draft of final correlation.

Emphasis Items

- Naming of map units
- Problems and deficiencies noted at final field review.

FUNCTION: Training.

Emphasis Items

- Basic Soil Survey Course
- Soil correlation course
- NTC workshops for state soils staffs
- Participate in state workshops
- Training of individuals in NTC
- Training during field reviews
- Training aids and modules

The emphasis is on progressive soil correlation. During each field review, the taxonomic units and map units recognized since the last review need to be reviewed and approved. Map compilation should keep current with progressive correlation. Development of the soil survey manuscript should also keep pace with correlation.

The National Soil Survey Quality Assurance Staff will make its input early in the survey, beginning with a critical review of the memorandum of understanding. It is essential that staff members participate in the initial field review or an early progress review. It is anticipated that the same staff member will participate in the final field review and review the draft of the correlation that accompanies the review report. If the state does an adequate job of legend development and progressive correlation, the final field review can be held as much as 1 year before the completion of mapping. A draft of the correlation is to be prepared by the state at the final field review. This draft is circulated for review by cooperators and the National SSQA Staff. When mapping is complete, the final correlation document is prepared and approved by the state soil scientist.

Soil Survey Databases
Maurice J. Mausbach
Soil Conservation Service, Washington, D.C.
June, 1988

This one of my favorite topics as, we are actively pursuing the redesign of the National Soil Survey databases. This presentation will summarize our strategy for soil survey databases, our short and long range database plans, and our plans for geographic databases.

National Soil Survey Database Strategy

As with most databases, our soil databases have evolved over many years and were designed to meet specific needs. The Soil Classification file is the official record of data on soil series and was developed before we automated the official soil series description. The soil interpretations record (SIR) stores data that are necessary to generate tables for our manuscripts and the map unit use file (muuf) was originally a mechanism to obtain the appropriate data from the SIR. Because of this evolution, the databases are separate entities, and were often on separate computers. In recent years, the SIR and muuf files have become very popular and are being used for purposes in addition to the original design, such as modeling (SIR) and single phases interpretations (map unit interpretations record in the State Soil Survey Database). The databases have served us well for about two decades but need to be brought up to current technology.

Our main objective in updating the databases is to develop, support, and maintain a coordinated (integrated), distributive soil information system from the individual databases that we now have.

The three components of the information system are

- o A national centralized database consisting of the national standards and data sets generated by the NCSS.
 - National Soil Series Standard
 - National Soil Characterization Database
 - National Soil Survey Schedule
 - National Soil Survey Area Database

- o A state database of data tailored for specific soil survey areas and other data sets to support the state soil survey program
 - Map Unit Interpretation Record
 - State Soil Survey Schedule
 - State parts of National Soil Series Standard, and National Soil Characterization Database

- o A Field database for collecting and summarizing data collected during a soil survey and a soils database to support district office activities.
 - Pedon Data Record (SOI-SCS-232 data)
 - Map Unit Interpretations Record for survey area
 - CAMPS

Our strategy to accomplish the objective of a National Soil Information System is:

1. Establish a national soil database management authority. The authority will reside with the National Leader for Databases at the National Soil Survey Center (NSSC).
2. Establish a centralized, integrated National Soil Survey Database. This database includes our present Official Series Descriptions, Soil Classification file, SIR, MUUF, Soil Characterization Data, Soil Taxonomy, and geographic data sets. To accomplish this goal of an 'integrated database', we have established analysis teams made up of NHC!, NTC, state, and field soil scientists. These teams describe in detail the flow of soil information through the system and describe the processes which transform the data. Once this user phase of analysis is completed, a more detailed design phase will develop specific system requirements. We are in the analysis and design phase for the national soil series record database. An NCSS work group will start on the analysis phase for the National Soil Characterization database this summer.
3. Continue to enhance the State Soil Survey Database.
4. Further develop an integrated system to support data collection and management at soil survey field offices.

Present database activities

Soil Survey Field Office Database

We have recently distributed the Pedon Description Program (PDP). This system captures site and morphologic data commonly recorded on the SCS-SOI-232 form and stores it in a standard format (Pedon Data Record) for characterization data. It runs in a unix/prelude or dos/rbase environment. The data may be summarized dependent on user needs using the relational database software, or narrative and tabular pedon descriptions can be printed using PDP software.

A transect/note module is being tested and will be available later this summer. It runs in the dos/rbase environment and will be fully integrated with the PDP software. The system will

generate summary and statistical reports based on transect or note data.

We plan to add other modules to the system based on recommendations of our field soil scientists.

Many soil survey parties are developing software and databases to generate map unit descriptions and to manage other functions at the field office. We plan to advertise the availability of these systems via National Bulletins and our electronic bulletin boards.

State **Soil** Survey Database

We have recently tested a procedure for input and edit of SOI-6 data and automated procedures for transmitting the files to Iowa State University. We are planning an update to SSSD in August that will contain the SOI-6 and Soil Survey Scheduling procedures. An input/edit procedure is in development for the SIR and STATSGO muuf data using the SSSD system.

We are currently using the ATST unix computer to process the official soil series descriptions and hope to further develop the process to include an electronic/telecommunications review procedure. We have asked ISU to develop an electronic system for the SIR review process.

National Soil Series Standard

The soil series standard will consist of the official soil series descriptions, soil interpretations record and soil classification files. It will contain the limits (ranges), typical pedon, and a representative value for each property used to define a series. The representative value, as presently envisioned, will be a single value for a property, such as percent clay, that best represents the series.

We are in the design and analysis stage for the National Soil Series Standard and plan to have a prototype system next year.

In the short range, we have consolidated the official soil series, SIR, and soil classification files at the Iowa State University computer and have linked common data elements. We plan to continue to modernize the current system by loading the map unit use and SIR files into a relational database at Ames. This will enable users to interactively develop queries or reports other than the standard tables that are now available using regional or national data sets. We are also working on an electronic network to transfer and process official soil series at the NSSC.

National Soil Characterization Database

This database has been under development for at least a decade. The Pedon Data Subsystem (PDS) was developed and published a few years ago but was never implemented nationally. Technology rapidly rendered the PDS obsolete. Thus, we have organized an interagency task group to plan a new system that would house soil characterization data generated by the NCSS at a central location with access by all. This group will meet in July to design a database. Plans are to have a prototype system by July 1989.

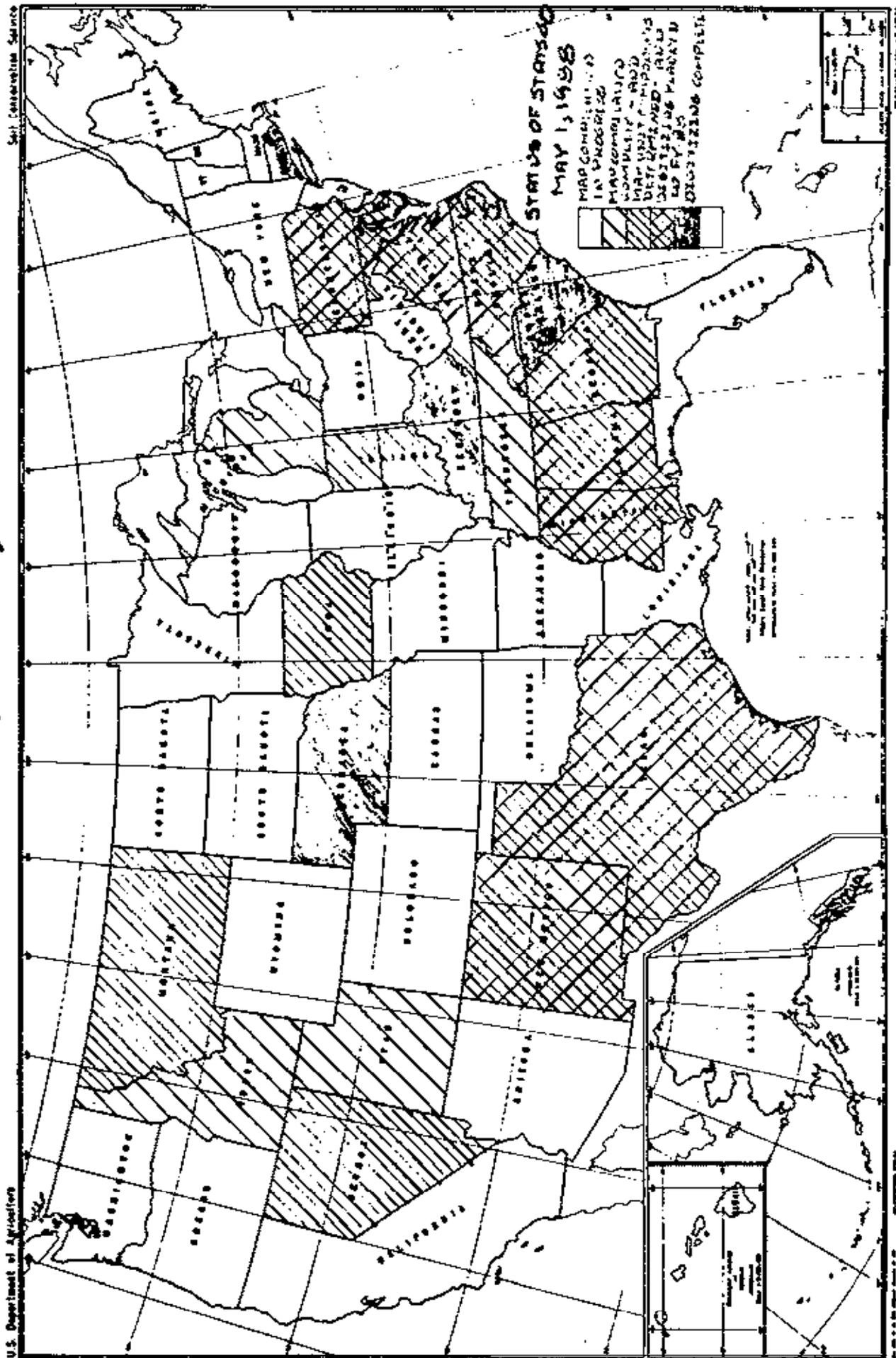
Soil Geographic Databases

- o NATSGO (National Soil Geographic data)- The base map has been digitized and we are working on a simplified procedure for accessing NRI/SIR data which provide the soil attributes for the system. NATSGO will be loaded in an ARC/INFO GIS system on the Data General computer at NHQ. NATSGO with a limited amount of attribute data has been loaded in GRASS on a Soil Survey Division computer system at NHQ.

- o STATSGO (State Soil Geographic data) - The states are making progress (Fig. 1) on completion of the base maps. We will issue a user guide for use of STATSGO in minicomputer ARC/INFO in the next several months. STATSGO has been used with GRASS for a small state. A user guide is planned for STATSGO/GRASS after additional work with the system. We are receiving numerous calls for STATSGO data from federal and state agencies for use in their GIS systems.

- o SSURGO (Soil Survey Geographic data) - We are near completion of the test of GRASS GIS system and have recently published policy and standards for SSURGO in the National Soils Handbook (see NSH Amendment 4). Digitizing specification for SSURGO will be issued soon in CGI National Instruction No. 170-303. The Soil Survey Division together with C&GIS Division has prepared a plan to test various alternatives for integrating digitizing in the soil survey process. Hopefully eight states will cooperate with testing to be completed by April 1989. The objective is to determine the most cost effective method or methods to digitize soil maps as an integral part of the soil survey process using SCS FOCAS computer equipment.

FIGURE 1. STATUS OF STATE SOIL GEOGRAPHIC DATABASES
(STATUS)



GEOGRAPHIC INFORMATION SYSTEMS - SCS STATUS

by Lee **Sikes**
USDA-SCS, National Cartographic Center
Fort Worth, Texas

Changing technology has caused **some** rather **drastic** changes in the **way** our work is done. Earlier today, someone mentioned that we **are** in the fourth generation of soil surveys. The graphical display of soils has changed from shaded **line** maps to soils superimposed on imagery. We have changed from mosaics to high altitude photography to orthophotography. All of these maps have been printed on paper and bound in the soil survey report.

The next generation of soils maps **will** probably be an "electronic" generation. As older surveys are updated and as new areas are mapped for the first time, more of them are being compiled on orthophotoquads so that eventually they can be digitized and soils data entered into a computer data base. Soils information **will** become one layer in a Geographic Information System.

A Geographic Information System is a combination of computer hardware and software which **is** designed to collect, manage, manipulate, analyze, and display spatially referenced and tabular digital data. Building a GIS is like stacking up a large number of clear overlays or maps, all of which are of the same scale and registered to a common set of reference points. The computer can "look" down through all the overlays and compare layers of data to each other.

Gale **TeSelle** is the Director of the Cartography and Geographic Information Division at National Headquarters. One of his main functions has been to work with other agencies to standardize the format for digital data so that data may be exchanged and used in different systems.

The Soil Conservation Service is primarily concerned with digitizing or scanning soils but soils is only one layer within the GIS. Other resource data, such as forest types, land use, land ownership, etc., may be digitized by other agencies but will **become** part of **SCS's** GIS. The U.S. Geological Survey has **linework** (streams, roads, boundaries) in digital form called Digital Line Graphs (**DLG's**). SCS should be able to use this data, rather than redigitizing these features.

Another function of **TeSelle's** staff is to recommend hardware and software which can best be used for building Geographical Information Systems in SCS. This has been complicated by the proliferation of different systems being put into use at all levels of government, also at universities and in the private sector.

At the present time software developed in the public domain by the U. S. Army - Construction Engineering Research Lab (**CERL**), located

in Champaign, Illinois, shows much promise for use by SCS. This software is called GRASS - Geographical Resources Analysis Support system. Pilot test sites in seven states (Colorado, Michigan, Missouri, New York, Oklahoma, Vermont, and Washington) are evaluating this software for use on the SCS's field office equipment. The equipment is basically on AT&T 3B2/400 minicomputer coupled with PC 6300 color display stations. Results of these tests should be in soon.

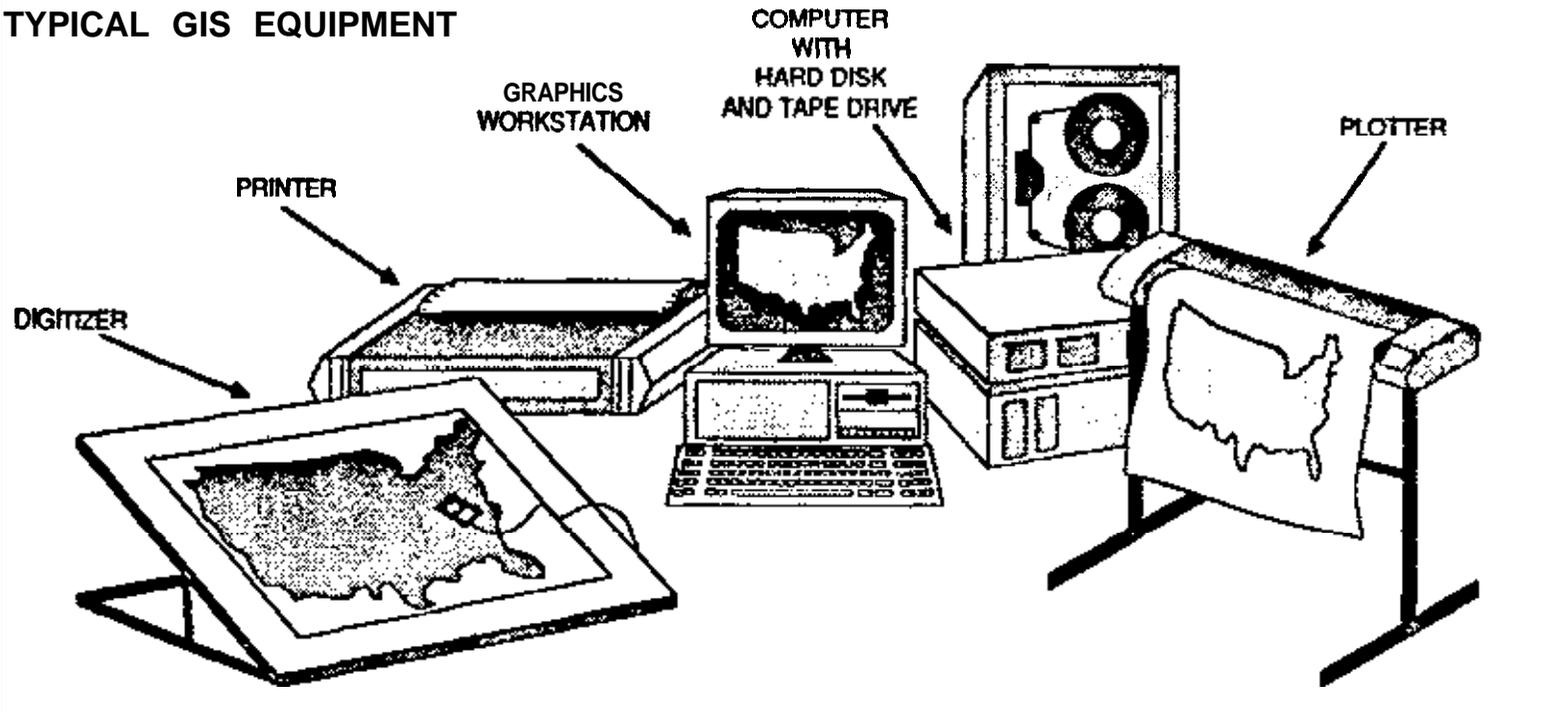
At the National Cartographic Center (NCC) in Fort Worth, three in-house systems are presently in use: (1) Computervision (CV) equipment and software, which has been in use approximately thirteen years, (2) ARC/INFO software on the Data General mini-computer and also on the AT&T 6300 microcomputer, and (3) GRASS software on the AT&T 3B2/400

As mentioned earlier, **soils is only** one layer in a **GIS**. I am confident that **we** will arrive at an efficient way of digitizing and publishing soils Information. The big challenge will be to build and use GIS in a way that **will** best help us manage all our **resources**.

DEFINITION

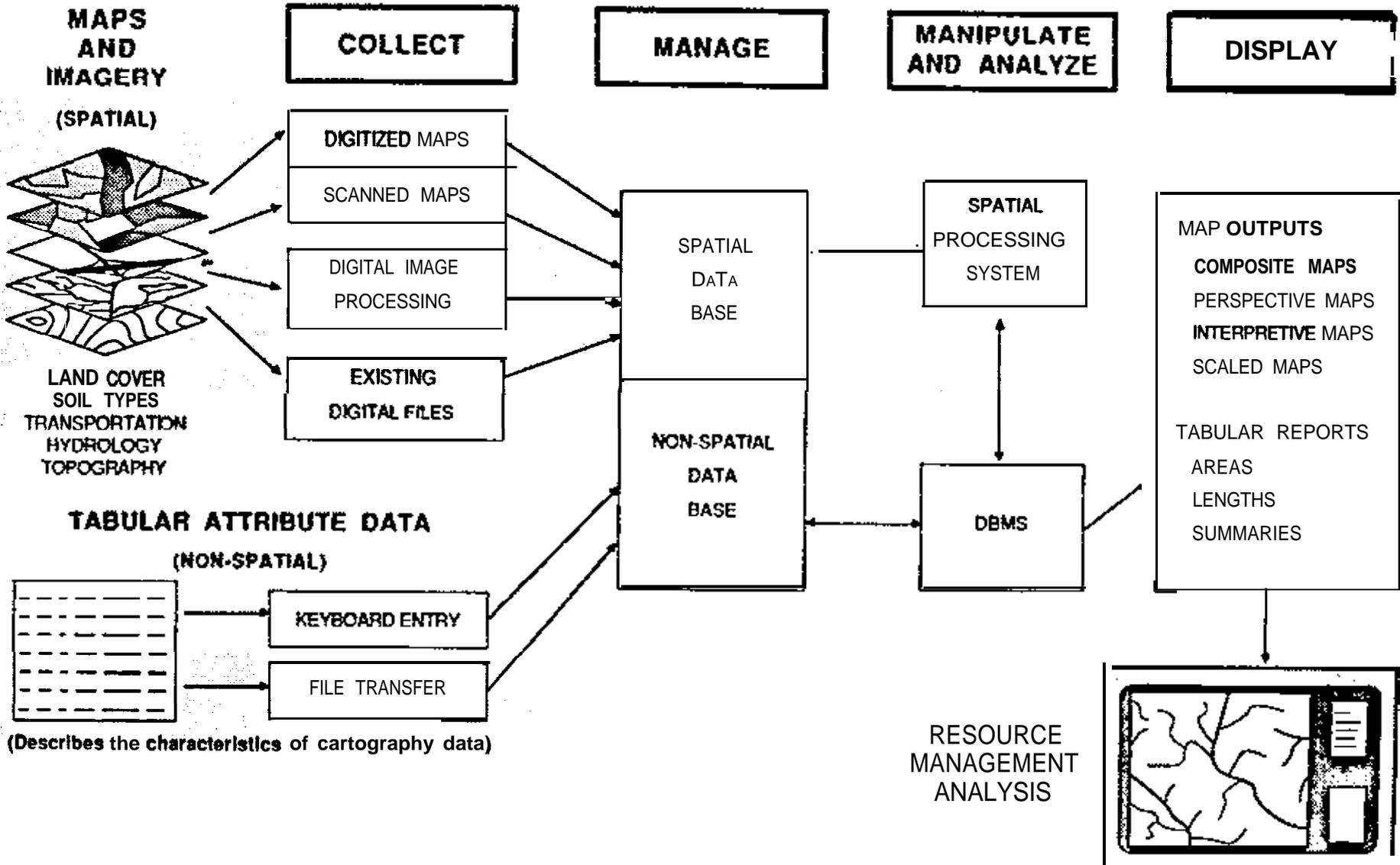
A **GIS** is an integrated hardware and software system designed to collect, **manage**, manipulate, analyze, and display spatially referenced and tabular digital data. **Spatial** data consists of features associated with a geographic location. These features can be points, lines, or area characteristics, such as roads, soil boundaries, land cover, etc.

TYPICAL GIS EQUIPMENT



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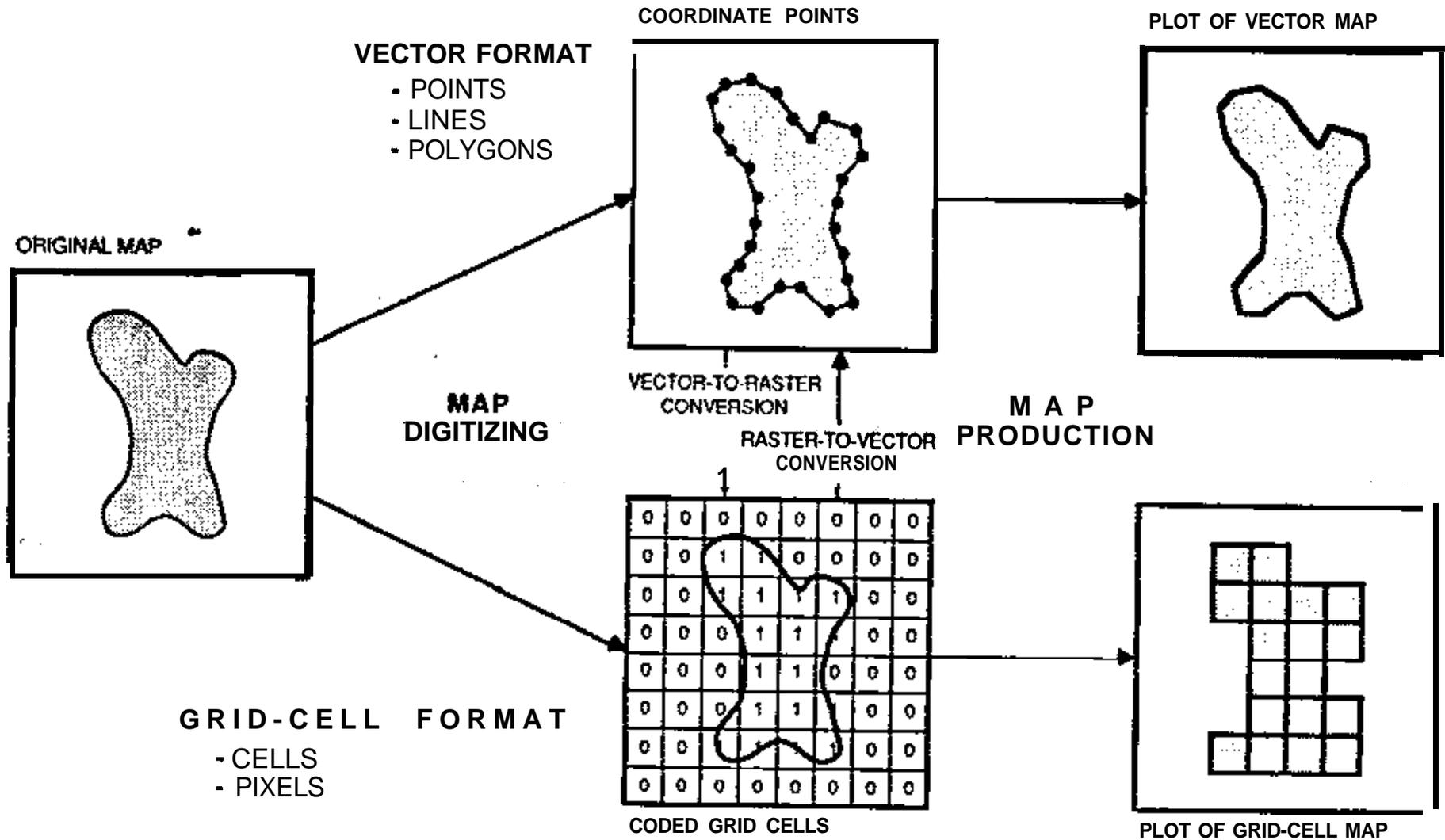
GIS FUNCTIONS



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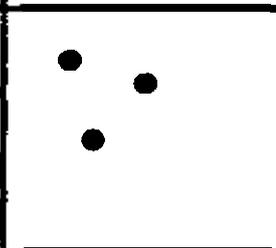
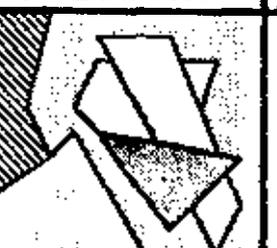
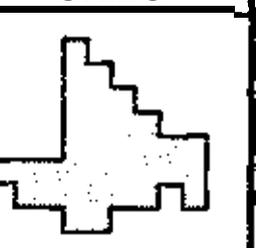
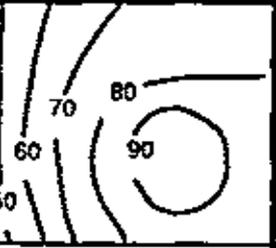
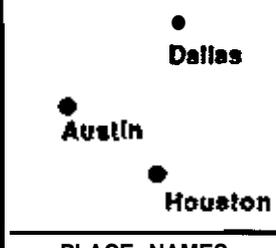
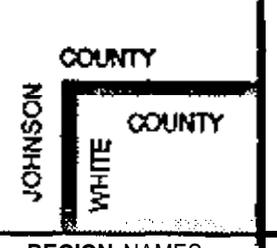
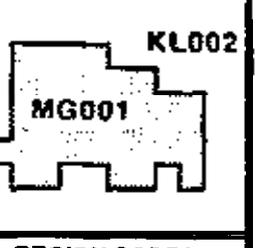


COLLECT DATA (Digitize, encode, scan, etc.)



MANAGE DATA

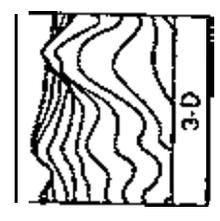
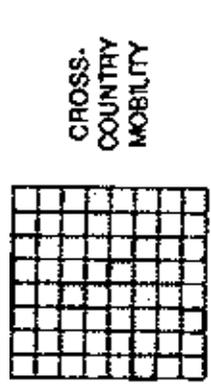
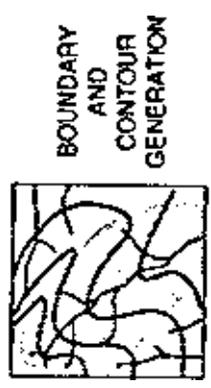
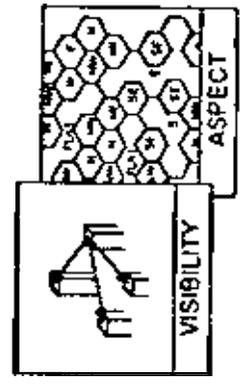
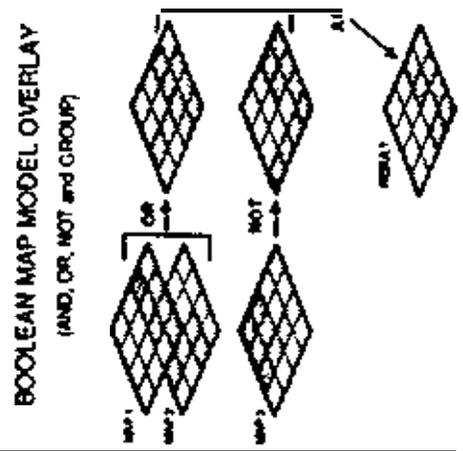
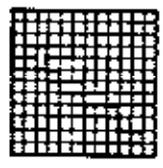
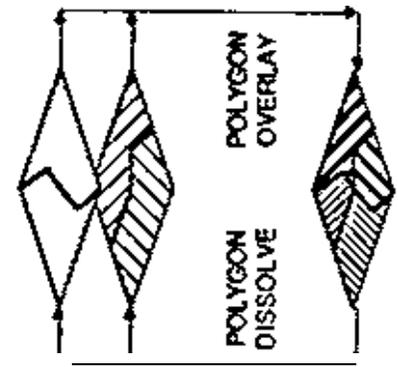
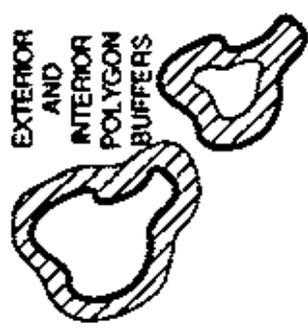
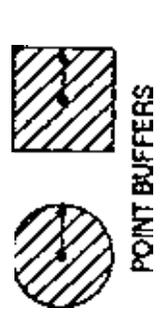
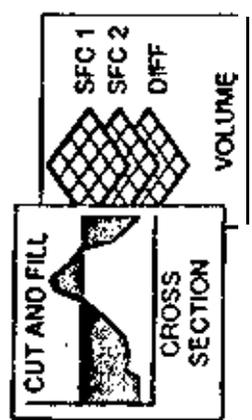
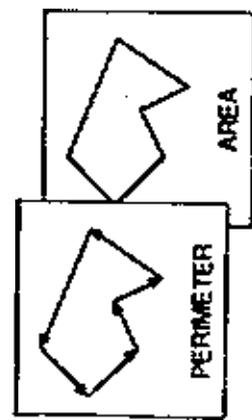
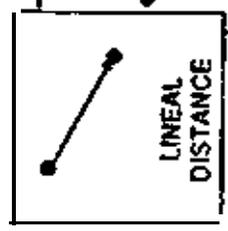
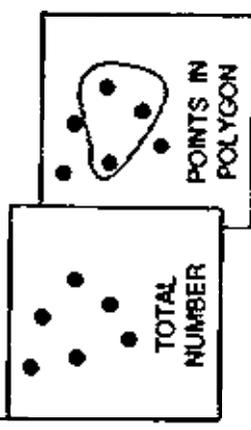
DATA ARE STORED IN THESE CATEGORIES:

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FEATURES				
	WELL SITES	ROADS	LAND USE	SITE SUITABILITY
SURFACES				
	ELEVATIONS	CONTOURS	SLOPE CLASSES	CONTOURS
LABELS / TEXT				
	PLACE NAMES	FEATURE NAMES	REGION NAMES	REGION CODES

DATA BASE MANAGEMENT SYSTEM FUNCTIONS
DATA STORAGE
QUALITY CONTROL
DATA REPRESENTATION
DATA SECURITY
DATA REPRESENTATION
DATA MAINTENANCE
DATA DISTRIBUTION

b2

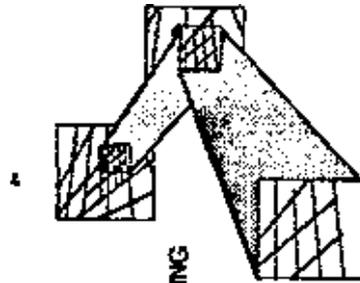
ANALYZE DATA



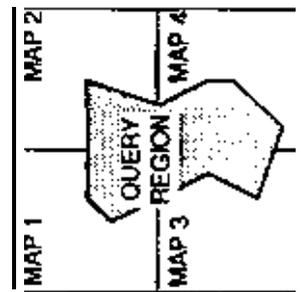
MANIPULATE DATA



BROWSE MAPS / TEXT



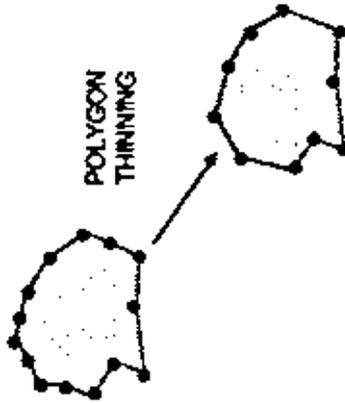
WINDOWING



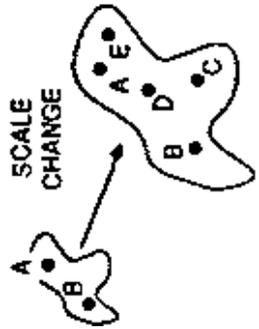
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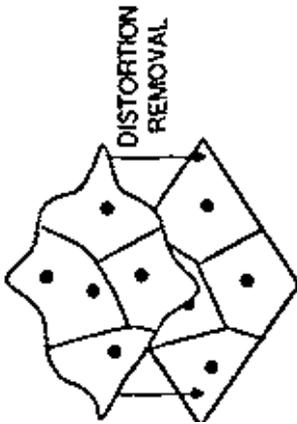
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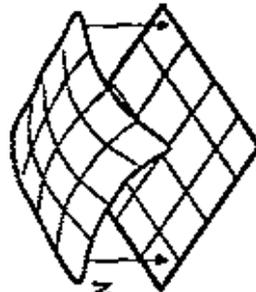
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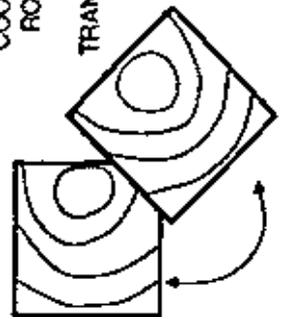
SCALE CHANGE



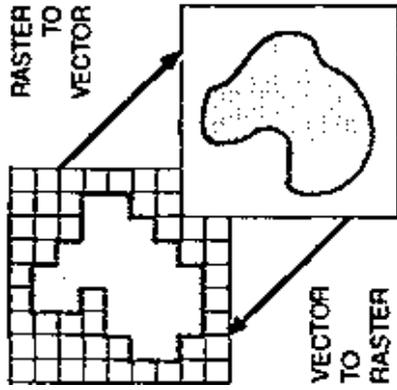
DISTORTION REMOVAL



PROJECTION CHANGE

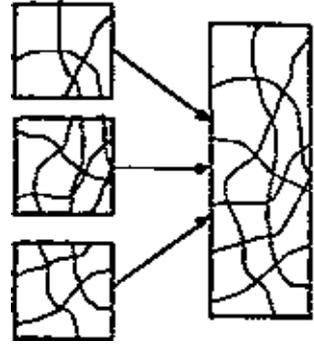


COORDINATE ROTATION AND TRANSLATION



RASTER TO VECTOR

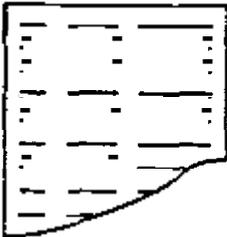
VECTOR TO RASTER



EDGE MATCH

DISPLAY DATA

42

HARDCOPY MAPS	GRAPHIC DISPLAYS	TABULAR LISTINGS
		

CARTOGRAPHIC SUPPORT FOR THE NCSS
by Lee **Sikes, SCS**, National Cartographic Center
Fort **Worth, Texas**

Before getting into production Statistics, let me show you the latest organization chart for the National Cartographic Center. As you can see, **we** no longer have assistant heads for the East, West, or Operations. Carter Steers is now the Assistant Head of Staff. Dennis Darling and Don Stelling are Branch Chiefs. We are still searching for a Chief for the GIS Branch. Vacancy announcements are out for several positions in the GIS Branch--one cartographer, one head of CIS and Analysis Section, one head of Remote Sensing Section, and one Systems Analyst. These are **GS/GM12/13** positions.

We have approximately 133 employees **in** the National Cartographic Center. Our ceiling is 135.

The NCSS Branch **is** headed by Don Stelling. I am his assistant. There are 34 employees in the branch, located in four sections, plus a Printing Specialist.

Harris "Red" Feathers is the Head of Aerial Surveys Section. That section is responsible for obtaining imagery for mapping and publication.

Victor **McWilliams** is the Head of the Photobase Section. That section receives imagery from Aerial Surveys Section and orders halftone negatives, photobases, and related overlays. Type overlays, names overlays, and drafting or scribing materials are also provided to the states by this section. **Ratioed** film positives from original soil survey field sheets are prepared **in** this section. Preliminary drafting of neatlines, grid ticks, and values is performed.

Marsha Reed is the Head of the Negative Preparation Section. This section receives the map finished overlays from the states or contractors and prepares the final **litho** negatives for publishing the maps. They also prepare interim copies from the **litho** negatives, e.g., "**image bleed**" photographic prints or **litho copies**.

Carl Stauber is the Printing Specialist. He reviews the negatives and proofs for jobs prior to sending them to the printing contractor. He also reviews the flat copies of the printed maps before they are sent to be bound into the soil survey publication.

Hugh **Allcon** is the Head of the Contract Map Finishing Section. This section **was** formed June 1985 and provides map finishing for states who no longer maintain this capability or are overloaded with jobs.

The National Cartographic Center has been staffed for the last several years to produce 80 photobase jobs and 80 negative prep jobs. This year, due to a shift **in funds** from **the** Publications Branch, NHQ, to states needing soil mapping on highly erodible lands, we will not publish as many jobs--maybe only 40 to 50.

(1)

We expected that production of photobasea would begin to drop off in 1988 due to the completion of once-over mapping in several states. However, this has not been the case. Many requests are coming into NCC for compilation materials in order to begin updates of older surveys.

A majority (91 percent) of the jobs being prepared for map compilation are on orthophotoquads. This is quite a change from just a few years ago when most jobs were being compiled and published on high altitude photography. The size of soil survey areas varies from an average of 12-15 full orthophotoquads in the eastern states to 40-50 orthophotoquads in western states. The cost of buying the orthophotoquads from USGS is \$700 per quad for new ones, \$60 per quad if the quads are available "off the shelf." In-house costs to prepare a set of photobases--full quad format--and related overlays is approximately \$165/quad.

In the Negative Prep Section, we have a backlog of approximately 130 jobs for which final negatives have been made. Host of these jobs will be sitting in NCC for a year or longer awaiting the text preparation and edit prior to publication. We are able to make a limited number of Interim copies from these negatives. These will be the "image bleed" copies, so called because the halftone negatives are not masked to the neatline; therefore, the Image extends to the edge of the paper or film. We can make 100 to 200 litho copies or two sets of photographic prints, or one set of composite film positives which you can run through a blue-line machine to make more copies.

The NCSS Branch continues to support the soil survey by providing materials for all phases of mapping, compilation, and printing. We are dependent on other Federal agencies for imagery, both mapping and publication. Although we do maintain a photographic lab, we are, to a large extent, dependent on a private contractor for photomechanical work. The keys to obtaining materials for soil surveys are planning well in advance and communicating your needs to the National Cartographic Center.

(2)

REPORT ON MAP FINISHING CONTRACTING
 NATIONAL CARTOGRAPHIC CENTER
 FORT WORTH, TEXAS

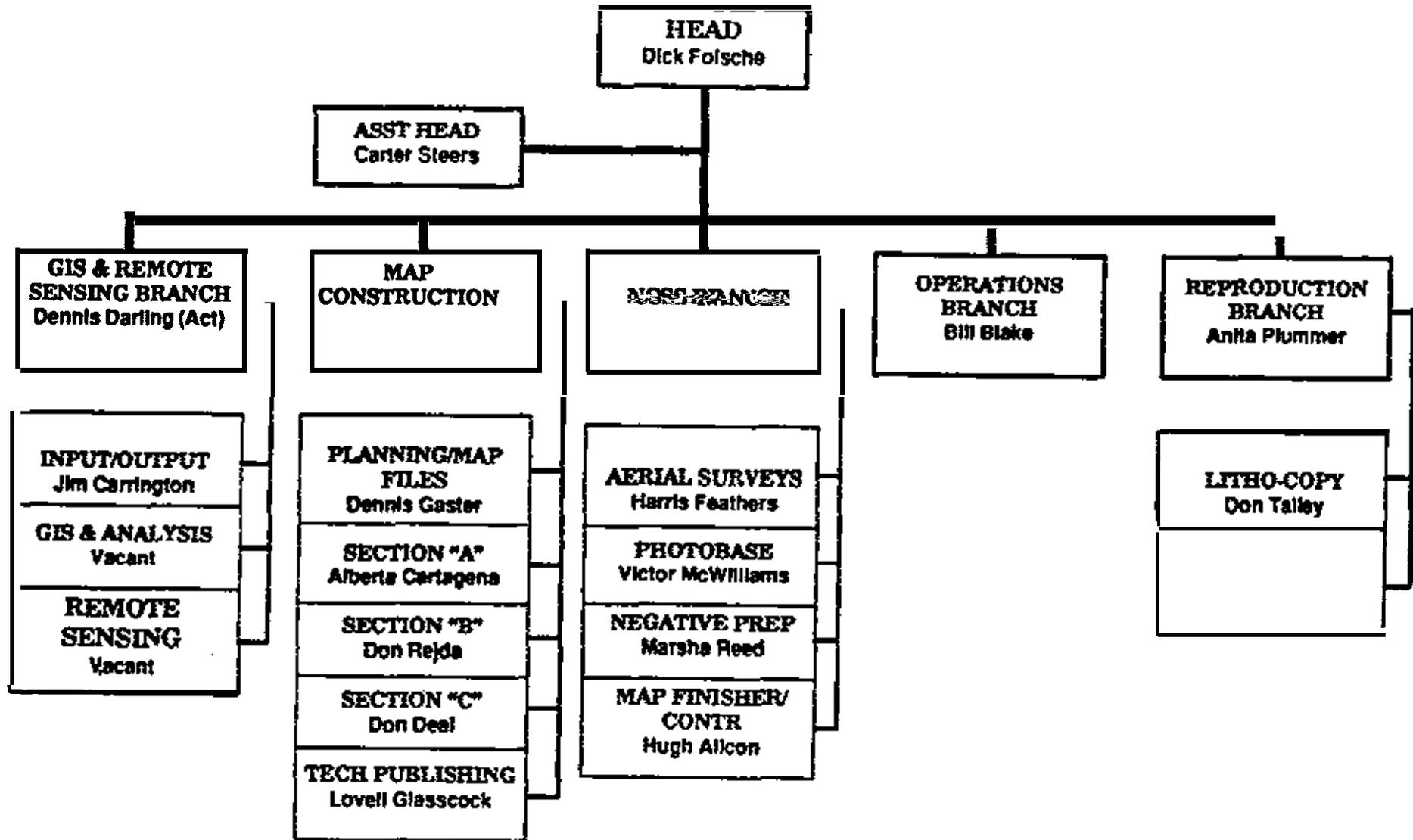
This report describes work that has been performed by the National Cartographic Center since June of 1985, for NCSS map finish scribing. Seventeen states have participated in contracting for map finishing services through the NCC. Fifty-two survey areas have been contracted totaling 2,684 map sheets, of which 407 of the map sheets were full quad format. Total contract cost for these 52 surveys is \$355,929.58 or an average of \$6,844.72 per survey area. The average for map sheet is \$132.61. The cost range is \$53.44 per map sheet to as much as \$529.37 per map sheet. The higher price range was for highly detailed soils and culture on a full quad format.

Most of the compilation received from the states is quite adequate for contract map finishing. Some are very well done, while others are poorly done and/or contain excessive errors. We can usually correct errors, missing symbols, soil lines, etc., by referring to the field sheets. However, poor quality work cannot be corrected efficiently. The poor quality compilation usually produces poorer quality maps at a higher cost. We pay contractors \$2.00 each for authors errors. Authors errors are errors that are the responsibility of SCS.

NCSS PRODUCTION

<u>Publication Imagery Ordered</u>	<u>FY-87</u>	<u>FY-88 (thru May 1988)</u>
Number of surveys	64	46
Number of Orthoquads	1138	1202
 <u>Mapping Imagery Ordered</u>		
Number of Surveys	101	51
 <u>Happing Imagery shipped to States</u>		
Number of Surveys	63	60
 <u>Photobase Preparation</u>		
Number of Surveys	67	61
Number of Map Sheets	3715	4292
 <u>Negative Preparation</u>		
Number of Surveys to Printer	46	41
Number of Misc. Reproduction Jobs	110	67

National Cartographic Center



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REMOTE SENSING AND NATIONAL AERIAL PHOTOGRAPHY
by Lee Sikes, SCS, National Cartographic
Center, Fort Worth, Texas

AS you are aware, remote sensing and imagery acquisition are two very important activities in SCS which impact on various programs. Our National Remote Sensing Coordinator is Olin Bockes, a member of Gale TeSelle's staff in NHQ.

In this capacity, Olin communicates with his counterparts in other Federal and State agencies and the private sector. He is seeking new ways to use remote sensing in the National Resource Inventory (NRI) for 1992. He is also seeking ways to integrate image processing into the FOCAS equipment now being used by the SCS state and field offices.

One project that Olin is heading up is the preparation of remote sensing training modules by a team of SCS personnel. Each module consists of a slide/tape set and instruction booklet, to be used by the student in a one-to-four hour session, depending on the subject. These modules will be available to each SCS field office through the National Employee Development Staff. Hopefully, they will be available by the end of 1988.

At the National Cartographic Center, a Remote Sensing Section was added to the GIS and Remote Sensing Branch in November 1987. Three persons, R. H. Griffin II, Wayne Weaver, and John Hart, were transferred in from the Programs Staff, SNTC. Mike Rasher, a District Conservationist from Georgia, and Gary Hallbauer, a new hire from Texas A&M, came on board in February 1988. This gives the section a multi-disciplinary combination of people and a variety of expertise in remote sensing.

The section is experimenting with image processing, the use of video, and the use of 35 mm slides. Section personnel assisted Richard Duncan, State Conservationist in Hawaii, and Harry Sato, State Soil Scientist in Hawaii, in purchasing and setting up a 70 mm camera in order to photograph areas in Hawaii important to the Food Security Act.

The National High Altitude Photography (NHAP) program is winding down. Over a seven-year period (1980-1986) contracts for flying all 48 conterminous states were let. Flying is 98 percent complete. Only a few gaps remain where reflights are necessary.

A new program, National Aerial Photography Program (NAPP), is now underway. This is a five-year program to fly the 48 conterminous states (see map and chart - NHAP vs NAPP). This photography will generally be flown on a state-by-state basis instead of one degree by one degree blocks. Only one camera is in the airplane. The film will be color infrared (CIR), scale 1:40,000.

At this point, I want to say that the acquisition plans are not fixed in concrete.

(1)

Your assistance is needed in making state officials aware of NAPP and the advantages of contributing to the **program**. Any state contributing half the cost of flying **will** receive priority scheduling and a guarantee that it **will** be flown **according** to schedule. Estimated cost for flying is \$7.00 per square mile. Also, prices for reproductions from this film will be reduced for states that cooperate. Flight lines for NAPP will be north-south along quarter-quad centers. As you can see from the overhead -- Aerial Photography Coverage Patterns-- it takes ten exposures to give stereoscopic coverage for one 7-1/2' quadrangle. This additional film may cause storage problems for ASCS, Salt Lake City, UT, and EROS Data Center, Sioux Falls, SD.

The NAPP photography can be used to produce orthophotography on a quarter-quad format, at scale 1:12,000. This makes NAPP very attractive to SCS users.

At the present time, USGS is preparing various orthophoto products for Dane County, Wisconsin. These include both color infrared (CIR) and black and white reproductions. Soon **we** hope to have prices and **projected** delivery dates for these products.

(2)

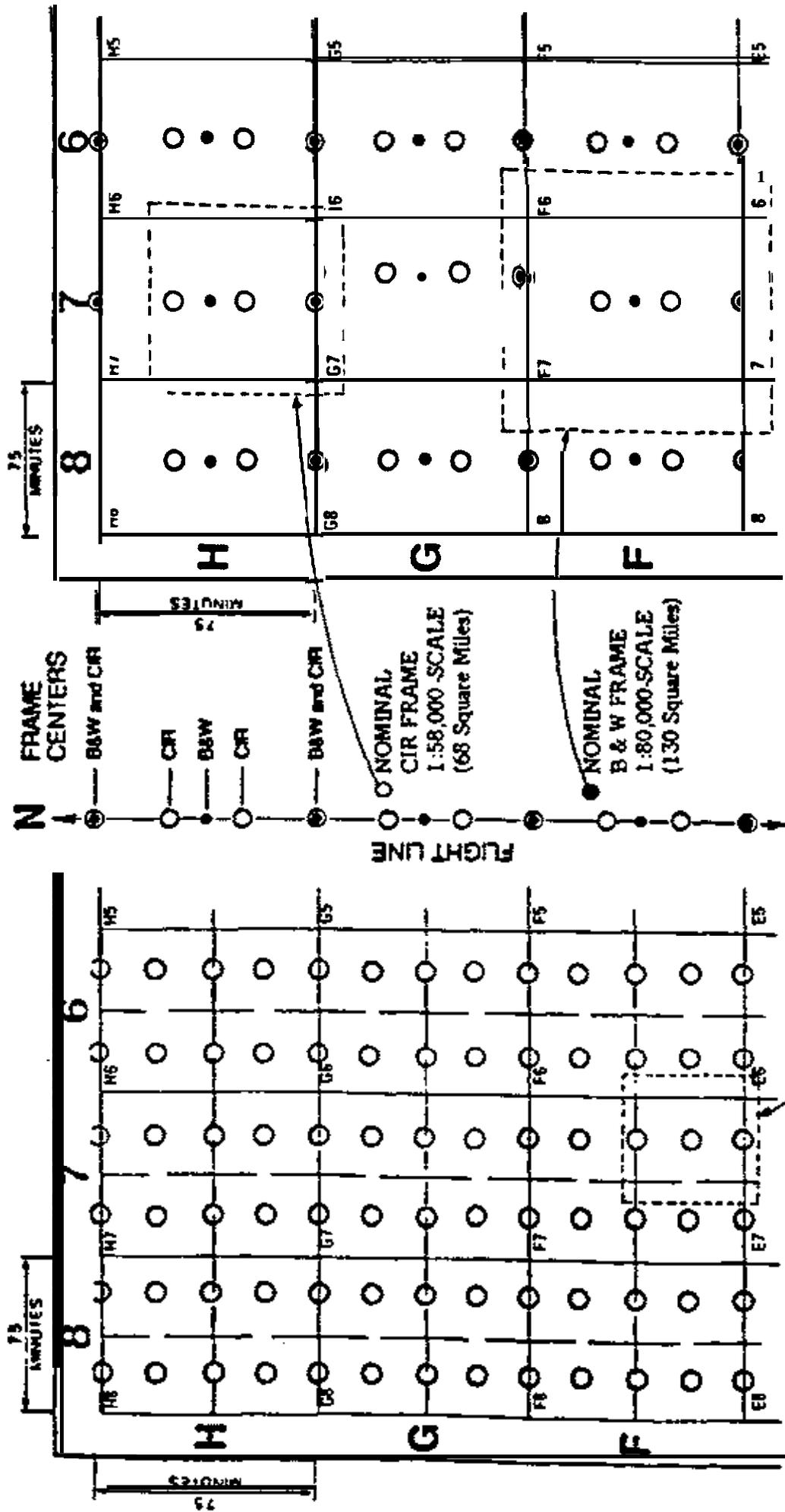
NAPP
NATIONAL AERIAL PHOTOGRAPHY PROGRAM
TECHNICAL CRITERIA CHANGES, NHAP VS NAPP

	<u>NHAP</u>	<u>NAPP</u>
FLIGHT HEIGHT	40,000 FT.	20,000 FT.
SCALE	1:80,000 1:58,000	1:40,000
FORMAT	QUAD CENTERED	¼ QUAD CENTERED
CAMERA(S)	2	1
FOCAL LENGTH(S)	6 INCH 8.25 INCH	6 INCH
FILM EMULSION(S)	2402 (B&W) 2443 (CIR)	2443 (CIR)
NEWPOS	N P	P
EXPOSURES FOR 7.5 QUADRANGLE COVERAGE	3 4	10
VEGETATIVE STATUS	LEAF-OFF-NHAP 1 LEAF-ON-NHAP 2	LEAF-OFF/LEAF-ON NEGOTIABLE
UNITS OF COVERAGE	1° x 1° BLOCKS	STATES/SECTORS OF STATES

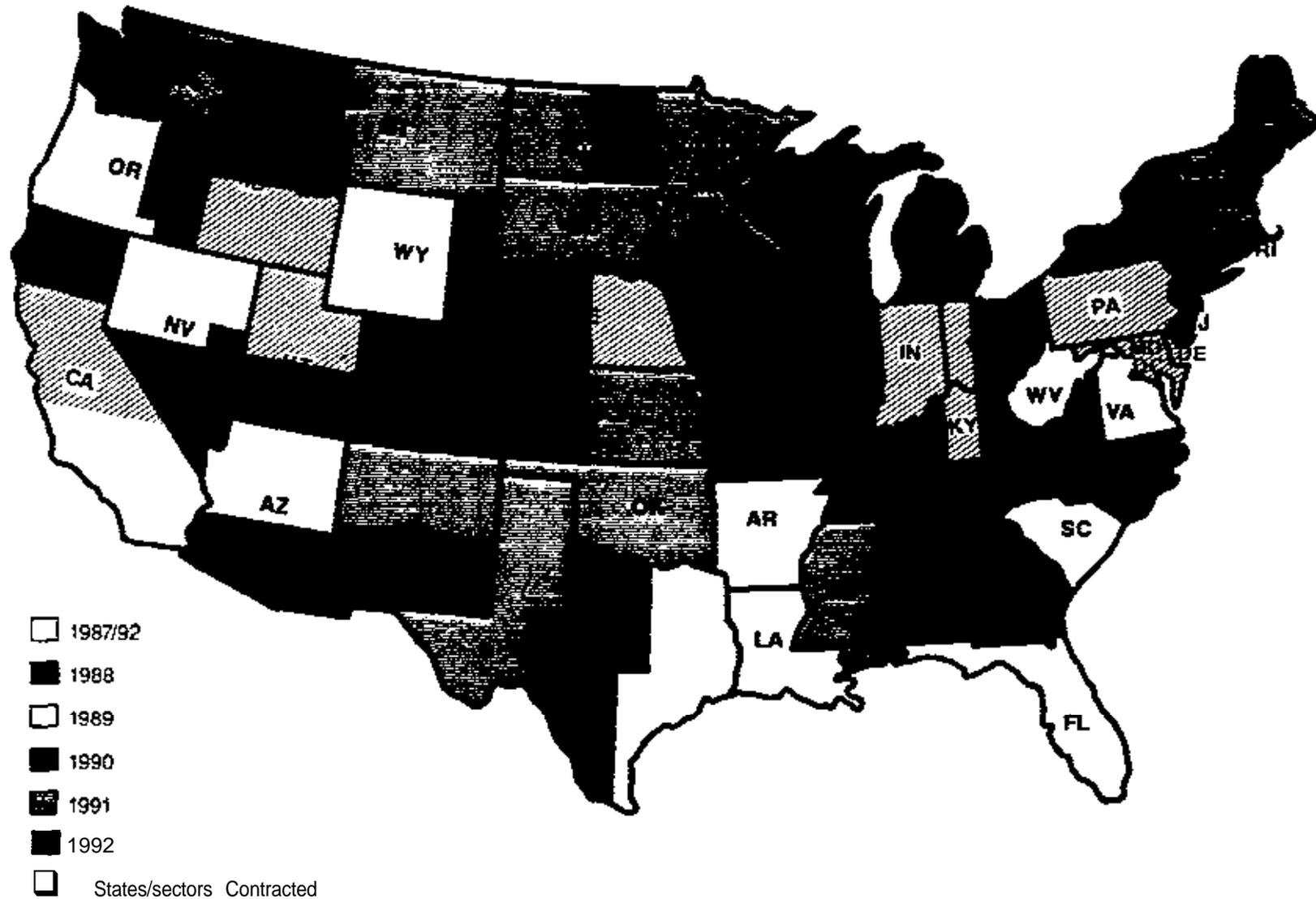


67

Aerial Photography Coverage Patterns



MULTI-YEAR NATIONAL AERIAL PHOTOGRAPHY PROGRAM (NAPP) ACQUISITION PLAN



ICOMOD REPORT

Robert V. Rourke
Chairman ICOHOD
University of Maine
Orono, Haine

June 13, 1988

ICOMOD was organized about 1982 under the chairmanship of F. Ted Miller who remained in that capacity until his retirement. I became chairman upon his retirement and remain in the position at this time. Under Ted the first circular was produced. It was a review of the problems of spodic horizon identification in the United States and was supported by data. Ted also organized a spodic horizon review in the Northeast that considered soil profiles from New York through Vermont, New Hampshire and finished in Maine. It was from this review that his statement "Looks like a skunk, smells like a skunk, it is a skunk!" arose as he viewed a morphologic Spodosol that did not meet the chemical criteria of the spodic definition. He also arranged a meeting in Lincoln, NE at the soil laboratory in December 1983 to discuss, review and initiate study toward improving the spodic definition. It was from that meeting that the paper on typical Spodosol morphology was developed. Ted retired in 1985.

Since that time there have been several circulars written for review and comment by the committee members. The problem of

intended to replace these criteria with either new definitions or different critical levels within the original criteria. The soils to be reviewed in October 1988 in the Northeast section of North America will be accompanied at each location by data presenting several methods of spodic testing. An added feature of this tour will be several days of paper presentation by soil scientists from around the world. A circular following this meeting will present the alternatives that have been discussed and proposed during the soil review.

Data developed to attempt to separate andic from spodic, and spodic from cambic are available. There are 23 profiles of andic: soils from Japan, 25 profile having spodic or cambic features from the Northeast, and 10 profiles of spodic or andic soils from Alaska. There will be added data from the midwest as it become available. Since this information has all been gathered at a single laboratory, by the same people, using the same technique it will be a unique basis from which to develop revised definition of the spodic horizon. It will also lead to the formation of new subgroups in Spodosols, Andisols, and Inceptisols.

The proposed new definition of the spodic horizon will likely include its recognition in the Ap horizon. It will have minimum thickness requirements of 10 cm of both the albic and spodic combined, or of 10 cm if there is no albic. A depth requirement of 12.5 cm for recognition of the spodic is proposed for soils having an isomesic or warmer soil temperature regime. An albic horizon must be present to recognize a spodic horizon in material that meet the definition of andic soils. The presence of sand grains with cracked coating or distinct dark pellets of coarse-silt size or larger will be sufficient to meet spodic horizon definition. Added criteria to be developed are the chemical definitions. The part of the definition that restricted a spodic to horizons that became no redder with depth has been dropped as this only forced out horizons that otherwise would have been considered as spodic. It is anticipated that improved morphologic definitions of the spodic horizon will arise from the October meetings.

Northeast Soil Survey Conference
Orono, Maine
June 12 - 17. 1988

REGIONAL **ENVIRONMENTAL** ASSESSMENT

Duane A. **Lammers**, Jeffrey J. **Lee** and M. Robbina Church
USDA Forest Service and **USEPA**, Environmental Sciences Laboratory,
Corvallis, OR

AQUATIC EFFECTS RESEARCH PROGRAM

The U. S. Environmental Protection Agency (EPA), in cooperation with the National Acid Precipitation Assessment Program (NAPAP), has designed and implemented an Aquatic Effects Research Program (AERP) to address the effects of acidic deposition on surface waters in regions of concern. The AERP is focusing on four primary policy questions related to the effects of acidic deposition on aquatic systems:

1. How extensive is the damage? (extent);
2. What is the projected rate and extent of future damage? (rate);
3. **What** deposition rates will provide various levels of protection for susceptible surface waters? (dose/response); and
4. How rapidly will these aquatic systems recover at various deposition rates? (recovery)

NATIONAL SURFACE WATER SURVEY

The National Surface Water Survey, which represents the foundation of the AERP, has documented the proportion of lakes and miles of streams in regions of concern in the United States that are presently acidic or potentially susceptible to acidic deposition (extent).

DIRECT/DELAYED RESPONSE PROJECT

The Direct/Delayed Response Project (DDRP) is taking the next step by predicting future acidification trends. The central question being addressed by DDRP is:

Within the regions of concern, how **many** surface **water** systems will become acidic due to current or altered levels of acidic deposition, and on what long-term time scales?

The project approach was to select a set of watersheds to represent a region of concern and predict the future response of each watershed to various levels of acidic deposition. The statistical framework for selecting the set of watersheds will then be used to extrapolate the watershed specific results to each region.

A multi-regional terrestrial database was needed to accomplish DDRP objectives. Since existing data bases did not meet project needs, a survey was designed and implemented to provide consistent information on soils and other watershed attributes. Existing procedures used in the National Cooperative Soil Survey were adapted to promote regional consistency and representativeness. A rigorous quality control and quality assurance plan was implemented to promote and document mapping quality.

Soil survey activities have been completed in two regions (Northeast, Southern Blue Ridge Province) and have started in a third region (Mid-Appalachia). Mapping of additional watersheds in the Northeast region also is underway. Mapping and sampling activities have been accomplished cooperatively with the Soil Conservation Service and University Experiment Stations. The statistical approach and the field activities have undergone several peer reviews successfully.

Multiple analytical approaches ranging from statistical analyses and input-output sulfur budgets (Level I) to single factor response time estimates (Level **II**) to the application of dynamic surface water acidification models (Level III) are being used to estimate the time scale over which aquatic systems respond. The Level III models include:

1. Model of Acidification of Groundwater in **Catchments** (MAGIC);
2. Integrated Lake-Watershed Acidification Study (ILWAS);
3. Enhanced Trickle Down" (ETD).

These three models were developed for different regions in the United States, but all three models integrate the processes considered important by the scientific community in predicting the effects of acidic deposition on surface water chemistry.

As with any research program, the DDRP is predicated on several assumptions:

1. Sulfur is the principal acid anion controlling **long-term** acidification of surface waters;
2. The major **soil** processes controlling surface water acidification are sulfate adsorption and base cation supply (ion exchange and mineral weathering); and
3. The major processes influencing long-term acidification are sufficiently known and incorporated **in** the dynamic models to permit realistic forecasts of the long-term aquatic system chemical response to acid deposition.

A critical question related to the DDRP is "How important are the underlying assumptions in satisfying the DDRP objectives?"

Although the ETD, ILWAS, and MAGIC models have been shown to be capable of addressing policy issues, the uncertainty associated with their predictions has not been evaluated; that is

model predictions have not been compared to long-term changes. The long-term historical records of surface water chemistry for aquatic systems potentially susceptible to acidic deposition required to test these models do not exist.

Even though the models represent our best understanding of watershed processes, it is uncertain whether they include all of the proper processes, and whether the rates, capacities, and interactions of these processes are represented with sufficient accuracy. While it **isnot** possible to compress time and test the long-term model forecasts, it is possible to design experiments to test the underlying DDRP assumptions and hypotheses related to mobile anions and base cation supply, to identify the interactions of these processes with other potentially important **watershed** processes, and through inference, to evaluate the behavior of the DDRP models and their ability to forecast **long-term** acidification of surface waters.

EPISODIC RESPONSE PROJECT

Short-term, episodic acidification has been documented to occur during storm events and **snowmelt** in many aquatic systems of the United States. These short-term pulses of acidity may have significant adverse biological effects and, therefore, represent an important source of uncertainty for the estimates of acidic deposition effects on lakes and streams. The Episodic Response Project (**ERP**) is designed primarily to quantify this component of uncertainty in regional population estimates, and to determine the degree to which episodic acidification adversely affects fish populations.

Specific objectives are to determine:

- o the magnitude, duration and frequency of episodes in streams
- o long-term effects on fish populations
- o improved regional estimates of acid deposition on fish populations
- o regional estimates of surface waters that experience biologically-relevant episodes
- o improved understanding of key processes and factors that affect severity and associated effects on fish populations

WATERSHED **MANIPULATION** PROJECT

The scientific needs associated with making model forecasts of future surface water acidification trends are being addressed in the Watershed **Manipulation** Project (**WMP**). The objectives of the project are:

1. Identify and quantify the relative importance of various processes in controlling surface water acidification with particular emphasis on the role of

- sulfate adsorption and base cation supply in the **long-term watershed** response to acidic deposition;
2. Assess the quantitative and qualitative watershed response to various levels of acidic deposition; and
 3. Evaluate the behavior of the Level II and III DDRP models and their ability to predict short-term watershed responses to experimental manipulation.

The DDRP models serve as a framework for hypotheses testing experimentation conducted at laboratory, plot, hillslope, and watershed scales within the **WMP**. Conducted at the Bear Brook catchments in eastern **Maine**, or with soils from the catchments, these experiments and the integration of their results will provide a critically needed evaluation of the DDRP models and advance the knowledge of the factors that control surface water acidification.

REGIONAL EPISODIC AND ACIDIC MANIPULATION **STUDY**

The Regional Episodic and Acidic Manipulation (**REAM**) Project is being conducted as a complimentary component of both the WMP and the ERP. The basic element of this activity is a simple, catchment-scale, acidic manipulation that addresses questions associated with both chronic and episodic acidification. Although data from the REAM site will be used to evaluate the DDRP models, with limited exceptions, the detailed, process research being conducted in **WMP** will not be included in the **REAM** research.

ECOREGIONS

Having recognized that many important environmental scientific and management questions require some sort of **regionalization**, Jim **Omernik**, at EPA's Environmental Research Laboratory in **Corvallis**, has led the development of an **ecoregions** approach to the study and assessment of these problems. The capacities and potentials of natural systems, their present uses, anthropogenic stresses, and their natural resiliencies vary considerably from one place to another. **Water** quality problems, for example, are too numerous to be studied and treated on a site by site basis. On the other hand, the complexity of systems and the effects of human perturbations on them dictates that all systems, nationwide, not be treated the same way.

The need for regional stratification in environmental assessment and treatment is generally understood and accepted. The definition of regional frameworks, however, has been fraught with inconsistencies, misdirection, and misunderstanding, often leading to ineffectual results. Regional frameworks are commonly "taken off the shelf" having been designed for purposes other than the problem being addressed. **Many frameworks are** a compilation of the works of many and are inherently laced with inconsistencies to accommodate many individual interests. In

addition, most regional frameworks have been defined primarily on one dimension. Nap units in Bailey's Ecoregions of the United States, for example, are based primarily on potential natural vegetation.

One of the frameworks considered for studying and assessing ecosystems ~~was~~ Land Resource Regions and Major Land Resource Areas of the United States originally developed by Austin (Austin, 1972; U. S. Department of Agriculture, ~~1970~~).

Report of Research In Progress To The Northeast
Soil Survey Conference
Orono, Maine June 12-17, 1988

Storrs Agricultural Experiment Station
University of Connecticut, Storrs
Harvey Luce, Plant Science Department

Pesticides and groundwater-Extension education: A cooperative effort is underway with the goal of developing an "expert system" which will operate on an IBM compatible personal computer. The intent of this expert system is to provide assistance to extension personnel and others in advising pesticide users as to how they might minimize the potential of groundwater contamination. The data base information for this expert system is sorted by pesticides, by cultural practices, and by soil series. This information is being used to derive logic statements. This project involves the efforts of personnel of the cooperative extension services and the agricultural experiment stations of Connecticut, Massachusetts, and Rhode Island. Additional assistance has been provided by SCS in Connecticut and state agencies in all three states.

Movement of toxic organics from on-site septic systems: Septage, leachate, and groundwater down gradient of leaching fields have been sampled and tested for a number of organic chemicals. A variety of toxic organic chemicals have been identified in the septage and leachate and in the down gradient groundwater. Concentrations in the groundwater were very low in all cases. In a parallel study, the capacity of seven selected soils to sorb two different chemicals is being measured using chemicals "spiked" with radioactive C ¹⁴. Of the soil parameters studied, only organic matter was found to be significantly related to

³-N levels
Copake and

Maine Agricultural Station Report

Robert V. Rourke

Research concerning the effect of **woodash** on soil nutrient composition is being conducted by Professor Susan Erich. The research involves a comparison of ash and lime as soil amendments. **Mixtures** of either ash and soil or lime and soil were incubated for several months then analyzed for **pH**, lime requirement, and major cations. This work is to evaluate the effectiveness and efficiency of ash as compared to lime, and to evaluate the K supplying power of the ash. In other areas of research, Professor Erich is initiating an experiment in the greenhouse in which the effect of corn root growth on nitrogen mineralization from manure is evaluated.

Professor **Rollin** Glenn has initiated a research project to evaluate whether preplant corrective fertilization of all essential soil supplied nutrients by deep soil incorporation and annual maintenance dressings will eliminate apple nutrient deficiency disorders associated with current fertilization practices. This experiment is also evaluating the impact of neutral salt calcium applications to reach 80% Ca saturation of 60il CEC, and the impact of this source of Ca upon micronutrient availability compared to common liming materials. The experiment is also testing the current recommendation of **80% Ca**, **15% Mg**, and **5% K** saturation **as** to the uptake of these nutrients. The influence of herbicide treatment upon the uptake of micronutrients is also being observed.

Soils work currently being addressed by Professor Larry Zibilske in the soils microbiology program include an examination of the contribution of aggregate-bound nutrients (**N** and **K**) to plant nutrition. This is being approached using the isotope **¹⁵N** and **Rb** for the **K** tracer.

Additional work is being conducted to monitor the distribution of **N** in soils which have received various organic amendments. Changes in the distribution of **N** among aggregate size fractions and the implications for plant nutrition in these systems are being considered.

The forest soils research program of the Department of Plants and Soil Sciences and the **MAES** directed by Professor Ivan Fernandez is focused on quantifying nutrient cycling in northern New England forests, particularly as that cycle is affected by disturbance. This includes a range of studies evaluating (a) the spatial and temporal variability of soil properties as well as foliar chemistries in relation to the essential nutrients and metals; (b) the effects of atmospheric deposition on nutrient cycling; (c) the effects of ash and sludge disposal on forest lands; and, (d) the effects of harvesting systems and site preparation on forest soil nutrient capital. The studies ongoing

range from whole watershed nutrient budgeting, experimental field plots treated with acid precipitation or ash/sludge amendments, intensive nutrient cycling studies in spruce-fir where all major pools and fluxes of elements are measured, to greenhouse and laboratory experiments evaluating key processes to better define field research results. This program includes the Watershed Manipulation Project funded by US EPA, the Rowland Integrated Forest Study funded by USDA FS and part of the Forest Response Program's Spruce-Fir Cooperative as well as the Oak Ridge National Laboratory managed Integrated Forest Study program. In addition, forest product industry funds are supporting research on the disposal of sludge and ash on forest soils.

Soil characterization studies conducted in cooperation with the SCS USDA CSS continue. These studies are concentrated upon soil mapping units in active soil survey areas and are conducted by Robert Rourke a soil scientist with the MAES. Soil data are developed from soil horizons sampled in the field. These mapping units are replicated at five locations at least a mile apart. Soils information developed on an horizontal basis to 1 meter depth include: soil moisture moisture desorption curves; bulk density; soil texture; coarse fragment content; exchangeable cations; KCl acidity; BaCl₂TEA acidity; organic carbon; and soil reaction in water, CaCl₂, and KCl. These data are published at intervals as Experiment Station technical bulletins. Added support is provided to the soil survey through special analyses as needed and in participation in field reviews.

MASSACHUSETTS AGRICULTURAL EXPERIMENT STATION
Peter L. M. Veneman
Department of Plant and Soil Sciences
Amherst, Mass. 01002

Personnel

During the last 2 years significant changes have taken place at UMass. John Baker, our soil **chemist, currently serves as** Head of the Department. Since **March** of this year, Steve Bodine is Director of the Massachusetts soil testing laboratory, located at the **Waltham** Experiment Station. His place at the soil characterization laboratory has been taken by Judy **Bartos**. We have strengthened our faculty by the addition of **two** new members specialized in microbial ecology. Steve **Simkins** has research interests in kinetic modeling, while Larry Mallory is interested in the physiological aspects of microbial processes. These additions complete the environmental direction the Department had chosen some years ago.

Soil Moisture Regimes

Studies of soil moisture regimes associated with particular soil morphological features continued. Our emphasis has shifted from the glacial **outwash** and **triassic** till soils to the wetlands of the Connecticut River. Supported by a grant from the U.S. Fish and Wildlife Service, we are studying the vegetation and hydric properties of a series of hydrosequences in the floodplain. Purpose of the study is **to evaluate whether or not** hydric soils always support hydrophytic vegetation. Over 20 sites were extensively described and sampled. The sites will be monitored for ground water levels, temperature, soil moisture tension, **redox** potential and microbiological activity.

Another study is being initiated through the Massachusetts Department of Environmental Quality Engineering- Division of Water Pollution Control. This research is aimed at providing data about the relationship between soil morphology and maximum ground water levels with the intend to include soil morphological criteria in the state environmental code for on-site sewage disposal. **Some** 100 sites are projected to be described and sampled over the next 2 years. This study is being carried out by **Corrie Chase-Dunn**, while Michael Reed is finishing some of his studies in the sandy, younger **tills**.

Fragipans

Dave Lindbo **is** finishing his research about the **fragic** character of the New England hardpans. Preliminary information indicates that extensive soil formation has taken place in the loamy tills (older till), while the sandier, younger till exhibits much less development, if any. Considering the amount of argillans in the upper part of the Bx-horizons, the deep oxidation of the basal till, decreasing bulk densities with depth and the

fact that more than 60% of the horizon shows fragic properties, we concluded that the upper parts of most loamy **hardpans** in southern New England are fragipans. While the sandier tills show insufficient fragic character to be considered a **fragipan**. Geologists currently are rethinking the stratigraphy of southern New England's glacial deposits and put the origin of the loamy till in the late **Illinoian**, which could account for the strong soil development evident in these materials.

On-site Sewage Disposal

With support of the U.S. Geological Survey we are assessing the potential of modular peat systems for denitrification. While peat systems* have been used for on-site sewage disposal in Maine and Minnesota with good results, **most** of these systems were designed to provide aerobic soil conditions. Eric **Winkler** is researching the potential for denitrification in partially saturated systems, while still providing adequate treatment. An experimental pilot facility was started this summer and results are not expected until next spring.

Phosphorus Sorption

Nadim **Khouri** finished his research on P-sorption processes in Massachusetts soils. Most standard laboratory techniques to determine P sorption tend to underestimate true field conditions. Five different techniques were evaluated and correlated with selected soil properties by means of regression curves. Iron and Al appeared to be good predictors of P-sorption for most determination methods. These results indicate that routine soil survey information can be used to assess the potential of a particular site for **wastewater** disposal.

Soil Water Movement

Daniel Hillel and Ralph Baker are investigating the causes and effects of fingering in layered soils. Water movement in these soils generally is not following the classical approach of a uniform wetting front, but the flow seems to be concentrated in a distinct, funnel-type flow. This results **in much higher** fluxes than predicted and may result in ground water pollution due to insufficient contact times and inadequate treatment. Ultimate goal of the project is to mathematically describe these phenomena and to model flow of contaminants.

Landfill Leachate Treatment utilizing Artificial Wetlands

Artificial wetlands consisting of peat and reed/canary grass appear to provide excellent treatment of landfill leachate. Proposed EPA regulations call for the installation of liners at all landfill sites throughout the nation. Besides considerable costs to install such a liner, small **unsewered** communities may have an additional problem by the lack of adequate treatment facilities for the collected landfill leachate. Ron **Lavigne** showed in batch and plug flow studies that our artificial wetlands provided a high degree of treatment. Current research is **focussed** on expanding the system to a pilot-scale facility.

Spatial Distribution of Organic Matter

Application rates and efficacy of **herbices** and pesticides are much dependent on the soil organic matter content. **Previous** observations indicated that considerable variation in organic matter **content** occurred within soil mapping units. **Mohammad** Mahinakbarzadeh is researching the extent of the spatial variability of selected mapping units in Massachusetts using **semivariograms** and kriging techniques. The results of this research should be of interest to farmers and environmentalists because it permits an assessment of the need to change the application rates of particular pesticides and herbicides in different sections of farm fields.

Maryland Agricultural Experiment Station Report

Martin C. Rabenhorst

Textbook by D. S. Fanning During the last two years, Del Fanning has been writing a book to be published by John Wiley and Sons entitled "Soil Morphology, Genesis, and Classification" This book is an enhanced and expanded version of the notes and handouts from the course on the same subject which he has been teaching since 1964. The book will hopefully be published during 1988.

Soil Survey of Baltimore City and Last Acre Ceremony Planned This past year, work has been largely completed on the mapping of Baltimore City with completion scheduled by the end of 1988. With this date approaching, we in Maryland are beginning to schedule our "second" last acre ceremony, which will probably be held during October.

An Update on the Classification of Highly Man-Influenced Soils

A classification of highly man-influenced soils that Del Fanning has been involved in developing over several years has been updated for inclusion in his soil morphology, genesis, and classification textbook. This scheme involves the definition of new diagnostic taxonomic criteria (dredgic, garbic, spolic and urbic materials and the scalped land surface) and the employment of these criteria in the definition of taxa (e.g. Urbic Udorthents, Dredgic Sulfaquepts). It is proposed that a bulk density of 1.5 Mgm^{-3} be used as a criterion to separate dredgic from urbic and spolic materials. There is still discussion regarding whether spolic and urbic materials should and can be separated.

Proposed Changes in Soil Taxonomy of Acid Sulfate Soils

Following extensive work and discussion with John Witty, Del Fanning has proposed the following changes to Soil Taxonomy to accommodate our present understanding of Acid Sulfate Soils.

1. Minimum thickness of 15 cm for the sulfuric horizon.
2. Changes to bring all mineral soils with a sulfuric horizon within 50cm into the Inceptisol order, regardless of the occurrence of sulfidic materials of an n-value >1 within a depth of 50cm; and to exclude soils with sulfuric horizons from aridisols (ie. salorthids).
3. Addition of a great group of Sulfochrepts for soils with a sulfuric horizon and without an aquatic moisture regime and not artificially drained (ie. certain Minesoils).
4. Changes in definitions of several "Sulf" great groups and subgroups.

Iron and Trace Metals in some Tidal Marsh Soils of the Chesapeake Bay

Work has been completed this year on assessment of exchangeable and solid phase metals in tidal marsh soils by graduate student Tom Griffin. Sediments from six marshes were sequentially extracted in order to determine their relative Fe, Zn, Cu, Pb, Ni and Cd content, and to ascertain the relative magnitude of the mechanisms involved in their retention. The sediments were dated using ^{210}Pb techniques in an effort to evaluate historical rates of metal deposition. Marshes in the vicinity of Baltimore harbor were found to contain higher metal concentrations than those marshes in other areas of the bay thus indicating that the degree of metal contamination is related to the distance from a metal source. Rates of deposition were related to historical

periods of industrial discharge and to the use of leaded fuels. Iron was retained in the marsh sediments mainly in the oxide and sulfide (FeS_2) phases and was apparently controlled by **redox** conditions. Copper, Cd and to a lesser extent Zn and Ni were apparently controlled by sulfide precipitation and pyrite co-precipitation *thus* rendering them non-influential and unavailable to the marsh **biota**. Lead however, appears to be weakly complexed by **organics** and is a potential ecological threat since it is more readily available to plants and organisms and thus may accumulate in the food chain.

Processes and Rates of Pedogenesis in some Maryland Tidal Marsh Soils

Tidal marsh profiles from various locations around the Chesapeake Bay were studied by graduate student Tom Griffin, and were dated using ^{210}Pb techniques. These soils, which were classified as **Sulfhemists**, Sulfaquents and Hydraquents, were characterized with respect to bulk density, organic matter, S and Fe speciation and pyrite content. These data were interpreted in the context of marsh accretion and soil forming processes. Rates of accretion ranged between 0.35 and 0.75 cm y^{-1} , indicating that the marshes examined are keeping pace with the rate of sea level rise. Generally, those marshes accreting **most** rapidly had a higher mineral content and a higher reactive Fe (FeS_2 -Fe plus "free" Fe) content. Pyrite S and organic S were the dominant S species forming from the microbial reduction of SO_4^{2-} . **Redox** conditions, Fe reactivity, organic matter content and SO_4^{2-} concentrations were the major factors controlling S and Fe transformations. Models have been developed to relate these various factors to pyrite formation and the degree of **pyritization**.

A Reconnaissance Study of the Soils of Selected Triassic Basins of the Mid-Atlantic USA

Basins of Triassic age rocks occur extensively through the Mid-Atlantic USA, arcing continuously from central New Jersey through southeastern Pennsylvania and central Maryland and then occurring linearly, but less **continuously**, through central Virginia and North Carolina. Compilation of previous data showed that soils derived from Triassic sediments in the basins of North Carolina and southern Virginia have stronger morphological expression, more clayey **argillic** horizons than soils derived from Triassic sediments of northern Virginia, Maryland, and Pennsylvania. A reconnaissance trip was taken to examine and sample soils and parent materials in several Triassic basins of Maryland, Virginia, and North Carolina. Field observations and laboratory results indicate that the fundamental differences in soil, are parent material controlled. A greater proportion of weatherable minerals in the sandstones of the more southern basins has presumably led to the development of soil properties in strong contrast to those on sandstones in the more northern Triassic basins.

Aquods on the Eastern Shore of Maryland

A study has been initiated by graduate student Margaret Condon to examine the genesis and characterization of soils which contain spodic or spodic-like horizons in the lower Eastern Shore. Preliminary work has show" pyrophosphate and dithionite extractable Fe to be very low throughout these soils and extractable Al to be higher and associated with the carbon rich Bh horizons. Topographic and hydrologic factors have been postulated to be responsible for the formation of the spodic properties.

Induced Iron Sulfide Formation in a Chesapeake Bay Tidal Marsh

A tidal marsh in Dorchester County, Maryland was selected to study the impact of additions of iron oxide-rich soil materials within the marsh soil profile. Previous research in this marsh suggested that low iron inputs may be limiting to iron sulfide formation. Soils in this marsh consist of 50 to 75 cm of peat which are underlain by a submerged mineral soil, and are which classified as **euic, mesic Terric** Sulphemists. Porous inert bags containing 100g portions of a silty clay soil material having 5.21% DCB extractable Fe, were placed at 2 depths (i.e. 15 and 30 cm) within 2 soil profiles in the marsh. Mean **redox** potentials (Eh) at the depths studied ranged from +90 to -60 mV. Iron sulfides had formed in all zones except **that** with the highest **redox** potential. Black Fe monosulfides were observed on freshly cut slabs and occurred as thick (1 to 5 mm) hypocoatings around the perimeters of the soil material. Individual crystals of this phase were too small to be resolved using light microscopy. **Framboidal** pyrite was observed within the same general **zone** as the monosulfides. The relative quantities of both iron sulfide phases increased as **redox** potentials measured in the soils decreased.

Micromorphology and Trace Metal Analysis of Glauconitic Parent Materials in Maryland.

Samples were collected from the oxidized and reduced zones of three glauconitic sediment columns from the Nanjemoy and **Aquia** (Eocene) formations on the Maryland Atlantic Coastal Plain. While absent from the oxidized zone, pyrite in the reduced zone ranged from 6 to 8 g kg⁻¹. A portion of this pyrite was shown in thin section to be intimately associated with the glauconite. As shown by scanning electron microscopy, this pyrite occurred as euhedral octahedral crystals and clusters of crystals within the matrix and in fissures of glauconite grains. Pyrite not within glauconite grains occurred as framboids, as well as **euhedral** crystals and clusters. Chemical analyses of magnetically separated fractions suggest enrichment of **Zn** and **Cu** in the glauconite phase and **Zn** in the pyrite phase. Interpretations of **Ni**, **Cd**, and **Pb** data are less clear. Both whole soil and magnetic fractions of the two sites from the Aquia formation were higher in all five trace metals than those from the Nanjemoy site. The glauconitic materials appear to be generally higher in trace metals than non-glauconitic counterparts on the Coastal Plain.

Micromorphology of Acid Sulfate Soils in Baltimore Harbor Dredged Materials

When first deposited, most dredged materials have high water content and associated high n-values and have neutral **pH**. With drying, prismatic structure forms and ped faces becomes decorated with jarosite and iron "oxides" during the rapid formation of sulfuric horizons. **Iron** "oxide" coatings or hypocoatings appear to form first, but as **pH** drops to low values (-3) jarosite also forms. Microscopic observations have shown the iron "oxides" both behind the jarosite and external to the jarosite at ped faces. Both Fe oxides and jarosite occur most commonly as hypocoatings and less commonly as true coatings. Framboidal pyrite is present in the sulfuric horizon with concentration apparently increasing with depth and toward the interiors of peds. Many diatoms are present in the soil materials which may contribute to low bulk density. These also indicate algal contributions to organic matter used in sulfate reduction, as pyrite occurs within some diatom tests. Microprobe (**EDX**) line scans across ped surfaces show enrichment in **Al** as well as **Fe**, **S**, **K**, suggesting association of **Al** with iron "oxides" and jarosite.

Extractability of Heavy Metals from Acid Sulfate Soils in Dredged Materials.

Graduate student Mohammed El Desoky has been conducting an incubation experiment to evaluate the release of heavy metals from the oxidized and reduced zones of dredged materials from Baltimore Harbor. A sequential extraction of H_2O , DTPA, acid ammonium oxalate, and H_2O_2 has been used. The oxidation of **sulfidic** materials of the reduced zone with time tends to cause an increase in pe, a quick drop in **pH** and an increase in the soluble salts. Under these conditions, the **pH** of the reduced zone (approx. 7.0) reached that of the oxidized zone (approx. 3.5) within 7 weeks. The oxidized zone samples showed a small increase in pe and a small drop in **pH** reflecting that some sulfides were present. Sulfide-bound metals in the reduced zone transform with time (and oxidation) to oxalate and DTPA extractable **forms**.

Evaluation of SWAN-gypsum for Reclamation of Acid Sulfate Soils in Dredged Materials.

SWAN-gypsum is produced by SCM Corp. in Baltimore by combining concentrated sulfuric acid with aragonite ($CaCO_3$). Graduate student Offiah Offiah has been working to characterize and evaluate this material as a potential soil amendment. The SWAN-gypsum is comprised of 50% gypsum and 35% H_2O and also contains $CaCO_3$, Fe "oxides", and trace amounts of hydrous oxides of Mg, V, Cr, Mn, Ti, and Al. By x-ray diffraction the iron "oxides" are mostly goethite ($FeOOH$). Incubation studies have indicated that **this** material has some neutralizing ability toward the acidity of acid sulfate soils in dredged materials. A quick bioassay using pre-germinated wheat seeds (*Triticum aestivum* L.) demonstrated the alleviation of aluminum toxicity by quantities of SWAN-gypsum sufficient to raise the **pH** to 4.7 or more. Field tests under a reclamation setting are being conducted.

Physical Modeling of Soil Reflectance This project is being undertaken by graduate student Jim Irons who is affiliated with Goddard (NASA) under the direction of Dick Weismiller. The work is designed to better understand and mathematically formulate relationships between radiation characteristics and the physical properties of the soil, which is necessary for accurate retrieval of information by remote sensing. A goniometer has been built at the NASA/Goddard Space Flight Center for use in observations of soil mineral BRDF (bidirectional reflectance distribution function). At present, initial measurements have been made on quartz, **montmorillonite**, and kaolinite.

Oyster Shell Midden Effects on Soil Chemical Properties.

Following earlier work, graduate student Ian Kaufman has begun a project to study oyster shell **midden** sites in Maryland's Atlantic Coastal Plain soils along the Chesapeake Bay and its tributaries. Soils of these sites are characterized by large quantities of oyster shells, high **pH**, and dark A horizons. Preliminary work compared differences in the soil chemical properties of the A horizons of four adjacent fields along the Chester River. There were higher levels of **organic matter** [**3.6%** vs. **1.3%**] and CEC [**13.3 cmol(+)kg⁻¹** vs. **0.6 cmol(+)kg⁻¹**] in the midden-affected soils than in unaffected ones. A comparison of ratios of soluble - to - exchangeable cations also revealed "**midden** effects" that might explain mechanisms for the unusually high organic matter levels in these soils.

Cornell University Agricultural Experiment Station Report

W.J. Waltman

The experiment station, in cooperation with the New York SCS staff, has initiated a study to determine soil temperature regimes in the Catskills, Salamanca Re-entrant, Glaciated Allegheny Plateau and Champlain Valley. The study will attempt to model soil temperatures with respect to elevation, aspect, soil drainage, and cover type. From the first year measurements, which closely approximated the 30 year norms, the frigid (0-8°C) soil temperature regime can occur in valleys with elevations of 1480 ft because of cold air drainage from the plateau summits. Additionally, a large portion of the prime agricultural lands in New York will have MAST of less than 8°C and should be recognized as frigid series. In the Salamanca Re-entrant, Ultisols formed in residuum and colluvium occur on the high plateau summits (1900 to 2400 ft) and have frigid soil temperature regimes. From this research, we hope to 1) amend Soil Taxonomy to allow frigid Ultisols, 2) relate the soil temperature regimes to the applicability of no-till and inclusion within crop yield models, and 3) overlay perspective plots of digital elevation data with models of the soil temperature regimes to predict the mesic/frigid boundaries on landscapes.

A study of "Dye Tracer Analysis for Evaluating Nonpoint Source Pollution" in cooperation with the Dept. of Ag Eng. and the SCS was completed during the past year. This study explored methods of using non-toxic dyes to relate macropore flow to soil structure and the stratigraphy of glacial deposits. The patterns of dye movement were correlated with saturated hydraulic conductivity, bulk density, particle size distribution, moisture content, and descriptions of soil structure. From our measurements of saturated hydraulic conductivities, the values for permeability provided by the SOI-5 Interpretation Records are grossly underestimated (100X). The detailed descriptions of dye movement, along with soil characterization data are used to refine existing models of macropore flow in New York soils and develop interpretations for nonpoint source contamination of groundwater.

During the past six months, Ray Bryant has been on sabbatic leave to Turrialba, Costa Rica, to develop a soils database for Central America and also teach soil genesis and classification.

NY-1

In the past year, a Novell network was installed in the Soil Characterization Laboratory, which is currently handling six workstations, including XRD and DTA. Presently, we are involved with converting hardcopy profile descriptions to our Soil Characterization Database, which collectively (Expt. **Sta.** Reports, theses, and recent projects) amounts to 800 pedons. Similarly, we will be converting our Soil Characterization Database from RBASE to ORACLE/UNIX and developing linkages to GRASS.

Jamil **Macedo** and Kent Snyder have completed their Ph.D. programs. J. **Macedo's** thesis was entitled "Preferential Reduction of Hematite over Goethite in some Oxisols in Brazil" and K. Snyder's thesis dealt with "**Pedogenesis** and Landscape Evolution in the Salamanca Re-entrant, South-western New **York.**" Brad **Inman** has recently completed his M.S. thesis entitled "Strength Analysis and Micromorphology of Fragipans in Loess-Derived Soils of Northeastern Louisiana." Current graduate research projects include "Comparative Iron Mineralogy in Brown and **Redbed Till-Derived Soils of the Catskills**" (T. **MacFie**) and "**Radon Flux in New York Soils**" (G. Carignan).

Pennsylvania Agricultural Experiment Station Report
Robert L. Cunningham

The once-over mapping of Pennsylvania was completed with the final acres mapped in Bedford County on October 23, 1987. Experiment Station representatives and SCS emphasized in that ceremony that soil survey data needs to be adapted to the new tools for managing and delivering information. Frequent discussions by soil survey personnel with the PA Dept of Ag, PA Dept of Environ Resources, PA Dept of Highways, and PA Power and Light Company have an objective of developing a Geographic Information System. Soils data would be a vital layer and would be compatible in quality and availability with other resource data such as streams, roads, and land use. Several special projects with public and private organizations are evaluating the adequacy and usability of soil survey information using software information systems such as ERDAS and PC - ARC/INFO. Links among narrative morphology, tabular analyses, interpretation, and spatial map data need more attention. The data sets need to be evaluated from a perspective of being used in an information management system. Numerous errors in digitized soil maps emphasize the importance of quality control and adequate edit techniques when generating data to be managed by shelf software and to be merged with other resource data. None of the 7 county digitized map data sets in PA are usable as delivered from SCS Computer and Cartographic Division. Polygon closure errors are most serious as errant arcs create additional polygons without meaning and identification. Left and right identifiers are frequently confused, coordinate systems sometimes are changed within one county data set, and neat lines are missing from some quadrangles of map data. Errors exist in labeling of polygons and this is an extremely difficult error to check. These errors with these survey maps digitized very early in the game and before programs were developed to use such data emphasize the importance of "using" the data. As with the reports, only when the data are used in making management and planning decisions are some of the data errors discovered. Information systems do offer edit techniques that can improve the quality of soil survey data.

Conversion of soil survey report information into formats compatible with information system technology offers a challenge and opportunity for the next generation of soil surveys. The data in PA must be converted, for states that are presently collecting data, there is an excellent opportunity to take advantage of technology to develop usable data sets.

The Land Analysis Laboratory improves the capability of PA to investigate the potential of information systems for soil survey information. Examples are projects with the Centre County Conservation District to evaluate agricultural non-point pollution potential of watersheds, with PP&L to evaluate techniques that develop digitized soil information, and with various agencies in providing usable resource data such as topographic, geologic, and edaphic. Additional studies include the development of techniques to evaluate reclaimed mined land that was formerly prime agriculture land.

The Experiment Station program was greatly enhanced by an additional cooperative agreement between Penn State and SCS to provide data base management services to SCS. The agreement also provides for an SCS soil scientist to be housed in the Laboratory to assist in the development of soil information systems.

Specific research activities are briefly described in the following paragraphs. Additional information is available upon request.

The A, B, and C (total of 108) horizons from various parent materials and drainage classes were analyzed for amorphous materials by weight loss and chemical addition methods. Preliminary results indicate that amorphous material ranges from 4.0 to 0.5% and it decreases from the surface downward.

A study of radon in soils of Pennsylvania indicates that there is a summer maximum and a winter minimum. The radon concentration is much higher, 10 to 100 times, in the soil than has been reported in houses.

An investigation of the influence of red rock versus brown rock material in glacial till on the development of pre-Wisconsinan soils has been initiated stressing the importance of parent material on soil formation.

The following conclusions were drawn from a study of central Pennsylvania well-drained soils developed from limestone materials: (1) pedogenetic sand (iron cemented aggregates) were formed in the A and B horizon, (2) the clay in the soil is a weathering product from the limestone as well as illuvial material from a previous soil that has been eroded, some additions of aeolian material were also identified, (3) formation occurred during the last 50,000 to 350,000 years, and (4) periglacial activity has influenced the characteristics of the upper horizons.

Soils developed from tall grass prairie in northwestern Pennsylvania have occupied the site for the last 3,000 to 4,000 years, have more organic matter than typical midwestern prairie soils, and fit the trend of decreasing total soil organic matter from east to west across the United States.

The Soil Characterization Laboratory has a new director, Mr. Robert Dobos who replaces Dr. Richard C. Cronce. The Lab conducted an EPA - acid rain comparative laboratory data study with results are similar to the Northeast study that was published in 1985. The laboratory is developing a user-friendly data base that includes profile descriptions and analytical data. Encoding and editing profile descriptions dating back to 1957 is nearing completion. Future sampling will be directed to completion of the data base for Pennsylvania, to support specific research activities, and to respond to service requests. An updated methods manual is in manuscript form and is expected to be published in 1988.

In affiliation with ORSER (Office for Remote Sensing of Earth Resources) several projects are in progress that directly relate to soil resources: Soil and vegetation, as well as hydrogeomorphic features (basin shape, geometry, drainage density) are derived from remotely sensed data. Hydrologic parameters obtained through remote sensing are directly applied to watershed erosion models. GIS's are sources of input to stormwater management models and non-point source pollution models. Landscape ecology, determined for watersheds in Alaska, created by digital elevation models from stereo SPOT imagery. These projects are under the direction of Dr. Gary W. Petersen.

Rhode Island Agricultural Experiment Station Report
William R. Wright

1. Distribution of Heavy Metals from Urban Runoff in a Vegetated Detention Basin. B. Eisenberg, W.R. Wright

Urban development generally results in an increase in impervious surfaces which accumulate urban-borne pollutants. These pollutants are washed off during storm events, and may result in the degradation of existing waterbodies. Previous studies have shown that properly designed detention basins effectively control stormwater runoff quantity, but little information is available on their ability to attenuate pollutants. This study was designed to investigate the distribution of heavy metals in a vegetated detention basin. A 4 acre detention basin which receives runoff from a 13 acre parking lot was selected for study. Sediment samples were obtained at various depths from selected transects and analyzed for heavy metals. Preliminary analyses indicate that heavy metal contents are 10 to 20 fold higher in the basin than background levels. Concentrations of Cd, Cu, Pb, and Zn, which averaged 1.85, 16.6, 157, and 137 ug/g respectively, accumulated primarily in the surface litter layer. Metal concentrations were highly correlated with vegetation type, organic matter content of litter, and location in basin.

2. Nitrogen Removal from On-site Sewage Disposal Systems: A Field Evaluation of Alternative and Conventional Designs. B. Lamb, G. Loomis, A. Gold and C. McKiel.

The objective of this study was to identify a practical nitrogen removal system for on-site sewage disposal. A field laboratory was constructed with 3 replicates of each of the following 3 systems: a recirculating sand filter (RSF) system; a RUCK system; and a conventional system. Nitrogen outputs from the systems were monitored for 2 years. Each replicate of the alternative systems consisted of a sand filter as the site for nitrification, a rock tank as the site for denitrification, and a soil absorption trench. The RSF system replicates used septic tank effluent (STE), methanol and ethanol as carbon sources for denitrification; the RUCK replicates used greywater as the carbon source. The RUCK and RSF sand filters achieved 60-70% nitrification on a mean annual basis. The RSP system with methanol or ethanol as the carbon source showed average N removals of 60-90%, with rock tank denitrification of 98-100%. The RUCK system with greywater exhibited more variable results; total N removal and denitrification ranged from 20-80% and 30-100%, respectively. Total N removal in the conventional system was 1-9%.

3. "Use of Soil Survey and GIS Processing for Groundwater Protection. A.J. Gold, S. Tso, P.V. August and W.R. Wright.

A Geographic Information System (GIS) was used to evaluate the utility of Soil Survey data for locating stratified drift deposits that are associated with major groundwater aquifers in New England. Orthophoto corrected soil maps (1:15,840) and surficial geology maps (1:24000) from five 7.5 minute USGS topographic quadrangles were digitized using the GIS software product ARC/INFO on a Prime computer. Each polygon in the soils dataset was recorded as being indicative of stratified drift or glacial

West Virginia **Agricultural** and Forestry
Experiment Station Report

John C. Sencindiver

Since the last conference, the Soil Conservation Service (SCS) has published the Ritchie County Survey Report (issued 1986) in cooperation with the West Virginia Agricultural and Forestry Experiment Station. SCS has also hired five soil scientists and two soil science student trainees during the past year.

This year marks the 100th anniversary of the West Virginia Agricultural and Forestry Experiment Station. In celebration of this anniversary the Division of Plant and Soil Sciences will be hosting the Northeastern Branch Meetings of the **American** Society of Agronomy. The Experiment Station has also planned other activities.

After two years of planning and writing numerous documents, West Virginia University (WVU) has been appointed the coordinating institution of a consortium of universities to be funded as a National **Mine** Reclamation Center. North Dakota State University, Pennsylvania State University, Southern Illinois University, and the University of North Dakota are other members of the consortium. Federal funding has been appropriated, and oversight responsibility for the National Center has been assigned to the U.S. Bureau of Mines. The WVU Energy and Water Research Center will administer the program.

Current research studies of the soil science group include the following:

1. Abandoned **mineland** reclamation.
2. **Minesoil** mineralogy.
3. Characterization and classification of minesoils.
4. Use of natural and man-made wetlands to treat acid mine drainage.
5. Land application of sewage sludge.
6. Utilization of fly ash and **wood** residues in **mineland** reclamation.
7. Lime requirement of minesoils.
8. Characterizations of soils for wastewater disposal potential.

A list of publications and theses of the soil science group from 1962 to present is available upon request.

Virginia Agricultural Experiment Station Report

James C. Baker

This report will focus on the soil survey program in Virginia and Virginia Tech's role in the National Cooperative Soil Survey.

Soil Genesis, Morphology, and Soil Survey Personnel

J. C. Baker - Project Leader and Soil Survey Coordinator
W. J. Edmonds - Soil Survey Field Coordinator
T. W. Simpson - Extension Agronomist - Soil and Land Use
W. L. Daniels - Resident Instructor - Mined Land Reclamation
D. F. Ams - International Programs (Indonesia)
K. W. Newkirk (Molten) - Computer Application Specialist
13 Field Soil Scientists
3 Interpretative Soil Scientists - County
3 Interpretative Soil Scientists - State Health Department

Present Status

Modern soil survey information is available for approximately 17.5 million acres of Virginia's 25.4 million acres. To date 60 counties have modern soil surveys, 22 counties have surveys in progress, and 15 counties have old or no survey information. All surveys presently underway are on a cost sharing basis with the county contribution ranging from 10 to 25 percent of the cost of the soil survey.

The current Virginia Tech soil survey program has 8 progressive soil surveys underway involving 13 field soil scientists. The surveys cover all the physiographic provinces and include: Amherst, Appomattox, Floyd, King William, Nelson, Patrick, Surry, and Washington. One soil scientist is assigned to the state SCS office for map editing and finishing and one soil scientist is assigned at Blacksburg to work with manuscripts, map compilation, and data analysis. This makes a total of 15 soil scientists.

The soil characterization laboratories at Blacksburg provide characterization data on chemical, physical, and mineralogical properties of soils for both federal and state soil surveys in Virginia. The major benefit of these laboratory facilities, coupled with an active participating field program, operating under the supervision of the Department of Agronomy, is that research can be controlled and directed that will best serve the needs of Virginia and also contribute to regional and national programs that are a part of the National Cooperative Soil Survey. Several of our research efforts will have impact on the rules that govern operation of the National Soil Survey program. Thus under the umbrella project entitled "Investigation, Characterization, and Soil Survey of Designated Counties in Virginia", many separate investigations have been made, many more are currently underway, and several are planned for the future, although the 1985 Food Securities Act has focused immediate attention toward mapping the farm lands by 1990. The following investigations are examples of the kinds of research that are now a part of the Virginia Tech soil survey classification and genesis research program

SOIL GENESIS, SOIL SURVEY AND LAND USE RESEARCH ACTIVITIES RECENTLY COMPLETED OR UNDERWAY AT VIRGINIA TECH.

Pam Thomas, J. C. Baker, and T. W. Simpson.

- i) Erosion and productivity studies of Piedmont region of Virginia.
- ii) Description of taxonomic variability in a eroded soil mapping unit in a Piedmont landscape.

Mark Stolt, J. C. Baker, T. W. Simpson

- i) Model of soil reconstruction within and among soil landscapes.
- ii) Study of saprolite weathering in soil landscapes formed from schistic and gneissic parent material.

William J. Edmonds, et. al.

- i) Floodplain and low terrace systems along the great valley of Virginia.
- ii) Bottomland and terrace systems in the lower Coastal Plain of Virginia, Surry, Sussex, and Southampton Counties.

Mike Genthner, W L. Daniels, and J. C. Baker

- i) Genesis and characterization among residual soils influenced by colluvium in the Virginia Piedmont.

Barry Stewart and W L. Daniels

- i) Soil development in mine soils.

J. A. Roberts, W L. Daniels, J. C. Bell, and J. A. Burger

- i) Early stages of mine soils genesis in S. W Virginia.

Steven Feldman, L. W. Zelazny, and J. C. Baker

- i) Studies of high elevation Haplumbrepts in S. W Virginia.

Paul Gassman, L. W. Zelazny, J. C. Baker, and W J. Edmonds

- i) Characterization methods for quantifying soil mica.

Thomas Saxton, J. C. Baker, and T. W. Simpson

- i) The extent and nature of capping on major interfluves along an east to west transect in the Southern Piedmont of Virginia.

Soil Survey Scholarships

There are 3 students enrolled in Agronomy at Virginia Tech that are receiving the soil science scholarship. They are:

		<u>QCA</u>
Daphne Roots	Jr.	2.42
Dwight Owen	Jr.	2.53
Curtis Moore	so.	2.21

These students along with "87" graduates, Glen McClenny, Stuart Lynn, Victoria Sage, and Christine Robertson won the 1987 National Collegiate Soil Judging Contest held at Cornell. They were coached by Dr. Tom Simpson. Mark Stolt, graduate research assistant, was assistant coach.

EXPERIMENT STATION REPORT - DELAWARE

NEC-50, Northeast Soil survey Committee

R.A. Rebertus

Soil Survey Update. After many years, and much hard work by Dick Hall, the State Soil Scientist, Delaware is back in the soil survey business. A statewide soil survey' update has recently been initiated, Phase I is the 'Inland Bays Area," the watershed of Rehobeth and Indian River Bays, with funding assistance by EPA through the Delaware Department of Natural Resources and Environmental Control. A Memorandum of Understanding was recently signed, the first between SCS and the Experiment Station. The laboratory characterization analyses is being conducted in the **pedology** laboratory at the University through contract with SCS. There is continuing close cooperation between the Experiment Station and SCS on matters of mapping legend development and correlation.

Loess-Derived Soils. Work is continuing on the characterization and genesis of soils formed in loess over sediments of the Pensauken Formation in the northern Coastal Plain of the state. The objectives of this investigation **are** to obtain information on the variability in properties of **loess-derived** soils, determine their taxonomic placement, and assess the influence of loess thickness on classification. Major findings **over** the last year include: all soils formed in loess **or** in the underlying Pensauken Formation are in a mixed mineralogy class and mineralogy is quite uniform, pedon to pedon; the pedons sampled are Ultic **or** Typic Hapludalfs rather than Typic and Aquic **Hapludults** as expected, and there appears to be no way to predict classification at the subgroup level; it is difficult to predict particle-size class placement based on field diagnostic criteria.

Soil Moisture Regimes. A cooperative study with the Delaware Dep. of Natural Resources on morphological indicators of soil moisture regimes in the Coastal Plain of Delaware has received second year funding from U.S.G.S. and the State Inland Bays Program. An important determinant in evaluating morphological indicators of soil moisture regimes is stratigraphy. Some geological formations do not reduce readily while others reflect either relict conditions or slowly permeable strata rather than high regional water tables.

Affect of Selective Dissolution on Particle Density. Particle density (D_p) measurements made in conjunction with a study of herbicide retention and movement showed smaller than expected average D_p . Therefore a study was recently initiated on the effects of selective dissolution and extraction on D_p and, ultimately, the influence of D_p assumptions on particle-size determinations.

Future Plans. I intend to devote myself full time to my business partnership, BSA Land Resource Consultants, Inc. of Odessa, DE beginning next year.

DE-I

1988 NCSSC WORKING COMMITTEE 1

The Impact of the Food Security Act
on the Soil Survey Program in the Northeast

Committee Members:

William F. Hatfield, Chairman
James Baker
Will **Hanna**
Steve Hundley
Dennis Lytle
Glenn W. Patterson

Sidney A.L. Pilgrim
Fred M. Putnam
Martin C. Rabenhorst
Dean Rector
Garland **Lipscomb**

Background

The Food Security Act of 1985 (**FSA**) requires that the soil survey of all **cropland** be completed by December 31, 1989. In order to meet this challenge, the Soil Conservation Service, which has leadership responsibility for carrying out the provisions of the bill, has made numerous adjustments. The affect of these adjustments **was the** basis for the charges to the committee.

Charges

1. Identify NCSS responsibilities for FSA and how they affect the soil survey program in the Northeast.
2. Identify NCSS activities to be carried on in the northeast after 1990 when the mapping is completed for FSA.

Committee Report

General :

A brief questionnaire was used to address the charges. The questionnaire was mailed to **all** committee members. The results of those responding were summarized and a draft report was provided to the committee members at the conference for any additional adjustments. The questions are stated below, followed by a synopsis of the responses including discussions at the conference.

Summary of responses to questions:

1. Has FSA affected the soil survey program?

All respondents indicated yes, but for a variety of reasons. Some states

4. **Have starts** of new soil surveys been delayed?

Some states have actually started new surveys because of FSA. As an example, counties that have a high proportion of **cropland** to be mapped should be completed. In states where we're contingent upon counties providing cost sharing, some county officials are reluctant to contribute funds after the agricultural lands have been mapped. Some states indicate that updates may be delayed but new starts have not been delayed.

5. Has completion of previously started surveys been delayed?

Yes. Several states indicated that because of details (within and outside the state) that numerous surveys were being delayed.

6. Has FSA affected field reviews, correlations, or publication schedules?

Some reviews have been delayed, others have been shortened to **accomodate** reviews in counties with extensive mapping for FSA. The pattern of mapping has been altered from block mapping to the less efficient farm or tract mapping. Those states that have delayed reviews have also delayed each succeeding part of the work. The emphasis is on quantity, but it is essential that quality be maintained.

7. Will the number of soil scientists remain constant after **1990**?

The demand for soil scientists has increased significantly. The need is based not only on NCSS traditional roles, but has increased at the state and local levels. However great the need, only a few states thought the number would actually increase or stabilize at the current level. The consensus of the group was that an area soil scientist and one or two parties working on updating previously published surveys would be a realistic approach.

8. What activities should receive the highest priorities after **1990**?

- A. After completion of FSA work the backlog of surveys will need to be correlated and published.
- B. Basic soil services.
 - a. Interpretations.
 - b. User training (within SCS and outside **SCS**).
 - c. Remapping at a larger scale.
 - d. Interdisciplinary input.
 - e. Maintaining technical guides, etc.
- C. Updating and recorreling previously published surveys.
- D. Developing potential or similar methods of presenting soil survey data.
- E. GIS development.

9. What positive effects has FSA had on the soil survey program?

- a. Has given that portion of soil science that deals with field identification, characterization, and interpretation a "shot" of enthusiasm. I
- b. Although there is added pressure, soil scientists have a feeling of being needed. I
- c. Increased awareness of the need for soil survey. I
- d. Forced soil scientists to set priorities and to become more efficient. I
- e. Broadening of experience for soil scientists on details. I
- f. Accelerated the mapping of cropland. I
- g. Increased funds. I

NE Cooperative Soil Survey **Conference**

Committee 2: Soil-Water Contamination

Background

Many uses of soil involve the addition of wastewater to the soil such as, sewage lagoons, septic tank absorption fields, etc. In addition, various land uses provide the introduction of potentially harmful water into the soil environment. In many cases this has the potential of contaminating surface and ground water supplies. The increase use of soils information, especially in the area of wastewater disposal, raises concerns as to whether our soil interpretations are adequate and comprehensive. Concerns have also been raised as to whether there has been sufficient research to answer some of the waste disposal questions that are being asked.

Committee Charges

1. What are the soil properties that are important to the soil-water relationship, especially involving the addition-of **wastewater** or the movement of **organics** through the soil?
2. Evaluate interpretations in the NSH relating to the addition of wastewater to the soil? Are the guidelines in the NSH sufficient for rating the interpretations?
3. Identify new interpretations that may be needed.
 - a. Are there interpretations that should be developed for wastewater disposal that are not in the NSH?
 - b. If so which ones?
 - c. What soil properties and ranges are needed for the interpretations?
 - d. What are the restrictive features?
4. Is more research needed to better understand the soil-water relationship, especially relating to **wastewater** disposal and to the movement of organic compounds in the soil environment? If so, in what areas and for what soil properties?

Committee Members

Thomas Bailey, FS, VA
Richmond J. Bartlett, University of Vermont, VT
William **Broderson**, SCS, NJ
Lee **Daniels**, VPI&SU, VA
Delvin S. Fanning, University of Maryland, MD
Tyrone Goddard, SCS, NY
David **E.** Hill. CT Agricultural Experiment Station, CT
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Dave G. **VanHouten**, SCS, VT
Peter L.M. **Veneman**, University of Massachusetts, MA, Chairman
William R. Wright, University of Rhode Island, RI

Discussion

Charge 1, What are the soil properties that **are** important to the **soil-water** relationship, especially involving the addition of wastewater or the movement of **organics** through the soil?

Attached, as appendices A and B, are the sections from the National Soils Handbook (NSH) dealing with sanitary facilities and **wastewater** management, respectively. In the following table, the properties denoted by "+" are considered of significance for on-site sewage disposal (class I), sewage lagoons (class II), and sanitary landfills trench-type (class III) or area-type (class IV).

Soil property	-----Class-----			
	I	II	III	IV
texture		+	+	
coarse fragments	+	+	+	
permeability	+	+	+	+
depth to bedrock	+	+	+	+
depth to pan	+	+	+	+
depth to water table	+	+	+	+
SAR			+	
pH			+	
salinity			+	
slope	+	+	+	+
flooding	+	+	+	+
unstable soils	+	+	+	+

* USDA and/or Unified classification

** Includes **downslope** movement, pit formation, differential settling, subsidence.

In the NSH section dealing with waste management (see Appendix B) **several soil** properties are considered to facilitate the interpretation of a soil for a particular use. The "+" sign denotes when a particular soil property is considered important for manure and processing waste (class I), municipal sewage sludge (class II), wastewater used for irrigation (class III), treatment by slow (class IV) or rapid (class V) infiltration, and by overland flow (class VI).

Soil property	class					
	I	II	III	IV	V	VI
coarse fragments	+	+	+	+	+	+
permeability	+	+	+	+	+	+
depth to bedrock	+	+	+	+	+	+
depth to restricting pan	+	+	+	+	+	+
depth to water table	+	+	+	+	+	+
SAR	+	+	+	+		+
pH surface horizon	+	+	+	+	+	+
salinity	+	+	+	+		+
cation exchange capacity		+	+	+		+
bulk density		+	+	+		
available water capacity		+	+	+		
slope	+	+	+	+	+	+
flooding	+	+	+	+	+	+
erosion susceptibility	+	+	+	+		

* Includes erosion factor of surface layer ($Kx\%$ slope) and/or wind erodibility group.

The movement of **organics**, however, has not been specifically addressed by the NSH. Most exhibit non-polar properties, while some are immiscible in water. Potential leachability is affected by the fundamental molecular properties, the reaction with the soil, the rate of degradation, the type and rate of transformation, and most importantly its solubility in water. Important soil characteristics are:

- * organic matter content
- * **redox** conditions
- * porosity
- * particle size
- * depth to the ground water
- * **coarse** fragments
- * bulk density
- * slope
- * susceptibility to erosion
- * **pH**
- * permeability
- * pore distribution
- * **structure**
- * depth to flow restricting layers (bedrock, cemented pans)
- * flooding
- * cation exchange capacity
- * soil temperature (frost-free season)

Most of these factors already are included in current tables dealing with wastewater disposal (see Appendices A and B), while some are more

important than others. In the case of predicting the potential movement of pesticides in soils, the organic matter content, pH, and the soil-water state (see charge #4) are probably most significant.

Charge 2. Evaluate interpretations in the NSH related to the addition of wastewater to the soil. Are the guidelines in the NSH sufficient for rating the interpretations?

The current interpretation procedures for wastewater application and management are presented in Appendices A and B. The committee suggests that these interpretation guidelines need to be reevaluated. The committee strongly feels that local soil potential guidelines are of more value to local users. Interpretations need to be rewritten at the local level. Some members feel that permeability by itself, may be inadequate to give sufficient information, i.e. are the rates adequate for contaminant removal. Other features such as organic matter content and CEC need to be included.

It is recommended that use of the term "poor filter" as the restrictive feature for various uses in coarse soils, be replaced by the term "rapid percolation". This change is to accommodate engineering use of this term. To an engineer, coarse sand may represent an excellent rapid filter, while our use of the term refers to inadequate treatment due to potential rapid movement of the wastewater. Also, in some of the current guide tables, the presence of permafrost is reported under the property heading "USDA TEXTURE". This should be changed to the more appropriate basic property of "FROZEN SOIL".

- Charge 3. Identify new interpretations that may be needed,
- a. Are there interpretations that should be developed for waste disposal that are not in the NSH?
 - b. If so which ones?
 - c. What soil properties and ranges are needed for the interpretations?
 - d. What are the restrictive features?

A guide to assess the potential leachability of pesticides should be developed, although some committee members found this to be too seasonal. On the next page is a proposed guide table to develop interpretations for such a purpose. Other environmental factors, such as landscape position, loading rates and the water state may be considered as well. The committee recommends that the table not be adopted at this time, but to study what the specific needs or use are, for example pesticides, landfills, fertilizer application, etc. Once the purpose has been established, one or more specific tables could be developed.

Some on the committee felt that the present format of SLIGHT, MODERATE, and SEVERE is detrimental to the presentation of soil survey interpretations due to the potential misuse of the information. Most committee members agreed that we can not completely eliminate these terms. It is the recommendation of this committee that the limitation terms of SLIGHT, MODERATE, and SEVERE be reviewed. A better set of

rating terms is probably desirable. Changes in the presentation of limiting features is also a recommendation of the committee. It is felt that more information is conveyed if data is presented in formats such as "high water table, 0-2 ft". rather than the relative term of "wetness" as is currently being used.

Table 1. Proposed guides to **assess** the risk for movement of pesticides in soil.

PROPERTY	LIMITS			RESTRICTIVE FEATURE
	SLIGHT	MODERATE	SEVERE	
1. Organic matter content	<4%	2-4%	<2%	Low organic matter
2. Permeability (IN/HR) (0-60")	---	---	>6	Rapid infiltration
3. Depth to high water table (FT)	>3.0	1.0-3.0	<1.0	Wetness
4. Moisture regime	---	---	aquic	Too wet
5. Depth to bedrock	>3.0	2.0-3.0	<2.0	Shallow soils
6. Depth to flow restricting pa"	>3.0	2.0-3.0	<2.0	Presence of pan
7. Soil reaction (pH) surface layer	>6.0	4.5-6.0	<4.5	Too acid
8. Slope (PCT)	<8.0	8.0-15.0	>15	Slope
9. Flooding	none, rare	occas.	freq.	Flooding
10. Fraction >3 IN (WT PCT)	—	--	>35	Large stones

Charge 4. Is more research needed to better understand the soil-water relationship, especially relating to wastewater disposal and to the movement of organic compounds in the soil environment? If so, in what areas and for what soil properties.?

In trying to address the soil properties that are important to the soil-water relationship, it is clear that those identified in the above

exercise is to assess the amount of water being stored in the soil profile at any particular time. For example, a 2-cm rain over a 1-hour interval in August, most likely has less of a chance to result in ground water pollution than a similar event in April. Several rather complicated computer models have been developed to derive this type of information, but most of them are specific to a particular site and are not based on soil survey information.

Some years ago Dr. Robert Grossman of the National Soil Survey Laboratory in Lincoln, Nebraska developed a method to anticipate potential moisture stress in soils for certain crops. His "soil-water state" prediction model utilizes local climatic and crop growth data and combines that with soil profile information compiled from form 5, to predict the soil-water state (dry, moist, wet) of each soil series on a monthly basis. Attached are sample calculation* for some representative New England soils (Appendix C). Given the rapid advances in PC computer technology it should not be too difficult to develop similar programs to calculate the soil water state of all soil series in a Major Land Resource Area (MLRA). This information could be used to assess the appropriate time to dispose of wastes, the time for optimum treatment efficiency, the sensitive period for ground water pollution depending on, specific land uses (application of pesticides, wastewater disposal, etc.), and the general suitability of a site comprised of particular soil series for wastewater renovation.

During the last 2 years, researchers and extension people from various universities, and USDA-SCS personnel in the southern New England states have been working on a PC-accessible program concerned with the potential impact of pesticides on the ground water (see University of Connecticut-Storrs research report in the Proceeding* of this conference). Pertinent data of almost 1,000 pesticides have been entered in a data base. Currently, an effort is on the way to incorporate soil survey information, but this is only general soils information and does not include important information on the soil-water state, seasonal changes in soil structure, and difference* in soil organic matter type and content. Any model that pretends to simulate actual field condition* should have this type information included.

A considerable effort is currently under way by various state and federal agencies to research the impact of a variety of constituents on ground water quality. During the next few years these results will improve our understanding of the flow processes through the soil matrix and allow a better assessment of the leachability of these compounds under particular environmental conditions. Soil survey information can play a major role in providing the link between the experimental results and the actual field situation. This committee recommends that a concerted effort is undertaken to assess the temporal changes in the soil-water state, and to combine this type of information with existing data bases which provide information about the basic chemical and physical properties of the waste material or potential pollutant under consideration.

Recommendations.

Based on the items included in this report and the deliberations during the meeting, the committee recommends the following:

1. To change the restrictive feature designation of "poor filter" to "rapid percolation".
2. To use the "frozen soil" designation as the appropriate **soil** property in the interpretation guide tables for waste management, to indicate a permafrost condition.
3. To reevaluate the use of the limitation terms "slight, moderate, and severe".
4. To more accurately define the limiting features in the interpretation tables.
5. To evaluate the potential of using soil-water state information in simple prediction models assessing the potential leachability of pollutants.
6. To develop a computer **assisted procedure** calculating the temporal variability in the soil-water state of major soil series in several **MLRAs** in the northeastern region .
7. To continue this committee to accomplish items 5 and 6 of these recommendations,

Appendix A.

Sanitary Facilities

Source: National Soils Handbook

P. 603-59 - 67.

§603.03-1 Sanitary facilities.

The nature of the soil is important in selecting sites for septic tank absorption fields, sewage lagoons, and sanitary landfills and in identifying limiting soil properties and site features to be considered in planning, design, and installation. Those soil properties that determine the ease of excavation or installation of these facilities also affect the ratings. Soil limitation ratings of slight, moderate, or severe are given for septic tank absorption fields, sewage lagoons, and trench and area type sanitary landfills. Soil suitability ratings of good, fair, and poor are given for daily cover for landfill.

(a) Septic tank absorption fields. See table 603-10. Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into the natural soil. The centerline depth of the tile is assumed to be at a depth of 24 inches. Only the soil between depths of 24 and 60 inches is considered in making the ratings. The soil properties and site features considered **are** those that affect the absorption of the effluent, those that affect the construction and maintenance of the system, and those that may affect public health.

(1) Properties and features that affect the absorption of the effluent are permeability, depth to a seasonal high water table, depth to bedrock, cemented pan, and susceptibility to flooding. Stones, boulders, and a shallow depth to bedrock, ice, or a cemented pan interfere with installation. Subsidence interferes with installation and maintenance. Excessive slope may **cause** lateral seepage and surfacing of the effluent in downslope areas. Also, soil erosion is a hazard where absorption fields are installed in sloping soils.

(2) Some soils are underlain by loose sand and gravel or fractured bedrock at a depth less than 4 feet below the distribution lines. In these soils the absorption field may not adequately filter the effluent, particularly when the system is new, and as a result the **ground-**water supply may be contaminated. Soils that have a hazard of inadequate filtration are given a severe rating.

(3) Percolation tests are used by some regulatory agencies to evaluate the soil's suitability for septic tank absorption fields. These tests should be performed during the season when the water table is highest and the soil is at minimum absorptive capacity. The percolation rates do not correspond to the permeability rates because they are measured by different methods. Experience indicates that soils that have a percolation rate faster than 45 minutes per inch function satisfactorily, soils that have a rate between 45 and 60 minutes per inch have moderate limitations, and soils that have a rate slower than 60 minutes per inch have severe limitations. 1/

1/ U.S. Department of Health, Education and Welfare, Public Health Service, 1969 **Manual** of Septic Tanks, PHS Publication No. 526, p. 8.

603.03-1 (a) (4)

(4) If slippage or pitting is observed or if combinations of soil properties and geologic conditions suggest susceptibility to or probability of such phenomena, the soil is rated SEVERE and SLIPPAGE or PITTING is listed as the restrictive feature.

(5) In many of the soils that have moderate or severe limitations for septic tank absorption fields, it may be possible to install special systems that lower the seasonal water table or to increase the size of the absorption field so that satisfactory performance is achieved. 2/ However, such systems are not considered in this guide.

2/ Bouma, J. 1974. New Concepts in Soil Survey Interpretations for Onsite Disposal of Septic Tank Effluent.

Table 603-10. Septic tank absorption fields.

PROPERTY	SLIGHT	LIMITS		RESTRICTIVE FEATURE
		MODERATE	SEVERE	
1. USDA TEXTURE	---	---	ICE	PERMAFROST
2. TOTAL SUBSIDENCE (IN)	---	---	>24	SUBSIDES
3. FLOODING	NONE	RARE	COMMON	FLOODING
4. DEPTH TO BEDROCK (IN)	>72	40-72	<40	DEPTH TO ROCK
5. DEPTH TO CEMENTED PAN (IN)	>72	40-72	<40	CEMENTED PAN
6. DEPTH TO HIGH WATER TABLE (FT)	>6	4-6	<4	PONDING WETNESS
7. PERMEABILITY (IN/HR): (24-60") (24-40")	I 2.0-6.0	I/0.6-2.0	<0.6 >6.0	PERCS SLOWLY POOR FILTER
8. SLOPE (PCT)	<8	8-15	>15	SLOPE
9. ~ / FRACTION (WT PCT) >3 IN	<25	25-50	>50	LAROE STONES
10. DOWNSLOPE MOVEMENT	---	---	<u>II/</u>	SLIPPAGE
11. FORMATION OF PITS	---	---	<u>III/</u>	PITTING

I/ Weighted average to 40 inches.
I/ Recheck to see if rating should be SLIGHT.
II/ If the 8011 la susceptible to movement downslope when loaded, excavated, or wet, rate "SEVERE-SLIPPAGE."
III/ If soil is susceptible to the formation of pits caused by the melting of ground ice when the ground cover is removed, rate "SEVERE-PITTING."

Part 603 - Application of Soil Information

603.03-1(b)

(b) Sewage lagoons. See table 603-11. Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons have a nearly level floor surrounded by cut slopes or embankments of compacted, relatively impervious soil material. Aerobic lagoons generally are designed so that the depth of sewage is 2 to 5 feet. Relatively impervious soil for the lagoon floor and sides is desirable to minimize seepage and contamination of local ground water.

(1) Soil permeability is a critical property in evaluating a soil for sewage lagoons. Most porous soils will eventually seal when being used as a sewage lagoon; however, until they do, the **hazard of** pollution is severe and it is difficult to maintain the constant water depth required for proper operation. Soils that have a permeability rate exceeding 2 inches per hour generally are too porous for proper operation of sewage lagoons and may cause contamination of shallow wells. Fractured bedrock within a depth of 40 inches may create a pollution hazard. Bedrock and cemented pans create construction problems.

(2) The slope limits are based on the specification that the effluent be 2 to 5 feet deep. If it is shallower than this, weeds grow; if it is deeper, an aerobic environment is more difficult to maintain. Slope must be gentle enough and the soil material thick enough over bedrock or a cemented pan to make smoothing practical, so that the lagoon is uniformly deep throughout.

(3) If floodwater overtops the lagoon, it interferes with the functioning of the lagoon and carries away polluting sewage before sufficient decomposition has taken place. Ordinarily, therefore, soils susceptible to flooding have a severe limitation for sewage lagoons. If, however, floodwaters are slow and flooding is rarely, if ever, more than 5 feet deep--not deep enough to overtop the lagoon embankment--the susceptibility to flooding does not constitute a severe limitation rating.

(4) Soils that contain a large amount of organic matter are not suitable for the floor of the lagoon. The organic matter promotes an anaerobic rather than aerobic environment and is detrimental to the proper functioning of the lagoon.

(5) Depth to water table is important if it influences the water level in the lagoon. If it does, then a pollution hazard also exists. Depth to water table is disregarded if the lagoon floor is of slowly permeable soil material at least 4 feet thick. Soils that contain rock fragments are undesirable sites because the fragments interfere with the manipulation and compaction needed to prepare the lagoon floor.

(6) If slippage, pitting, or differential settling is observed or if combinations of soil properties and geologic conditions suggest the susceptibility to or probability of such phenomena, the soil is rated SEVERE and SLIPPAGE, or PITTING, is listed as the restrictive feature.

603-62

(430-VI-NSH, July 1983)

Table 603-11. Sewage lagoons.

PROPERTY	LIMITS			I RESTRICTIVE FEATURE
	SLIGHT	MODERATE	SEVERE	
1. USDA TEXTURE		---	ICE	PERMAFROST
2. PERMEABILITY (IN/HR) (12-60")	<0.6	0.6-2.0	>2.0	SEEPAGE
3. DEPTH TO BEDROCK (IN)	>60	40-60	<40	DEPTH TO ROCK
4. DEPTH TO CEMENTED PAN (IN)	>60	40-60	<40	CEMENTED PAN
5. FLOODING	NONE, RARE	---	<u>I</u> /COMMON	FLOODING
6. SLOPE (PCT)	<2	2-7	>7	SLOPE
7. UNIFIED (ANY DEPTH)	---	OL, OH	PT	EXCESS HUMUS
8. DEPTH TO HIGH WATER TABLE (FT)	---	---	+	PONDING
	>5	<u>2</u> /3.5-5	<u>2</u> / <u>3.5</u>	WETNESS
9. <u>3</u> /FRACTION >3 IN (WT PCT)	<20	20-35	>35	LARGE STONES
10. DOWNSLOPE MOVEMENT	---	---	<u>II</u> /	SLIPPAGE
11. FORMATION OF PITS	---	---	<u>III</u> /	PITTING
12. DIFFERENTIAL SETTLING	---	---	<u>V</u> /	UNSTABLE FILL

2/Disregard wetness if a layer at least 20 inches thick has permeability of less than 0.2 in/hr.

3/Weighted average to 20 inches.

II/If the soil is susceptible to movement downslope when loaded, excavated, or wet, rate "SEVERE-SLIPPAGE."

III/If the soil is susceptible to the formation of pits caused by the melting of ground ice when the ground cover is removed, rate "SEVERE-PITTING."

IV/If floodwater will not enter or damage sewage lagoon (low velocity and depth <5 feet.), disregard flooding.

V/If the soil is susceptible to differential settling, rate "SEVERE-UNSTABLE FILL."

Part 603 - Application of Soil Information

603.03-1(c)

(c) Sanitary landfill (trench). See table 603-12. Sanitary landfill (trench) is a method of disposing of solid waste by placing refuse in successive layers in an excavated trench. The waste is spread, compacted, and covered daily with a thin layer of soil that is excavated from the trench. When the trench is full, a final cover of soil material at least 2 feet thick is placed over the landfill.

(1) Ratings are based on properties to a depth normally observed during soil mapping. However, because trenches may be as deep as 15 feet or more, geologic investigations are needed to determine the potential for pollution of ground water as well as to determine the design needed. These investigations, generally arranged for by the landfill developer, include examination of stratification, rock formations, and geologic conditions that might lead to the conducting of leachates to aquifers, wells, water courses, and other water sources. The presence of hard nonrippable bedrock, creviced bedrock, or highly permeable strata in or immediately underlying the proposed trench bottom is undesirable because of difficulty in excavation and potential pollution of underground water.

(2) Properties that influence risk of pollution, ease of excavation, trafficability, and revegetation are major considerations. Soils that flood or have a water table within the depth of excavation present a potential pollution hazard and are difficult to excavate.

(3) Soil slope is an important consideration because it affects the work involved in road construction, the performance of the roads, and the control of surface water around the landfill. Soil slope may also cause difficulty in constructing trenches where the trench bottom must be kept level and oriented to follow the contour.

(4) If slippage, pitting, or differential settling is observed or if combinations of soil properties and geologic conditions suggest the susceptibility to or probability of such phenomena, the soil is rated SEVERE and SLIPPAGE, PITTING, or SUBSIDES is listed as the restrictive feature.

(5) The ease with which the trench is dug and with which a soil can be used as daily and final cover is based largely on texture and consistence of the soil. The texture and consistence of a soil determine the degree of workability of the soil both when dry and when wet. Soils that are plastic and sticky when wet are difficult to excavate, grade, or compact and difficult to place in a uniformly thick cover over a layer of refuse.

(6) The uppermost part of the final cover should be soil material that is favorable for the growth of plants. It should not contain excess sodium or salt and should not be too acid. In comparison with other horizons, the A horizon in most soils has the best workability and the highest content of organic matter. Thus, for a trench-type landfill operation it may be desirable to stockpile the surface layer for use in final blanketing of the fill.

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(430-VI-NSH, July 1983)

PROPERTY	LIMITS			RESTRICTIVE FEATURE
	SLIGHT	MODERATE	SEVERE	
1. USDA TEXTURE				PERMAFROST
2. FLOODING	N			FLOODING
3. DEPTH TO BEDROCK (IN)				DEPTH TO ROCK
4. DEPTH TO CEMENTED PAN (IN): THICK THIN				CEMENTED PAN
5. $\frac{4}{8}$ /PERMEABILITY (IN/HR) (BOTTOM LAYER)				SEEPAGE
DEPTH TO HIGH WATER TABLE (FT): APPARENT PERCHED				
7. SLOPE (PCT)				
8. $\frac{4}{8}$, $\frac{2}{8}$, $\frac{6}{8}$ /USDA TEXTURE		C	S1	TOO CLAYEY
$\frac{5}{8}$ /USDA TEXTURE		L	CC S S	----- RECOMMEND RECOMMEND RECOMMEND -----

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603.03-1(d)

(d) Sanitary landfill (area). See table **603-13**. Sanitary landfill (area) is a method of disposing of solid waste by placing refuse in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil that is imported from a source away from the site. A final cover of soil at least 2 feet thick is placed over the completed landfill. Properties that influence trafficability and risk of pollution are the only considerations for area sanitary landfills.

(1) Flooding is a serious problem because of the risk of washouts and pollution downstream and the difficulty of moving trucks in and out of flooded areas.

(2) Permeability of the soil is an important consideration in all but the most arid parts of the country. If permeability is too rapid, or if fractured bedrock or a fractured cemented pan is close to the surface, the risk of the **leachate** contaminating the water supply is great. A high water table may also transmit pollutants to the water supply and is likely to restrict truck movement during wet seasons.

(3) Slope is a consideration because of the extra grading required to maintain roads on sloping soils. Furthermore, **leachate** may flow along the soil surface on sloping soils and cause difficult seepage problems in completed fills.

(4) **If** slippage, pitting, or differential settling is observed or if combinations of soil properties and geologic conditions suggest the susceptibility to or probability of such phenomena, the soil is rated **SEVERE** and SLIPPAGE, PITTING, or SUBSIDES is listed as the restrictive feature.

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603.03-1(d)(4)

Table 603-13. Sanitary landfill (area).

PROPERTY		
1. USDA TEXTURE		
2. FLOODING	N	
3. DEPTH		

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603.03-1(f)

(f) Daily cover for landfill. See table 603-14. Daily cover for **landfill** is the soil material that is applied daily to compacted solid waste in an area type sanitary landfill. The cover material is obtained **offsite**, transported, and spread on the area. The required soil characteristics for both daily and final cover material are nearly enough alike for one rating to serve.

(1) Suitability of a soil for use as cover is based on properties that reflect workability and the ease of digging and of moving and spreading the material over the refuse daily during both wet **and** dry periods. Soils that are loamy or silty and free of stones are better than other soils. Clayey soils may be sticky and difficult to spread; sandy soils may be subject to soil blowing.

(2) The soil must be thick enough over bedrock, a cemented pan, or the water table so that material can be removed efficiently and yet leave a borrow area that can be revegetated. Some damage to the borrow area is expected, but if **revegetation** and erosion could be serious problems, then the soil is rated severe.

(3) Slope affects the ease of excavation and moving of the cover **material**. Slope also may affect the final configuration of the borrow area and, hence, runoff, erosion, and reclamation.

(4) In addition to these features, the soils selected for daily cover for landfill should be suitable for growing plants. They should not contain significant amounts of substances toxic to plants such as a high content of sodium, salts, or lime.

Appendix B.

Waste Management

Source: National Soils Handbook

P. 603-118 . 132

Table 603-37. Off-road motorcycle trails.

PROPERTY	LIMITS			RESTRICTIVE FEATURE
	SLIGHT	MODERATE	SEVERE	
1. USDA TEXTURE	---	---	ICE	PERMAFROST
2. FRACTION >3 IN (WT PCT) (SURFACE LAYER)	<10	10-25	>25	LARGE STONES
3. DEPTH TO HIGH WATER TABLE (FT)	--- >2	--- 1-2	+ <1	PONDING WETNESS
4. EROSION FACTOR (K) X PERCENT SLOPE	>2	2-4	>4	ERODES EASILY
5. <u>27</u> /USDA TEXTURE (SURFACE LAYER)	---		SC, SIC, C	TOO CLAYEY
6. USDA TEXTURE (SURFACE LAYER)	---	LCOS, VFS	COS, S, FS	TOO SANDY
7. UNIFIED (SURFACE LAYER)	---		I?T	EXCESS HUMUS
8. SLOPE (PCT)	<25	25-40	>40	SLOPE
9. <u>11</u> /COARSE FRAGMENTS (WT PCT) (SURFACE LAYER)	<40	40-65	>65	SMALL STONES
10. USDA TEXTURE (SURFACE LAYER)	---	S IL, SI VPSL, L	---	DUSTY
11. FLOODING	NONE, RARE, OCCAS	FREQ	---	FLOODING
12. OTHER	---	---	<u>XVI</u> /	FRAGILE

11/100-~~1~~ passing No. 10 sieve.
27/Soils in UST, MR, ARID, BOR. or XER suborders, great groups, or subgroups, rate one class better.
XVI/If the soil is easily damaged by "se or disturbance, rate "SEVERE-FRAGILE."

§603.03-6 Waste management.

(a) Introduction. The use of organic wastes and wastewater as production resources will result in energy conservation, prevent the waste of these important resources, and prevent problems associated with their disposal. **Where** disposal is the goal, a maximum amount is disposed in a minimum area to hold costs to a minimum; risk of environmental damage is the principal constraint. Where the reuse goal is pursued, a minimum amount is applied **to a** maximum area to obtain the greatest benefit; environmental damage is unlikely.

(1) The nature of the soil is important in the application of organic wastes and wastewater to land as fertilizers and irrigation; it is also important when the soil is used as a medium for treatment and disposal of these wastes. Favorable soil properties are required to prevent environmental damage.

(2) This section contains guides for interpreting soils for use in management of manure and food processing wastes (**§603.03-6(b)**); municipal sewage sludge (**§603.03-6(c)**); wastewater used for irrigation (**§603.03-6(d)**); treatment of wastewater by the slow rate process (**§603.03-6(e)**); treatment of wastewater by overland flow process (**§603.03-6(f)**); treatment of wastewater by rapid infiltration process (**§603.03-6(g)**); and carbonaceous material used as soil conditioner and stabilizer (**§603.03-6(h)**). Wastewater includes municipal and food processing wastewater and lagoon or storage pond effluent. Manure, food processing waste, and municipal sludge may be liquid; however, for the purpose of these guides they are not considered to be wastewater unless the water content is more limiting to rate of application than is the nutrient or biochemical oxygen demand (**BOD**) content.

(3) These guides are for the management of defined classes of organic waste and wastewater, whether or not the objective is treatment and utilization as a crop 1/ production resource (§§603.03-6(b), 603.03-6(c), 603.03-6(d)); treatment without regard to crop needs (§§603.03-6(e), 603.03-6(f), 603.03-6(g)); or land reclamation (§603.03-6(h)). Not considered in these guides, but important in evaluating a site, are location and accessibility of the area, size and shape of the area, and use and management of the treatment area. Geology, hydrology, and climate are considered only to the extent that they are reflected in the kind of soil mapped. Waste quality and rate of application are considered to the extent that they are within the "safe" limits as recommended in such publications as: Application of Sewage Sludge of Cropland--Appraisal of Potential Hazards of the Heavy Metals to Plants and Animals, November 1976, MCD-33, EPA 430/9-76-013; Municipal Sludge Management--Environmental Factors, October 1977, MCA-28, EPA 430/9-77-044; Criteria for Classification of Solid Waste Disposal Facilities and Practices, EPA, in Federal Register, Vol. 44, No. 179, September 13, 1979, pp. 53460-53464; and Process Design Manual for Land Treatment of Municipal Wastewater, October 1977, EPA 625/1-77-008, or within regulatory guidelines adopted by the individual state(s) if the state regulation is more restrictive.

1/ The type of crop that can be grown and its utilization for human or animal consumption may be specified by local, state, or county health regulations.

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603.03-6(b)

(b) Manure and food processing waste. See table 603-38. Manure is excrement-of livestock and poultry. The consistency of manure is labile; it changes in storage or treatment, and it depends upon bedding used and upon whether the manure is diluted or allowed to dry. Food processing wastes consist of damaged fruit and vegetables and the peelings, stems, leaves, pits, and soil particles removed in food preparation. Most wastes produced in milk, cheese, and meat processing are liquids. Paunch manure is a" exception.

(1) Manure and food processing wastes have variable nitrogen content. The material is either solid, slurry, or liquid. If a high nitrogen content is present, it limits the application rate. Toxic or otherwise dangerous wastes, such as those mixed with lye used in food processing, are outside the meaning of manure and food processing wastes as used in this guide.

(2) The soil properties and features considered are those that affect soil absorption, plant growth, microbial activity, susceptibility to wind or water erosion, and the rate and method of application of wastes. Soil properties that affect absorption are permeability, depth to a high water table, sodium adsorption ratio, depth to bedrock or a cemented pa", and the available water capacity. Soil reaction, sodium adsorption ratio, salinity, and bulk density are soil properties that affect plant growth and microbial activity. Wind erodibility group, erosion factor, slope, and susceptibility to flooding are used to measure the potential for wind and water erosion. Stones and depth to a high water table can interfere with application of the waste. Permanently frozen soils are not suited to treating wastes.

(3) The soil rating guideline is based on utilizing the nutrients in the waste for crop production and is not directed toward reclaiming or restoring critical areas or making most efficient use of moisture. Application can be by tank wagon or conventional irrigation methods modified as necessary to function properly using liquid wastes or by surface or subsurface application of solid and slurry wastes.

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603.03-6(b)(3)

Table 603-38. Manure and food processing waste.

PROPERTY	LIMITS			RESTRICTIVE FEATURE
	SLIGHT	MODERATE	SEVERE	
1. USDA TEXTURE	---	---	ICE	PERMAFROST
2. PERMEABILITY (IN/HR) (0-60")	---	---	>6	POOR FILTER
3. DEPTH TO HIGH WATER TABLE (FT)	>3.0 ---	1.5-3.0 ---	>1.5 +	WETNESS PONDING
4. SLOPE (PCT)	<8	8-15	>15	SLOPE
5. DEPTH TO BEDROCK (IN)	>20	10-20	<10	DEPTH TO ROCK
6. DEPTH TO CEMENTED PAN (IN)	>20	10-20	<10	CEMENTED PAN
7. SODIUM ADSORPTION RATIO (GREAT GROUP) (0-20")	---	---	>12 SODIUM, CALIC, I ALKALI PHASES)	EXCESS SODIUM
8. SALINITY (MMHOS/CM)	<4	4-8	>8	EXCESS SALT
9. FLOODING	NONE RARE	OCCAS	FREQ	FLOODING
10. FRACTION >3 IN (WT PCT) (SURFACE LAYER)	<15	15-35	>35	LARGE STONES
11. SOIL REACTION (pH) (SURFACE LAYER)	<3.6	<3.6	---	TOO ACID
12. EROSION FACTOR (K x % SLOPE) (SURFACE LAYER)	<3	3-7	>7	ERODES EASILY
13. WIND ERODIBILITY GROUP	3, 4, 4L, 5, 6, 7, 8	1, 2	---	/SOIL BLOWING

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603.03-6(c)

(c) Municipal sewage sludge. See table 603-39. Municipal sewage sludge as used here is the residual product of the treatment of municipal sewage. The solid component is composed mainly of cell mass, 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.

(1) **Municipal** sewage sludges have variable nitrogen content. Some sludge contains 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.

(2) The water content of sludge ranges from about 98 percent to about 40 percent or less. The sludge is called liquid above about 90 percent water, slurry from about 90 to **50** percent water, and solid below about 50 percent water. Depending on the water content, the sludge can be moved by pump, conveyor, **or** auger.

(3) The soil properties and features considered in rating the degree of limitation are those that affect soil **absorption**, plant growth, microbial activity, susceptibility to wind or water erosion, and rate and method of application. Soil properties that affect absorption are permeability, depth to a high water table, soil reaction, sodium adsorption ratio, salinity, and bulk density. These soil properties also affect plant growth and microbial activity. Wind erodibility group, erosion factor, **slope, and** susceptibility to flooding are used to measure the potential for wind and water erosion. Stones and depth to a high water table can interfere with application of the wastes. Permanently frozen soils are not suited to treating wastes.

(4) The soil rating guideline is based on utilizing the nutrients in the waste for crop production and is not directed toward reclaiming or restoring critical areas or making most efficient use of moisture. Application can be by tank wagon or by irrigation type equipment modified as necessary to function properly using slurry sludge or by surface or subsurface application of solid and slurry sludges.

Table 603-39. Municipal sewage sludge.

PROPERTY	LIMITS			RESTRICTIVE FEATURE
	SLIGHT	MODERATE	SEVERE	
1. FROZEN SOIL	---	---	ICE	PERMAFROST
2. PERMEABILITY (IN/HR) (0-60")	2.0-6.0	0.6-2.0	0.6 6.0	PERCS SLOWLY POOR FILTER
3. DEPTH TO HIGH WATER TABLE (FT)	3.0	1.5-3.0	1.5 +	WETNESS PONDING
4. SMPE (PCT)	8	8-15	15	SLOPE
5. DEPTH TO BEDROCK (IN)	40	20-40	20	DEPTH TO ROCK
6. DEPTH TO CEMENTED PAN (IN)	40	20-40	20	CEMENTED PAN
7. SODIUM ADSORPTION RATIO (GREAT GROUP) (0-20")	---	---	12 (NATRIC, HALIC. ALKALI PHASES)	EXCESS SODIUM
8. SALINITY (MMHOS/CM) (0-20")	4	4-8	2	EXCESS SALT
9. FLOODING	NONE	RARE	COMMON	FLOODING
10. BULK DENSITY (G/CC) (0-40")	1.7	1.7	---	ROOTING DEPTH
11. CATION EXCHANGE CAPACITY (AVE MEG/100/G) (0 to 20")	15	5-15	5	LOW ADSORPTION
12. AVAILABLE WATER CAPACITY (IN) (0-60")	6	3-6	3	DROUGHTY
13. FRACTION 3 IN (WT PCT) (SURFACE LAYER)	15	15-35	35	LARGE STONES
14. SOIL REACTION (pH) (SURFACE LAYER)	6.5	1.6-6.5	3.6	TOO ACID
15. EROSION FACTOR (K x % SLOPE) (SURFACE LAYER)	3	3-7	7	ERODES EASILY
16. WIND ERODIBILITY GROUP	3, 4, 4L, 5, 6, 7, 8	1, 2	---	SOIL BLOWING

603.03-6(d)

(d) Wastewater used for irrigation. See table 603-40. The wastewater considered is from municipal wastewater and food-processing plants, lagoons, and storage ponds.

(1) Municipal wastewater is the waste stream from a municipality. It contains domestic waste and in some areas includes industrial waste. It may be untreated, although this is rare, or it may be wastewater which has received primary or secondary treatment. Food-processing wastewater is the wastewater resulting from the preparation for public consumption of **fruits**, vegetables, milk, cheese, and meats. In some places it is high in sodium and chloride. Lagoon and storage pond effluents as discussed here refer to the effluent from facilities used to treat or store domestic wastes, wastewater from food processing, or liquid animal wastes. The effluent from a municipal or food-processing plant lagoon or storage pond commonly is very low in carbonaceous and nitrogenous matter. Nitrogen content ranges from 10 to 30 **mg/l**. The effluents from animal waste treatment lagoons or storage ponds have much higher concentrations of these materials, mainly **because** the manure has not been diluted **as** much as domestic wastes. Nitrogen content varies considerably but generally is from 50 to 2,000 **mg/l**.

(2) Some wastewater may cause an increase in sodicity or salinity in the soils in arid and semiarid regions, but this generally is not a problem in humid regions. The heavy metal contents of effluents are usually low; however, chemical analyses should be made prior to use.

(3) Soil properties and features are listed that need consideration in the design, construction, **management**, and performance of wastewater irrigation systems. The soil properties important in design and management are sodium adsorption ratio, depth to a high water table, the available water capacity, permeability, wind erodibility, erosion factor, slope, and flooding. Soil properties or features that influence construction are stones, depth to bedrock or a cemented pan, and depth to a high water table. The properties that affect performance of the **irrigation** system are depth to bedrock or a cemented pan, 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 adsorb heavy metals. Permanently frozen soils are not suited to irrigation.

(4) The soil rating guideline is based on utilizing the water for crop production and is not directed toward only the disposal or **treatment** of the wastewater. Checks should be made to ensure that heavy metals and nitrogen are not added in excessive amounts.

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603.03-6(e)

(e) Treatment of wastewater by the slow rate process. See table 603-41. This is the process by which wastewater is applied to the land at a rate normally between 0.5 and 4.0 inches per week. The primary purpose is wastewater treatment rather than irrigation of crops. Application rates commonly exceed that needed as supplemental irrigation for crop production. The applied wastewater is treated as it moves through the soil. Much of the treated water percolates to the ground water, and some enters the atmosphere by evapotranspiration. Surface runoff of the applied water generally is not allowed. Waterlogging is avoided either through control of the application rate or the use of tile drains, or both.

(1) The wastewater considered includes municipal wastewater and effluent food-processing plants, lagoons, and storage ponds. Municipal wastewater is the waste stream from a municipality. It contains domestic waste and possibly industrial waste. It may be untreated sewage, although this is rare, or may be wastewater which has received primary or secondary treatment. Food processing wastewater is the wastewater resulting from the preparation for public consumption of fruits, vegetables, milk, cheese, and meats. In some places it is high in sodium and chloride. Lagoon and storage pond effluents as discussed here refer to the effluent from a facility used to treat or store food-processing wastewater, domestic wastes, or animal wastes. Domestic and food-processing **wastewater** is very dilute, and the effluent from facilities treating or storing it commonly is very low in carbonaceous and nitrogenous matter. Nitrogen content ranges from 10 to 30 **mg/l**. Lagoons or storage ponds for animal wastes 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 generally is from 50 to 2,000 **mg/l**. Heavy metal content generally is low; however, chemical analyses **should** be made prior to use.

(2) The soil properties and features considered in rating the degree of limitation are those that affect soil absorption, plant **growth**, microbial activity, susceptibility to wind or water erosion, and application of wastes. Properties that affect absorption are sodium adsorption ratio, depth to a high water table, the available water capacity, permeability, depth to bedrock or a cemented pan, soil reaction, cation exchange capacity, and slope. Soil reaction, sodium adsorption ratio, salinity, and bulk density are soil properties that affect plant growth and microbial activity. 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 wastes. Permanently frozen soils are not suited to treating wastewater.

(3) The soil rating guideline is based on treating the wastewater and is not directed toward using the water as a **source** of moisture for crop production. However, it is assumed that crops are grown or may be grown as a part of the soil-plant treatment process. Checks should be made to ensure that heavy metals and nitrogen are not added in excessive amounts.

603-126

(430-VI-NSH, July 1983)

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603.03-6(d)(4)

Table 603-40. Wastewater used for irrigation.

PROPERTY	LIMITS			RESTRICTIVE FEATURE
	SLIGHT	MODERATE	SEVERE	
1. USDA TEXTURE	---	---	ICE	PERMAFROST
2. SODIUM ADSORPTION RATIO (GREAT GROUP) (0-20")	---	---	12 (SODIUM, CALIC, ALKALI PHASES)	EXCESS SODIUM
3. SALINITY (MMHOS/CM) (0-20")	4	4-8	8	EXCESS SALT
4. SLOPE (PCT) SURFACE SPRINKLER	3 6	3-8 6-12	8 12	SLOPE
5. DEPTH TO HIGH WATER TABLE (FT)	3	1.5-3.0	1.5 +	
6. DEPTH TO BEDROCK (IN)	40	20-40	20	
7. DEPTH TO CEMENTED PAN (IN)	40	20-40	20	
8. PERMEABILITY (IN/HR) (0-60")	0.2-2.0 ---	0.06-0.2 ---	0.06 6	
9. AVAILABLE WATER CAPACITY (IN) (0-60")	6	3-6	3	
10. FRACTION 3 IN (WT PCT) (SURFACE LAYER)	15	15-35	3	
11. FLOODING	RARE	OCCASIONAL	FREQUENT	
12. EROSION FACTOR (K x % SLOPE) (SURFACE LAYER)	2	2-4	4	
13. WIND ERODIBILITY GROUP	4, 5, 6, 7, 8	3, 4L		
14. BULK DENSITY (G/CC) (0-40")	1.7	1.7		
15. SOIL REACTION (pH) (SURFACE LAYER)	6.5	3.6-6.5		
16. CATION EXCHANGE CAPACITY (AVE MEQ/100 G) (0-20")	15	5-15		

Table 603-41. Treatment of wastewater by the slow rate process:

PROPERTY	LIMITS			RESTRICTIVE FEATURE
	SLIGHT	MODERATE	SEVERE	
1. USDA TEXTURE	---	---	ICE	PERMAFROST
2. SODIUM ADSORPTION RATIO (GREAT) (GROUP) (0-20")	---	---	12	EXCESS SODIUM (NATRIC, HALIC, ALKALI PHASES)
3. SALINITY (MMHOS/CM) (0-20")	4	4-8	8	EXCESS SALT
4. SLOPE (PCT) SURFACE SPRINKLER	3 6	3-8 6-12	8 12	SLOPE SLOPE
5. DEPTH TO HIGH WATER TABLE (FT)	3 ---	1.5-3 ---	1.5 +	WETNESS PONDING
6. PERMEABILITY (IN/HR) (0-60")	0.6-6.0 ---	6.0-20 0.06-0.6	20 0.06	POOR FILTER PERCS SLOWLY
7. DEPTH TO BEDROCK	60	40-60	40	DEPTH TO ROCK
8. DEPTH TO CEMENTED PAN (IN)	60	40-60	40	CEMENTED PAN
9. AVAILABLE WATER CAPACITY (IN) (0-60")	6	3-6	3	DROUGHTY
10. FLOODING	NONE	RARE	COMMON	FLOODS
11. BULK DENSITY (G/CC) (0-40")	1.7	1.7	---	ROOTING DEPTH
12. FRACTION 3 IN (WT PCT) (SURFACE LAYER)	15	15-35	35	LARGE STONES
13. SOIL REACTION (pH) (SURFACE LAYER)	6.5	3.6-6.5	3.6	TOO ACID
14. CATION EXCHANGE CAPACITY (AVE MEQ/1000) (0 to 20")	15	5-15	5	
15. EROSION FACTOR (K x % SLOPE) (SURFACE LAYER)	2	2-4	4	ERODES EASILY
16. WIND ERODIBILITY GROUP	3, 4, 5 4L, 5	1, 2	6, 7, 8	SOIL BLOWING

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603.03-6(f)

(f) Treatment of wastewater by the overland flow process. see table 603-42. In this process, wastewater 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 generally is 150 to 300 feet. Application rates range from 2.5 to 16 inches per week. The wastewater loses solids and nutrients to plant and soil surfaces as it flows downslope in a thin film. Most of the water reaches the collection ditch; some is lost by **evapotranspiration**, and a small part percolates to the ground water.

(1) The wastewater considered is from municipal wastewater and food-processing plants, lagoons, and storage ponds. Municipal wastewater is the waste stream from a municipality; it contains domestic waste and possibly industrial waste. It may be raw sewage (untreated), although this is rare, or it may be wastewater which has received primary or secondary treatment. Food-processing wastewater is the wastewater resulting from the preparation for public consumption of fruits, vegetables, milk, cheese, and meats. In some places it is high in sodium and chloride. Lagoon and storage pond effluents, as discussed here, refer to the effluent from a lagoon or storage pond used to treat or store food processing wastewater, domestic wastes, or animal wastes. Domestic wastes are very dilute, and the effluent from a facility treating them commonly is very low in carbonaceous and nitrogenous matter. Nitrogen content ranges from 10 to 30 **mg/l**. Lagoons and storage ponds treating animal wastes 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 generally is from 50 to 2,000 **mg/l**. Heavy metal content generally is low; however, chemical analyses should be made prior to use.

(2) The soil properties considered in rating the degree of limitation are those that affect absorption, plant growth, microbial activity, and design and construction of site. Properties that affect adsorption are soil reaction and cation exchange capacity. Soil reaction, salinity, and sodium adsorption ratio are soil properties that affect plant growth and microbial activity. Slope, permeability within a depth of about 30 inches, depth to a high water table, flooding, depth to bedrock or a cemented pan, and stones are soil properties that influence design and construction. Permanently frozen soils are not suited to treating wastewater.

(3) The soil rating guideline is based on treating the wastewater and is **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. Wastewater generally is applied by sprinkler or surface application methods.

Table 603-42. Treatment of wastewater by the overland flow process.

PROPERTY	LIMITS			RESTRICTIVE FEATURE
	SLIGHT	MODERATE	SEVERE	
1. USDA TEXTURE	---	---	ICE	PERMAFROST
2. SLOPE (PCT)	1-8	0-1, 8-12	12	SLOPE
3. PERMEABILITY (IN/HR) (30-60")	0.2	---	0.2	/SEEPAGE
4. DEPTH TO BEDROCK (IN)	60	40-60	40	DEPTH TO ROCK
5. DEPTH TO HIGH WATER TABLE (FT)	3	1.5-3.0	1.5 +	WETNESS
6. FLOODING	NONE	RARE	COMMON	FLOODING
7. FRACTION 3 IN (WT PCT) (0 to 40")	15	15-35	35	LARGE STONES
8. SOIL REACTION (pH) (SURFACE LAYER)	6.5	3.6-6.5	3.6	TOO ACID
9. DEPTH TO CEMENTED PAN (IN)	60	40-60	40	CEMENTED PAN
10. SODIUM ADSORPTION RATIO (GREAT GROUP) (0-20")	---	---	12 (NATRIC, HALIC, ALKALI PHASES)	EXCESS SODIUM
11. SALINITY (MMHOS/CM) (0-20")	8	8-16	16	EXCESS SALT
12. CATION EXCHANGE CAPACITY (AVE MEW 100 0) (0-20")	15	5-15	5	LOW ADSORPTION

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603. 03- 6(g)

(g) Treatment of wastewater by the rapid infiltration process. See table 603-43. In rapid infiltration, the wastewater is applied in a level basin and **percolates** through the soil. The treated-water eventually reaches the ground water. **Application** rates range from 4 to 120 inches per week.

(1) Because thickness of soil material needed for proper renovation of the wastewater, is more than 72 inches, geologic and hydrologic investigations during the planning stages are needed to ensure proper design and to determine reliability of performance as well as the potential for pollution of the ground water.

(2) The wastewater considered generally is from municipal **wastewater** treatment plants. Nitrogen content generally is low. Normally, heavy metal content is low; however, chemical analysis should be made prior to use.

(3) The soil properties that influence risk of pollution, design and construction, and performance are major considerations. Depth to a high water table, flooding, and depth to bedrock or a cemented pan present a potential hazard and influence design and construction. Slope and stones are also important considerations in design **and** construction. Properties that influence performance are permeability and soil reaction. Permanently frozen soils are not suited to treating wastewater.

(4) The soil rating guideline is based on treating the wastewater and is not directed toward using the water as a source of moisture for crop production. **Vegetation** is not a necessary part of the treatment process; hence, the basins may or may not be vegetated.

Table 603-43. Treatment of wastewater by the rapid infiltration process.

PROPERTY	TS			RESTRICTIVE FEATURE
	SLIGHT	MODERATE	SEVERE	
1. FROZEN SOIL	—	—	ICE	PERMAFROST
2. SLOPE (PCT)	3	3-6	6	SLOPE
3. PERMEABILITY (IN/RR) (20-72")	2-20	0.6-2 20	0.6 ---	PERCS SLOWLY POOR FILTER
4. DEPTH TO HIGH WATER TABLE (IN)	---	—	72 ^{1/}	WETNESS
5. DEPTH TO BEDROCK (IN) FLOODING	---	---	72 ^{1/}	DEPTH TO ROCK FLOODING
6. DEPTH TO CMENTED PAN (IN)	—	---	72	CEMENTED PAN
7. FRACTION 3 IN (WT PCT) (0-40")	15	15-35	35	LARGE STONES
8. SOIL REACTION (pH)	3.6	3.6	---	TOO ACID

^{1/} Weighted average to 40 inches.

Part 603 - Application of Soil Information

603.03-6(h)

(h) Carbonaceous materials used as a 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 generally are very low in nitrogen. These wastes are solid, and some can be spread by using blowers.

(1) A specific guideline table has not been prepared for rating soils for the utilization of these materials 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. Practices are 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, in the future will 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 does **not** exceed the regulatory guidelines adopted by the Federal Government (**Criteria for Classifications of Solid Waste Disposal Facilities and Practices, EPA, in Federal Register, Vol 44, No. 179, September 13, 1979, pp. 53460-53464**) or by the individual state(s), if the state regulation is more restrictive.

(2) Soils vary widely **in the** extent to which their tilth can be improved by the addition of organic materials. In general, more benefits are gained by applying organic materials to--

- Soils that are low in organic matter;
- Sandy soils, to improve the available water capacity and reduce soil erosion;
- Clayey soils, to improve tilth, reduce **cloddiness**, and reduce the energy required in **tillage**; and
- Silty and sandy soils that have a very low content of clay, to reduce soil compaction.

(3) If the organic waste is very low in nitrogen, less than about 1.2 percent dry weight, its decomposition in the soil commonly results in the tie-up of soil nitrogen in's form unavailable to crops **for a** period of several months. This is caused by the competition of the soil microflora and the crop for the nitrogen present. If crops are to be grown, additional nitrogen generally is needed to raise the average nitrogen content of the organic material from to 1.2 to 1.5 percent dry weight or more. Thus, more nitrogen is required than if the organic material had not been applied.

Appendix C:

Source: Soil-Water States for Select Soils
in the Northeast Region

SOIL-WATER STATES

FOR

SELECT SOILS

IS THE

NORTHEAST REGION

by

Loyal A. Quandt
Soil Correlator
Northeast Regional Technical Center

and

Robert B. Grossman
Soil Scientist
National Soil Survey Laboratory

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WATER INFORMATION SHEET FOR THE SOIL SURVEY
by Robert B. Grossman and Loyal A. Quandt

INTRODUCTION

A water information sheet is being developed by a National committee of the 1983 National Soil Survey Conference. The purpose is to assemble in one place information on water related characteristics.

The front side of the sheet pertains to the soil series. The backside pertains to a mapping concept (usually the naming phase of a map unit) plus an important use of this mapping concept. This combination of mapping concept and soil use is called an annual use sequence. For the example (see item 6 in upper right corner on backside), the naming phase of the map unit is Charlton fine sandy loam, 3 to 8 percent slopes. The use specified is corn silage-hay with conventional tillage. (other important uses of the same naming phase of the map unit would require additional pages.) Specification of soil use is necessary because without it, we cannot establish the near surface water transmission properties (infiltration for example), or the pattern of water states (dry, moist, wet).

COMPONENTS OF THE SHEET

Item 1

This is the soil series to which the information on the first page pertains.

Item 2

This is a water balance diagram based on monthly normal precipitation and evapotranspiration; the latter by the Thornthwaite method. A large number of these monthly normal values are in computer storage and the diagram can be generated by computer. The procedure was developed by John Thompson. The station selected should be central to the occurrence of the soil series. Here the Mansfield Hollow Lake, Tolland Country, Connecticut station was used.

Item 3

A computer program was developed by Franklin Newhall to describe the water regime of soils in terms of the various water regime criteria in the USDA "Soil Taxonomy" system. The program uses the same monthly precipitation and evapotranspiration values as does item 2.

Item 4

The data in the upper set of rows is for a specific pedon. Emphasis is on

estimation of retention at 1 and 10 kPa is based on calculation of the air-filled porosity at 33 kPa retention and addition of a portion of this porosity to the water volume at 33 kPa. In item 8, we will be concerned with water state classes (Dry, Moist, and Wet). The water contents at 1500 kPa is the boundary between Dry and Moist, and 1 kPa separates Moist and Wet. A tension of 200 kPa has been selected as approximating where many intertilled crops would show stress, and a further separation of the moist classes as shown in item 8. For most crops there is a critical period when highly moist level is needed (figure 1).

Item 5

This is reference information for items 1-4.

Item 6

This gives the annual use sequence as previously discussed. All the information on this side of the sheet pertains to this combination of mapping concept plus use.

Item 7

Part A gives rooting depths at physiological maturity (figure 2) for the specified plant(s) (figure 3) in the annual use sequence (here cotton silage-hay, figure 4). Two depths are considered: (1) the boundary between common and few roots and (2) the base of few roots or approximately the depth of rooting.

Part B gives the centimeters of water between the suction specified from the soil surface to the base of common roots and from the surface to the base of few roots (figure 5). The intent is to link between laboratory water (figure 6) retention measurements (see item 4) and rooting depth information for a specific soil use. For annuals such as corn silage, only part of the water in the zone of few roots is considered to be available. For perennials, all of the water is considered available.

Part C is where information on water movement into and within the tillage zone and ear surface is recorded. We assume that water transmission would change with soil use.

For most crops there are critical periods in the growing season when a high moisture level must be maintained for high yields. If there is enough moisture for germination and for the development of an adequate stand, the critical period almost always occurs in the latter part of the season when the crop is approaching harvest. The critical period for a number of commonly irrigated crops is shown in the following list,

- Potatoes Blossom to harvest.
- Melons . . . * . . . * Blossom to harvest.
- Sweet corn Tasseling through silking.
- Tobacco Knee-high to blossom.
- Cotton First bloom through boll-maturing stage.
- Strawberries Fruit development to ripening.
- Field corn Tasseling through silking.
- Sugar beets 3 to 4 weeks after emergence.
- Small grain Boot to heading stage.
- Pasture After grazing.
- Alfalfa Start of flowering and after cutting.
- Orchard Fruit development.

Figure 1 Critical periods for Crops

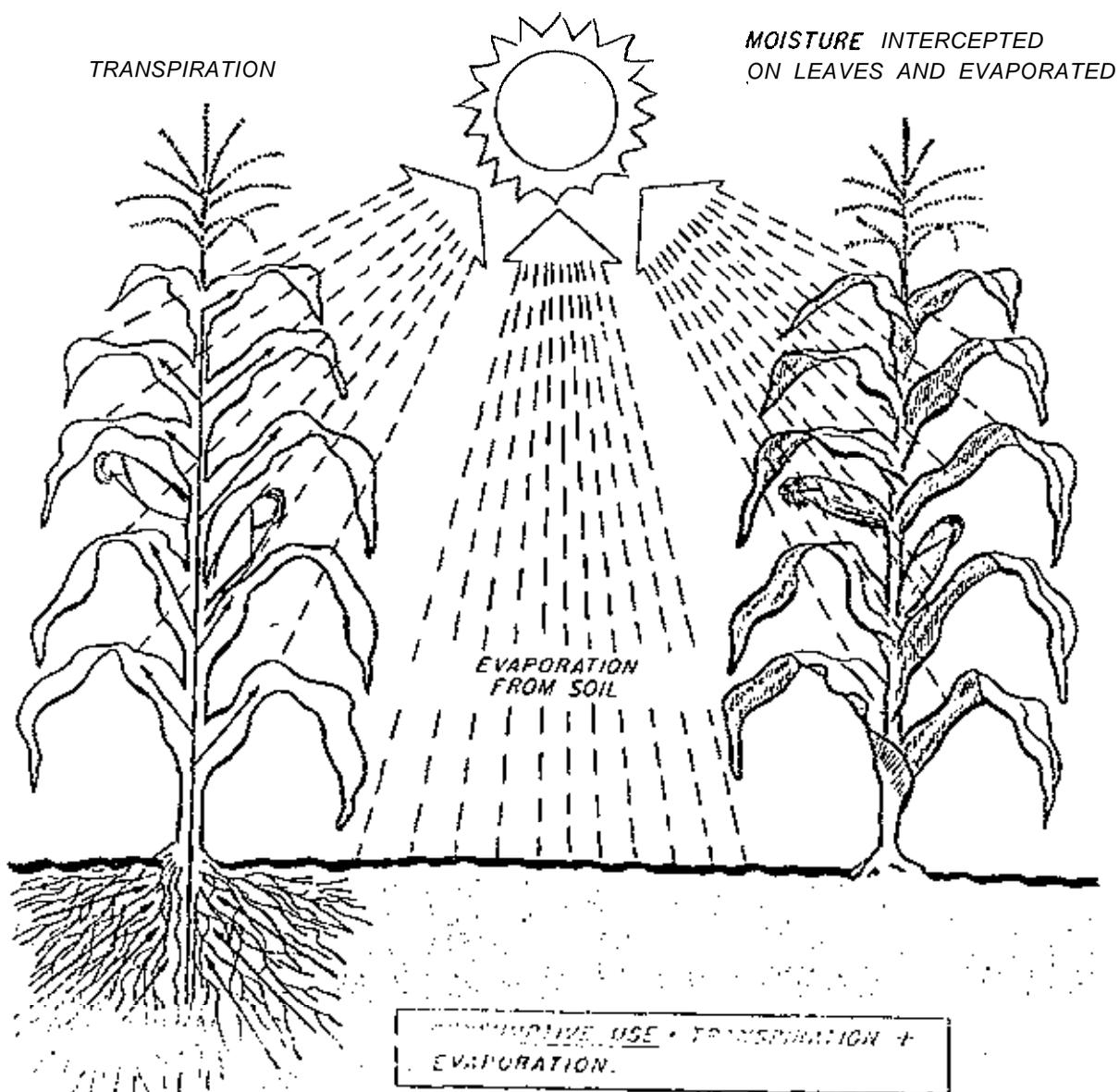


Figure 2 Diagram of physiological maturity for specified crops

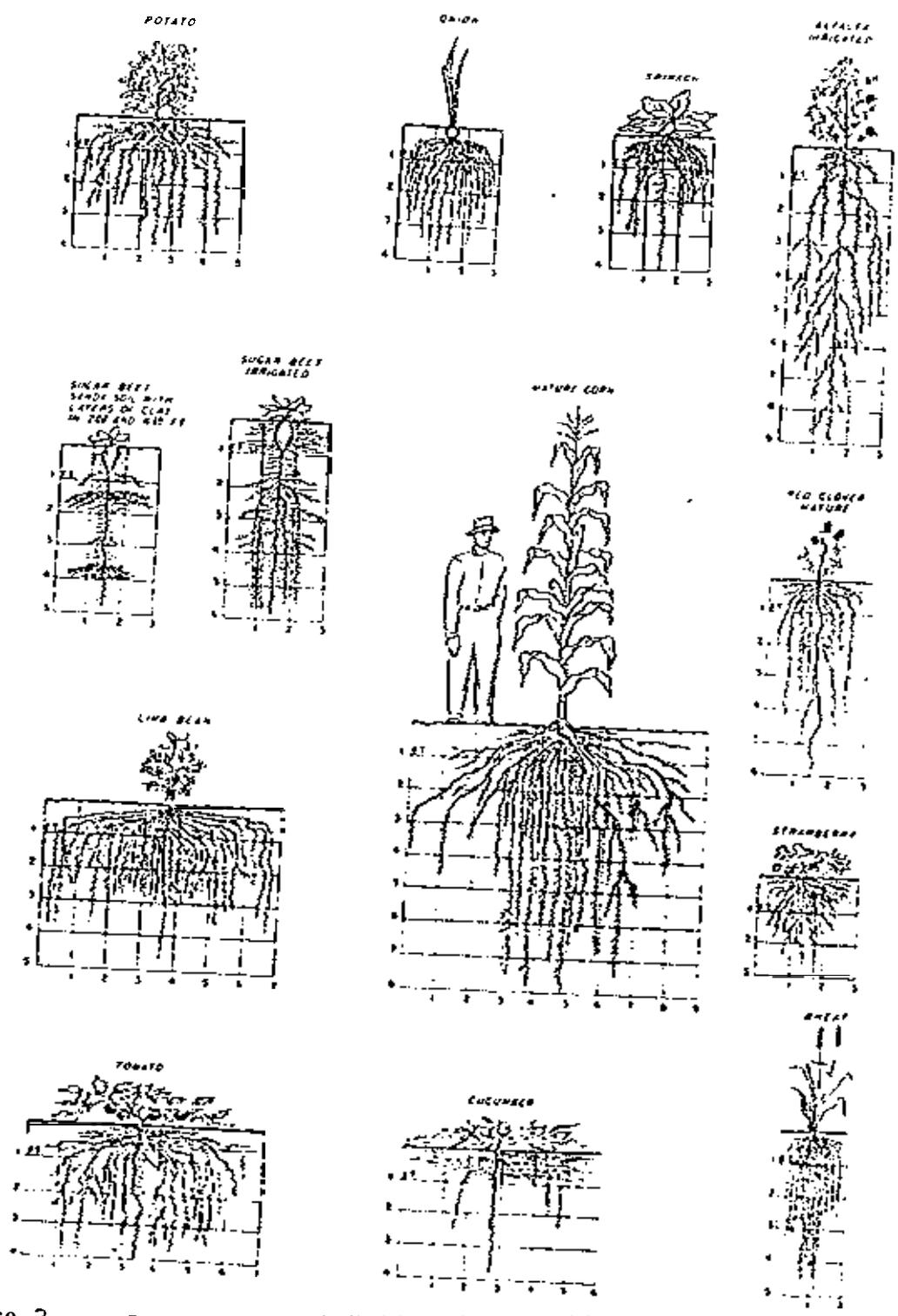
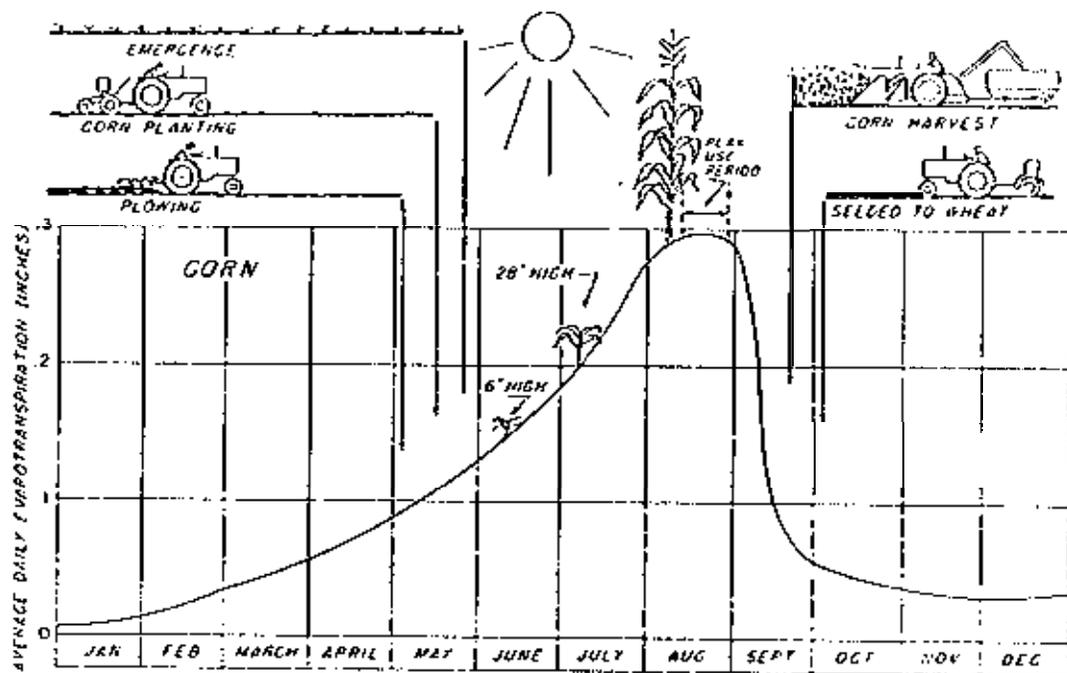
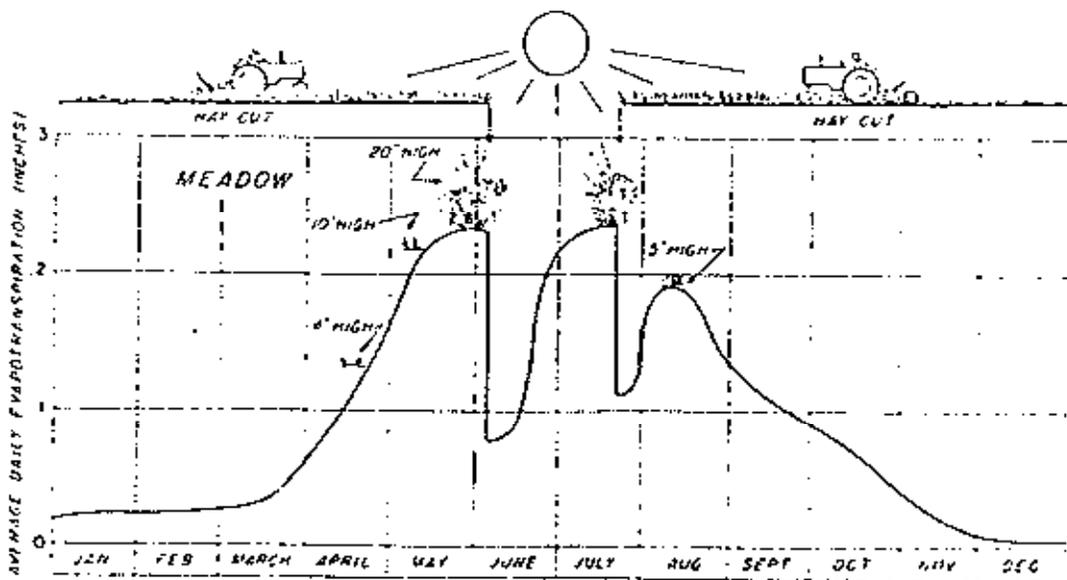


Figure 3 --Root systems of field and vegetable crops



CONSUMPTIVE USE FOR YEAR 1953 WITH CORN, FOLLOWED BY WINTER WHEAT UNDER IRRIGATION ON LYSIMETER #107C AT THE SOIL AND WATER CONSERVATION RESEARCH STATION, COSHOCTON, OHIO.



CONSUMPTIVE USE FOR YEAR 1953 WITH IRRIGATED 4-YEAR MEADOW OF ALFALFA, REC 6 WHEN TIMING ON LYSIMETER #107C AT THE SOIL AND WATER CONSERVATION RESEARCH STATION, COSHOCTON, OHIO.

Figure 4 -- Average daily consumptive use for irrigated corn and meadow at Coshocton, Ohio. (From Harrold, L. L., and Dreitelbis, F. R. Evaluation of Agricultural Hydrology by Monolith Lysimeters, 1944-55. U.S. Dept. Agr. Tech. Bul. 1179, 166 pp. 1958.)

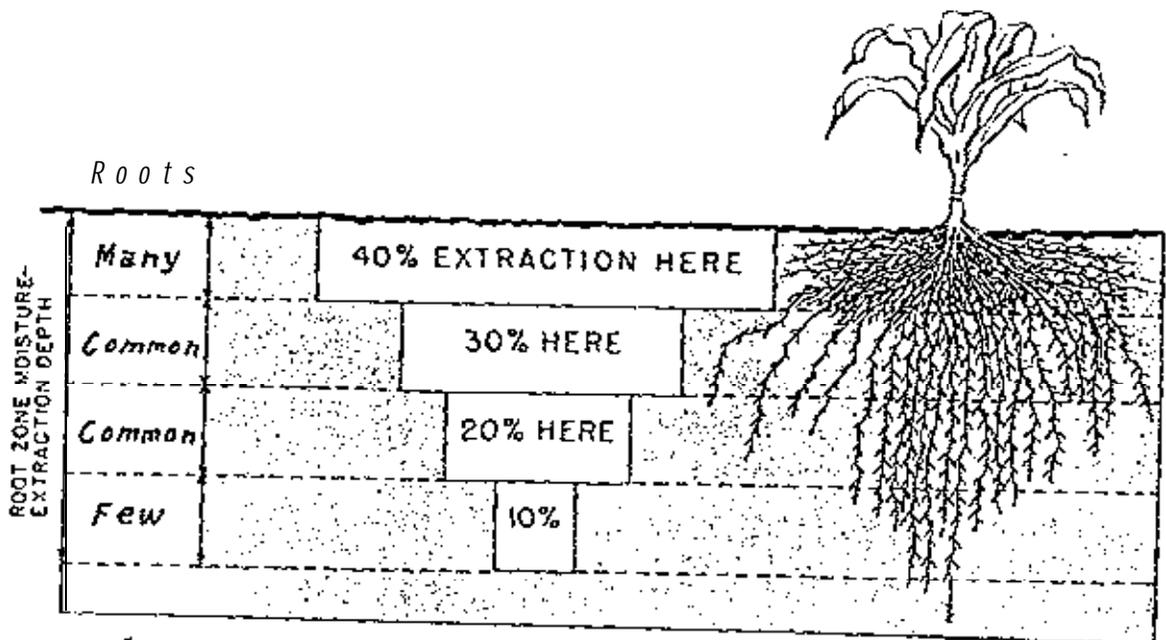


Figure 5 --Average moisture-extraction pattern of plants growing in a soil without restrictive layers and with an adequate supply of available moisture throughout the root zone.

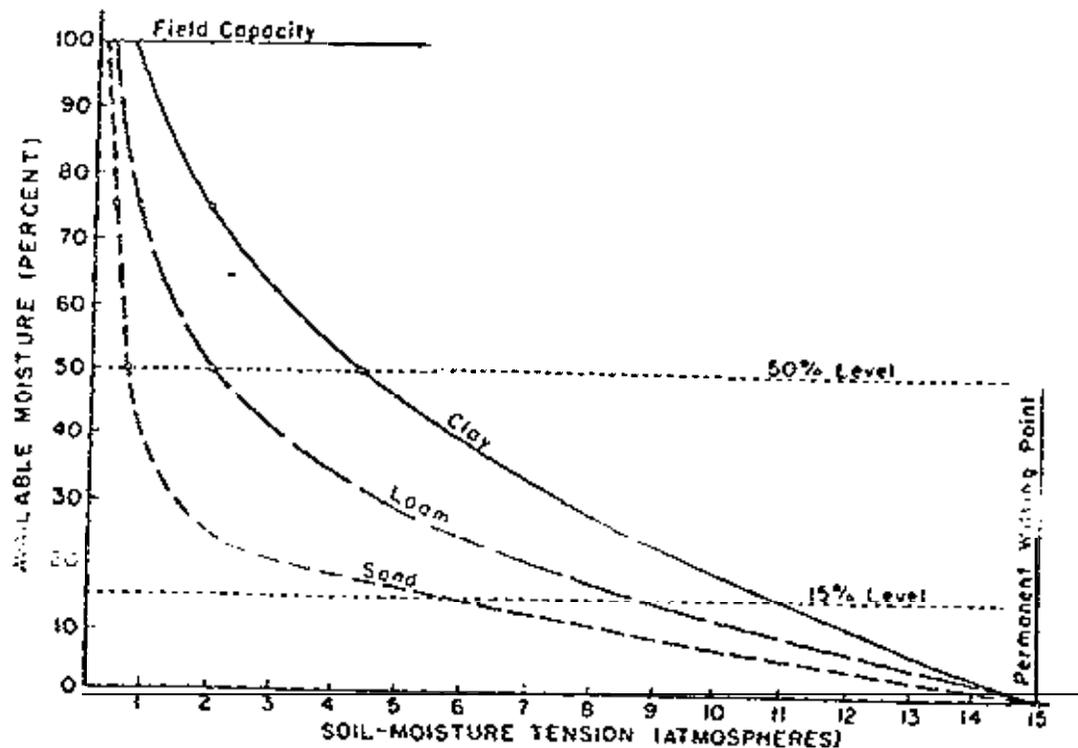


Figure 6.--Moisture-release curves for three soils. (From Thorne, A. D., and Raney, W. A. Soil Moisture Evaluation. U.S. Dept. Agr. ARS 41-6, 14 pp. 1956.)

SOILS

Manor
Matopeake
Cullen
Hazelton
Charlton

SOILS

Rhinebeck
Vergennes
Winooski
Hadley
Bridgehampton

<u>SYMBOL</u>	<u>TENSION</u>	<u>SYMBOL</u>	<u>TENSION</u>	<u>SYMBOL</u>	<u>TENSION</u>
				Very Dry (DV)	
				-----	10,000 KPa
Dry (D)	1500 KPa	Dry (D)	1500 KPa	Slightly Dry (DS)	
-----		-----		-----	1500 KPa
		Slightly Moist (MS)		Slightly Hoist (MS)	
		-----	200 KPa	-----	200 KPa
Moist (M)				Moderately Moist (MM)	
				-----	33or10 KPa
		very Moist (MV)		Highly Moist (MH)	
-----	1 KPa	-----	1 KPa	-----	1 KPa
Wet (W)		wet-no free water (WN)		Wet-no free water (WN)	
		-----	0 KPa	-----	0 KPa*
		Wet-free water (WA)		Wet-free water (WA)	

*Except high clay content.

The symbol F is for froze" more than half of the month. (PND-FLD refers

Hence, he classes are

DISCUSSION

A few remarks follow about the applications and implications of the water information sheet.

Quality Control

For quality control of water information in a soil survey, we need (1) a widely accepted format for the assembly and reduction of expensive, hard-to-get field measurements and (2) the commitment to paper of estimates of the water regime of soils where they can be subject to evaluation and improvement. Preferably, the format for reduction of hard-to-get field data should be the same as that used for estimates. If the format is the same, it would facilitate use of the data to check and improve our estimates. The water information sheet is designed to meet the needs of our quality control program.

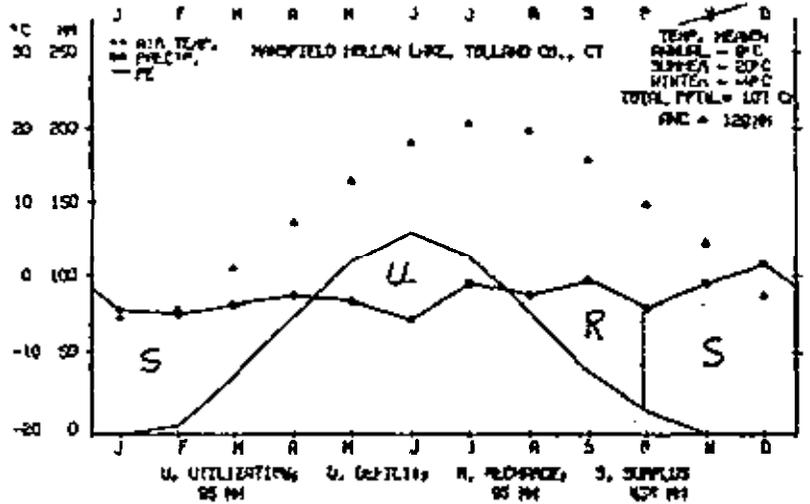
Evaluation by Soil Use

Most agronomic soil questions require that the use of the soil be specified. Reference to a soil series, a phase, or a map unit is commonly not enough. The mapping concepts must be subdivided on the basis of use. Examples would be no-till versus conventional

Other uses could be explored beyond our present standard interpretations. Wetland and prime farmlands might be defined, in part, on **the** pattern of water states. **Heat** capacity, thermal conductivity, shrink-swell, and soil cracking could **be** estimated using the field **water** content estimates. Rooting depth information might be useful **in** formulating both improved estimates of available water capacity and approaches to erosional T estimates. Finally, Curve Number analysis might be a useful index to replace **our** present soil survey runoff classes.

ITEM 2

ITEM 1



Series:
Charlton
Typic Dystrachrepts, coarse-
loamy, mixed, mesic
No. Records:

ITEM 3

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
NORMAL AIR TEMPERATURE DEGREES CELSIUS	-4.4	-3.7	1.6	7.6	13.3	18.3	21.2	20.3	16.2	10.9	4.9	-7.1	8.4
NORMAL POTEN. EVAPOTRANSPIRATION MM EQ ET	0	0	5	37	76	122	152	137	80	41	16	8	616
NORMAL PRECIPITATION MILLIMETERS	81	76	69	79	66	74	98	94	100	82	98	111	1022

SOIL MOISTURE PROBABILITIES TO OBTAINING SOIL MOISTURE REGIME FOR SOIL THERMOMY

PERCENT PROBABILITY	CRITERIA FOR MOISTURE CONTROL SECTION INDEX
1	10 DRY SOME/ALL PARTS REG 76 OR MORE DAYS CUMULATIVELY WHEN SOIL TEMP 5 DEG C OR HIGHER
2	5 DRY SOME/ALL PARTS REG 176 OR MORE OF DAYS CUMULATIVELY WHEN SOIL TEMP 5 DEG C OR HIGHER
3	5 DRY ALL PARTS REG 1/2 OR MORE OF DAYS CUMULATIVELY WHEN SOIL TEMP 5 DEG C OR HIGHER
4	5 DRY ALL PARTS REG 3/4 OR MORE OF DAYS CUMULATIVELY WHEN SOIL TEMP 5 DEG C OR HIGHER
5	100 MOIST SOME/ALL PARTS REG 76 OR MORE DAYS CONSECUTIVELY WHEN SOIL TEMP 5 DEG C OR HIGHER
6	0 DRY ALL PARTS REG 45 OR MORE DAYS CONSECUTIVELY DURING 120 DAYS AFTER SUMMER SOLSTICE
7	100 MOIST ALL PARTS REG 45 OR MORE DAYS CONSECUTIVELY DURING 120 DAYS AFTER WINTER SOLSTICE

ITEM 4

A	B	C	D	E	F	G	H	I	J	K	L
Depth	Water Retention						Hydraulic Conductivity Saturated		Bulk Density	Volume	EC
cm	kPa						cm/day		g/cc	Pct	µmhos/cm
	Vol. Pct										
0-3											
3-15	34	26	18	12	7	19			1.32	2	
15-41	29	22	14	11	7	15			1.44	5	
41-66	28	21	14	9	5	16			1.43	10	
66-112	21	16	11	8	5	11			1.70	15	
112-137	20	13	7	5	3.9	10			1.65	15	
0-20	34			12	7				1.50 ^a	2	
20-50	29			11	7				1.45	7	
50-100	21			8	5				1.65	12	
100-150	20			5	3				1.65	15	
150-200	20			5	3				1.65	15	

^a estimates
^b Estimate for tilled condition after settling due to wetting.

ITEM 5

- Ref. Nos.
- Item 1: Explanation A
 - Item 2: Explanation A Assume fine sandy loam surface horizon texture with 0.16 ANC. Also, 0.13 ANC for second and 0.11 for third horizon. Calculate to 100 cm.
 - Item 3: Explanation A
 - Item 4: Explanation A Pedon 558C7-7-1 in Soil Survey Investigation Report 20, Water retention from Hill, D. E. and Shearin, A. E. 1969. The Charlton Soils Bulletin 705. Connecticut Agricultural Station. Estimate 200 kPa as half way between 33 and 1500 kPa retention. Lower block estimates for depth intervals of Item 8.

ITEM 7

Quantity

A Rooting Depth, cm
 Plants: Corn
 Base Common: 50
 Base Few: 100

B Root-related Retention Difference Sum, cm
 Base Common
 10-200 kPa: 6
 10-1500 kPa: 8
 Base Few
 10-200 kPa: 10
 10-1500 kPa: 11

C Water Movement, cm/day
 Infiltration Rate:
 Intake Rate:
 Surficial Hydraulic Conductivity
 Saturated:
 kPa:

ITEM 6

Annual Use Sequence(s):
 Charlton Fine sandy loam, 3-8 percent slopes: corn silage-hay with conventional tillage.
 Twoflyng Survey(s):
 Tolland County, Connecticut
 Compiler(s):
 Ed Sautter
 Loyal Quandt
 Oliver Rice
 Carl Langlois
 Bob Grossman

ITEM 8

Depth cm	Average = 6 years in 10										Part A Driest 2 years in 10										Wettest 2 years in 10																
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	
0-20	WA	WA	WA	MV	MV	MV	MS	MS	MS	MV	MV	MV	WAWA	WA	MV	MV	MS	MS	D	D	MS	MV	MV	WA	WA	WA	WN	MV	NV	MV	MV	MV	MV	MV	WN	WN	
20-50	WA	WA	WA	WN	MV	MV	MS	MS	MS	MV	MV	MV	WA	WA	WA	WN	MV	MS	MS	MS	MS	MS	MV	MV	WA	WA	WA	WN	MV	WN	WN						
50-100	MV	MV	MV	MV	MV	MV	MS	MS	MS	MV	MV	MV	MV	MV	MV	MV	MV	MS	MS	MS	MS	MV	MV	MV	MV	MV	WN	MV	MV	xv	xv	MV	MV	MV	MV		
100-150	MV	MV	MV	MV	MV	MV	MV	MV	MV	MV	MV	MV	MV	MV	MV	MV	MV	xv	MV	MV	MV	MV	MV	MV	MV	MV	MV	MV	MV	MV	MV	MV	MV	MV	MV		
150-200	MV	MV	MV	MV	MV	MV	MV	MV	MV	MV	MV	MV	MV	MV	MV	MV	MV	MV	MV	MV	MV	MV	MV	MV	MV	MV	MV	MV	MV	MV	MV	MV	MV	MV	MV		
PND-FLD	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:		
Runoff											Part B																										
CN	96	98	96	69	79	79	57	57	57	79	73	73	96	98	96	69	79	62	57	57	57	62	73	73	96	98	96	84	79	79	75	75	75	79	87	87	
Erosion	:	:	:	X	X	:	:	:	:	X	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
Growth	:	:	:	:	:	X	X	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	

ITEM 9

Item 6:
 Two years of corn and 3 years of hay. Grass hay predominately. Moldboard plow late April.
 Disk early May. Plant late May. 50% cover early July. Harvest late September-early October. Cover crop
 of 'ye early October. Pertains to first year of hw.

Item 7:
 Part A - Explanation A Ref. Nos. No adjustment for base of few roots
 Part B - Explanation A
 Part C - Explanation A

Item 8:
 Part A - Explanation A Assume dryness, wetness pertain to growing season.
 Part B - Explanation A Hydrologic Group B. Assume contoured.
 Part C - Explanation A

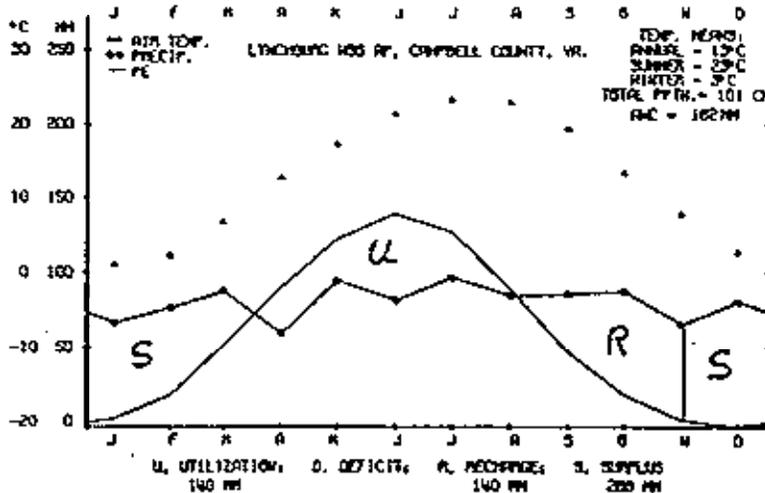
Soil Type: Charlton stony fine sandy loam
 Soil No.: S58Conn-7-1
 Location: Tolland, Tolland County, Connecticut. 0.9 mile southwest of Grant Hill School on the north side of New Road.
 Vegetation: Mainly white oak, hickory, red maple, yellow and black birch and a few white ash; sparse undergrowth of shrubs.
 Slope: 6 percent
 Drainage: Well drained.
 Parent Material: Glacial till, predominantly derived from shist.
 Sampled by: Alexander, Flach, Grossean, Waggoner, Hill, Conway, de Roo, and Shearin.
 Described by: Shearin

Horizon and
 Boltsville
 Lab. Number

- O1 1-1/2 to 1/2 inches. Largely undecomposed leaves and organic debris.
 Not sampled
- O2 1/2 to 0 inches. Partially decomposed litter.
 Not sampled
- A1 0 to 1 inches. Very dark grayish brown (10YR 3/2) and dark brown (10YR 3/2) fine sandy loam; well mottled with fine roots; massive; boundary abrupt.
 S5-43
- B1 1 to 5-1/2 inches. Dark brown (10YR 3/3) fine sandy loam; very weak coarse subangular blocky structure; very friable; coarse skeleton about 10 percent; boundary clear.
 S5-44
- B2 5-1/2 to 16 inches. Dark brown (7.5YR 4/4) fine sandy loam; very weak medium subangular blocky structure; very friable; coarse skeleton 15 to 20 percent; boundary clear.
 S5-45
- B23 16 to 26 inches. Dark yellowish brown (10YR 4/4) fine sandy loam; very weak medium subangular blocky structure; very friable; coarse skeleton about 20 percent; boundary clear.
 S5-46
- C1m 26 to 45 inches. Intermingled olive brown (2.5Y 4/4) and dark grayish brown (10YR 4/2) gravelly sandy loam with pockets of gravelly loamy coarse sand; massive. This horizon consists of firm to very firm discontinuous tongues or pockets of a weak but brittle pan mixed with very friable material in about equal proportions. Silt films are common in the weak pan.
 S5-47
- C2 45 to 54 inches. Olive (5Y 4/3) gravelly coarse sandy loam or gravelly loamy coarse sand; very friable to loose.
 S5-48

ITEM 2

ITEM 1



Series:
 Cullen
 Typic Hapludults, clayey, mixed,
 thermic

No. Records:

ITEM 3

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
NORMAL AIR TEMPERATURE DEGREES CELSIUS	1.5	7.9	11.5	13.3	17.9	22.4	23.5	20.4	13.7	8.4	3.2	1.2	11.2
NORMAL POTENTIAL EVAPOTRANSPIRATION MM IN 24 HRS	2	3	22	34	45	145	231	95	51	22	4	749	
NORMAL PRECIPITATION MILLIMETERS	20	64	92	63	74	55	100	48	81	70	67	84	1000

SOIL MOISTURE PROBABILITIES TO DETERMINE SOIL MOISTURE RESERVE FOR SOIL TANKING

PERCENT PROBABILITY	CRITERIA FOR MOISTURE CONTROL	SECTION ENTER
1	ONE SOIL/FALL PARTS PER 48 OR MORE DAYS CUMULATIVELY	WHEN SOIL TEMP 5 DEG C OR HIGHER
2	ONE SOIL/FALL PARTS PER 4/10 OR MORE OF DAYS CUMULATIVELY	WHEN SOIL TEMP 5 DEG C OR HIGHER
3	ONE ALL PARTS PER 1/2 OR MORE OF DAYS CUMULATIVELY	WHEN SOIL TEMP 5 DEG C OR HIGHER
4	ONE ALL PARTS PER 3/4 OR MORE OF DAYS CUMULATIVELY	WHEN SOIL TEMP 5 DEG C OR HIGHER
5	FOUR SOIL/FALL PARTS PER 74 OR MORE DAYS CONSECUTIVELY	WHEN SOIL TEMP 5 DEG C OR HIGHER
6	ONE ALL PARTS PER 45 OR MORE DAYS CONSECUTIVELY	DURING 120 DAYS AFTER SUMMER SOLSTICE
7	FOUR ALL PARTS PER 45 OR MORE DAYS CONSECUTIVELY	DURING 120 DAYS AFTER WINTER SOLSTICE

SOIL TEMPERATURE RECORD: KCSIC ESTERATED FROM NORMAL AIR TEMPERATURES
 SOIL MOISTURE RECORD: UDBC ESTERATED FROM PROBABILITY VALUES IN CHART 1a to 3a & f
 AND MOISTURE REQUIREMENT AS TYPICAL PART ANGELBOLL

ITEM 4

DEPTH	Water Retention					Hydraulic Conductivity		Bulk Density	Volume	EC
	1	10	33	200	1500	10-1500	Saturated	5kPa	>2mm	
cm	kPa					cm/day		g/cc	Fcc	umhos/cm
	Vol. Pct									
0-10	29	27	25	17	9	18		1.58	20	
10-20	29	27	25	18	12	15		1.73	8	
20-46	46	46	45	39	33	11		1.46	2	
46-72	47	46	43	39	24	12		1.28	2	
72-97	52	51	49	44	38	11		1.28	1	
97-132	52	51	50	44	38	11		1.29		
132-157	50	57	53	36	19	28		0.88		
0-25	29			38	11			1.50	13	
25-50	46			39	33			1.46	2	
50-100	50			42	36			1.28	1	
100-150	56			39	29			1.09	0	
150-200	60			36	19			0.88	0	

a/ Estimate for tilled condition after settling due to wetting.

ITEM 5

Ref. Nos.

Item 1: Explanation A

Item 2: Explanation A Use 0.16 for A.M.C. of surface horizon, Computed for 150 cm depth.

Item 3: Explanation A

Item 4: Explanation A

Pedon S77YA-013-001. Assumed retention 33 kPa for third horizon of 31.3 percent. 200 kPa assumed half way between 33 and 1500 kPa retention. Calculated total porosity for 10 and 1 kPa retention using particle densities adjusted for extractable iron and for organic matter if either or both appreciable. Lower block estimates for depths in Item 8.

Classification: Clayey, kaolinitic, thermic Typic Hapludults
 Soil: Cullen loam NSSL Nos. 78P0214-78P0220
 Pedon No. S77VA 031-1(1-7)
 Location: Campbell County, Virginia. 1/4 miles East

Micro morphology (Method 4B1b): R. D. Yeck - National Soil Survey Laboratory

- S1 Somewhat porous matrix dominated by mineral grains representing all sand sizes. Some light brown rims on ped faces. Small quantities of oriented clay mostly authigenic. A few black fine sand size aggregates.
- B21+ Dense clay matrix flecked with imbedded sand grains. Oriented clay mainly authigenic, some pressure oriented.
- B22+ Dense dark red clayey matrix with imbedded sand grains. Sand grains more concentrated in some areas such more than others. Large quantities of oriented clay skins in channel pores. Also authigenic and pressure oriented clay common.
- C Primarily linearly oriented rock structure. One small area of clay formed in place that includes some translocated clay in channels.

COMMITTEE 3
T FACTOR

Committee Members:

F.L. Gilbert, SCS, NY (Chairman)
R.B. Bryant, Cornell University
M. Crouch, SCS, VA
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R.B. Grossman, SCS, MWNTC
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J.C. Loerch, SCS, WV
H. D. Luce, Univ. of CT
G. Martin, SCS, PA
L.A. Quandt, SCS, NENTC
R.F. Ship, Penn State
Carol A. Wettstein, SCS. MD

Background:

The T factor is the soil loss tolerance of the Universal Soil Loss Equation. It is defined as the maximum rate of annual soil erosion that will permit crop productivity to be sustained economically and indefinitely. This definition plus other guidelines for the T factor are in Section 603 of the National Soils Handbook. During the past year, with the use of computers and the **emphasis** of the 1985 Food Security Act, soil scientists have been taking a closer look at the T factors assigned to soil series. As a result, the guidelines for determining the T factor have been questioned and several states have proposed changing the T factor for many soil series.

Committee Charges:

1. Evaluate the guidelines for assigning the T factor to a soil series in the National Soils Handbook (NSH).
2. Is the definition of renewable and nonrenewable soil in the NSH sufficient? If not how can it be improved?
3. Can observable soil properties be used as criteria to assign T values to a series? If so, what properties?

RECOMMENDATIONS:

1. Charge: Evaluate the guidelines for assigning the T factor to a soil series in the National Soils Handbook (NSH).

The Guidelines are general and clear. It is apparent, however, that the application of these guidelines has not been carried out in good fashion.

It is the committee's recommendation that a computer program be developed that would query data to locate inconsistencies.

2. Charge: Is the definition of renewable and **nonrenewable** soil in the NSH sufficient? If not, **how can** they be improved?

The definition is insufficient and is subject **to** varied interpretations. We suggest that criteria be developed for renewable and nonrenewable subsurface layers followed by specific applications to subsurface layers; **i.e.**, till with bulk densities of 1.8 or greater, saprolite. etc.

3. Charge: Can observable soil properties be used as criteria to assign T values **to** a series? If so. what properties.

Yes. we **believe** observable properties can be used as criteria to assign T values., , **Some** of these properties are:

- a. Depth to rock, saprolite, **coarse** layer, **fragipans**, dense till, clay **pans**, **micaceous** layers, free carbonates. extremely acid or alkaline layers, and other root limiting layers.
 - b. Texture (available moisture).
 - c. Organic matter distribution.
 - d. Soil structure.
 - e. Soil tilth.
 - f. Rock fragments.
4. Terminate this committee.
 5. Continue study of the subject of soil tolerance to erosion but with a new committee. Focus the committee as follows:

Explore a new system in addition to the present that would indicate soil fragility. The system would **use** existing data. To this end, we recommend that the conference structure a committee to explore a fragility index based upon readily available records. We further recommend that the committee consider all available research in devising a fragility index. Several proposals have been published. The fragility index should consider various planning horizons, the years that the soil would be used for production. The new quantities should be presented in such a way that they would **not** be confused with the current "T" values.

TASK FORCE 1

SOILS OF THE NORTHEASTERN STATES

Chairman: Edward Ciolkosz. Pennsylvania State Univ., PA

Vice Chairman: Everett C. Stuart, SCS. RI

Task Force Members:

Christine Evans, Univ. of New Hampshire, NH
Richard L. Hall, SCS, DE
William E. Jokela, University of Vermont, VT
Garland H. Lipscomb, SCS, PA
Niles A. McLoda, SCS, VA
Walter E. Russell, FS. WI
Ed Sautter, SCS, CT

Background

Bulletin 848, of the Pennsylvania Agricultural Experiment Station, Soils of the Northeastern United States, was published in 1984. Conittee 4 of the 1984 Northeast Cooperative Soil Survey Conference suggested that an additional report be prepared that would provide interpretations for the map units on the General Soil Map in Bulletin 848. This has not been done. The supply of Bulletin 848, Soils of the Northeastern United States, has diminished to the extent that if an interpretative report were prepared, there would be no publication to go with it. Additionally, SCS is requiring all states to prepare a state general soil map (STATSCO) at a scale of 1:250,000. This map will be available with some interpretive material.

Task Force Considerations: (Charges)

1. Does the proposed interpretative report (to supplement Bulletin 848) overlap, conflict, or duplicate information that will be prepared by the STATSCO map?
2. Should Bulletin 848 be reprinted?
3. Should Bulletin 848 be reprinted with revisions?
4. Should Bulletin 848 be replnted with interpretations?
5. If revisions and additions of interpretations are suggested, who will develop the interpretations and revise the Bulletin?

Reconrnendations

1. The bulletin should be revised and a standard format be established for the chapters to make the bulletin more consistent and complete.
2. The map should be compared to the STATSCO map and revised only if there are major discrepancies between the two maps.
3. Only general interpretations should be included in the bulletin at about the great group level.
4. The conference steering committee should establish a map and bulletin conittee and an overall committee chairman to get the job done.

FINAL COMMITTEE REPORT
TASK FORCE 2
STATE SOIL SURVEY **DATABASE**

Task Force Members:

- **Ei. Schellentrager**, Soil Conservation Service, VT,
Chairman
- W. Edmonds, VPI and State Univ, Vice-Chairman
- ***K. Bracy**, FS, VA
- D. Childs, Soil Conservation Service, WV
- R. Day, Penn State Univ.
- P. Johnson, FS, PA
- ***R. Rebertus**, Univ. of Delaware
- ***B. Stoneman**, Soil Conservation Service, VA
- ***R. Taylor**, Soil Conservation Service, NJ
- ***W. Waltman**, Cornell Univ.
- ***E. White**, Soil Conservation Service, ND
- ***P. Gowland**, Oak Ridge National Lab.
- ***D. Scanu**, Soil Conservation Service, MA
(+-denotes task force member present)

Task Force 2 of the Northeast Cooperative Soil Survey Conference was established in order to provide guidance in the application and distribution of automated soils information.

OVERVIEW: (as partially presented)

Both of these records are stored in a relational format, that is, the data are stored as simple tables. An individual table contains columns which store information that relates to a specific category of information. These tables contain key data elements that allow tables to be linked.

One of the major functions of the State Soil Survey Data Base is to provide an edited data set for the Computer Assisted Management and Planning System (**CAMPS**). **CAMPS** is designed to facilitate operations in the **USDA-Soil Conservation Service** field offices by providing a set of integrated, computer-assisted tools for use by District Conservationists and staff. **CAMPS** is based on the concept of a central database containing most of the data elements used in daily operation of field offices. Supporting this database is a collection of computer software that organizes, maintains, and presents the data in an effective easy-to-use manner.

At present, the two major data sets of this central database are, the Client Operating Records (**COR**), and the Soil Survey Area Data (**SOILS**).

The **SOILS** database integrates most of the commonly used types of soils data, making the data easier to use in the decision making processes. The database is derived from the data files used in the soil survey, the **SOI-5** and the **SOI-6**. These data are downloaded from the national database at Iowa State University to the State Soil Survey Data Base. **After** review and tailoring the data to be specific to local conditions, the data set is downloaded to **CAMPS** by the state soil staff.

The soil survey ID and map unit symbol are the major links between **SOILS** and **COR**. **COR** provides a list of the map unit symbols for a client's field. **SOILS** supplies extensive soil data for each map unit for use in evaluation and planning. The **SOILS** database is flexible enough to be adapted to suit the different needs of each state. Range, woodland, soil interpretations, and other related types of data can be included with the basic soil survey information or left out if not needed. These data, although very detailed, are made manageable by storing only the data needed by the field office.

Committee Charges

1. Is there soils data that should be in the State Soil Survey Data Base but currently cannot be stored?
2. Is there data needed by Universities or consultants that is not currently in the State Soil Survey Data Base?
3. How can individuals, other than Soil Conservation Service, use the data in the State Soil Survey Data Base.
4. Should individuals, other than Soil Conservation Service, access a **3B2**? If so, what security factors need to be considered?

Committee Report

A questioner was sent to Task Force members on February 10, 1988. The questioner solicited responses to the

charges. There were three respondents. Following is a summary of their comments.

Charge 1: Is there soils data that **should be in the State Soil Survey Data Base** but currently cannot be stored?

Summary of Responses:

1. National Soil Survey Laboratory Soil Characterization Data.
2. State or locally developed interpretations, i.e. irrigation and drainage groups, land @valuation part of Land Evaluation and Site Assessment Process, relative farm land values.
3. Weather site data.
4. Crop yield data from agriculture experiment stations or Soil Conservation Service research projects.
5. State Department of Transportation soil characterization data.

Comments:

A. As previously stated, one of the primary uses of the State Soil Survey Data Base is the support of **CAMPS**. While some laboratory characterization data may be helpful in field office planning, the majority is not. The National Soil Survey Laboratory has recently made available data tables similar to those in the State Soil Survey Data Base. These tables, which also work within the UNIX environment, contain the current description and characterization data from **pedons** which the laboratory has sampled. These data are very helpful in the soil correlation processes. Some of the old SSIR characterization data is also available. The program is not menu driven and requires the user to write his/hers own queries to **access** the data tables.

B. The State Soil Survey Data Base is flexible enough to allow the State Soil Staff to add 'user defined' data elements to the data tables. This is equivalent to adding a new category of data to the Soil Interpretation Record or Map Unit Interpretation Record. Four tables have been provided in the State Soil Survey Data Base schema for a state to add their data elements. The State Soil Survey Data Base user manual provides documentation for adding these data to the tables.

Charge 2: Is there data needed by Universities or consultants that is not currently in the State Soil Survey Data Base?

Summary of Responses:

1. Laboratory Characterization data compatible with the modeling capabilities of geographic information systems. (**GIS**)
2. Digital soils data and attributes associated with **STATSGO** map units.
3. Site specific data, i.e. lab data, crop yields
4. Mineralogy and lithology data.

Comments:

The State Soil Survey Data Base will eventually become a" integral part of the geographic information system being developed and tested by Soil Conservation Service across the country. The automated soils data residing in the State Soil Survey Data Base should not be confused with the **spatial** soils data contained in a digital map file. These are two distinctively different sources of data, which are merged to form a geographic information systems. In the Soil Conservation Service, the State Soil Survey Data Base will support **geographic** information systems through the CAMPS program. A CAMPS-Geographic Analysis and Support System (GRASS) interface is being tested at sites across the country.

In most cases, the **modeling** done with **geographic** information systems in Soil Conservation Service will be limited to that which will support field office operations. However, Soil Conservation Service can provide both automated characterization data and soil survey data to **users** interested in **geographic** information systems modeling with existing data bases.

Charge 3: How can individuals, other than Soil Conservation Service, use the data in the State Soil Survey Data Base?

Comments:

The overall consensus was that the State Soil Survey Data Base has a great potential for providing soils information to a wide variety of **users**. In the northeast, some requests by private consultants for soils information are being handled through the State Soil Survey Data Base at the State Office level. Some states are using the State Soil Survey Data Base as an educational resource in schools.

In many states, the preferred mode of delivery of soils data still appears to be **through** the District Conservationist or Area Soil Scientist. Larger data searches are being conducted in the State Offices. **Once** operational, many states will be relying on geographic information systems to deliver spatial soils data linked to the State Soil Survey Data Base.

Charge 4: Should individuals, other than Soil Conservation Service, access a 3B2? If so, what security factors need to be considered?

Summary of Responses:

1. Those people who are interested in soils data should work with field office personnel who will provide the reports.
2. Any individuals may access the State Soil Survey Data Base, however permissions should be limited to **reading** the data only.
3. Any cooperating agency should have access to the data, inside or outside of the **3B2** environment.

Once they have possession of the information it is their business what they do with it.

Comments:

There appear to be two schools of thought on this issue. One is that Soil Conservation Service is responsible to insure the security of the automated soils data. The other is that what Soil Conservation Service provides the data to any individual and whatever they do with it is their own business.

The State Soil Database manager, and ultimately the State Soil Scientist is responsible for the integrity of the State Soil Survey Data Base. This involves insuring that no automated data in the State Soil Survey Data Base conflicts with published Soil Conservation Service soil reports. While the State Soil Survey Data Base has the capability of being edited in order to meet specific user demands, the edits must not conflict with each other or other reports.

The State Soil Survey Data Base resides in an **AT&T 3B2**. (commonly in each State Office). The UNIX data tables can be downloaded to other **3B2's** or access may be provided via telecommunications. As it exists now, only the Soil Database Manager may edit the State Soil Survey Data Base data, while anyone with a **login** to the **3B2** may view the data and prepare reports.

In response to the need to support field office **DOS-CAMPS** sites, a method for downloading the State Soil Survey Data Base tables in an environment other than UNIX has been provided. This method segments the state UNIX data set and downloads the **MUIR** tables for use in the **RBase** data management software which runs in the MS-DOS environment. This method permits simple report writing capabilities to field office DOS workstations. This method could also be used to download DOS data sets outside the **CAMPS** environment.

Unfortunately, once the data sets have been removed from the State Soil Survey Data Base, there is no assurance that changes will not be made to the data. A question which is then posed, 'Does our responsibility to provide soils data to interested users override the risk that once the data is provided it may be changed? Is it our responsibility to assure proper and correct application of soils information, automated or not?'

Follow-up Questionnaire

In order to get a broader base of opinion and assist in evaluating the current status of the State Soil Survey Data Base in the northeast region, a second questionnaire was distributed on March 30, 1988. This questionnaire was distributed to all Soil Conservation Service State Soil Scientists and the State Soil Survey Data Base Managers in the northeast region. There were five respondents to this questionnaire.

I. Upon review of the current capabilities of the State Soil Survey Data Base, please answer the following questions:

1. Are there soils data available which is currently in the State Soil Survey Data Base and should be? If yes, what are the sources of these data?

Responses:

Most of the respondents felt, for their needs, the data currently available in the State Soil Survey Data Base was sufficient. The following data needs were highlighted:

- a. The need for a automated of keeping track of the deposition of map units in on-going surveys, i.e. conversion legends.
- b. State Department of Transportation physical soil characterization data.
- c. National Soil Survey Laboratory soil characterization data.
- d. Cost factor data for developing soil potentials.
- e. Soil pedon descriptions (SCS-232's)
- f. State and Local interpretations i.e. potential for ground-water contamination by septic tanks, animal waste, etc.

2. Are there data in the State Soil Survey Data Base which are in a format which is not readably accessible or useable to the 'casual' user?

Comments:

Currently the 'casual' user must rely on the standard reports provided through the menu system. The consensus appears that this is adequate for many users because it mimics the tables provided for in the published soil survey report. However, many requests for soils information must be provided for by writing Prelude queries of the data base tables.

Queries of the database tables requires some fundamental knowledge of relational databases as well as Prelude database commands. Data which the respondents believed should be more readably accessible included:

- a. Current soil identification legends
- b. Listing of soils and their hydrologic groups sorted by hydrologic groups.
- c. Soil Classification
- d. Plant names
- e. Crop yield units.

Most respondents realized that it would be impractical to provide for reports containing every conceivable combination of data. They emphasized training in Prelude database commands and relying on the Soil Database Manager to provide complex reports.

II. Upon review of the past, present, and potential future **users** of the State Soil Survey Data Base, please answer the following questions:

1. Have you provided any the State Soil Survey Data Base generated reports to Soil Conservation Service or non-Soil Conservation Service users? If yes, to whom? What type of report?

Comments:

While many of us are still in the early stages of learning to use automated soils data, some are realizing the savings in time and costs of generating reports using the State Soil Survey Data Base. Some of the reports which have been generated for non-Soil Conservation Service users include:

- a. Hydrologic soil groups.
- b. Custom map unit lists.
- c. Acreage/Extent of mapunit.
- d. Hydric soil list.
- e. **Acreage** of county with corn yield > 130 bu and soybean yield > 40 bu.
- f. Soils within given Major Land Resource Areas with siliceous mineralogy.
- g. Copies of Official Series Descriptions.
- h. Available water capacity by layer.
1. Universal Soil Loss Equation data provided to **ASCS**.

2. If you answered yes to question 1 above, how much time do you figure was saved by generating a report from automated soils data? Was the report in a form which was acceptable and understandable by the user?

Comments:

Respondents commented that these reports were generated in a fraction of the time it would have taken to do them manually. In some cases the reports would have been impractical to provide prior to the State Soil Survey Data Base. Users generally responded favorably to the format of the reports.

3. If you have individuals other than Soil Conservation Service employees using the State Soil Survey Data Base, how are you providing access? and,

4. Are you providing automated soils data to non-UNIX users? If so, how?

Comments:

Most respondents indicated that they currently have no plans to provide access to the State Soil Survey Data Base by non-Soil Conservation Service users. Non-Soil Conservation Service personnel requesting reports are generally having to request them through the State Office

Soils Staff. The reports are then generated, most often by the Soil Database Manager, and forwarded to the user.

Those states which are fortunate enough to have exclusively UNIX workstations are providing the State Soil Survey Data Base to those stations directly or through telecommunications. Those primarily with DOS workstations are providing the MUIR tables to those sites within the RBase/CAMPS structure.

III. Upon review of the amount of automated soils data available and the time (man-hours) necessary to provide automated soils data to users at the state-field office level, please answer the following questions:

1. How many staff years are you dedicating to the State Soil Survey Data Base now? How much time do you think will be necessary in the future?

Comments:..

On the average, Soil Conservation Service Soil Staffs are dedicating approximately 1/3 staff year to the State Soil Survey Data Base. Most respondents saw this commitment increasing to one full staff year (soil scientist) and 1/2 staff year (computer assistant) in the future.

2. What limitations, if any, have you found in using the State Soil Survey Data Base in the AT&T 3B2-UNIX operating environment? How do you Plan to deal with these limitations?

Comments:

Most of the limitations found in using the State Soil Survey Data Base in the 3B2/UNIX environment resulted in other, large, computation intensive, data bases residing on the same system, in particularly National Resource Inventory and Administration. While these problems are remedied somewhat by partitioning the State Soil Survey Data Base onto it's own disk and providing 4 megabytes of RAM, the problems are reoccurring. These problems include:

- a. Very slow indexing and updating of data tables.
- b. Being 'kicked' off the system entirely.

States with large data sets (many soil survey areas and series for which they are responsible) are having problems due to the size of the data files. Some of these problems are being overcome by segmenting the data sets into two directories. However, this causes confusion about where to access the data and is inconvenient when preparing reports for soil survey areas in two different directories.

3. Should individuals, other than Soil Conservation Service employees, access the State Soil Survey Data Base in the Soil Conservation Service AT&T 3B2? If so, what security measures would you like to see in place, if any?

Comments.:

These responses fall in line with the responses from the first questionnaire.

4. How much time have YOU spent in training individuals (non-Soil Conservation Service included) in the use of the State Soil Survey Data Base? What type of training? Who has been trained?

Comments:

One of the most favorable signs noted in all of the responses is the training being provided to individuals on the use of the State Soil Survey Data Base. All respondents indicated that some time has been spent on training. Several states indicated that formal training sessions have been conducted or are being planned.

While staff commitment for the State Soil Survey Data Base is currently very low, respondents indicated a growing awareness of the applications of automated soils information. Most responding indicated a desire to increase both awareness of the State Soil Survey Data Base to Soil Conservation Service and non-Soil Conservation Service individuals. This is desirable, considering there were no non-Soil Conservation Service responses to the first questionnaire, possibly indicating a lack of awareness of this valuable data source. Respondents also indicated that training, as well as staff commitment must keep pace with the development of automated soil data techniques.

RECOMMENDATIONS:

CHARGE 1: Are there soils data that should be in the State Soil Survey Data Base but rrently cannot be stored?

This committee recommends that Soil Conservation Service offices work closely with Agriculture Experiment Stations in determining the need for additional the State Soil Survey Data Base data tables. These data tables should be designed to meet the demand for both University and Soil Conservation Service needs.

CHARGE 2: Are there data needed by Universities or consultant's that is not currently in the State Soil Survey Data Base?

This committee identified categories of data which could be useful to Universities and consultants. These data generally do not conform to the current structure of the State Soil Survey Data Base. This committee recommends that the Soil Conservation Service and Universities continue to investigate a means for linking site specific (point) data to soil map units and automating these data.

CHARGE 3: How can individuals, other than Soil Conservation Service, use the data in the State Soil Survey Data Base?

The lack of responses of many of the non-Soil Conservation Service committee members to the questionnaire, as well as discussion during committee meetings and the general sessions, indicated to the task **force** that there is little awareness of the availability of automated soil survey information outside of the Soil Conservation Service. This committee recommends that the Northeast National Technical Center draft a letter to all regional State Soil Scientists. 'This letter will encourage the State Soil Conservation Service offices to identify key personnel in cooperating agencies and provide make available to them training in the State Soil Survey Data **Base**. Training in the State Soil Survey Data Base should be a ongoing function as the State Soil Survey Data Base continues to evolve. It is the consensus of this task force that the State Soil Survey Data Base software and data should be available to those who ask for it. State wide data could be distributed through the University/Extension systems. County based data could be distributed through the Soil and Water Conservation Districts. Soil Conservation Service National Headquarters should provide policy pertaining to the potential reimbursement of costs associated with the distribution and subsequent maintenance of data and software.

CHARGE 4: Should individuals, other than Soil Conservation Service, access a 382. If so.-what security factors need to be considered?

This task force recognized the importance of maintaining the integrity of the Official State Soil Survey Database. This database commonly resides in a **AT&T 382** in the Soil Conservation Service State Offices. In addition to the State Soil Survey Data Base this computer often stores many other, large and computation intensive databases. While the **382** is designed to be multi-user, many task force member states are experiencing significant slow down in response time when a number of process are running at once. In the more sever cases this slow down is coupled with being kicked off the system entirely.

It is recommended by this task force that telecommunication access to the **382** in which the Official State Soil Survey Database resides should be limited. When access is provided via telecommunications or any other method, read only permissions should be assigned to the **login**.

It is recommended that this task force, having met it's charges, be discontinued.

Final Report of 1986 Committee 3

Role of the Experiment Stations in the Future

John C. Sencindiver, Chairman

Committee Charges

1. Evaluate the contribution of Universities (i.e. experiment stations) in the future NCSS.
2. Make specific **recommendations**

Committee Action

This committee was continued beyond the 1986 meeting primarily to complete a survey. Experiment station representatives in the Northeast were asked to respond to the following items:

1. List the job opportunities for soil scientists in your state. Include information on the demand for soil scientists, types of positions held and available, education requirements, and salaries.
2. List the federal, state, and local laws and regulations that require services of soil scientists.
3. If your Department or College has a recruitment program for soils students or other agricultural students, please summarize that program.
4. Please submit the following information:
 - a. General graduate or undergraduate curricula requirements.
 - b. Course outlines for soil survey, morphology, mapping, genesis and classification related **courses**.
 - c. Suggested training aids including textbooks, reference books and audio-visual materials.

Several experiment station representatives responded to the survey. The responses have been **summarized** and will be sent to each experiment station representative.

Since the work of the committee has been completed, **Committee 3** (1986) has been discontinued.

SOIL-WOODLAND INTERPRETATIONS

Committee Members:

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R. Weismiller, University of Maryland, MD

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Background

The 1986 Soil-Woodland Committee revised or developed Soil-woodland rating guides to reflect the needs for the Mrtheast. Modifications were made on the tentative guidelines in the National Forestry Manual (NFM). Because the percent of rock outcrop, stones and boulders covering the surface was not resolved at the 1986 Cooperative Soil Survey Conference, the Committee was continued.

In December 1987 a meeting was held in Montpelier, Vermont, for the purpose of resolving the rock outcrop and rock fragment issue. Those that attended the meeting included a forestry consultant, a Vermont State Forester, the SCS Forester for Vermont and five soil scientists representing three Northeast States, the NENTC and Washington County, Vermont.

bring the meeting the limitations imposed by rock outcrops and rock fragments was studied for each rating guide. Some modifications were made on the guides where it was deemed necessary.

The modified rating guides were sent to all Committee 4 members for comment. Some additional changes were made to reflect their comments. The rating guides following this report reflect the changes made in 1986 as well as the modifications made just prior to the 1988 Conference.

Recommendations:

2. **The** Soils Staff and the **Forester** at the **NENTC** should study over the rating guides and **comments** and **make** final revisions for **use** in the **Northeast**.

3. **This committee** should be discontinued.

(3) Surface **texture** must be **course** enough so that **water enters** readily but **not so** coarse as to have a **low** available water capacity. Seedling **mortality is greatest on soils** with sandy and clayey surface textures.

(4) The amount of water held in the **soil** for plant use is determined by the available water capacity of the soil and the effective rooting depth. The amount of water held within a 20-inch effective rooting depth is used as an indicator of droughtiness.

(5) Seedling mortality may also be affected by the high temperatures and evaporation associated with steep south facing slopes.

Table 537-1.--Guide to Seedling Mortality Ratings of Soils for Forest Use.

Criteria	Slight	Moderate	Severe
1. Depth to high water table (ft)	>1	0-1	+ ^{1/}
2. Drainage class	Well to somewhat poorly	Poorly to somewhat excessively	Very poorly or excessively
3. USDA Texture (dominant texture within upper 20 inches)	SL, FSL, VFSL L, SIL, LFS, LVFS	S, FS, COS, VFS LS, SCL, SICL, CL	C, SIC, SC, FB HM, MPT, MUCK PEAT, SP
4. Effective rooting ^{2/} depth (inches)	>20	10-20	<10
5. Slop. %: North and east facing South and west facing	All <15	15-35	>35
6. Rock fragments larger than 2 mm within upper 20 inches (pct. by wt.)	<50	50-65	>65

^{1/} + indicates ponding.

^{2/} Limitation to effective rooting development may be bedrock, fragipan, or dense basal till.

537.11-3

5537.11-3 **Erosion hazard.**

(a) Definition. **Erosion hazard is the probability that damage may occur as a result of site preparation and following cutting operation⁶ where the soil is exposed along roads, skid trails, fire lanes, and log handling areas.**

(b) Ratings.

Slight - No particular preventive **measures** are needed under **ordinary conditions.**

Moderate - Erosion control **measures** are needed in certain silvicultural **activities.**

Severe - Special precaution⁶ are needed to control **erosion** in most silvicultural **activities.**

(c) Management implications. **May indicate need for type⁶ of road, trail, landing, and fireline construction and maintenance: need for specialized equipment; and specialized operations such as cross-slope operation⁶ or yarding uphill with cable.**

(d) Factor⁶ causing erosion hazard. **Erosion hazard can be predicted from three factors--percent slope, the percent by weight of rock fragments in the surface layer, and the erodibility factor (K). The erosion hazard becomes more severe as slopes increase in steepness, the percent by weight of rock fragment⁶ decreases, or the erodibility factor increases. Other factor⁶ that effect the erosion hazard are the length of slope and the rainfall factor.**

537-6

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SUBPART B - SOIL-WOODLAND INTERPRETATIONS

PART 537 - SOIL-TREE RELATIONSHIPS AND INTERPRETATIONS

537.11-4

§537.11-4 Windthrow hazard.

(a) Definition. windthrow hazard is the likelihood of tree being uprooted (tipped over) by the wind as a result of insufficient depth of the soil to give adequate root anchorage.

(b) Ratings..

Slight - Normally there are no trees blown down by the wind. Strong winds may break trees, but they do not uproot them.

Moderate - An occasional tree may blow down during periods of soil wetness with moderate or strong winds.

Severe - Many trees may be expected to blow down during periods of soil wetness with moderate or strong winds.

(c) Management implications. A moderate or severe rating alerts the forest land manager to windthrow danger. It indicates need for more care in thinning or perhaps no thinning at all. Specialized equipment might be necessary to avoid damage to surface root systems. A plan calling for periodic salvaging of windthrown trees might be desirable. Use special care in planning cutting areas to minimize the danger of windthrow. Seed tree systems of regeneration with isolated single trees or groups of trees are not practical for moderate or severe windthrow hazard areas. Plan and maintain road and trail systems to allow salvage of blown-over trees.

(d) Soil factors causing windthrow hazard. Restricted rooting depth is the principal reason for increased windthrow hazard. The rooting restriction may be caused by a high water table, fragipan, bedrock, or any other restricting layer.

Table 537-3--Guide to Windthrow Ratings of Soils for Forest Use

Criteria	Slight	Moderate	Severe
1. Depth to high water table (ft)	1	0-1	+ 1/
2. Effective rooting depth (in) <u>2/</u>	40	20-40	20

1/ Indicates Ponding

2/ Limitation to effective root development may be bedrock, fragipan, or dense basal till.

537-8

(NENTC-June 1988)

4(86)-6

§537.11-5 Equipment limitations.

(a) Definition. Equipment limitations are limits on the use of harvesting equipment, year round or seasonally, as a result of soil characteristics. The limitations are based on rubber tired skidder equipment.

(b) Ratings.

Slight - Equipment use normally is not restricted in kind or time of year because of soil factors. For soil wetness, equipment use can be restricted for a period not to exceed 1 month.

Moderate - Equipment use is moderately restricted because of one or more soil factors. Equipment use might be limited by slope, atonee, soil wetness, soil instability, extremes of soil texture (clayiness or sandiness), or combinations of two or more factors. For soil wetness, ● equipment use is restricted 1 to 3 months.

Severe - Equipment use is severely restricted because of one or more soil factors. For soil wetness, equipment use is restricted more than 3 months.

537.11-5(d)

Table 537-4.--Guide to Equipment Limitation Ratings of Soils for Forest Use

Criteria	Slight	Moderate	Severe
1. Duration of water table above 1.5 feet (months)	<1	1-3	>3
2. Rock outcrops ^{1/} Pct. of surface Class	<10 1,2,3	10-25 4	>25 5,6
3. Boulders ^{2/} Pct. surface cover Class	<15 0,1,2,3	15-75 4	>75 5
4. Stones ^{2/} Pct. surface cover Class	<15 0,1,2,3	15-75 4	275 5
5. Depth to hard bedrock (inches)			<10
6. Surface texture		Sands And loamy sands 20 inches	C,SIC,SC FM,HM,MPT, MUCK,PEAT, SP
7. Slope (%)	<15	15-35 ³	>35
8. Flooding	None, rare, OCCAA	Freq, long Or less	Freq, very long
9. Potential Frost Action ^{4/}	Lov	Moderate	High
10. Temperature regime			Cryic

^{1/} percent rock outcrop is obtained from map unit description. Rating cannot be made on taxonomic unit. (Soil Survey Manual, May 1981)

^{2/} Use dominant condition for restrictive feature. Both boulders And Atonee are considered in determining surface area covered And class for either bouldery or stony.

1537.11-6 Plant competition.

(a) Definition. Plant competition is the likelihood of the invasion or growth of undesirable species when openings are made in the canopy. (Caution: Plant competition is not to be used to determine subclass rating.)

(b) Ratings.

Slight - Competition of unwanted plants is not likely to prevent the development of natural regeneration or supersede the more desirable species. Planted seedlings have good prospects for development without undue competition.

Moderate - Competition may delay natural desired tree or planted trees and may hamper stand development but it will not prevent the eventual development of fully stocked stands.

Severe - Competition can be expected to prevent natural or planted regeneration unless precautionary measures are taken.

(c) Management implications. A **moderate** or **severe** rating indicates the need for careful and the possible need for site preparation following harvest release treatments to ensure development of the new crop. It alerts the forest manager to the need for establishing the new forest for tree crop production without undue delay.

(d) Soil factors causing plant competition. In most land resource areas, plant competition becomes more severe with increased moisture or increased available water capacity. Generally, it is more severe on poorly drained soils and on soils with a high available water capacity. Do not make separate ratings for deciduous tree crops and conifers.

Table 537-5.--Guide to Plant Competition Ratings of
Soils for Forest Use

Criteria	Slight	Moderate	Severe
1. Depth to <u>seasonal</u> <u>high water table</u> (feet)	> 3	1.5-3	< 1.5
2. Available <u>water</u> capacity < 2 in upper 40 <u>inches</u> (inches)		2-5	> 5

537.11-7

§537.11-7 Special consideration - forestry equipment use.

The equipment commonly used in forest management is subject to many soil related conditions. Tables that identify the feature restriction to forestry activities in addition to the rating can be used by woodland owners or forestry managers in planning the use of soils for wood crops. Use of these tables are optional. Two forestry activities have been identified for special interpretations: Site preparation, and haul roads and skid roads.

§537.11-7a-1 Site Preparation.

(a) Definition. Site preparation is the mechanized operations to prepare a site for planting tree seeds or seedlings. The ratings are based on limitations for efficient equipment operation. It is assumed that operating techniques are used which do not displace or remove topsoil from the site nor create channels to concentrate storm runoff.

(b) Ratings.

Slight - Physical site conditions impose little or no limitations on kind of equipment or time of operation.

Moderate - Physical site conditions impose some limitations on the kind of equipment and/or time operation. Conditions reflect a physical limitation to the efficient use of the equipment.

Severe - Physical site conditions are such that special equipment or techniques are needed and/or time of efficient equipment operation is very limited.

(c) Management implications. Restrictions on equipment use indicates to a manager the need for choosing the right equipment to be used and the need for timing operations, so as to avoid seasonal limitations. The more severe the limitations, usually, the more costly are the cultural operations.

(d) Factors causing limitations. Wetness, flooding, rockiness, stoniness, rock fragments, depth to hard bedrock, texture, and slope are soil and topographic features which affect equipment use in site preparation and planting operations. Periods when the soil is saturated at or near the surface should be avoided to minimize environmental damage. In addition, special equipment is usually required in these periods. Soils with flooding hazards of long duration should be avoided to prevent damage to equipment and/or the environment. Surface stones and boulders and rock outcrops are problems for efficient and safe equipment operation. Rock fragments and hard bedrock at very shallow depths can interfere with equipment used in site preparation. As slope gradients increase traction problems increase. Clayey and sandy soils have special traction problems. Clayey soils have reduced traction when wet; and sandy soils have reduced traction when dry. Severe environmental damage occurs when rubber-tired or track-type equipment is used on organic soils unless frozen.

537-11a

(NENTC-June 1988)

Table 537-6a.--Guide to Equipment Limitations for Mechanical Site Preparation

Criteria	Limit			Restrictive Feature
	Slight	Moderate	Severe	
1. Duration of water table above 1.5 (months)	<1	1-3	73	Wetness
2. Flooding	None, Rare Occas	Freq, long or less	Freq, very long	Flooding
3. Rock Outcrop ^{1/} Pct. Surface Cover Class	<10 1,2,3	10-25 4	>25 5.6	Rock Outcrop
4. Boulders ^{2/} Pct. Surface Cover Class	<3 0,1,2	3-15 3	715 4.5	Too Bouldery
5. Stones ^{2/} Pct. Surface Cover Class	<3 0,1,2	3-153	715 4,5	Too Stony
6. Fraction 3-10 ^{3/} inches in diameter	25	25-50	750	Too Cobbly
7. Depth to hard bedrock (inches)			<10	Depth to rock
8. USDA Texture ^{4/}				
a. Organic material			FB, HM, MPT, MUCK, PEAT, SP	Low Strength
b. Clayey textures		C, SIC, SC		Too Clayey
c. Sandy textures		COS, FS, S, VFS		Too Sandy
9. Slope (%)	<15	15-35	735	Slope

^{1/} Percent rock outcrop is obtained from map unit description. (Soil Survey Manual, May 1981)

^{2/} Use dominant condition for restrictive feature. Both boulders and stones are considered in determining surface area covered and class for either bouldery or stony. (National Soils Handbook, July 1983. Sac. 602.00-5 (c)(3) (ii) (E))

^{3/} Average percent by weight from 0 to 10 inches.

^{4/} Dominant texture 0 to 10 inches.
(NENTC-June 1988)

537-11b

537.11-7a-3

¶537.11-7a-3 Haul Roads and Skid Roads.

(a) Definition. Haul roads are access roads leading from log landings to primary or surfaced roads. Generally, there are unpaved roads and not graveled. Skid roads are maintained roads from skid trails to log landings. The intent of this rating is to indicate the degree and kind of limitation for location of haul roads and skid roads.

(b) Ratings.

Slight - There are no serious limitations to location, construction, and maintenance, or season of use.

Moderate - There are some limitations which can be overcome with routine construction techniques. Construction and maintenance costs are higher than if rated "slight," or season of use is somewhat limited.

Severe - There are some limitations which require special and/or expensive techniques to overcome. Construction and/or maintenance costs are high or season of use may be severely restricted.

(c) Management implications. Restrictive features indicate to the manager the kind of practices needed to overcome the limitations. The ratings will aid in the selection of the least costly routes.

(d) Factors causing limitations. Wetness, rockiness, depth to hard bedrock, stoniness, soil strength, slope, soil texture, and flooding are soil properties and hazards which should be considered in selecting routes for haul roads. Wetness and flooding affect the duration of use. Rock outcrops, stones, and boulders which are difficult to move construction when cutting and filling is needed. The soil inferred from the AASHTO group is a measure of the traffic the soil. Slope affects the equipment use and the cutting requirements.

SUBPART B - SOIL-WOODLAND INTERPRETATIONS

537.11-7a-3(d)

Table 537-6c.--Guide to the Location of Haul Roads and Skid Roads

Criteria	Limits			Restrictive Feature
	Slight	Moderate	Severe	
1. Duration of water table above 1.5 feet (months)	<1	1-3	>3	Wetness
2. Rock Outcrop(X) ^{1/} Pct. Surface Cover Class	<2 1.2	2-10 3	210 4,5,6	Rock Outcrop
3. Depth to bedrock (inches) Herd Soft	>40 720	20-40 <20	<20	Depth to rock Depth to rock
4. Boulders ^{2/} Pct. Surface Cover Clear	<3 0,1,2	3-15 3	>15 4,5	Too Bouldery
5. Stoner ^{2/} Pct. Surface Cover Class	<3 0,1,2	3-15 3	>15 4,5	Too Stony
6. AASHTO groups ^{3/}	-		A-S	Low Strength
7. Slop. (%)	<15	15-35	>35	Slope
8. USDA Texture ^{4/}				
A. Organic material	-	-	FB, HM, MPT, MUCK, PEAT, SP	Low Strength
b. Clayey textures	-	C, SIC, SC		Too Clayey
c. Sandy textures	-	COS, FS, S, VFS	-	Too Sandy
9. Fraction 3-10 inches (wt pct) ^{5/}	<25	25-50	>50	Too Cobbly
10. Flooding	None, Rare	Occ	Freq	Flooding

^{1/} Percent rock outcrop is obtained from map unit description. (Soil Survey Manual, May 1981)

^{2/} Use dominant condition for restrictive feature. Both boulders and stones are considered for determining surface cover covered and clear for either bouldery or stony. (National Soils Handbook, July 1983, Sec. 602.00-5(c)(3)(11)(E))

^{3/} Thickest layer between 0 and 40 inches.

^{4/} Dominant texture 0 to 10 inches.

537.11-a

9537.11-g Special considerations - pests and diseases.

Some forest pests and diseases are more likely to be a problem on certain soils. Where there is evidence of this problem for a particular soil, indicate the pest or disease in the interpretation. Relative ratings are not made for this hazard. Where the relationship is suspected, state the facts as known. This alerts the forest manager to the possibility of disease or insect attack. Managers can avoid the danger by selecting species that are not susceptible, or may continue without change except to increase vigilance for early detection and control.

0537.11-g Special crops.

Some specialized forestry crops--Christmas trees, decorative greens, nuts--can be grown most profitably on

537.12(d)

(b) Management implications. The forest manager can minimize planting failures by matching the species with the soil. This precaution is particularly important with a tree crop because of the long-term nature of the commitment.

§537.11-12 Understory vegetation.

(a) Definition. Understory vegetation is the collection of plants that make up the ground cover below the canopy (under the canopy density that represents the highest wood production), mostly under 15 feet in height.

(b) Ratings. Plants are listed in order of abundance, starting with the most abundant. States are encouraged to enter the percent of plant composition by weight or incidence if available.

(c) Management implications. Information on the kinds and amounts of understory plants can be used to (1) evaluate the ecosystem, (2) assess domestic livestock grazing resource, (3) evaluate wildlife habitat potential, (4) evaluate potential for specialty crops such as greenery, (5) identify brush encroachment problems following harvest cutting, and (6) classify wetlands.

§537.12 Woodland interpretations for SCS-SOI-5.

(a) SCS-SOI-5 provides the data for woodland tables D and E of soil survey manuscripts. Detailed instructions for completing SCS-SOILS-S's are found in Part II of the National Soils Handbook, §407.1(a)(6) and (9).

(b) SCS foresters are responsible for providing, checking, and reviewing forestry data on SCS-SOI-S's (See NSR, Part II. §407.1(b)(3)). They are also responsible for making changes when errors are discovered or new data are developed (See NSR, Part II. §407.1(e)).

(c) SCS foresters review the tables that come from SCS-SOI-5's and SCS-SOI-6's to ensure accuracy and current data use. They must correlate data with other states.

(d) It is essential that the woodland section reflect correlation with surrounding soil surveys. If there is to be a departure in woodland productivity and interpretations for the rated hazards from the current SCS-SOI-5, suitable phases or variants must be established by submitting a revised SCS-SOI-5. In some circumstances erroneous data may have been selected in adjoining surveys, because of extrapolation or estimates based on similar soils or new data may have been accumulated that change previous assumptions. If this happens, documentation should offset the previous record, and the SCS-SOI-5 should be revised. Procedures for updating the soil interpretation record are given in §407.1(e) of the National Soils Handbook. In all cases, the state and NTC staffs should be advised. The forest land data base is useful and essential in giving credibility to the interpretation. In cases of arbitration, the forest land data base carries enough weight to establish a changed interpretation.

(NENTC-June 1988)

537-13

537.13

4537.13 Woodland portion of soil survey manuscripts.

(a) General. After ordination is completed and soil related management ~~limitations are~~ rated, tables and descriptions must be prepared for soil survey manuscripts or for technical **guides**. Woodland **tables D** and **E** are usually printed by computer by request of the survey party leader. It may be **necessary** to adjust the tables if more recent information or final correlation supports the change. For additional instructions on preparing of the woodland portion of a soil survey. see National Soils Handbook. Part II, §603.1(a)(2)(vi)(C) and (D).

(b) Tables. On receipt of table E. Woodland Management and Productivity, and table D, Woodland Understory, check to determine that they contain the latest available data. The Productivity Class column should be changed to Volume in **cFA as shown** in the example on page 537-14. Make adjustments as needed. Check all columns for consistency and accuracy. Have available the final **correlation**, to be sure soil map units are correct. Write in changes and advise all people involved. If **SCS-SOILS-5's** for adjacent states or **MLRA's** are used, it is likely that some changes will be necessary to **meet** local conditions. The state may desire to supplement table E with additional **tables using** the guides **537-6a, 537-6b, 537-6c**, and

Minutes of NEC-50, Soil Survey, Meeting
Northeast Soil Survey Conference
University of Maine, Orono
June 13-14, 1988

The meeting was convened on Monday, June 13 at 8:00 p.m. by chairman Marty Rabenhorst. Those in attendance were: Bill Wright, University of Rhode Island; Bill **Waltman**, Cornell University; Tom Simpson, Virginia Tech; B e r l i e Schmidt, USDA-CSRS; John Scencindiver, West Virginia University; Bob Rourke, University of Maine; Russ Rebertus, University of Delaware; Marty Rabenhorst, University of Maryland; Karl Langlois, USDA-SCS; Chuck Krueger, Pennsylvania State University; D. Dobos, Pennsylvania State University; Ed Ciolkosz, Pennsylvania State University; and Jim Baker, Virginia Tech.

The minutes of the 1987 meeting were approved as written and distributed by the previous secretary, Marty Rabenhorst.

Comments from CSRS Representative

Berlie L. Schmidt, USDA-Cooperative State Research Service, replaced C. M. Smith as our CSRS representative. Berlie declared his interest in working with this Committee and then reviewed Federal Research Initiatives that would be of interest to those on the Committee. These are largely in area of groundwater quality, although soil erosion and productivity continues to be emphasized.

Comments from Administrative Advisor

Administrative Advisor Chuck Krueger reviewed the 1988 Hatch appropriation which had a 4.9% increase over 1987, essentially covering inflation. Level funding has been proposed by the Congress for 1989. The 1990 competitive research grants budget request will include a new \$6 million program in basic soil science. Groundwater quality and low input agriculture are the areas relating to soil science which will receive new funding in 1989. Lastly, the continuance of the NEC-SO Committee was addressed. Our Advisor stated that he felt the Committee has a good record of accomplishments, hopes we will apply for continuance, and, inasmuch as he believes it is important to rotate office, will ask that a new administrative advisor be named to replace him.

Old Business

1. **Committee on Pedon Data**

Bill **Waltman** summarized progress in listing soil characterization data from experiment stations in the northeast. Pedon data is needed from Virginia Tech, Delaware, Rutgers, and Vermont. Bill then reviewed a method for entering soil profile descriptions from hardcopy (e.g., theses) using a scanner. This procedure eliminates laborious retyping of profile descriptions into computer files.

2. Bulletin 848. Soils of the Northeastern States

Ed Ciolkosz reviewed the history of this **bulletin**. It is out of print and a decision needs to be made by the Committee whether to reprint as is, revise, or take no action.

3. Soil Survey Training Course

Jim Baker gave a **followup** report from the Committee established at the 1986 meeting to consider whether a regional field-oriented course in soil mapping is needed, where one should be held, who would teach it, etc. He reported that Chris Evans of the University of Vermont has volunteered to expand her current course into a regional undertaking. A description of that course was distributed.

New Business

1. Continuance of NEC-50 Committee

Chairman Rabenhorst opened the discussion by reviewing past attendance at the meetings. Lack of attendance by some members is a result of insufficient travel funds provided by the Experiment Stations rather than a low level of interest. Many members fund travel to the meetings from their research projects. The Administrative Advisor pointed out that by **keeping** our departmental chairman and Experiment Station directors informed on what we accomplish, travel funds may more likely be provided. A discussion followed as to whether it would be desirable to link our off-year meetings with those of other regional committees; however, it might be difficult to find another regional committee that has significant representation from within NEC-50 membership. Another suggestion was that the off-year meetings be held on a trial basis in conjunction with the Soil Genesis Field Trip, possibly the day before the field trip.

Next, justification for continuance of NEC-50 was discussed. A list of accomplishments was read by President Rabenhorst. These included the establishment of a regional graduate level pedology field course, initiation of deliberation on the need for a regional field course to teach the principles and skills of soil survey, evaluation of soil survey research needs in the northeast, listing of pedon data in the northeast, Bulletin 848 Soils of the Northeastern United States, listing of available soil survey publications, and a comparative study of soil characterization data in the northeast which was published in 1985 in Soil Science. The list of goals includes continued work to establish a soil database for the northeast region, continued sponsorship of the northeast regional graduate level pedology field course, possible reprinting and revision of Bulletin 848, and development of a plan for implementation of a regional field course in soil survey methods.

Ed Ciolkosz moved that the Committee be continued. The motion was seconded. The motion was then amended to read "for five years". It was unanimously approved as amended.

The meeting was recessed at **9:50** and reconvened at **8:30** a.m. June 14, beginning with a continuation of the discussion of accomplishments and **goals** of the NEC-50 Committee. In lieu of the pending offer to teach a **regional** soil survey course, it was decided to place the goal for the development of a plan for implementation of a regional soil survey field course into the accomplishment category for the justification document for **committee** continuance.

The discussion then moved to whether the Committee should continue as a coordinating committee or seek change to a funded research committee. C. Krueger stated that the items this Committee addresses probably do not fit well under a research group. **M. Rabenhorst** expressed the opinion that there was not one overriding research objective which would tie this group together as a regional research group. It was decided that an additional goal of the Committee should be to explore the development of the Committee into a funded regional research project.

J. Scencindiver **suggested** that the promotion of undergraduate recruitment be added as a goal of the Committee.

2. **Report on Soil Genesis Field Trip**

Tom Simpson distributed the final 1988 field trip schedule. Plinthic and colluvial soils, and soils at high altitudes of the Blue Ridge Province in Virginia will be emphasized. New Hampshire was suggested as a potential site for the 1989 field trip.

3. **Report on 1988 Soil Judging Contest**

Ray Shipp at Penn State will be the host.

4. Elections

Bill Wright was elected for the 87-90 term to the NE regional Soil Taxonomy Committee; Bill **Waltman** for the 88-91 term; and Chris Evans (in absentia) for the 89-92 term, with Tom Simpson elected as an alternate.

Ed **Ciolkosz** expressed his willingness to serve as regional representative to the National Soil Characterization Database Task Force and was immediately accepted for that post. Bill **Waltman** was named as alternate. That group will plan strategy on how to accomplish the collation of **U.S.** and state soil data into one database.

R. Rebertus requested he be replaced as incoming chairman. B. Rourke was nominated and accepted as replacement chairman. John Scencindiver was nominated and approved as Secretary.

Respectfully Submitted,



Russell A. Rebertus
NEC-50 Secretary, 1988

NORTHEAST COOPERATIVE SOIL SURVEY CONFERENCE
MINUTES OF BUSINESS MEETING

June 17, 1988

Recorded by John Sencindiver

The business meeting was called to order at 10:15 am by Jim Baker, Conference Chairman. The minutes of the 1986 meeting were formally accepted. No old business was discussed.

New Business

Jim Baker proposed an amendment to the By-Laws of the Northeast Cooperative Soil Survey Conference. The amendment was to change throughout the By-Laws the wording "Head, Soils Staff" to "Head, Soil Interpretations Staff." The change is needed because of SCS's staffing changes. The proposal was considered a motion to adopt. The motion was seconded, and vote for passage of the motion was **unanimous**.

Karl Langlois announced the members of the Northeast Soil Taxonomy Committee as follows:

<u>Name</u>	Term'
Peter Veneman	1986-1989
William Wright	1988-1990
William Waltman	1988-1991
Christine Evans	1989-1992
William Hatfield	1986-1989
David Van Houten	1988-1990
Carol Wettstein	1988-1991
Marc Crouch	1989-1992

* Term ends January 1 of concluding year.

Karl Langlois made a few, brief comments about the conference. He thanked all of the committees for the good work they had done. Everyone in attendance applauded the effort of Dennis Lytle and Ken LaFlamme in the arrangements made for the conference and the field trip.

The Conference Steering Committee reported that West Virginia was the planned site for the 1990 conference. John Sencindiver gave an official invitation. The Steering Committee recommended John Sencindiver as Vice-Chairman in charge of local arrangements. This recommendation was accepted as a motion, which was seconded and passed by unanimous vote.

Jim Baker symbolically passed the gavel to Dennis Lytle, the incoming chairman. Dennis adjourned the meeting at 10:45 am.

BY-LAWS OF 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: Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Virginia, Vermont, West Virginia, and the District of Columbia.

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

Head, Soil Interpretations Staff, Northeast National Technical Center, Soil Conservation Service.

National Soil Survey Laboratory Liaison to the Northeast.

Cartographic **Staff** Liaison to the Northeast.

Three representatives from the soils staff of the USDA - Forest Service as follows:

- One from the Eastern Region, National Forest System
- One from the Southern Region, National Forest System
- One from the Northeastern Area, State and Private Forestry

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. Organization and Management

A. 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 chairmen and vice-chairmen. The Steering Committee consists of the following four members:

Head, Soil Interpretations Staff, **NENTC, SCS** (chairman)
The conference chairman
The conference vice-chairman
The conference past chairman

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

2. Meetings and Communications

A planning meeting is to be held about 1 year prior to the conference. Additional meetings may be scheduled by the chairman if the need arises.

Most of the committee's 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** chairman and vice-chairmen.

The Steering Committee is responsible for the **formulation** 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 State Directors, **(b)** The Northeastern State Conservationists, SCS, **(c)** Director of Soils 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.

4. Chairman's Responsibilities

- a. Call a planning meeting of the steering committee about 1 year in advance of and if possible at the place of the conference to plan the agenda.
- b. Develop with the steering committee the first and final drafts **of** the conference's committees and their charges.
- c. Send committee assignments to committee members. The committee assignments will be determined by the Steering Committee at the planning meeting. The proposed chairman and vice-chairman of each committee will be contacted personally by the conference chairman or vice-chairman and asked if they will serve prior to final assignments. SCS people will be contacted by a SCS person and experiment station people will be contacted by an experiment station person.
- d. Compile and maintain a conference mailing list that can be copied on mailing labels.
- e. Serve as a member of the editorial board of the Northeast Cooperative Soil Survey Journal.

B. Conference Chairman and Vice-Chairman

An experiment station representative and a **SCS** state soil scientist alternate as chairman and vice-chairman. This sequence may be altered by the steering committee for special situations. The vice-chairman named 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. Send out **a** first announcement of the conference about **3/4** year prior to the conference.
4. Send written invitations to all speakers or panel members. These people will be contacted beforehand by phone or in person by various members of the Steering Committee.
5. Send out written requests to experiment station representatives to **find** out if they will be presenting a report at the conference.
6. Notify all speakers, panel members, and experiment station representatives in writing that a brief written summary of their presentation will be requested **after** the conference is over. This material will be included in the conference's proceedings.
7. Preside over the conference.
 - a. Provide **for** appropriate publicity for the conference.
9. Preside at the business meeting **of** the conference.
10. Serve as a member of the editorial board of the Northeast Cooperative Soil Survey Journal.

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. Develop the program agenda 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. Notify all persons attending the meeting of the **arrangments** for the conference (rooms, etc.). Included in the last mailing will be a copy **of** the agenda.
5. Compile and distribute the proceedings of the conference.
6. Serve as a member of the editorial board of the Northeast Cooperative Soil Survey Journal.

C. Past Conference Chairman

The past conference chairman's responsibilities are primarily to provide continuity from conference to conference. In particular, his responsibilities include the following:

1. Serve as a member of the Steering Committee.
2. Assist in planning the conference.
3. Serve as the editor of the Northeast Cooperative Soil Survey Journal. This responsibility encompasses gathering information with the other editorial board members, printing the Journal, and distributing it.

D. Administrative Advisors

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

E. Committee Chairman and Vice-chairman

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

IV. 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 **of** each participant on the mailing list.

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

Five copies to the Director of Soils, SCS. for distribution to National office staff,

Two copies to each SCS National Technical Center Head of Soil Interpretations Staff for distribution and circulation to both the SCS and cooperators within their region.

Five copies to the Region **8** and 9 Forest Service Regional Directors.

Three copies to the National Canadian Soil Survey office.

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 and Regional Soil Survey Conferences

The elected Experiment Station chairman or vice-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 Director of Soils and SCS. in consultation with the NENTC Director and state conservationists.

One member of the Steering Committee will represent the Northeast region at the Southern, North Central and Western Regional Soil Survey Conference. If none of the members of the Steering Committee can attend a particular conference, a member of the conference will be selected by the Steering Committee for this duty.

VII. Northeast Cooperative Soil Survey Journal

The Northeast Cooperative Soil Survey Conference will publish a journal on soil survey and related topics at least once each year. The journal will be governed by an editorial board made of the Steering Committee for the Northeast conference. The editor of the journal will be the past conference chairman. His responsibility will be to assist in gathering information for the journal, as well as printing and distributing the journal.

VIII. Northeast Soil Taxonomy **Committee**

Membership of the standing committee is as follows:

Head. Soil Interpretations Staff, NENTC, SCS (permanent chairman, non-voting)
Three Federal representatives
Three State representatives

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

IX. Silver Spade Award

The award will be presented every two years at the conference meeting. It will be presented to a member of the conference who has contributed outstanding regional and/or national service to soil survey. One or two individuals can be selected for the award every two years. The selection committee will be made up of past award winners with the last award recipient *acting as* chairman of the selection committee. If multiple awards were given at the previous meeting, the chairman of the selected committee will be elected by the committee. The recipients of the award will become members of the Silver Spade Club.

X. Amendments

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

By-Laws Adopted January 16, 1976

By-Laws Amended June 25, 1982

By-Laws Amended June 15, 1984

By-Laws Amended June 20, 1986

By-laws Amended June 17, 1988

Re: PROCEEDINGS OF THE 1988 CONFERENCE

As most of you know, the proceedings of our conference are assembled and distributed by the vice-chairman. The vice-chairman does not print the proceedings. Thus, we ask you to type, reproduce, and send to Dennis Lytle, vice-chairman, your talk, committee report or experiment station report. He should receive the report by July 4, 1988.

In order to get continuity in the proceedings, please follow the **instructions** given below in preparing your materials.

All Information (Talks, Committee Reports and Expt. Station Reports)

1. 8-1/2 x 11 inch paper.
2. Single space typing.
3. Printed on both sides (front and back).
4. One-inch margins right and left.
5. 200 copies.

Talks (Papers, etc.)

Format as indicated under "All Information" plus at the top of the page:

1. Title of talk.
2. Followed by author and organization of the author (SCS, Washington, D.C.; Pennsylvania State University, etc.).
3. Followed by body of the talk or paper.

Committee Reports

1. Format as indicated under "All Information" plus at the top of the 1st page:
 - a. **Committee** number.
 - b. Committee title.
2. Followed by committee members (indicate chairman, vice-chairman, and committee charges).
3. Followed by the committee report plus recommendations.
4. Pagination:
Paginate the **committee** reports with the committee number in the bottom center of the page. For example, 2-1, 2-2, etc.

Experiment Station Reports

1. Format as indicated under "All Information" plus at the top of page one:
 - a. Name of the Agricultural Experiment Station. For example, Massachusetts Agricultural Experiment Station Report.
 - b. Author.
2. Followed by the Report.
3. Pagination:
Paginate the report using the Post Office abbreviation of your state plus the page number (in lower center of page). For example, MD-1, MD-2, etc., MA-1, MA-2, etc.

Dennis Lytle
Conference Vice-Chairman

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NATIONAL COOPERATIVE SOIL SURVEY
Northeast Regional Conference Proceedings
Blacksburg, Virginia
June 15-20, 1986

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PROCEEDINGS OF THE

**Northeast
Cooperative
Soil
Survey
Conference**



Virginia Polytechnic Institute and State University

Blacksburg, Virginia

June 15-20, 1986

Proceedings of the

1986 NORTHEAST COOPERATIVE SOIL SURVEY CONFERENCE

held on June 15-20, 1986 at

Virginia Polytechnic Institute and State University
Blacksburg, Virginia

Sponsors

Virginia Agricultural Experiment Station
Cooperative Extension Service
Virginia Department of Conservation and Historic Resources

Assembled by

James C. Baker, **VPI** and State University, 238-C Smyth Hall,
Blacksburg, VA 24061

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General Presentations

- Northeast Cooperative Soil Survey, Karl H. **Langlois**, Jr. (Acting Head, Soil Survey Staff, SCS, **NENTC**)
- Soil Survey Investigations, Ellis G. Knox (National Leader Soil Research, SCS. Washington D.C.)
- National Soil Survey Laboratory, Ronald D. **Yeck** (Liaison to the Northeast, SCS, **NSSL**)
- Comments from the Northeast National Technical Center, Arthur B. Holland (Head, SCS, NENTC)
- Virginia Geographic Information System (**VirGis**), V. O. Shanholtz (Dept. Ag.Eng. Virginia Tech)
- Soil Distribution Studies in Virginia, William J. Edmonds (Field Coordinator, Virginia Tech Soil Survey)
- Panel Discussion: Soil Surveys--Post Mapping Interpretations
- Soil Surveys Utilized, David L. Jones (Soil Specialist SCS, Richmond, Virginia)
- Post Mapping Interpretation for Soil Survey of Prince William County, Virginia, John Elder (Interpretative Soil Scientist, Prince William County, Virginia, Virginia Tech)
- Public Health Perspectives on Soil Survey Information, Jay F. **Conta** (Soil Scientist, Bureau of Sewage and Water, Virginia Department of Health)
- Soil Features Related to Wastewater Disposal, John J. Simon (Department of Agronomy, Virginia Tech)
- My View of You. Comments by Dick Arnold (National Soil Survey Leader, SCS, Washington, D.C.)

General Reports

- Northeast Soil Survey Committee (**NEC-50**), William R. Wright (Dept. Nat. Resources Science, University of Rhode Island)
- National Technical Work Planning Conference of The Cooperative Soil Survey, Ray B. Bryant (Cornell University)
- Cartographic Support of Soil Surveys, Donald L. **Stelling** (Chief NCSS Branch, SCS, **NCC**)

Procedures for Estimating Mineralogy of 0.02 mm Fractions of Soils by X-Ray Diffraction, William J. **Edmonds** (Field Coordinator, Virginia Tech Soil Survey)

Interpretations of N.E. Soil **Maps--Followup** Report 1984 Committee #4, Loyal **Quandt** (Soil Correlation, SCS. **NENTC**)

Experiment Station Reports

Maryland - Martin C. Rabenhorst (University of Maryland, College Park)

New Jersey - Douglas Wysocki (Rutgers University)

New York - Ray B. Bryant (Cornell University, Ithaca)

Pennsylvania - Robert L. Cunningham (Pennsylvania State University, University Park)

Rhode Island - William R. Wright (University of Rhode Island, Kingston)

Virginia - James C. Baker (Virginia Polytechnic Institute and State University, Blacksburg)

West Virginia - John C. Sencindiver (West Virginia University, **Morgantown**)

Committee Reports

Committee 1. Use of Soil Characterization Data for Other Than Soil Classification Purposes, Ronald D. **Yeck** - Chairperson

Committee 2. Criteria for Limits of Properties of Soil Series, Martin Rabenhorst - Chairperson

Committee 3. Role of the Experiment Station in the Future. John Sencindiver - Chairperson

committee 4. Soil Woodland Interpretations, Karl **Langlois** - Chairperson

1986 Northeast Cooperative Soil Survey Conference

Business Meeting, Peter L. M. **Veneman** - Chairperson

Conference By-Laws

Instructions for NECSSC Proceedings

List of Participants

CONFERENCE AGENDA

AGENDA

Northeast Cooperative Soil Survey Conference
Center for Continuing Education
Virginia Tech
Blacksburg, Virginia

June 15-20, **1986**

Sunday - June 15

4:00-7:00 p.m.

6:00-8:00 p.m.

Monday - June 16

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1:15-1:45 p.m.	Virginia Soil and Water Conservation Programs	Don Wells, Department of Conservation and Historic Resources Div. Soil and Water Conservation
1:45-2:15 p.m.	VIRGIS-Data Bases	Vernon Shanholtz, Virginia Tech
2:15-2:45 p.m.	Soil Distribution Studies in Virginia	William J. Edmonds, Virginia Tech
2:45-3:00 p.m.	Break	
3:00-5:00 p.m.	Committee #1 - Use of Soil Characterization Data for Purposes Other Than Classification	Ron Yeck, Chair
	Committee #2 - Criteria for Limits of Properties for Soil Series	Martin Rabenhorst, Chair

Tuesday - June 17

General Session

8:00-9:00 a.m.	Panel Discussion - Soil Surveys Utilized: Post Mapping Interpretation	David Jones, SCS, Va. Larry Johnson, Fairfax, Va. John Elder, Virginia Tech Jay Conta - Va. Dept. Health Tom Simpson - Moderator, Virginia Tech
9:00-9:30 a.m.	Questions and answer session from the audience	Tom Simpson - Moderator
9:30-10:00 a.m.	Soil Mineralogy Characterization	Lucian Zelazny, Virginia Tech
10:00-10:15 a.m.	Coffee Break	
10:15-11:45 a.m.	Committee #3 - What are the Future Roles for State Universities and Experiment Stations in Soil Survey	John Sencindiver, Chair
	Committee #4 - Developing Interpretative Guides for (a) Forestry	Karl Langlois, Chair

- 11:45-1:15 a.m. Break for Lunch
- 1:15-2:00 p.m. Final reports from
1984 Committees
#1 Erosion-Productivity
Studies
#4 Interpretation for
N.E. Soil Maps
- 2:00-2:30 p.m. On Site Sludge Disposal in Va. Tom Simpson - Virginia Tech
- 2:30-3:00 p.m. Soil Water Features Relating to on Site Waste Water Disposal John Simon, Virginia Tech
- 3:00-3:15 p.m. Break
- 3:15-4:00 p.m. Soil Taxonomy Committee Presentations
- 4:00-4:45 p.m. Final Reports from 1984 Committees
#2 - Soil Survey Training Course
#3 - Role of Soil Series in Taxonomy
- Evening Session**
7:30-9:00 p.m. N.E.C.-50 Meeting

Wednesday - June 18

- 8:00 a.m.- Field Trip
5:00 p.m.
- 6:00-8:00 p.m. Picnic - Agronomy Turf Center

Thursday - June 19

- 8:00-9:45 a.m. General Session
Experiment station Reports -
15 minutes each
Connecticut-----Barvey Luce
Maine-----Robert Rourke
Massachusetts-----Peter Veneman
Maryland-----Martin Rabenhorst
New Hampshire-----Nobel Peterson
New Jersey-----Douglas Wysocki
New York-----Ray Bryant
- 9:45-10:00 a.m. Coffee Break

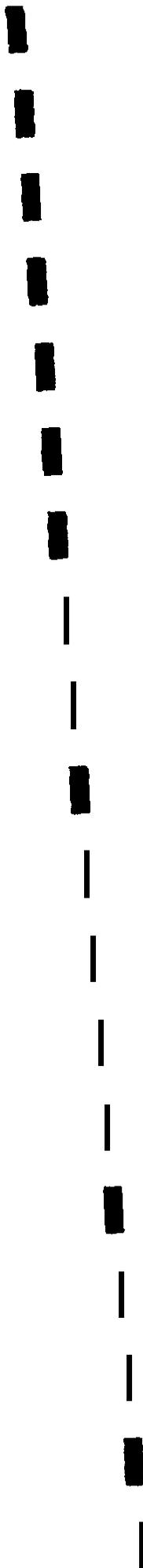
10:00-11:15 a.m.	Experiment Station Reports: Pennsylvania Rhode Island Vermont West Virginia Virginia	Robert Cunningham William Wright John Sencindiver James Baker
11:15-11:45 a.m.	OPEN	
11:45-1:15 p.m.	Lunch Break	
1:15-1:30 p.m.	Report from the National Soil Survey Conference	Ray Bryant
1:30-1:45 p.m.	Report from Southern Region	A. D. Karanthanasis
1:45-2:00 p.m.	Report from North Central Region	N. E. Smeck
2:00-2:15 p.m.	N.E.C.-50 Committee Report	Bob Rourke
2:15-2:30 p.m.	Report - U. S. Forest Service	
2:30-2:45 p.m.	Reports - Other Agencies	
2:45-3:00 p.m.	Break	
3:00-5:00 p.m.	Final Committee Work #1 Soil Characteri- zation Data #2 Criteria for Limits of Pro- perties for Soil Series #3 Future Roles of Experiment Stations in Soil Survey #4 Interpretative Guides	Ron Yeck Martin Rabenhorst John Sencindiver Karl Langlois

Friday - June 20

General Session
Final Committee Reports

8:00-8:30 a.m.	Committee #1 - Use of Soil Characterization Data for Purposes Other Than Classification	Ron Yeck
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8:30-9:00 a.m.	Committee #2 - Criteria for Limits of Properties for Soil Series	Martin Rabenhorst
9:00-9:30 a.m.	Committee #3 - What are the Puture Roles for State Universi- ties and Experiment Stations in Soil Survey	John Sencindiver
9:30-10:00 a.m.	Committee #4 - Developing Interpre- tative Guides for (a) Forestry	Karl Langlois
10:00-10:15 a.m.	Break	
10:15-12:00	Business Meeting -Plans for 1988 Conference -Conference Wrap Up -Adjournment	Karl Langlois Head, N.F.N.T.C. (Acting)



GENERAL PRESENTATIONS

Northeast Cooperative Soil Survey Conference
Karl H. Langlois, Jr.
Acting Head, Soil Survey Staff
Soil Conservation Service

The acid rain study started a couple of years ago as a pilot project in Maine and New York. Later the study was enlarged to include all of the New England states plus New York and Pennsylvania. This study involved approximately 150 watersheds and included two phases. First the watersheds were mapped and later the sites were revisited to gather soil samples. Universities were included in the sampling as receiving laboratories. These labs included the University of Maine, University of ~~Conneticut~~ at Storrs, and Cornell.

These were but a few of the many accomplishments we had in the Northeast. I want to briefly review **some** of the actions taken on recommendations made in our last (1984) conference committee reports.

Committee 1 - Regional Erosion - Productivity Studies - The concerns and recommendations of the committee were reported at the 1985 National Work Planning Conference that was held in Fort Collins, Colorado. Action is currently taking place in Washington to the extent that the crop yield form will be revised. The committee was discontinued.

Committee 2 - Soil Survey Training Course - An article containing the concerns of the committee and information generated by the committee is in the process of being published. This article will stress the **foreseen** problems of soil **scientists that** do not have field training. The committee was discontinued. A report will be given later in the week.

Committee 3 - Role of Soil Series in Taxonomy - The committee recommended that the role of the series not be changed and suggested that fewer problems would arise if inclusions and normal errors of observation were better understood. This will be an ongoing process and needs to be implemented in teaching and training. The committee was discontinued.

committee 4 - Interpretations of NE General Soil Map - The committee **recomended** that interpretations be developed but little has been done.

Areas of Concern

Many times over the last several years we have talked about computerising our lab data. The National Soil Survey Laboratory has stored most of their recent lab data on a main frame at the Nebraska State House. This allows us to retrieve data but does not allow us to query or work with the data. Many of the Universities have their lab data on a computer that they can use. My concern is that there is a lot of data that is not computerized. Also it is difficult to access the data that is computerized. We need to make a better effort to enter all data and have it available to all Universities and SCS offices that need to access it.

The form for the collection of crop yield data has been available for several years. The data is entered on the Crop Yield form, SCS-SOI-1, and keyed into the Washington Computer Center. Some states have been collecting data but most states have collected little or none. The collection of yield data has been discussed at our last conference and at the National Work Planning Conference in 1985. The people in this room must be instrumental in seeing that yield data is collected. I suggest that University personal incorporate the collection of yield data into their research study plans. SCS personal must involve other disciplines for collection of the data, we as soil scientists cannot do it all. We know this database is important and needed, so lets make a concerted effort to collect the data and enter it into the Washington Computer Center.

A couple of years ago you received a bulletin from Washington about making a state general soil map, **referred** to as **STATSGO**. Some of the states have been working on the map and some states have done very little. A lot of work and time is required in the construction of this map. I anticipate that the NTC will be involved with some correlation **desisions**, especially between states, and we prefer to know what is involved as soon as possible. My concern is that time is running short. I encourage you to continue working on the map and to start joining between states as soon as possible.

Program Emphasis in the Northeast

There is a strong soil survey program in the Northeast. we will continue to emphasize the importance of a good mapping program. We are also keeping a steady pace publishing our soil surveys and want to continue or increase that pace. If older surveys need updating we encourage you to start early to obtain the needed information. Because of the proposed move of the NTC to Fort Worth we cannot fill some of the positions that have been vacated and are, therefore, currently understaffed. We need your help and ask that you make an extra effort to review the material that you send to the NTC to make sure it is as error free as possible.

Jim Doolittle has been on the NTC soil staff over a year working with Ground Penetrating Radar. By the end of this fiscal year he will have used the radar in 35 states. He has accumulated much data and has knowledge of where the radar works best. There are many areas in the Northeast where the radar can be used to its fullest potential and it is time to train field soil scientists how to use it. Our initial plan is to train field soil scientists in the Northeast and South regions how to operate the radar. The equipment we have can be shared by soil scientists and perhaps in the near future another unit will be purchased.

The function of the NTC with Ground Penetrating Radar will be to train field soil scientists how to use the radar, provide guidelines for areas in which it can best be used, and develop ways to use the information. The NTC will also help with special uses such as developing methods of producing block diagrams from radar data, and helping develop research projects.

The Ground Penetrating Radar can be used for project soil surveys and basic soil services. We anticipate that the radar will be used extensively for determining map unit composition and the **stastical** purity of map units. Universities are conducting many research projects in which the Ground Penetrating Radar could be used as a tool to give them more information about the sites.

The last item I would like to talk about is computers. I believe SCS is **truely** in the computer age. Last week the team at Fort Collins released two sets of software that will be used extensively by SCS in the near future. They include the **3SD** (State Soil Survey Database) and CAMPS (Computer Assisted Management and Planning System). This software is undergoing testing and should be ready for distribution throughout the country in the fall or winter of this year.

The **3SD** will be used by all state office soil staffs and will contain all **SCS-SOI-5's** and SCS-SOI-6's used by the state. It will also contain all official series descriptions used by the state. This information will be able to be used, and retrieved, in any way it is needed. Some of the data, such as yield data, will need to be updated. This database will be very important because it will be the data that will go into the CAMPS program for all counties in the state. A soil scientist in all state offices will need to keep the database up to date. This individual will need to spend a lot of time learning the new equipment and the 3SD program, but the time spent will provide many benefits by having up to date data available at all times.

The CAMPS database will be used at the county level. Conservationists will use it to develop conservation plans. The program will be able to generate tables like those currently in soil surveys plus they will generate any combination of these tables. CAMPS can also be used by soil scientists for basic soil services. It is a program that will be very powerful and **usefull**.

Overall we have a strong soil survey program. I anticipate it will continue that way or perhaps become stronger. We have an exciting future with the extension of Ground Penetrating **Rader** and the use of computers with **our 3SD** and CAMPS databases.

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SOIL SURVEY INVESTIGATIONS
ELLIS G. KNOX
SOIL CONSERVATION SERVICE
WASHINGTON, DC
JUNE 1986

As an oldtimer in the National Cooperative Soil Survey. I am happy to meet with you in your regional conference. As a newcomer to the Soil Conservation Service, I have come to listen, learn, and get acquainted.

At present there are four of us in soil survey investigations on the National Headquarters staff.

I have general technical responsibility for soil survey investigations throughout the SCS.

Milt Meyer, who was acting national coordinator, continues to look after radiation safety, coordinate the national soil moisture study (in which neutron probe measurements have been made in Texas, Georgia, Indiana, North Dakota, Washington, Colorado, and Iowa), and work with EPA on its acid deposition studies and with ARS on the lead-cadmium study.

Ron Paetzold has completed his work in cooperation with ARS to develop a nuclear magnetic resonance device for measurement of surface soil moisture and, since January, has been making an overall study of soil climate (water and temperature) with respect to soil taxonomy, soil interpretations, and standardization of methods.

Oliver Rice moved about 1 June to Temple, Texas, to take Wes Fuchs' place with ARS and ERS modelers to provide soil survey input to the EPIC and other erosion-productivity models and to extract as much information useful to the soil survey as possible.

There are modest hopes for a soil-geomorphology position with a first assignment in the Palouse region of the Pacific Northwest.

In addition, the overall SCS soil investigations program includes the National Soil Survey Laboratory, as its main effort, and the work of Reese Berdanier in the South and Erling Gamble in the Midwest and Northeast in NTC research positions. We should not overlook the research that is and can be done by SCS state and field office soil scientists. I am looking for ways to encourage, support (probably not with funds), improve, and extend these local studies and their results.

We all know that the **agricultural** experiment stations (**AES**) at **state** universities are a major part of the NCSS research effort. I want to do **all** I **can** to:

- learn what research is going on.
- arrange appropriate assistance whenever possible.
- serve **asa** link or catalyst when that is helpful.
- suggest research topics based on needs of the **soil** survey.
- encourage SCS soil scientists to undertake graduate study.
- encourage SCS state offices to **facilitate graduate** study.

We should also recognize that the Forest Service and other participants in the NCSS contribute to soil survey investigations.

I'll mention just a few of my current **concerns**:

1. There is **a** major effort to make the data of the SCS laboratories widely available. This involves merging three data bases of analytical results and adding pedon descriptions. When we have **some** confidence that we **can** handle our own data **we** will be very pleased to work **with** the AES laboratories to develop integrated data bases at national, regional, and state levels. In the meantime, we welcome and applaud the **AES** work that is **already** going on and will be as responsive as we **can**.
2. The National Soils **Handbook** emphasizes the role of benchmark series to focus investigative efforts. In practice, we ignore them so thoroughly that I **am** about to conclude that the benchmark soil idea is not useful. Some other way to organize and make best use of our investigations may be needed. Concentration of efforts in a few selected soil survey **areas** may give **us** a level of understanding about how the soils relate to the landscape, function in the natural environment, **and perform** under use and management, that can be extended to other soil survey areas.
3. Ground penetrating radar offers us a new view of the soil. It probably will not be as revolutionary for soil survey as aerial photographs, but the possibilities for its use in mapping, research, special investigations, selection of laboratory sampling sites, description of mapping units, etc. are exciting. We need to be working out how, where, how often, and by whom it will be used.
4. Probably all of you have your own ideas about research needs.

I invite you to suggest what research is needed and for the NCSS, how it should be done, who should do it, and what cooperative arrangements would be helpful. I want to do all I can to facilitate soil survey **research to meet these** needs.

THE NATIONAL SOIL SURVEY LABORATORY

Ronald D. Yeck,
SCS, Lincoln, Nebraska

Within the last year, perhaps the largest change at NSSL has been related to people--one transfer and several retirements. But there have been other changes too.

Dr. Maurice Mausbach transferred to National Headquarters where he is working with the **Soil** Geography group. Two additional soil scientists retired this last year as well as a technician and a secretary. Although the NSSL **is** not presently scheduled to move as part of the proposed **NTC** consolidation, until a final decision is made about the consolidation, budget and personnel uncertainties will play a role in filling vacant positions.

We are proposing to spread liaison duties among more people, perhaps six or seven, to give more scientists an opportunity **to** work in the field and at the same time to provide assistance to the Midwestern States that Maurice served. This will likely constitute some reassignment of areas for a number **of us**. We do hope to fill Maurice's position eventually. Fred Kaisakl and Larry Brown have been promoted to head **of** the Soil Chemistry Section and Analytical Staff Leader, respectively. We do plan to fill the positions they vacated as well as the technician and clerical positions.

Because we have been somewhat shorthanded during the past year, our analytical backlog has increased from 6 to about 9 months. Once positions are filled again, hopefully that backlog can be reduced.

In addition to the services with which you are familiar, some additional ones have been added since we last met. NSSL data are now directly accessible through a computer program called INTERACT. This allows you to search for the availability of data by county or state, series, or by taxonomic code and then select from that listing, the data that you want to retrieve. Very shortly computerized descriptions **will** also be available from a companion program.

We can provide trace element data (**B**, Se, Cd, Pb and others) on selected projects, although it is not part of our routine characterization. **Otto** Baumer of our lab, cooperating with drainage and irrigation engineers developed a program to produce water retention curves that are used in the **DRAINMOD** model. The curves can be developed automatically from stored data or from values provided by the user where values need to be estimated.

In summary, we have had personnel change⁸ which **will** have some effect on our program, but should not cause any decrease in services. We are dealing with budget constraints, as are most of you, and that may be reflected some in travel as well as equipment budgets. Some services have been added which we think you will find useful. We will continue to respond to new needs, many of which **will** come with the continued shift to more basic soil services activity.

COMMENTS FROM ~~THE~~ NORTHEAST NTC
Arthur B. **Holland**
Soil Conservation Service
Cheater, *Pa.*

I would **like** to discuss three items: the **NTC** consolidation, the Productivity Improvement Program (PIP), and soil survey production in the Northeast.

But, before I get into them I want to reemphasize what Karl **Langlois** has said. Soil productivity is one of the areas where we lack information that should be available to us to help us do our jobs. This very important **data has** been left out over the years. I tell the soil scientist that part of the problem is that the information is to be recorded on a Soils-1 Form; **as** a result, nobody else feels he has a license to touch that form! Personally, I think the data should be gathered not only by soil scientists, but by others who need and use the information.

Let me talk a little about the NTC consolidation, which several of you have asked about. I did not check with Washington this morning, so **I** may not be up to date; but **I'll** tell you what I know as of last week.

You may have heard, at the end of January the Chief of Soil Conservation Service announced that we would **consolidate** the four NTC's into one technical center. The NTC's at Lincoln, Portland, and Chester would be transferred to Fort Worth. The original date set was January 3, 1987. About 3 weeks ago, the Secretary of Agriculture announced that he was delaying approval of the consolidation until additional information had been gathered from state agencies and SCS state and field offices. A final decision will be made no later than February 1, 1987. An implementation committee has been put together, with several subcommittees looking at the various functions of the NTC. This committee will meet to write the mission and function of each of the NTC staffs.

Both Peter Myers, the new Assistant Secretary of Agriculture, and Wilson Scaling, Chief of the SCS, are strongly in favor of consolidating the NTC's.

Currently, the NTC's at Lincoln, Portland, and Chester are not permitted to make any permanent promotions or fill positions that become vacant because of retirement or transfer. However, at present the Northeast NTC has a vacancy announcement out for a temporary head of the Soils Staff. We've been without a head of staff since Ted Miller retired the first of the year. The temporary position will be in effect until February 15, which is the date we were originally scheduled to move.

Let me now address the Production Improvement Program. In 1955, the Bureau of the Budget established a policy wherein the government would not do any work that could be done by private industry. This laid on the back burner for many years until the past administration took office. We are now actively implementing the policy under the A-76 Program. All

programs of the government are **being** evaluated to see what is inherently governmental type work and what work can be performed outside of the government.

I happen to be on the committee that is looking at the **SCS's** Soil Survey Program. The Chairman of this committee is Verne Bathurst, State Conservationist of Arizona. He used to be **SCS's** Deputy for Administration in Washington. Also on the committee are **Budd Fountain**, State Conservationist for South Dakota; Tom **Wetmore**, an Area Conservationist in North Carolina; Jim Talbot, National Soils Engineer in Washington; and Ken Hinckley, as Advisor. Buell **Ferguson**, Assistant Chief for the Midwest, represents the Chief on the committee. We have met several times, putting together questionnaires and gathering information and data.

Four state soil **scientists**, four area or resource soil scientists, four project leaders, and four soils mappers met with us to list all the tasks and functions they perform in their positions.

These specialists recommended that the position known as "Basic Soil Scientist" be called "Soil Resource Specialist." They felt that basic soil service is not really what **we** want that position to do. Another change they suggested was to call the field staffs "Projects" rather than "Party."

These 16 people were from the four regions of the Soil Conservation Service, representing both large and small states. We had people from New Hampshire, as well as Texas -- we tried to get a true cross section.

After this group gave us a list of all their tasks, we put them together and sent them out to a representative sample of soil resource specialists, mappers, and project leaders, as well as all state soil scientists. We asked them to list the amount of time they spent on each one of these tasks, and if there were tasks that weren't included to add them to the list. We have accumulated this data and now have a pretty good picture of **how** and what is being done in **the** soil survey program. I think in another 6 or 8 months we will have a final report.

The same committee will be doing a similar study for the cartographic program.

The last item I would like to discuss with you is soil survey production in the Northeast.

Records I have reviewed show there are about 113 soil scientists in the Northeast who are out mapping. There are, in the Northeast, about 35 million acres in 101 survey areas remaining to be mapped. Looking at the rate of production over the last 5 years, the average acres mapped were 23 thousand acres per staff year. Eight states are still very active in the mapping process. The states that are published are still doing some mapping, but this data is based on the eight states that have not

completed their mapping "once over." The range of production varies from 13,000 acres per staff year, which is very very low, to a high of 41,000 acre* per staff year. At the present mapping rates. one state will not complete field mapping for 35 years, four states should finish within the next 20 years, and three states should finish within the next 10 **years.**

Chief Scaling is dedicated to getting the entire United States mapped and published as soon as possible.

I appreciate the opportunity to speak to you and meet with you.

Virginia Geographic Information System (VirGIS): Soils

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Introduction

In February 1965, Virginia Tech began work on a project for the Division of Soil and Water Conservation of the Virginia Department of Conservation and Historic Resources to develop a cost-effective, accurate, and timely method of **estimating** agricultural non-point source pollution source potential for the Chesapeake Bay. The purpose of the system developed (Virginia Geographic Information system - **VirGIS**) was to provide a method for identifying and prioritizing critical non-point pollution areas. Potential soil loss was assumed to index pollution potential and was calculated by the Universal Soil Loss Equation (USLE) with a delivery ratio (**DR**).

Map data, which were required for each factor of the **USLE** and **DR** calculations, were summarized on the basis of a uniform grid superimposed over the **map**. Each cell represents an area one hectare (2.4 acres) in size.

Activities with soils have involved the following related activities.

- Encoding soils into the **VirGIS** data base for the Chesapeake Bay study.
- Developing software interface for single phase soil mapping interpretation data placed on magnetic tape at Ames, Iowa.
- Creating a soil mapping unit attribute **file** from data contained on magnetic tape.
- Developing procedures to encode and mathematically rubber sheet unrectified geld soil survey work maps.
- Develop methodology to electronically generate **final** soils map from field work sheets and USGS topo sheets.

Chesapeake Bay Study

This is by far the largest task that we have undertaken in the **VirGIS** laboratory. When the current contract with the Division of Soil and Water Conservation is completed, the soils data layer will contain approximately 6 million acres and will cover 31 counties. Current plans are to complete the entire state, although all future efforts will be subject to the availability of funds.

These data are stored in a raster format, each cell representing 1 hectare of area. The raster format was chosen because of cost constraints and the need for the data encoding to be completed in a very **short** time span (3 months). Logistically, manual encoding was the only feasible option.

U.S. Geological Survey 7 112 minute topographic quadrangle maps (**1:24000**) were used as the base map. The Universal Transverse Mercator (UTM) projection was used as the coordinate system. All soils data were referenced to the State Plane Coordinate System of the base map,

which required a projection transformation. This was accomplished manually by the following steps.

1. The county soils surveys were pieced together according to the State Plane Coordinate system, which is shown on these maps.
2. This map was then overlaid on a county map containing only the UTM and State Plane Coordinate systems, and
3. The maps were then cut apart based on UTM coordinates.

The soils data were digitized and encoded into a soil mapping unit map file. based on a majority assumption. This assumption says select the mapping unit that occupies the greatest percentage of a cell. The soil erodibility factor (K) for the USLE was determined for each soil type from county soil survey reports and from discussion with local District Conservationists when data were unavailable. From this attribute list and the mapping unit map. a soil erodibility map was derived.

Software Interface

Software has been developed to retrieve the single phase soil interpretation data from magnetic tapes. This involved using the PL 1 programming language for tape excess and creating county soil mapping unit data attribute list readily accessible by **Fortran 77** software.

Menu driven software then was developed that allows the creation of data layers from the attribute file compatible with the **VirGIS** map files. For example, maps of depth to top soil can be quickly generated and hardcopy maps displays made for the area of interest. Also, from the attribute list the T factor can be readily obtained and used with the R, LS. and K maps to generate the erosion index (EI) required in the new Conservation Compliance Program being administered by the Soil Conservation Service (**SCS**).

These two are but a few of the many uses of soil interpretation data.

Digitizing Soil Survey Field Work Sheets

Unrectified soil survey field work maps were digitized using the Vector method with the arc-node strategy. This strategy provided an aesthetically pleasing appearance as the maps look "hand-drafted" and the arc-node (DIME) file structure provided a complete topological file for use in various Geographic Information System functions. Algorithms were developed to rectify data to match USGS Quadrangle maps at 1:24000 scale.

If a current pilot project, which is being completed under contract with SCS, Richmond, Virginia. is successful from both the quality of computer assisted rubber sheeting and the quality of map graphics, attention will focus on a production oriented computer assisted system to digitize held survey map sheets, rubber sheet the digitized data, complete map compilation and generate a publication quality soils map.

Summary

A Geographic Information System is being developed for the Virginia Chesapeake Bay Drainage area. The data base, in raster format at 1 hectare cell size. has been completed for the York and Rappahannock drainage basin. Current development is with the Shenandoah and parts of the lower James drainage basins, and Northampton County on the Eastern Shore. The soils data for the two counties will be entered using the Vector method and rasterized to a 1 ha cell size.

Menu driven software has been developed to extract soil characteristic data from magnetic tape files created at Ames, Iowa and to create digital maps to match the **VirGIS** data layer format.

Computer software is being developed that will allow soils survey field work maps to be digitized, rubber sheeted, compiled, and publication quality soils map generated.

SOIL DISTRIBUTION STUDIES IN VIRGINIA

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While *soil taxonomists* may be content to study and characterize points on the landscape, *pedons*, *soil surveyors*, *soil correlators*, and *soil survey users* must concern themselves with geographic distributions of soils (Campbell and Edmonds, 1984). This concern may be subjective, based on intuition and experience of soil mappers, or objective, based on quantitative studies. Conclusions drawn from these **studies** depend in part on inferences **drawn** from measurements. For this reason, *soil surveyors*, *soil correlators*, and *soil survey users* must be aware of the characteristics and significance of measurements used to characterize soils. Detailed discussions and references concerning measurements are presented by Churchman and Ratoosh (1959).

Measurements are values that provide names for soils or reflect magnitudes or amounts of their characters. The manner in which values represent soils determines the scale of measurement and type of statistical procedure used to analyze **them** (Davis, 1986). Soil scientists use nominal, interval, and ratio **scales** to characterize soils and study their distributions.

The objective of this presentation is to present some of the methods of data analyses used by the Virginia Cooperative Soil Survey to study geographic distributions of soils and their properties. The Virginia Cooperative Soil Survey includes the U.S. Forest Service, Soil Conservation Service, and the Virginia Polytechnic Institute and State University. Discussions of these studies will be in relation to scales of measurement given above and to appropriate statistical methods for analyzing the data.

NOMINAL SCALE

Nominal **scales** of measurement classify soils into mutually exclusive categories of equal rank. These categories provide names or identities for soils and enable us to count them. Placement of soil profiles into **taxonomic** classes is an example. Identification of one soil profile as Frederick and another as Sassafra implies nothing about the relative importance or magnitude of the two profiles. With the nominal scale, the number of soil profiles **occurring** in map units can **be** counted, and certain **nonparametric** statistical tests are appropriate.

Statistical Evaluation of the **Taxonomic** Composition of Three Sdl Map Units in Virginia (Edmonds and Lentner, 1986)

Probabilities of observing soil profiles that classify the same as soil profiles that are **members** of the the dominant **taxon** in map units are given by Edmonds and

where p is estimated by \hat{p} and q is estimated by $1 - \hat{p}$. Then, $P(x)$ estimates the probability of observing a stated map unit composition. The **probability** of observing x or fewer soil profiles is estimated by the cumulative probability function, $F(v)$, where:

$$F(v) = P(x \leq v) = P(x = 0) + P(x = 1) + \dots + P(x = v) \quad (3)$$

The probability of **observing** more than x profiles in a map unit is estimated by:

$$P(x > v) = 1 - F(v) \quad (4)$$

Conclusions

The probability of observing the dominant **taxon** in a map unit based on **several** random observations; i.e. the distribution of the dominant **taxon** and inclusions, is considerably less than the probability of observing the dominant **taxon** based on one future random observation, the probability implied by the map unit composition given in published soil survey reports. However, the probability of observing soils with similar responses to use and management can be much higher **because** map unit **definitions** take into account local characteristics of the soil and landscape.

Properties and Classification of Residual Soils Derived from Cambrian and Ordovician Limestones and Dolomites in Southwestern Virginia (Edmonds and Rector, 1985)

The application of soil series concepts (nominal scale) to the naming of soil profiles in a mapping context was simulated by Edmonds and Rector (1985). Soil profiles were identified as members of the Frederick, Groseclose, and **Lodi** series, using field observable properties, in and by soil scientists currently mapping soils in Washington, **Smyth, Wythe, Roanoke,**

Wallis test is an appropriate substitute for the parametric one-way analysis of variance test, the nonparametric **Wilcoxon** rank sum test is an appropriate substitute for the parametric independent t-test, and the nonparametric **Wilcoxon** signed rank test is an appropriate substitute for the parametric paired t-test ~~(M. J. R. Cantor)~~

trend or regression. **Degrees** of freedom (m) associated with regression are determined by the number of **coefficients** in the polynomial **equation fitted** to the data. Degrees of freedom associated with deviation are **determined** by the total **degrees** of freedom ($n-1$), where n is the total number of observations, minus degrees of freedom associated with regression, i.e. ($n-m-1$). The *F-ratio* tests the **null hypothesis**:

$$H_0: \beta_0 = \beta_1 = \beta_2 = \dots = \beta_m = 0 \quad (9)$$

against the alternative:

$$H_A: \beta_0, \beta_1, \beta_2, \dots, \beta_m \neq 0 \quad (10)$$

H_0 states that the partial regression coefficients are equal to zero and no regression or trend exists. Sum of **squares** due to regression for a higher polynomial equation minus the sum of squares of a lower polynomial equation divided by the difference in regression degrees of freedom gives the mean squares of regression due to increasing the **degree** of the polynomial. Mean squares **due to increasing** the polynomial degree divided by the mean squares due to deviation for the higher polynomial **form an F-ratio** that **can** be used to test the **significance** of the contribution of the additional **partial** regression coefficients. Degrees of freedom associated with the mean squares due to increasing the polynomial degree are determined by the difference in the **number** of partial **regression coefficients**. The F-ratio tests the **hypothesis**:

$$H_0: \beta_{(k+1)} = \beta_{(k+2)} = \dots = \beta_m = 0 \quad (11)$$

against the alternative:

$$H_A: \beta_{(k+1)}, \beta_{(k+2)}, \dots, \beta_m \neq 0 \quad (12)$$

H_0 states that the partial regression **coefficients** after the k th **term** are equal to zero or do not contribute significantly to regression produced by β_0 through β_k .

A trend surface can describe only the **regional** variation of soil temperature, as **determined** by **rather** broad-scale climatic controls, such as latitude, elevation, **propinquity** to the Atlantic coastline (in the instance of Virginia), and prevailing winds. At any given location, the observed **temperature** is determined not only by these climatic controls, but also by local, **site-specific** factors, **including** soil color, local topography, aspect, moisture status, vegetative cover, etc. **These** local departures from the regional trend are observed at **specific** locations as the numerical **difference** between the mean annual **soil** temperature calculated by the trend-surface polynomial and the observed estimate of the **mean** annual soil **temperature**. These differences (residuals) are used to evaluate the fit of a given trend surface, as their magnitude, sign, and pattern reveal areas where the trend surface has an **especially** good, or poor, **fit** in relation to the original data.

Conclusions

The **third-degree** trend-surface equation provided the best fit for the observed values for estimated **mean** annual soil **temperature** throughout the state of Virginia. Residuals can be explained by effects of local topography. Areas with high elevations in the Blue Ridge and the Ridge and Valley regions were cooler than predicted while areas with low elevations in the Piedmont and Ridge and Valley regions were **warmer** than predicted.

Solution to Eq. 8 using the X_1 and X_2 coordinates for a given soil survey **area** with this grid can be used to determine the weather station that best approximates the estimated mean annual soil temperature or to estimate the soil temperature for a survey area without a weather station.

Isotherms produced by the third-degree trend-surface show that the **15° C isotherm** which separates the mesic and **thermic** soil temperature classes (Soil Survey Staff, 1975) also separates the **Virginia** Piedmont into approximately **equal** parts. If **1° C** leeway on either side of this isotherm can be assumed, **since** it represents only an estimate, then soil **series** of **either** mesic or **thermic** family placements can be correlated throughout the Piedmont and northern Coastal Plain including the Eastern Shore.

(14)

(16)

$$\sigma_T^2 = \sigma_D^2 + \sigma_S^2 + \sigma_P^2 + \sigma_e^2 \tag{17}$$

Conclusions

Sampling and laboratory procedures are sources of variability in measurements of soil properties. Variances contributed by these procedures are **included in the residual or error** variances. Residual variances in this study were small for base saturation, clay content, and free iron indicating fairly precise sampling and laboratory techniques for estimating these properties. Conversely, residual variances were large for **pH**, quartz in the sand fraction, **kaolinite** and **gibbsite** in the clay fraction, and the oxidic ratio. Therefore, we cannot be **certain** that we have measured real **differences** in soils when dissection of these properties are used to differentiate classes.

In most instances, less than 50 percent of the variance in **observed** measurements were among delineations indicating that most of **the** variance in **the** soil properties studied were included **within** delineations, i.e., most of the variability was contributed by sites, **profiles**, and replications in the laboratory.

Taxonomic Variation within Three Soil Map Units in Virginia (Edmonds, Campbell, and Lentner, 1985)

Numerical taxonomic procedures; principal component, cluster, and **discriminant** analyses; were used to examine **the** taxonomic variation of map units in second-order soil surveys and to evaluate **taxa** in *Soil Taxonomy* as designators of map unit content, phenetic similarity of soil profiles, and soil **characters** as class **differentiae**. Data **used** in this study represented both ratio and interval scales of **measurement**.

Eigenvectors and **their eigenvalues** that constitute the principal components of the variance-covariance matrices were extracted using the FORTRAN program given by Davis (1973). Principal component scores were derived using applicable standardized morphological, chemical, physical, and mineralogical data.

Cluster analysis is a method for systematically searching for **order** and similarity in character space. **The objective** of cluster analysis is to **arrange** soil **profiles** into relatively uniform groups so that **relationships** within and **among** these groups are **revealed**. The soil profiles were grouped by the weighted pair-group method (Davis, 1973) using the **Euclidean** distance (Arkley, 1976; Mather, 1976) as a similarity **coefficient**. Heterogeneity within clusters or groups increases as the **similarity** coefficient increases.

Discrimination is the task of assigning individuals to categories based on prior knowledge of group **characteristics**. The soil **profiles** were grouped beforehand according to their **degree** of phenetic similarity by cluster analysis. **Discriminant** functions were calculated using the FORTRAN program given by Davis (1973).

Conclusions

Taxonomic purity was not attained within 7 m at any categorical level in *Soil Taxonomy*, and four soil orders were necessary for **objectively** designating the **pedologic** content of a map unit. Comparisons of groups of soil profiles by *Soil Taxonomy* and clusters **defined** by phenetic similarity revealed that **phenetically** similar soil profiles were placed in **different taxa** and **phenetically** different soil profiles were **combined** in the same **taxon**. Any given soil character was not considered to be accessory to any other character because of low **covariance**. No single soil **character** could be **identified** as an **effective** differentia when evaluated in light of its loading onto the **eigenvectors**.

Properties, Classification, and Upland Oak Site Quality for Residual Sdls Derived from Shales, Phyllites, Siltstones, and Fine-grained Sandstones in Southwestern Virginia (Edmonds, Rector, Wilson, and Arnold, 1986)

Discriminant analysis was used by Edmonds, Rector, Wilson, and Arnold (1986) to select **differentiae**

members of the same series assumes similar lithostratigraphic units. The assumption of similar lithology of the parent materials of soils previously correlated as members of the Berks and Weikert series in Virginia has been challenged by Va Tech, SCS, and USFS soil scientists based primarily on observed differences in timber yields, in forest species composition, and in land use.

Soils derived from four groups of parent materials, separated geographically and representing three chronostratigraphic units (Butts, 1940), were compared. These parent materials were derived from Basal Cambrian rocks of shale, siltstone, phyllite, and fine-grained subgraywacke of the Chilhowee group (BQ) on the western slopes of the Blue Ridge, from Cambrian rocks of shale and fine-grained sandstone of Rome-Waynesboro formation (RO) in southeastern portions of the Great Valley, from Ordovician rocks of shale and fine-grained sandstone of the Athens and Martinsburg formations (MA) in northwestern portions of the Great Valley, and from Devonian rocks of shale and fine-grained sandstone of the Brallier, Chemung, and Millboro formations (BR) in the Allegheny Mountains.

Discriminant analysis classifies soil profiles into alternative groups on the basis of several properties considered simultaneously provided the groups are distinct and each profile belongs to one of them (Afifi and Clark, 1984). Resulting discriminant functions indicate the direction and degree to which each property contributes to the discrimination of the groups. This technique can be used to array soil properties in descending order of the magnitude of their contributions to the discrimination. More accurate predictions of differences in group responses to use and management should result from groups defined by properties that provide the greatest discrimination.

Two groups of soil profiles characterized by several properties can be separated in multivariate space by a linear equation (discriminant function) for which the two groups have the maximum separation and the least inflation. First, it is necessary to calculate a set of A coefficients for properties used to characterize the soil profiles (Davis, 1986). The resulting discriminant function:

$$R = \lambda_1 \psi_1 + \lambda_2 \psi_2 + \dots + \lambda_m \psi_m \quad (18)$$

reduces the data for these properties for a given profile to a single number or discriminant score. Substitution of the midpoint between the means for groups A and B in equation 18 gives the discriminant index, R_D . The resulting equation is:

$$R_D = \lambda_1 \frac{\bar{A}_1 + \bar{B}_1}{2} + \lambda_2 \frac{\bar{A}_2 + \bar{B}_2}{2} + \dots + \lambda_m \frac{\bar{A}_m + \bar{B}_m}{2} \quad (19)$$

Next, means for properties used to characterize soils in group A are substituted into equation 18 to obtain R_A :

$$R_A = \lambda_1 \bar{A}_1 + \lambda_2 \bar{A}_2 + \dots + \lambda_m \bar{A}_m \quad (20)$$

which gives the multivariate mean of group A. Finally, means for the properties used to characterize soils in group B are substituted into equation 18 to obtain R_B :

$$R_B = \lambda_1 \bar{B}_1 + \lambda_2 \bar{B}_2 + \dots + \lambda_m \bar{B}_m \quad (21)$$

which gives the multivariate mean of group B. The multivariate distance

$$D_i = \frac{\bar{A}_i - \bar{B}_i}{D^2} 100 \quad (22)$$

In summary, soils derived from BQ were **discriminated** from soils derived from RO, MA, and BR by Ca^{2+} , Mg^{2+} , BS, SIF, AND SF when these properties were considered simultaneously in **specified** combinations. See Table I for and explanation of symbols. However, differences **between** soils derived from BQ and soils derived from MA and BR were not as distinct as between soils **derived** from BQ and RO as indicated by smaller D^2 values for BQ-MA and BQ-BR and the number of incorrectly classified profiles. **However**, smaller amounts of plant nutrients were considered to differentiate soils of the Sylco and **Sylvatus** series (Typic and Lithic Dystrachrepts) from soils derived from the other parent materials. Soils derived from RO were **discriminated** from soils derived from BQ, MA, and BR by **SF, SIF, SIM, SQ, BS, and CEC** when these **properties** were considered simultaneously in specified combinations. Sods developed from RO were distinctly discriminated from soils derived from BQ, MA, and BR **as** indicated by larger D^2 values for BQ-RO, RO-MA, and RO-BR and the correct classification of all profiles. **Larger** amounts of feldspar in the sand and silt fractions and smaller amounts of mica in the silt and quartz in the sand **were** considered to differentiate the Litz and **Chiswell** series (**Ruptic** Ultic and **Lithic** Dystrachrepts) from soils derived from the other parent materials. Soils derived from MA and BR were not considered to be discriminated for mapping and correlation purposes because of the small D^2 value for MA-RR and **differences** in the **quantile** distributions of the selected **differentiae**. Correlation of soils **developed** from parent materials MA and BR as members of the **Berks and Weikert** series agrees with previous correlations in published soil survey **reports**.

Conclusions

Properties selected to discriminate these soils had **non-normal** distributions for one or more parent materials. Therefore, **nonparametric** statistical procedures **were** used as a basis for **comparison**.

Discriminant functions based on ranks indicated that distinct groups were formed by soils derived from rocks of the **Chilhowee** group and from rocks of the Rome-Waynesboro **formation**. Soils derived from rocks of the **Brallier**, Chemung, **Millboro**, **Martinsburg**, and Athens formations were not separated from **each** other by the properties selected

Soil **properties** selected by **discriminant** analysis for discriminating soils derived from these parent materials can be used to explain observed differences in responses to use and management. Therefore, we conclude that **discriminant** analysis provides a heuristic method for selecting **differentiae** that discriminate groups of soils when considered simultaneously and provides a technique for selecting series **differentiae** below the family level in Soil Taxonomy (Soil Survey Staff, 1975).

OTHER STUDIES

Other studies in Virginia that used ratio scales of measurement to characterize soils are Edmonds (1983), Edmonds, Cobb, and Peacock (1986), Edmonds, Silberhorn, Cobb, Peacock, McLoda, and Smith (1985), and Harris, Iyengar, Zelazny, Parker, Lietzke, and Edmonds (1980).

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APPENDIX

Table 1. P-values associated with **Shapiro-Wilk** tests of normality for selected **properties** of soils derived from four parent materials. and **BR**.

Property'	Parent materials			
	BQ#	RO#	MA#	BR#
	$\alpha(W)$			
<i>Ca</i> ²⁺	0.135	< 0.010	< 0.010	< 0.010
<i>Mg</i> ²⁺	< 0.010	< 0.010	< 0.010	0.052
<i>K</i> ⁺	0.066	0.650	0.146	< 0.010
CEC	0.071	0.046	0.687	0.602
BS	0.040	0.012	< 0.010	< 0.010
ALS	0.488	0.418	0.098	0.035
SQ	< 0.010	0.457	0.010	0.023
SIM	0.262	0.183	0.043	0.505
SIF	0.571	0.493	0.010	0.592
SF	0.018	0.108	< 0.010	< 0.010

**Ca*²⁺, *Mg*²⁺, and *K*⁺ were extracted by N *NH*₄*OAc*, pH 7. CEC is by sum of cations. BS is the sum of extractable base divided by the sum of extractable bases plus exchange acidity times 100. ALS is the N KCl extractable *AP*⁺. SQ and SF are quartz and feldspar in the sand fraction. SIM and SIF are mica and feldspar in the silt fraction.
 #BQ = Chilhowee group. RO = Rome-Waynesboro formation. MA = Martinsburg and Athens formations. BR = Brallier, Chemung, and Millboro formations.

Table 2. Discriminant functions based on properties with > 10% contributions for discriminating soils derived from parent materials BQ, RO, MA, and BR.

Property	Coefficient	Percent Added	R_A	R_O	R_B	$\alpha(F)^*$
BQ - RO**						
BS	-0.9714	38.8	-17.65	-31.82	-45.98	< 0.0001
SIF	-0.8800	36.5				
SF	-0.5993	24.1				
BQ - MA						
Ca ²⁺	-0.3951	78.5	-4.29	-6.88	-9.48	0.0001
Mg ²⁺	-0.1384	21.5				
BQ - BR						
Ca ²⁺	-0.2512	57.6	-3.88	-6.08	-8.28	0.0011
Mg ²⁺	-0.1499	30.0				
BS	-0.0598	12.4				
RO - MA						
CEC	-0.8830	30.7	13.59	0.81	-11.98	< 0.0001
SQ	-0.3712	12.3				
SF	1.3243	57.0				
RO - BR						
SIM	-0.6205	32.2	16.24	6.60	-3.04	< 0.0001
SF	1.1357	67.8				
MA - BR						
Ca ²⁺	0.1031	15.6	-0.50	-1.40	-2.3	0.0181
SIM	-0.2214	84.4				

*P-values associated with Hotelling's T^2 test of the equality of the multivariate means.

**Negative coefficients for properties indicate increases toward parent materials designated by negative signs and positive coefficients indicate increases toward parent materials designated by positive signs.

SOIL **SURVEYS UTILIZED:** POST MAPPING INTERPRETATION
David L. Jones, SCS, **Richmond**, Virginia

Introduction:

In the past, we have placed great efforts in **completing** soil **surveys** and we are still continuing toward that end. In **the** not-too-distant past, we recognized that our soil surveys had **uses** beyond providing interpretative information for agricultural use. We **also** recognized that **most** of our employees, as well as, **the** general public are not agriculturally oriented. Consequently, if we have expanding uses of soil surveys and fewer people **understand** soil surveys and soil survey interpretation, we can understand why **there is** an increasing need to provide what we **term** Basic Soil **Services**. In Virginia we have 4 **SCS** Soil Scientist providing basic services.

Soil scientist given responsibilities for basic services provide staff assistance, provide soil information in these survey **areas** having old soil surveys, as well as, refine other soil information **for** the more **modern** soil surveys, and maintain liaison with cooperating agencies.

I. Staff Assistance include such things **as:**

- a. Providing training for **SCS** employees, as well as, **others** on proper **use of** soil resource* and application of soil **survey** information.
- b. Assist our conservationist in updating technical guides and assist staff and others in the proper use of soil survey **information** in SCS program development and planning, conservation evaluation and project activities.
- c. Provide for better use of our existing soil surveys through development of soil potential ratings.
- d. Conduct **onsite** investigations of soils; this may include **supplemental** mapping of selected areas.
- e. Examples:
 1. Some examples of things that SCS Soil Scientist have done in the way of providing staff assistance include: **The** completion of soil potential ratings for dwellings with **basements** (Stafford County), septic tank **absorptions** fields (Essex) and soil potential for soybean production for grain (**Richmond** County).

e. **Examples (continued):**

2. Land evaluation and site assessment has been completed for a few counties (**I** know of Clarke County, Hanover and **Culpeper** Counties) and land evaluation have been done on a much **wider** basis (don't know **what stage** of completion we are in at this time to having all survey areas completed with land evaluation). The need to have land evaluation done in all survey areas is important because it allows for **soils** to be placed in groups having certain relative values. Most of you are aware of the Federal agency requirement to determine the impact that a given project will have on a change in land use of prime agriculture soils.
3. Providing soil surveys for many of the military installations throughout the state.
4. We are at present participating in a study of a small watershed **on Acid Rain.**
5. **A couple** of years ago, the National Wildlife Federation **featured** soil as their theme. We provided assistance to them in putting out accurate and factual soils information as it relates to wildlife.

II. Updating Soil Surveys

- a. We haven't gone in a big way for re-correlating our older soil surveys, because we are still pressing ahead to complete a once over. However, we do have one recorrelation in progress (**Mecklenburg**). We are also in **the** process of publishing two (**2**) soil surveys that were mapped some several years ago and never correlated. We **updated legends** in **at least two (2) counties** for special projects (**Fauquier** and **Loudoun**).

III. **Finally, Basic Services** consist of maintaining liaison with cooperating agencies.

- a. **Adhering to NCSS** standards and correlation.
- b. Developing interpretations **to meet other agency needs.**

POST MAPPING INTERPRETATION FOR SOIL SURVEY
OF PRINCE WILLIAM COUNTY, VIRGINIA

BY
JOHN ELDER
VIRGINIA TECH, BLACKSBURG, VA.

I'm working as a soils and land use specialist in Prince William county, Virginia. Prince William County is located in Northern Virginia, the Second County removed from Washington, D. C., and is fast becoming a part of the giant metropolitan area.

I have been in this position about 5 years since Dwight **Kaster** retired. Dwight was a part of the Soil Survey team that mapped the County which was completed in 1965. He remained in the County as the Urban Soil Interpretation Specialist from that time until he retired in 1981. Prior to Dwight leaving, I spent about 3 years in the County studying the soils, sampling and running analysis for characterization, correlation and for interpretive data for various soil problems in the county. These three years gave me a good background of the area and its soils make-up.

The major portion of **my** time is now spent making soil characterization and **soil** evaluation studies for site plans and subdivision development. I work with all the County agencies' that have any thing to do with soil or land use development. These agencies include: 1. Department of Administration, 2. Department of Planning and Zoning, 3. Department of Public Schools, 4. Department of Parks and Recreation, and 6. Department of Environmental Health.

In making soil reports to these departments, I basically do three things. First, a comprehensive description of the soils and landscape is made. This description characterizes the main soil horizons that will influence the site plan and soil preparation for development. Secondly, the problems that the user of the land can expect are listed. These include such problems as materials and lay of the land. Thirdly, specific **recommendations** are made in **most** situations. For example, with the **Jackland** soils, it is **recommended** that the shrink-swell clays be removed and replaced with good quality compacted fill materials for **roads**, parking areas and other uses where strength is needed.

In working with soil interpretations, **many** of the problems are simple. These include **such** problems as: seasonal wetness, depth to bedrock, whether the bedrock is **rippable** or will blasting **be** needed, content of shrink-swell **clays**, stability in deep excavations, **compactibility** of material for fill, steepness of **slope**, flood hazard and ercdibility. With the **more** complex problem such as the deep alluvial sediments and old filled areas on-site Engineering testing is recommended.

Along with working with the County Agencies, **many** calls and office visits are answered for realtors, land investors, and private home builders. The private homeowners problems are **most** interesting but time consuming. Some of these soil problems are easily pinpointed and solved. While others are almost impossible, for example, one homeowner had burned out 4 sump pumps in one winter. He kept a supply of new pumps on hand and ready to install when the old one failed. The soils were on a toe slope with seepage water continuously pouring into the basement. The site had good elevation to an outlet. It was recommended that a trench **be** dug and that a free flowing drain be installed.

Sink holes from the on-site burial of building wastes, stumps and grubblings are a **common** problem. After 6 to 10 years, the materials decompose, leaving a void causing the surface to collapse. When this happens, so many people **become** frantic thinking their whole lot will subside taking their house with it.

On one homesite, the new house was built on a broad flat of poorly drained shrink-swell clay. A combination of swell pressure and water had actually collapsed the basement walls. Repairs caused by such soil problems as these are quite expensive.

Land development in Prince William County is a major industry in itself. It was reported that Ridge Development Company alone sold 1,060 residential units in 1985. Dale City Enterprises and Lake Montclair also are competitors in numbers of residential sales.

In 1985, my soil evaluations covered a total of 17,594 parcels, about 8,700 were for residential units, 4,800 were for **commercial** and industrial uses, 3,800 were for rezoning cases, 1,200 were for agricultural uses and 78 were soil evaluations for septic tank **drain-**field suitability. Along with these, several parcels were evaluated for 4 new school sites.

Our soil maps are at a scale of one (1) inch per 400 feet and are made to overlay the tax base maps. We plan to increase the soil maps to **1"=200'** scale or to the new tax **base** now being drafted. At this time, soil boundaries will be adjusted to fit the base contour **map** also at the same scale.

The County does have a detailed, accurate soil survey map. This coupled with a two (2) foot contour map on all site plans **gives** a reliable planning base to work with. Accuracy of soil **maps**, with enough supportive data, is the basis for a good soil interpretation program.

SOME PUBLIC HEALTH PERSPECTIVES ON SOIL SURVEY INFORMATION

JAY F. CONTA, SOIL SCIENTIST
BUREAU OF SEWAGE AND WATER
VIRGINIA DEPARTMENT OF HEALTH

As Dr. Simpson said, my name is Jay Conta. I am a soil scientist with the Virginia Department of Health (VDH) and have served in that capacity for almost three years now. Prior to that I was a soil surveyor for the SCS for seven years in various locations in North Dakota.

I'd like to give you a little background on how VDH became involved with soils and soil survey information. For many years the soil scientists with Virginia Polytechnic Institute and State University (VPI & SU) had provided technical advice and assistance when VDH needed it on an occasional basis. VDH soon realized that their demands were ever increasing and could not be met under the arrangements used at that time. So VDH and VPI & SU arranged to have a soil scientist assigned to assist VDH for a three year trial period starting October 1, 1961. That man's name was Bill Meyer, and the trial basis was so **successful that** he was on loan to VDH for over 24 years until his recent retirement. During his later years the workload expanded tremendously and in an **effort** to cover this demand I was hired to help even out Bill's responsibilities.

To highlight just some of his many accomplishments during his service to VDH I want to note that Bill developed a soils training manual and a soils course for sanitarians to help the on-site waste disposal program. In addition, he personally trained over 900 VDH employees, which doesn't include all the private citizens he educated during his many years of service. He also sat on nearly all the VDH committees dealing with waste disposal, and was instrumental in developing our current Sewage Regulations and in updating them.

Other responsibilities included and currently include: assisting local Health Departments at individual lots as to soil suitability for a septic system; evaluating sites for alternative systems such as low pressure dosing or mounds; acting as an expert witness at adjudicatory hearings, appeals and in circuit court cases: reviewing and making recommended changes to the Sewage Regulations; reviewing new proposed waste disposal systems and equipment: offering technical advice to VDH; evaluating soil and site conditions for septage and sludge lagoon construction; reviewing spray irrigation proposals for disposal of human wastes; representing VDH at state, regional and national conferences: and interacting with the Legislature and various special interest groups as requested.

To help you understand how great the demand is for soils information and services, I should say that until three years ago VDH had only Bill Meyer for all of the above mentioned duties and

responsibilities. There are now four of us providing these same services and we are all so busy we need help. Please note that I am the only soil scientist actually employed by VDH while all the others are with VPI & SU and are under contract to assist us. This cooperative arrangement has worked well and greatly increases our ability to serve the public.

That has given you a perspective of how VDH uses soils information. In respect to soil survey information specifically I'd like you to note that:

- a. Out of a five day soils training course given to sanitarians, 20% of my lecture time is devoted to soil surveys, their usefulness and their limitations. Please keep in mind we **have over** four hundred sanitarians in Virginia, nearly all of whom have had soils training, and due to turnover we typically train thirty to fifty new employees each year.
- b. The first thing we teach sanitarians is how to use a soil survey, locate a specific parcel of land, identify the general soil characteristics at the site, what types of suitability a soil might have for various uses, and the usefulness of the county general soils map.
- c. We emphasize repeatedly that the soils maps are not site specific and that at the current scale of mapping they provide good, useful - general - information. At a 1:15840 (4 inches/mile) scale this is true and so it becomes even more of a concern when mapping is done at a reduced mapping intensity of 1:20000 (3.2 inches/mile). We teach our staff that if a survey is available it should be referred to but that its main benefits are for general planning purposes.
- d. We end the course by saying that SCS criteria establishing their septic tank rating system is not based on our Sewage Regulations. That means their ratings for mapping units or soil series should be looked at critically and in most cases ignored. I have worked with the SCS in developing soil potential ratings for Essex County, Virginia, and that document has been published, and we would be very happy to cooperate on similar projects in the future.

In conclusion, my suggestions for how the taxpayers in the Commonwealth might be better served by soil survey information would be:

- a. Include a table in each soil survey listing your criteria for evaluating slight, moderate or severe suitability for septic systems and include the critical depths, rates or amounts in each category. This might

help eliminate some of the confusion when people compare your suitability ratings with our Sewage Regulations.

- b. Maintain the soil survey scale at no less detail than 1:15840. Less detailed mapping becomes increasingly less useful and informative, and will begin to have limitations even for general septic planning purposes. A point we all need to remember is that these maps are made for the users. In many areas of Virginia the users are an increasingly urban population that wants as much site specific information as possible.
- c. If chemical or physical characterization data are collected on certain soil series or landscapes, consideration should be given to including it in the survey manuscript. If that is not practical then the possibility of a supplemental publication of that information should be considered. The VPI & SU Experiment Station regularly produces such documents for Tech soil surveys and that should be expanded to include all surveys, no matter who makes them.
- d. Increased public service and cooperation between agencies. Although the SCS may be a federal agency, we all serve the taxpayers. We have noted in some cases that VDH or private citizen requests for soils information are denied. I am well aware of how numerous requests could easily tie up too much of a soil surveyor's time. However, some assistance in providing basic soil profile or landscape information would not embroil the SCS in local politics and yet would provide some valuable services needed by the public. An arrangement similar to that authorized for VPI & SU mappers, where some small amount of time is designated to be given to interpretive work, should be considered.
- e. To encourage SCS personnel to involve VDH people in your training activities when appropriate, and by allowing and strongly encouraging SCS personnel to become involved in intrerpretive (i.e., nonagricultural) training and programs put on by other agencies such as VDH or VPI & SU.

SOIL FEATURES RELATED TO WASTEWATER DISPOSAL

John J. Simon
Virginia Polytechnic Institute and State University
Blacksburg, Virginia

Land application of domestic and industrial wastewaters provides an **effective** means of recycling water and its **components** into the ecosystem. Successful **treatment** by soil requires that **wastewater** is **applied** in **quantities** that both maintain **infiltrative** capacity of the soil and do not **exceed** the capacity of the soil-plant system to assimilate biological and chemical contaminants. Virginia has an environmental quality **research** program which **relates** soil hydraulic, physical, and morphological **properties** to both the potential for adequate transmission of **effluent** through the soil and adequate **treatment** of **chemical** and biological components of **the wastewater**.

ONSITE WASTEWATER DISPOSAL RESEARCH PROGRAM

Situation Statement

Decreasing federal support for construction of sewage collection and treatment facilities and continued growth in both suburban and rural areas is resulting in **increased numbers** of residences **relying** on **some type** of on-site **wastewater** disposal and treatment system (OSWDS). **Sewage** from 20.9 million **residences** (24.1% of the U. S. total) was **treated** via OSWDS using septic tank **sub-surface** absorption systems (**ST-SAS**) or **cesspools** as of 1980 (Bureau of **Census, 1983b**). This **represents** a 26% increase during the last **decade** in the

been primarily limited to the saturated zone. Water table fluctuations have been continuously monitored with water level recorders.

The results of this research have indicated that septic tank drainfields with low pressure distribution of effluent, a state of the art design, can be used to successfully remove biological contaminants in many environmentally marginal coastal plain soils. Earlier research in the Virginia Coastal Plain had indicated gross pollution of surface water, as indicated by presence of fecal coliform indicator organisms, commonly occurred in these soils due to the poor distribution of effluent normally associated with conventional gravity distribution systems.

Recent research at a Matthews county home where Virginia Polytechnic Institute and State University (VPI&SU) personnel installed and monitored a full scale low pressure distribution drainfield in a soil with a water table, at or near the surface, part of the year also indicated that pollution of groundwaters by NO₃-N can be dramatically lessened in many instances using this technology. Current sewage handling regulations take into account these beneficial effects by allowing a reduction in drainfield area in many soils if low pressure distribution is used.

Mountain Valley Research

New regulations were promulgated by the Virginia State Board of Health during 1980 and 1981 (Virginia State Board of Health, 1982) which provided estimated loading rates for septic tank sub-surface absorption systems (ST-SAS) similar to those suggested elsewhere (U.S. Environmental Protection Agency, 1977). Of particular interest is a section of the code providing for up to a 50% reduction in trench bottom area required for fine textured soils with estimated percolation rates of 25 to 50 min cm⁻¹ when ST-SAS LPD are used. Much of the previous work in the coastal plain indicated that the regulations were adequate in sandy coastal plain soils. However, almost no research information was available for limestone-derived soils which are characterized by clayey B horizons. Soils developed in limestone and shale residuum with clayey Bt horizons comprise much of the Appalachian Valley, Kentucky, Tennessee, Arkansas, Missouri, and other parts of the U. S.

In response to this need, a research project was undertaken in 1982 to evaluate performance of prototype ST-SAS dosed with LPD over a spectrum of effluent flux densities which ranged from 0.4 to 3.6 cm d⁻¹ (trench bottom area basis). The objectives of this study were (1) to test the hypothesis that clayey, well drained soils are suitable for ST-SAS if LPD of effluent is used; (2) to determine approximate loading rates for soils with different grade, size, and type of structure, and depths to restrictive layers; and (3) to determine the extent of nitrification in clayey limestone-derived soils below ST-SAS in which effluent was (a) ponded and (b) unponded.

Research results indicate that ST-SAS should be placed as shallow as possible to maintain the maximum depth of well structured material below the bottom of the trench. Low pressure distribution of septic tank effluent (STE) did result in maintenance of a good infiltrative surface in ST-SAS if loading rates were adequately low. Table 1 contains proposed loading rate criteria for

Table 1. Summary of proposed loading rates for limestone-derived soils.

loading rate (cm d ⁻¹)		
0.5	1.0	2.0 - 3.0
weak coarse sbk ¹ , abk ² , pr ³ , or cr ⁴ structure	mod ⁵ to strong sbk, abk, pr, or cr structure 15 to 30 thick layer or > 30 cm but 25 to 50% c.f.	mod to strong sbk, abk, pr, or cr structure no apparent restrictions < 60 cm

¹subangular blocky

²angular blocky

³prismatic

⁴columnar

⁵moderate

limestone-derived soils dosed via low pressure distribution (Simon, 1986) It should be pointed out that these rates may not be suitable if gravity distribution is used due to clogging processes and inadequate distribution of effluent associated with gravity flow. An excellent discussion of these phenomena is available elsewhere (U. S. Environmental Protection Agency, 1977).

In well structured soils, nitrification was limited if positive pressures predominated in the zone of effluent flow (Simon, 1986). Denitrification in soils with average negative pressure heads but that approached 0 was not limited below unponded trenches. Effluent leaving the immediate trench bottom area in well structured, well drained soils may have solution NO_3^- -N concentrations of 70 mg L^{-1} or more. Solution NO_3^- -N concentrations below ST-SAS were of a similar magnitude independent of flux density if the effluent was not ponded in the trench and were close to TKN concentrations in the STE.

Movement of NH_4^+ -N substantial distances from ponded trenches in well structured soils under positive pressures indicated that a large potential exists for highly dispersive flow in similar soils of moderate to coarse structure when flow is saturated or occurs through large voids. Pressure dosing at fluxes $< 2 \text{ cm d}^{-1}$ should be used to minimize potential for transport of organisms by such dispersive flow until further research indicates otherwise.

Ongoing Research

Two full scale ST-SAS with LPD have been installed in the Shenandoah Valley as well as a sand mound with LPD. One of the ST-SAS and the sand mound are in soils underlain by shale at less than 1 m depth. The other ST-SAS is installed in a well drained mountain colluvial deposit containing some large boulders and weak structure below parts of the system. Long term performance of all the systems is being evaluated. In addition nitrogen balances will be determined for the sand mound.

A second major emphasis is being placed on determining the potential for denitrification below drainfields. Field studies utilizing acetylene blocking techniques and ^{15}N Nitrogen tracers are being conducted. In addition, solution samples and soil samples are being collected below a mass drainfield to determine the temporal and spatial distribution of nitrogenous species. At the conclusion of this study, recommendations for STE loading rates associated with mass drainfields will be made based on anticipated NO_3^- -N losses to the environment.

IRRIGATION OF FESCUE WITH TEXTILE WASTEWATER

Numerous studies have indicated that application of municipal, industrial, and food processing wastewaters at N levels near or below those required for maximum yield have resulted in minimal N leaching. This study (Simon et al., 1985; Simon, 1986) evaluated the N balance for irrigation of a nylon processing wastewater containing caprolactam at TKN concentrations of about 2000 mg L^{-1} . Wastewater was applied to 'Ky 31' tall fescue (*Festuca arundinacea*) growing on a Pamunkey sandy loam (fine loamy, thermic, mixed Ultic Hapludult) soil at total Kjeldahl nitrogen (TKN) levels of approximately 250, 430, and 1900 kg ha^{-1} in 1983 and at slightly lower TKN levels in 1982. Fescue yields and N uptake were comparable to those reported in the literature for similar levels of N fertilization. The organic N mineralized and nitrified rapidly during summer and fall months. Nitrate not removed by plant growth moved steadily through the soil profile during winter months in response to surplus rainfall. Fescue growth during the summer of 1983, but prior to irrigation, depleted subsoil NO_3^- remaining from wastewater applied in 1982. While some losses due to denitrification may occur, wastewaters with readily mineralizable, but high TKN concentrations should be applied at N levels expected to result in maximum uptake efficiency prior to periods of anticipated maximum plant growth. Wastewater should not be applied late in the fall if the grass is not anticipated to remove most N or unless winter rainfall will not result in substantial leaching.

Field measured NO_3^- -N distribution profiles were compared to those predicted by a transient model using an equivalent steady state analytical solution of the convection dispersion equation proposed by Rose et al. (1982a, b). In addition, an alternate model for estimating the movement of the solute peak through the profile was proposed and tested (Simon et al., 1985; Simon, 1986). Both models use water balance data as the primary input data. Estimates of soil dispersivity, and field capacity are also required.

Results indicate that for management purposes both **modelling** approaches **provided estimates** which were within **experimental** error. **This** relatively simple approach for **estimating** leaching of $\text{NO}_3\text{-N}$ and **other non-reactive** anions **offers** promise for providing a simple but rational basis for making **management decisions**. Further **research** is **recommended** where a similar approach is used as the basis for estimating **carryover N** for small grain **fertility** programs as well as for management of N losses from **wastewaters** and sludges applied to soils.

SUMMARY

A strong **environmental research** program addressing **the** fate of biological and chemical **components** of **waste** and **wastewater** applied to soils **exists** at **VPI&SU**. Current emphasis is on **determining the potential** loading rates for applying **STE** to soils as well as **defining** extent of **nitrification** and **denitrification** associate with a **spectrum** of soil morphological and physical **properties**. Additional **emphasis** is being **placed** on development of management **schemes** which reduce $\text{NO}_3\text{-N}$ losses via leaching.

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MY VIEW OF YOU

Dick Arnold, **SCS**, Washington, D.C.

It has been a pleasure being with you at your regional soil survey conference. Your discussions have dealt with some difficult issues and have suggested options for resolving the future.

Before we scatter like dandelion seeds in a breeze, I'd like **to share** some conclusions, some comments, of where we seem to be. In your own **mind's** eye, project your scenes, your memories, your aspirations. I've selected **a** few of mine to go with these thoughts.

The conservation reserve provisions of the 1985 Food Security Act are concerned with lands that erode at rates greater than **2T** and which may be degrading their sustainable productivity. Removing these lands from cropping by long term contracts is a consideration.

Throughout the country their **are** lands being cropped that differ in their sensitivity to erosion. In this region there are many soils which if cropped in the same old ways would be subject to high rates of erosion. Many of these areas are subject to high rates of erosion. **Many** of these areas are subject to the sodbuster provisions of the Farm Bill.

The NCSS is interested to assist by providing soil maps and reports for these lands. Not only must we continue to provide our services, in many places we are being asked to accelerate--primarily to accelerate the mapping. Also we must work hard to keep up the supporting documentation.

If sod is busted in the wrong places, the land is irreparably altered for the purposes that people had intended. If swamps are busted the consequences are often far more reaching than initially expected. In the view point of some, swamp busting needs the same careful consideration as sodbusting.

We, in the **NCSS**, are well known for our understanding, or at least recognition, of soil variability. We train ourselves and others to map systematic variability and work diligently to describe and explain the randomness of soil properties that occur. Thus the maps and the reports both carry important information about soil variability.

Even an unpracticed eye can detect differences in this field. Changes in surface color and plant response attest to soil variability. Soil maps delineate the obvious and even sometimes the less obvious differences. For the various map units interpretations are presented for potential users.

More and more we **are** measuring and mentioning the probability and reliability of our statements about soil map units. We are learning how to obtain such **estimates** but so far we have much less experience in presenting such information to users. A consumer's risk is related to the statistical accuracy expressed by the lower confidence limit. It is obvious that we have a long way to go to assist people **with** these aspects of soil interpretations.

When we write about yields, for example, crop yields under a high level of management, do we suggest that these yields can be expected only for a given percent of the area within delineations of the map unit? Or do we tend to imply that every place within the named delineation will respond similarly? Well, I leave that judgment to you and to the readers of our reports.

Do we go beyond spatial variability and describe or estimate temporal variability? Did you really mean to tell us that those high yields of corn could only be expected 4 years out of 10, unless irrigated? Come now, what do you want to tell users? Oh, by the way, are the probability **statements** the same for soybeans on this map unit? How about septic tanks? I feel we may have some unanswered questions.

There are a lot of marvelous **soils** in the U.S. People use them for hundreds of different purposes. It is very likely that local interpretations will become more and more relevant. Coordination and correlation will take on new meaning and complexity to assist in these activities.

Much of the U.S. is mapped and we have reasonable guidelines on how to complete the **once-over** mapping. It suggests that we can, and must also pay attention to other aspects of understanding such as how soils develop and how they behave. We still need to look at soils in their environment.

We will need **to** sample for **characterization**, but also for other reasons. Details needed for modeling, for testing and developing criteria for classification and for specialized technical groupings are such reasons.

Site specific information becomes valuable in assessing environmental conditions where the soils occur. Extrapolating from other weather stations is still done but on-site data is wanted for many of today's interpretations.

Technology transfer draws heavily on research findings at the experiment stations. Management practices, varieties, fertilizer, and explanations are important results of this research. Improved moisture values have been derived from theory and empirical relationships. Predicted changes of moisture patterns related to drainage and crop use are closer to observed field changes.

Soil data, climate data, crop data, and many of the interactions are being simulated with computer models. **CREAMS 2**, EPIC, ALMANAC, CERES, and other models feed on tremendous amounts of data. The models simulate soil moisture, its locations, and impact on nutrient use and plant growth. Rooting depths and limiting layers are incorporated in many of the simulation models. Soil properties of specific sites or **generalized** profiles can be used.

Simulation models like EPIC consider management practices like conservation **tillage** and various crop rotations. These models provide information that allow scientists to evaluate alternatives of crops, of management, and of soils and climatic conditions.

Estimating crop yields is a major objective of the simulation models. Insofar as the results are reasonable, extrapolations to other sites and similar conditions extend and expand field experiments.

Our future interpretations will need the best soils information we can provide. Other scientists will rely on our ability to assist them in understanding soil properties and interactions as we know them.

This week you have discussed forest management and site indices. Somehow one gets the impression that this tree was not "free-to-grow" and thus not a good representative for a site measurement. On the other hand its story might be a fascinating one indeed. Crop phenology is just as important in estimating tree growth and behavior as it is for other crops.

As we move ahead in the NCSS we remain committed to two major objectives: (1) providing the best soil maps we can as we complete a once-over mapping of the U.S. and (2) helping people to understand soils and to wisely use these resources through outreach activities.

Thank you for being the best--for caring and for sharing--for being the "good hands" of the U.S. soil survey.

GENERAL REPORTS

- MINUTES -

Northeast Soil Survey Committee (NEC-50)
June 17, 1986
Virginia Polytechnic Institute, Blacksburg

The business meeting was called to order by acting chairman Ray Bryant at 7:35 p.m. on June 17th. It was noted that Chairman Bob Rourke was unable to attend the meeting. The minutes of the 1985 meeting of the NEC-50 committee were read and approved.

CSRS - Report

Dr. Preston Jones, substituting for C. Smith who had another meeting to attend, presented an update on the **FY'86** and **FY'87** budgets. The **Gramm-Rudman** Bill resulted in a **4.9%** reduction in Hatch and Competitive Grants in **Fy'86** and approximately **10%** reduction in special Grants. The **FY'87** budget is still unclear, but the projection is level funding for Hatch. Special grants are as yet questionable, but **some** will undoubtedly survive. There are proposed to be substantial cuts in CES budgets for **FY'87**.

Administrative Advisor

Chuck Krueger reiterated Dr. Jones's comments on the budget. He indicated that the cuts will effect each state differently and that there may be more earmarking of Formula funds. For example, sustaining soil productivity and water quality are receiving additional interest and may result in increased funding.

Pedon Data

Bill **Waltman** reported on the computer list of characterization data for northeast soil pedons. The list currently contains approximately 1864 pedons from AES (**1955-present**) and 416 pedons from the National Soil Survey Lab (1975-85). The information includes, soil name, source of data, and kinds of data. Actual profile descriptions and laboratory data are not included at this time.

Northeast Soil Genesis Field Trip

Ed **Ciolkosz** presented a brief report of the 1986 field trip to be held from July 15th through 18th. The areas covered will include portions of Pennsylvania and West Virginia. For further information, contact Ed or John **Sencindiver**.

Ray Bryant presented a" invitation for the 1987 field trip to be held in New York State. The trip would start in Ithaca and end in Burlington, Vermont. Tentative plans provide for observation of high lime till soils, drumlin fields, organic soils, spodosols, rubble land on **White** Face Mountain, and lacustrine and marine soils of the Champlain Valley. It was moved and seconded (**Ciolkosz** and **Veneman**) to accept the offer by Cornell.

Road Log of Soils and Geomorphology

G. Olson reported on the feasibility of developing a road log for soils field trips. He distributed examples of geology road logs and soils tour brochures that he had developed for various areas in New York. He also commented on the favorable responses he obtained concerning the questionnaire he set out to NEC-50 members. It was voted to continue the committee to develop a plan of action, to investigate feasible sources of funding, develop a format, and suggest which geographic areas would be suitable for such a task. It was also suggested that the committee include public education as part of their charge. The committee is composed of G. Olson, chairman, E. Ciolkosz, and T. Simpson.

Regional Soil Survey Training Course

P.L.M. Veneman reported on the need for a Soil Survey Training Course. Considerable discussion took place considering such items as; where would it be held, who would teach it, how would expenses be paid, would the course be open to graduate or undergraduate students, would this type of a course be required of soil science students, when would it be offered, etc. It was voted that a committee composed of Veneman and Baker develop a plan of implementation and make recommendations at the 1987 Soil Survey meetings.

Soil Survey Publications in the Northeast

Ed Ciolkosz reported on the Spring 1986 issue of Soil Survey Horizons article on "Soils Information for the Northeastern Region." Thanks was expressed to Ed for providing the initiative for making this information available. The committee was dissolved.

Soil Judging

The 1986 Northeast Collegiate Soil Judging Contest will be held at Rutgers University on October 25, 1986.

The National Soil Judging Contest will be held at Cornell University in the Spring of 1987.

The 1987 Northeast Collegiate Soil Judging Contest will be hosted by Cornell University in the Adirondacks. Ray Bryant also proposed hosting a Coaches Workshop in the Adirondacks during August of 1987. There was general agreement that this was an excellent idea and Ray will send out notices at a later date.

Elections

Marty Rabenhorst was unanimously elected as secretary for the 1987 NEC-50 meetings.

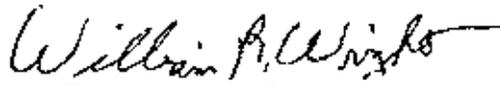
Doug Wysocki was elected as the NEC-50 representative to the National Cooperative Soil Survey meetings.

Peter Veneman was elected to replace Jim Baker on the Northeast Regional Soil Taxonomy Committee.

1987 Meetings

The 1987 Northeast Soil Survey Committee (NEC-50) will be hosted by Cornell University. The meetings will be held on August 11 and 12, 1987, in the Adirondacks followed by a Soil Judging Coaches Clinic on August 13th. Further notices will be sent to all members when the arrangements are finalized.

Respectively Submitted,



William R. Wright
Secretary

NBC-50 LIST

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Dr. Preston Jones
CSRS Representative

**Report on Proceedings of the
National Technical Work Planning Conference
of the Cooperative Soil Survey**

Ray R. Bryant
Cornell University

The 1985 National Technical Work Planning Conference of the Cooperative Soil Survey was held during the week of July 8-12, 1985 in Ft. Collins, Colorado. In his introductory remarks, R. W. Arnold reiterated the SCS soil survey mandate, which is to (1) provide and maintain a scientific basis, (2) provide scientific expertise (i.e., basic soil services), and (3) provide soil survey and interpretation (i.e., the once-over survey). Faced with impending budget cuts, a decision has been made to give highest priority to completing the once-over survey. The following technical committee and standing committee reports were given: Soil Survey Program Evaluation--K. Hinkley, Horizon Designations--T. Miller, Soil Survey Manual--J. Nichols, Current Activities in Soil Taxonomy--J. Witty, and Soil Moisture Relationships--R. Grossman. Of particular interest to this participant were the comments made by J. Witty with respect to Soil Taxonomy Committee activities. The role of regional Soil Taxonomy committees is to work out the bugs and send proposals forward to the Soil Taxonomy Policy Committee. Over 500 proposals have been submitted; many of these will be returned to the point of origin for reconsideration, modification, and resubmission. The general guidelines for submitting proposals for changes in Soil Taxonomy are published in the National Soils Handbook and Soil Taxonomy issue No. 3.

Task Force and Committee discussion groups met and reported on activities related to the following topics: Land Capability Classification--D. McCormack, Agronomic/Fertility Capability Classification--D. Goss, National GIS and Data Base Activities--G. Decker, SOI-5 Interpretation Records--W. Reybold, Soil Related Models--K. Flack and Relevant Pedological Activities--F. Miller. In addition, reports from international visitors and each of the Cooperative Soil Survey Regions were presented.

At the National Cooperative Soil Survey Steering Committee Meeting, the following actions were taken with respect to committee and task force activities.

Soil Moisture Committee: A report on the use of the Soil Property Record should be presented at the next meeting; proceed with the activities that would provide a water information record for an MLRA; the status of this committee will be changed to a working group (or task force).

Land Capability Classification Task Force: The committee is discontinued until such time as legislation demands development and implementation of a land capability classification system; the steering committee should consider the development of a new procedure for land evaluation at its next planning meeting.

Fertility Capability Classification Task Force: Bridging knowledge between pedology and agronomy seems to be quite localized in use and application; the committee is discontinued, but regional conferences are encouraged to be supportive of efforts that are underway in their states.

Geographic Information System Working Group: It was recommended that information be prepared and shared with each of the soil survey conferences; the committee is discontinued, but the IRM staff in SCS should take this on as one of its activities.

National Soil Interpretations Record Task Force: It was recommended that SCS personnel review the needs and develop a strategy for moving toward a new database format.

Committee on Soil Related Models: The NCSS supports the recommendation that NCSS take a lead in cooperating with modelers in soil science and other disciplines in establishing test areas in which the full impact of modeling on resource planning and assessment can be demonstrated.

Relevant Pedological Activities: Report is accepted and committee is discontinued; items of interest will be made available to the regional steering committees for their consideration.

Additional actions by the Steering Committee were:

- (1) There was general approval of a proposal to assign to each committee, task force, etc., a member of the Steering Committee, who would act both as an advisor and representative for the committee after its presentation.
- (2) It was agreed that the Steering Committee would assign someone at **NHQ, NTC, or other** location to follow up on the recommendations made and accepted by the conference.
- (3) It was recommended and agreed that the regional conferences summarize their recommendations that affect the national conference and forward them to the national Steering Committee for their use and action.
- (4) A resolution was passed to commend the editorial staff and the Madison staff, who work on "Soil Survey Horizons," for their excellent job in providing a vehicle of communications among people interested in the soil survey and related activities.
- (5) The committee **goes** on record in support of having the meeting location away from Washington D.C. **and in** the summer time because a field trip could be included.

Finally, participants went on a mid-week field trip to observe soils and landscapes in the Ft. Collins area.

CARTOGRAPHIC SUPPORT OF SOIL SURVEYS
Donnel L. Stelling
William L. Sikes
USDA-SCS-SNIC, Fort Worth, Texas

The SCS National Cartographic Center, Fort Worth, Texas, helps to support the soil survey program as follows:

- (1) obtaining imagery - mapping and publication
- (2) Preparing photobases and related overlays
- (3) Preparing final publication negatives
- (4) Preparing general soil and index maps and block diagrams

In addition to the above, Cartographic sends and retrieves materials from the Federal Records Centers, prints interim copies of map sheets, prepares photographic enlargements of map sheets and prepared duplicate line negatives of soil information.

Cartographic reentered the arena of contracting for map finishing during FY 86. To date, we have contracted five jobs. Another four jobs will be contracted by the end of June 1986. We expect this effort to grow, especially as state budgets are cut. Two full-time positions are presently working in contract map finishing.

A. Obtaining Imagery

Most of the imagery is obtained from two main sources:

- (1) ASCS, Salt Lake City, UT - NHAP-B&W-CIR
- (2) USGS - Orthophotography

The average cost of a survey covered by NHAP-B&W-CIR stereo is \$3250.00. Imagery generally will not be ordered until complete county coverage is obtained, because ASCS will not prepare control on partial county coverage. The average turnaround time for NHAP is 2 to 3 months.

USGS orthophotoquads now cost \$60.00 each for reproducibles, \$750.00 each for newly constructed quads.

The average eastern county takes approximately 15 orthoquads.

This year we will have a drop in production from 126 jobs (FY85) to approximately 90 jobs. This is happening because we have worked through a backlog of partially completed jobs which were transferred to Fort Worth during Cartographic consolidation and we are now working with

c. _____

E. NCSS Production

FY83 FY84 FY85 FY86 (thru May)

No. of ~~Prints~~

HARRIS R. FEATHERS, Section Head
Aerial Surveys Section, NCSS Branch
National Cartographic Center

Responsible for preparing orders for aerial photography,
orthophotography, inspection of imagery and status of imagery.

LEHMAN SPAN, Section Head
Map Finishing and Negative Prep Section, NCSS Branch
National Cartographic Center

Responsible for preparing map material for printing after
map finishing is completed.

HUGH ALLCON, Section Head
Map Finishing and Contract Section, NCSS Branch
National Cartographic Center

Responsible for review of map compilation before contracting
and other subject matter related to contracting.

VIC McWILLIAMS, Section Head
Section B, NCSS Branch
National Cartographic Center

Responsible for the production of General Soil Maps and
Index to Map Sheets.

PROCEDURE FOR ESTIMATING MINERALOGY OF 0.02-2.0 MM FRACTION
OF SOILS BY X-RAY DIFFRACTION

W. J. Edmonds

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Different classifications of the same soil can result from different methods of mineralogical analysis and from the mineralogical analysis of different size fractions by the same method. Edmonds and Rector (1985) observed that **about 28 percent** of the clayey soils developed from limestones and **dolomites** included in the study would have **different** classifications with regard to **weatherable** minerals criteria specified for **Paleudults vs Hapludults** (Soil Survey Staff, 1975) if the mineralogy of the coarse silt (0.02 - 0.05 mm) **were** not considered. Edmonds et al. (1986) noted that about 40 percent of the loamy-skeletal and loamy soils studied had different family **mineralogical** placement if the mineralogy of the coarse silt fraction **were** not considered. Therefore, an economically **feasible** procedure for analyzing **the** total 0.02 to 2.0 mm fraction of **soils** needs to be adopted instead of the usual grain count of **the** dominant size fraction of a conventional mechanical analysis as **specified** by Soil Survey Staff (1975). Such a procedure based on x-ray diffraction of the silt and sand fractions has been used by Edmonds and Rector (1985) and Edmonds et al. (1986). The procedure is given below.

Subsamples for mineralogical analysis are **treated** with citrate-dithionite-bicarbonate to remove oxide coatings. The sand fraction is separated by wet sieving. The silt and clay fractions are separated by **centrifugation** and **decantation** using dilute $N Na_2CO_3$ adjusted to **pH 9.5** as a **dispersant**. The sand fraction is ground for 5 minutes in a reciprocating ball mill. Semi-oriented smear mounts of the silt and **ground-sand** fractions are made on glass slides using **distilled H_2O** . X-ray diffraction patterns of **the** sand and silt fractions are obtained using a **Diano XRD-8300-AD** x-ray diffractometer equipped with a graphite crystal **monochromator**, **LSI-11 computer**, and printer. Samples are scanned at $2^\circ 20 \text{ minute}^{-1}$ using **$CuK\alpha$** radiation.

Amounts of silt and sand minerals are estimated from integrated x-ray diffraction peak intensities by **regression** equations developed by W. G. Harris, University of Florida, Gainesville, FL 32611 (1985, personal communications) for the x-ray diffractometer at Va Tech.

The ratio of the relative x-ray **diffraction** peak intensity of mineral a, I_a , to mineral b, I_b , is related to the ratio of their masses, M_a and M_b , by the following:

$$\frac{I_a}{I_b} = C_x - 1 \frac{M_a}{M_b} \quad (1)$$

where C_x is a constant determined empirically from the relationship of the intercept and **slope** of a line given by:

$$\frac{M_a}{M_b} = a + b \frac{I_a}{I_b} \quad (2)$$

formed by regressing known mixtures of M_a and M_b on their relative x-ray **diffraction** peak intensities. Other minerals in the **subsample** are estimated from:

$$M_{a1} + M_{a2} + \dots + M_{an} + M_b = 100 \quad (3)$$

which can be approximated by:

$$\frac{M_{a1}}{M_b} M_b + \frac{M_{a2}}{M_b} M_b + \dots + \frac{M_{an}}{M_b} M_b + M_b \cong 100 \quad (4)$$

This relationship assumes that the minerals detected represent the mineralogical composition of the soil. From this relationship, M_b can be estimated from:

$$M_b \cong \frac{100}{\sum_{i=1}^n \frac{M_{al}}{M_b} + 1.0} \quad (5)$$

Then M_{al} can be estimated from :

$$M_{al} \cong \frac{M_{al}}{M_b} M_b \quad (6)$$

Regression Equations for Va Tech X-ray Diffractometer

Regression equations were developed that related ratios of **integrated** x-ray diffraction peak intensities to ratios of known masses of **albite** and quartz, **microcline** and quartz, muscovite and quartz, **albite** and muscovite, **microcline** and muscovite, muscovite and kaolinite, quartz and kaolinite, and **microcline** and kaolinite for the **diffractometer** at Va Tech. These regression equations will need to be determined for diffractometers at other locations.

Albite and Quartz

d-spacings compared - 3.19 and 4.24

$$\frac{M_{alb}}{M_{qtz}} = 0.0273 + 0.98 \frac{I_{3.19}}{I_{4.24}}$$

$r = 0.99$

Microcline and Quartz

d-spacings compared - 3.24 and 4.24

$$\frac{M_{mic}}{M_{qtz}} = 0.069 + 0.277 \frac{I_{3.24}}{I_{4.24}}$$

$r = 0.99$

Muscovite and Quartz

d-spacings compared - 10.1 and 4.24

$$\frac{M_{mus}}{M_{qtz}} = 0.006 + 0.179 \frac{I_{10.1}}{I_{4.24}}$$

$r = 0.99$

Albite and Muscovite

d-spacings compared - 3.19 and 10.1

$$\frac{M_{alb}}{M_{mus}} = -0.196 + 1.19674 \frac{I_{3.19}}{I_{10.1}}$$

$r = 0.99$

Microcline and Muscovite

d-spacings compared - 3.24 and 10.1

$$\frac{M_{mic}}{M_{mus}} = -0.598 + 2.658 \frac{I_{3.24}}{I_{10.1}}$$

$r = 0.98$

Muscovite and Kaolinite

d-spacings compared - 10.1 and 7.2

$$\frac{M_{mic}}{M_{kao}} = 0.02 + 0.73 \frac{I_{7.2}}{I_{10.1}}$$

r = 0.99

Quartz and Kaolinite

d-spacings compared - 4.24 and 7.2

$$\frac{M_{qtz}}{M_{kao}} = 1.9 \frac{I_{4.24}}{I_{7.2}}$$

r = 0.99

Microcline and Kaolinite

d-spacings compared - 3.24 and 7.2

$$\frac{M_{mic}}{AL} = 0.1057 + 0.07956 \frac{I_{3.24}}{I_{7.2}}$$

r = 0.99

An Example

Mineral	d-spacing	Relative % *
mica	9.9	38.72
kaolinite		

$$\frac{I_{9.9}}{I_{5.07}} = \frac{21.27}{5.07} = 4.1953$$

M

This procedure has advantages over the petrographic technique for determining the mineralogy of the 0.02 - 2.0 mm fraction of soils. It requires less time and cost, aids in the identification of minerals in the coarse silt and very **fine** sand fractions, and alleviates problems associated with the number of rock **fragments** usually encountered in the silt and sand fractions of soils developed from argillaceous rocks, such as shales, siltstones, and **phyllites**, by the petrographic technique. This procedure aids in the **identification** of highly weathered **mineral** phases, such as phyllosilicates; e.g., kaolinite, chlorite, etc., and pseudomorphs **after** precursor minerals; e.g., kaolinite after biotite, in the sand and silt fractions which are **difficult** to identify by petrographic techniques. The difference in weight associated with grain morphology of mica is compensated for by this procedure. Weatherable minerals tend to increase with a decrease in particle size. Therefore, this technique has the advantage of being able to **economically** analyze the **finer** portion of the 0.02 - 2.0 mm soil fraction which can lead to a better representation of the soil mineralogy than a petrographic grain count of the dominant sand fraction, especially if the distribution of sand sizes is skewed toward the coarser end.

Disadvantages of this procedure are related to the assumption that the minerals identified by x-ray diffraction equal 100 percent. In random **or** semi-oriented smear mounts, many crystalline mineral phases have **peaks** that are **close** together or overlap. Small concentrations of minerals may not be detected. Amorphous soil components are not **detected**. Therefore, this procedure tends to **inflate** values for the dominant minerals.

However, the exact quantification of mineral suites of soils is not always necessary because semi-quantitative values determined by this procedure are relative and considered to be sufficient for computing ranks for comparing mineralogical properties of soils by **nonparametric** statistical methods. **However**, if **one** is interested in the exact quantification of the mineral suite of soils for classification or other purposes, then this procedure has the same limitations as other analysis that use x-ray **diffraction**, for example, quantitative analysis of the mineral suites of clayey soils.

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FOLLOW-UP TO
REPORT OF COMMITTEE
(1984 Soil survey Work Planning Conference)
INTERPRETATIONS OF NE GENERAL SOIL MAP

Chairperson - Loyal A. Quandt reported for Oliver Rice

Introduction

The Committee 4 charges for the 1984 Northeast Cooperative Soil Survey Conference were to:

1. Evaluate the need for developing and publishing interpretations for the published general soil map of the Northeast States.
2. Develop outline of content and format for possible regional publication.

1984 Committee Report and Recommendations

The Committee Report that was presented to the conference at Amherst, MA in 1984 provided the following:

1. That a regional soil interpretation bulletin be developed along the lines outlined in this report.
2. That the bulletin have a mixture of tabular and narrative information, and that information that can be reduced to a tabular form be presented that way.
3. That the dominant interpretations be presented in the style of those in NY Information Bulletin 119. Interpretations other than those in Bulletin 119 should be made, but additional interpretations will be more general rather than more specific. Interpretations for soil series will not be made.
4. That the map be digitized for use in geographic information systems and be made available to users who wish to make their own interpretative maps.
5. That the proposed bulletin consist of chapters; sections or parts that include:
 - A. Soil properties of the map units - the single most important part of the proposed bulletin.
 - B. Principal land uses in map units - see report section "Contents of Publication. "
 - C. Soil interpretations of map units - see section "Contents of publication. "
 - D. Rating guides used in preparing the interpretations.

- E. Examples of and guidance to prepare interpretative maps using geographic information systems.
6. **That** information on soil properties, suitability, limitations, soil properties affecting use etc., be presented **as** information that applies to a specifically stated proposition - a range of proportions - of map unit to minimize possible misuse of the data.
7. That a bulletin committee be constituted to work on this bulletin.

Summary of Recommendations

It is the opinion of the committee **that** the recommendations from the 1984 Committee report be implemented and a Soil Interpretation Bulletin be published. It is also recommended that the Steering Committee develop the plan of action for publication of this bulletin.

EXPERIMENT STATION REPORTS

Maryland Agricultural Experiment Station Report

, Martin C. Rabenhorst

Although Maryland celebrated its 'last acre' ceremony in the 1970's with the completion of the St. Marys county report, and completed a 'once over' mapping in a modern format with the publication of the Kent County report in 1982, the last acres are really yet to be mapped. This will hopefully be completed within the next two years as there has been recently signed a memorandum of understanding to map Baltimore City, which had not been included in the mapping of Baltimore County. Experience gained during the mapping of Washington D.C., will hopefully be applied toward this cooperative effort.

During the last six months, Del Fanning has been on sabbatical leave to work with the SCS (national office) on the classification of acid sulfate soils. He began this time by attending the International Symposium on Acid Sulfate Soils in Senegal, and then followed this up with visits to Egypt, Greece, and Germany. He recently completed an extended field trip from Maryland, through West Virginia, Ohio, Illinois, North Dakota and Saskatchewan, looking at active and post-active acid sulfate soils.

Distribution, characterization, and origin of closed depressions (Delmarva Bays) on Maryland's Eastern Shore

Mark Stolt has completed his work studying these unique wetland landforms which harbor a number of rare plants. Delmarva bays are very poorly drained, swampy closed depressions and are typically elliptical in shape. There is usually a distinct rim of well drained sands around the depression. A general distribution of these features was constructed for the northern Delmarva Peninsula. The bays have typically been mapped as Fallsington, Pocomoke, or Elkton. The greatest concentration of bays occurs in the central part of the Delmarva Peninsula and were found to be concentrated at elevations between 12 and 24 meters above sea level. Approximately half of the 53 bays examined were wooded. Twenty percent of these wooded depressions contained histic epipedons, and 50% of those with histic epipedons were Histosols. Within the very poorly drained basins, particle size distributions suggested the presence of argillic horizons in some pedons. Thin sections prepared from selected horizons confirmed this by the presence of illuvial clay along ped faces and root channels. Soils of the basins of the bays were Medisaprists, Typic, Cumulic, Fluvaquentic Humaquepts, or Typic Umbraquults. The soils of the rims were primarily Typic Hapludults.

Acid sulfate soils in Baltimore Harbor dredged materials

Gary Cheng has completed his work studying the soils formed in materials dredged from Baltimore Harbor. Most of the soils at the site studied were found to be active acid sulfate soils with a surficial pH of about 3. A detailed soil survey was made at the Masonville deposition site. Soils in the most recent 1 y deposited materials were Sulfaquents, in which a sulfuric horizon was not formed. In the older materials (up to 10 years since deposition) Sulfaquepts were dominant. Due to the high acidity of the Sulfaquepts, most plants cannot survive without acid neutralizing amendments. Therefore, laboratory and field lime incubation studies were conducted to determine the necessary application rates for raising the pH in reclamation. In the field, about 35 tons/acre of ground limestone was found to be necessary to achieve and hold the pH of a root zone of 9" at about 4.5 for a period of one year.

Ongoing Research

1) Factors affecting sulfur speciation in tidal marsh soils

Following the development of analytical procedures for the speciation of major S forms in marsh soils, additional effort is being spent on better documentation of levels at which the various necessary factors for S accumulation become limiting during pedogenesis.

2) Magnitude, chronology, and mechanisms of heavy metal accumulation in Chesapeake Bay tidal marsh soils

Work is being done to document the relative importance of various mechanisms by which heavy metals become occluded in tidal marsh soils. This will then be related to the rate of marsh accretion to evaluate the historical context.

- 3) The eluviation-illuviation of heavy metals in acid sulfate soils in Baltimore harbor dredged materials
Depth functions of sequential extractions of heavy metals will be used to study the processes of **eluviation** and illuviation in dredged materials. These processes appear to be very closely tied to acid sulfate weathering.
- 4) Investigation of the ability to utilize remotely sensed data to delineate and monitor erosion on agricultural lands
One of Dick Weismiller's students will be using available imagery to evaluate the applicability of this approach in the Maryland Piedmont.
- 5) Modelina of lightscattering by soil surfaces
This is a joint project with Goddard (NASA) to better understand and mathematically formulate relationships between radiation characteristics and the physical properties of the soil, which is necessary for accurate retrieval of information by remote sensing.
- 6) Studies of Glauconite containing soils
- 7) Studies of calcareous soils in Maryland

New Jersey Agricultural Experiment
Station Report - 1986
for
NEC-50, Soil Survey Committee
by
Douglas Wysocki

ONGOING RESEARCH:

PROJECT TITLE: Soil Landscape Relationships in New Jersey
PERSONNEL: Douglas Wysocki, Rutgers **University**
H.C. Smith, Soil Conservation Service

The occurrence of loess is being studied in Salem County on the Inner Coastal Plain to determine the age, origin, and distribution of the deposit. A number of soils with and without **loess** cover have been described and sampled for characterization in cooperation with the Soil Conservation Service. **Loess** thickness is about a meter in thickness and generally decreases away from the Delaware River, the presumed source. However, loess thickness six miles from the source area is nearly the same as on areas directly adjacent to the river.

This distribution may be a function of several factors. A number of tidal areas may have served as source regions. Multiple periods of deposition from a migrating (braided stream) source area could result in a non linear pattern. Erosion could have modified the original depositional sequence. *The* original loess deposits may have been subsequently reworked by eolian processes. Wind blown sand can be found sandwiched between silt layers indicating that waning periods of silt deposition occurred. Little if any soil development is observable in the lower loess or sand: Thus, the deposition of these materials appears to be closely related in time. Particle size analysis is being done to aid in determining the source of the loess.

No paleosols with datable material have been found beneath the loess. The loess, however, represents just one event that is related to Late-Wisconsin deglaciation and climate. Alluvial deposits of silts and gravels grade down several tributaries of the Delaware. Weathering and soil development on this material is considerably less than on older terraces. One sand and gravel deposit yielded fragments of Spruce which radio carbon dates at 23,500 BP. Loess blankets these deposits so must be younger than this. Field investigation also shows that **many soils** on the higher (> 90 feet) and older (Bridgeton and Pennsauken deposits) are developed in a layer of reworked and less weathered sediment. The origin of this sediment is open to debate. The material is poorly sorted and generally **covers** lower segments of the landscape. This sediment may represent erosion debris deposited during slope bevelling. Alternatively it could be colluvial material deposited during a periglacial environment. One observation which supports this theory is the

occurrence of numerous ice wedge casts in local gravel pits. Events in Late-Wisconsin time have markedly altered the landscape on the Coastal Plain of New Jersey. We are just beginning to understand the extent this alteration and its effects on soil formation.

NEWLY INITIATED RESEARCH:

PERSONNEL: Douglas Wysocki, Rutgers University.

PROJECT TITLE: Kinetics of Mottle Formation

The purpose of this project is to get an estimate on the length of time required for mottles to form under controlled laboratory conditions. Four soils with a range in texture from well drained locations (unmottled) will be collected as intact cores. The cores will be placed into appropriate size Plexiglas cylinders and subjected to different simulated hydrologic conditions: stagnant water, fluctuating level, and saturation with flow. Energy sources will be added and electrochemical potential monitored at sites of mottle formation. Mottle pattern produced will be described and related to the hydrologic regime, if possible.

Cornell University Agricultural Experiment Station Report

Ray B. Bryant

The experiment station, in cooperation with the SCS staff in New York State, has been heavily committed in support of the study of terrestrial effects of acid deposition on the acidification of surface waters in the Northeast. Thirty (30) pedons were sampled by the SCS and characterized by the Cornell University Soil Characterization Laboratory as part of a pilot study. Approximately 900 soil samples were collected by the SCS in New York and Pennsylvania and prepared for analysis at Cornell as part of the major study. Preliminary results show some correspondence between the alkalinity of surface waters and the alkalinity of soil horizons through which the water has percolated. Soil depth and presence or absence of a fragipan or dense till appears to be correlated with the acidification of surface waters within a given watershed.

A study of the effects of soil erosion on soil productivity in the northeast is being completed and summarized. A computer model that calculates a daily soil water budget during the growing season was developed and used to predict the reduction in corn **grain** yields that are expected to occur in response to the loss of soil and the associated decrease in rooting volume resulting from erosion. "Fragile soils" that experience sharp declines in productivity as a result of relatively small amounts of soil loss are being identified. The model may be useful as a subroutine in the EPIC model to improve predictions in the Northeast.

A study of the soils developed in sediments from Late-Quaternary water bodies in northern New York has been completed. Soils developed in marine, lacustrine, and brackish-water deposits were distinguished on the basis of potassium, sodium, and soluble salt content. Particle-size and carbonate content are not distinctive of the depositional environment but may reflect the composition of the rocks in **the source area**. The data support a westward influence of the Champlain Sea beyond where marine fossils have been found to date. The area appears to be contiguous with and transitional to freshwater drainage from the Ontario Basin. The data also support the presence of a brackish water phase in the St. Lawrence Valley, and a water plane for this late Champlain Sea phase is postulated.

A series of extractions on soil horizons from **spodosols** in the Adirondack Mountains shows that KOH extracts Al in amounts almost identical to that extracted by oxalate. KOI-I does not extract Fe. The data shows that **oxalate** would be a more useful extractant for characterizing spodosols than KOH. Spodic extractions on soils of a hydrosequence shows that the total amount of Fe and Al accumulation is similar in well drained soils and somewhat-poorly drained soils. However, the accumulation occurs above the water table, resulting in higher concentrations of Fe and Al at shallower depths in the profiles of the wetter soils.

Soil-geomorphic studies in the **periglacially** influenced area of the Salamanca re-entrant are near completion. This study is being expanded northward onto the till deposits in western New York.

A study of manganese oxides in soils derived from the Pottsville sandstone in Pennsylvania is being extended to soils and parent materials in New York. **Preliminary results suggest** that manganese in some soils are relicts of the parent material and are not indicative of present day wetness characteristics.

NY-I

Soil tour bulletins have been published for several relatively recently completed survey areas, including a soils tour of Central Park in New York City. The soil tour series of bulletins is an effective means of increasing public awareness of the importance of soils. A lab manual to accompany the text, "**Soils and The Environment**," is released. Together, these books provide a framework for a college level course on soil interpretations and land use.

Publications

- Timlin, D. J. 1986. Modeling corn grain yields in relation to soil erosion using a water budget approach. Cornell Univ. M. S. Thesis.
- Kern, J. S. 1986. Characterization of soils formed in lacustrine, marine, and brackish parent materials in northern New York. Cornell Univ. M. S. Thesis.
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- Kern, J. S. and Bryant, R. B. (Abs.). 1985. A comparison of clayey soils formed in lacustrine and marine deposits in northern New York. *Amer. Soc. of Agron.* p. 193.
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- Major, A. P. and Bryant, R. B. (Abs.). 1984. Spodosol morphology as related to landscape

THE PENNSYLVANIA STATE UNIVERSITY

AGRICULTURAL EXPERIMENT STATION

REPORT

R. L. Cunningham

The program objectives continue to include: 1) soil characterization, 2) soil genesis research, and 3) soil information systems. The state is 99 percent field mapped; however, several counties are undergoing "updating" that usually includes field investigations. Data from the characterization of 752 pedons throughout Pennsylvania have supported field survey and interpretations decisions. The soil data base is being expanded to include computerized soil profile descriptions and sampling site information planning for additional characterization and genesis investigations, particularly in counties undergoing updating. With the computerization of descriptions, classification will be verified at all levels down to the interpretative mapping unit. Presently, the SCS Lincoln Lab is converting hard copy profile descriptions and site information to floppy disks using standard coding and format on a fee basis.

The characterization data from our lab are requested frequently. An IBM-AT based system provides the greatest flexibility in selecting, sorting, and delivering the information. The characterization data are in compatible format with SCS-5--interpretations information, and SCS-6--mapping unit use file, all data are updated and corrected frequently. A methodology data set is planned to support the characterization analyses. No further field sampling of soils for characterization is planned until detailed interpretations of the accumulated information are completed.

Research studies include the fragipan study by Bill Waltman, limestone soils by Dick Cronce, soil data base by Dave Watkins, colluvial soils by Mike Hoover, steep sandy soils by Brian Carter, soil mottling by Bob Dobos, imagery interpretation by Nancy Parks, Tim Dean, and Dan Cooper, and an amorphous materials study by Dr. Ciolkosz.

Mapping aids from Digital Elevation Model data have been produced and offered encouragement to develop integrated terrain units (ITU's) that spatially represent a part of the landscape and have a set of multiple attributes that would include soil properties and interpretations. This research is being conducted in cooperation with SCS with some assistance from Pennsylvania Power and Light Company.

Several county reports have been published in the last two years until 57 of the 67 counties now have relatively recent soil survey reports. Adult education meetings are conducted by Extension on each new report released.

A list of publications from the Soil Genesis and Morphology Group is available upon request.

Rhode Island Agricultural Experiment Station

William R. Wright

Soil Properties in the Transition Zone of Forested Wetlands

F.C. Golet and W.R. Wright

This project, which is in its second year, is analyzing the inter-relationships between water regime, vegetation, soils, and other features such as microrelief along broad transition zones bordering areas mapped as forested wetlands. Properties measured include; vegetation species and cover, water tables, moisture tensions, soil temperatures, oxygen levels, redox potential, and various physical, chemical, and morphological properties of soils. These data will be utilized to quantify the biological, physical, and chemical characteristics of this zone and to develop a **multivariate** technique for the field identification of forested wetland boundaries. Specific objectives are: 1) to describe the changes in soil properties that occur along the transition zone of forested wetlands in southern Rhode Island; 2) to relate these changes in soil properties to changes in vegetation, ground elevation, and the elevation of the water table across the transition zone; and 3) to suggest criteria for the field identification of hydric soil conditions in forested areas.

Field Evaluation of Nitrogen Control Systems for
Individual Sewage Disposal Systems

A.J. Gold and W.R. Wright

This study was initiated to field evaluate several denitrification systems as a means of reducing nitrogen input to groundwaters and coastal waters from individual sewage disposal systems. Three options are currently being evaluated and include; the RUCK system (black water-grey water), a recirculating sand filter (black water-black water) and a conventional system. Specific objectives are: 1) to determine the fate of nitrogen in each component of each system, 2) to evaluate both grey water and black water as sources of organic carbon for denitrification, and 3) to quantify the nitrate loading to groundwater for each system.

RI-1

Off-Site Transport of Nutrients and Herbicides

From Turfgrass Plots

A.J. Cold

Twelve hydrologically isolated Bluegrass plots were established on 3% slopes. Each plot was instrumented to collect both runoff water and gravitational water from ceramic plates. Plots were treated with fertilizer and herbicides by a commercial lawn care company. One-half of the plots received a scheduled irrigation based on soil tension data and the other half were over irrigated. Initial data suggest that significant movement of nitrate-nitrogen only occurred on those plots which were over watered.

Establishment of a Rhode Island Geographic Information System

P.V. August and W.R. Wright

A two year agreement has been made with the R.I. Department of Environmental Management to develop and establish a State-Wide Geographic Information System, Digitizers, Tektronix graphic CRT's and Calcomp Plotters have been procured and the ARC/INFO software has been installed on the University's Prime 9955 computer system. The Environmental Data Center located in the Department of Natural Resources Science (URI) will provide input/output services for all data bases, quality control, and computer generated map products.

Virginia Agricultural Experiment Station Report

James C. Baker

This report will focus on the soil survey program in Virginia and Virginia Tech's role in the National Cooperative Soil Survey.

Soil Genesis, Morphology, and Soil Survey Personnel

J. C. Baker - Project Leader and Soil Survey Coordinator
W. J. **Edmonds** - Soil Survey Field Coordinator
D. **F.** Amos - International Programs (Nepal)
T. W. Simpson - Extension Agronomist - Soil and Land Use
W. L. **Daniels** - Resident Instructor - Mine Land Reclamation
K.W. Molten - Computer Application Specialist
13 Field Soil Scientist
3 Interpretative Soil Scientists - County
3 Interpretative Soil Scientists - State Health Department

Present Status

Modern soil survey information is available for approximately 15.5 million acres of Virginia's 25.4 million acres. To date 52 counties have modern soil surveys, 19 counties have surveys in progress, and 26 counties have old or **no** survey information. All surveys presently underway are on a cost sharing basis with the county contribution ranging from 10 to 25 percent of the cost of the soil survey.

The current Virginia Tech soil survey program has 8 progressive soil surveys underway involving 13 field soil scientists. The surveys cover all the physiographic provinces and include: **Accomack, Appomattox, Charles City, King William, Nelson, Patrick, Washington, and Wythe** Counties. One soil scientist is assigned to an SCS field party in Amelia County, and one soil scientist is assigned at Blacksburg to work with manuscripts, map compilation, and data analysis. This makes a total of 15 soil scientists.

The soil characterization laboratories at Blacksburg provide characterization data on chemical, physical, and mineralogical properties of soils for both federal and state soil surveys in Virginia. The major benefit of these laboratory facilities, coupled with an active participating field program, operating under the supervision of the Department of Agronomy, is that research can be controlled and directed that will best serve the needs of Virginia and also contribute to regional and national programs that are a part of the National Cooperative Soil Survey. Several of our research efforts will have impact on the rules that govern operation of the National Soil Survey program. Thus under the umbrella project entitled "Investigation, Characterization, and Soil Survey of Designated Counties in Virginia", many separate investigations have been made, many more are currently underway, and several are planned for the future. The following investigations are examples of the kinds of research that are now a part of the Virginia Tech soil survey classification and genesis research program.

Soil Survey Scholarships

There are 5 students enrolled in **Agronomy at Virginia Tech** that are receiving the soil science scholarship. They are:

		<u>QCA</u>
Glenn McClenny	Sr.	3.50
Stuart M. Lynn	Sr.	2.82
Daphne Roots	Jr.	2.42
Victoria Sage	Jr.	3.35
Harold Bradley	Pr.	-0-

These students, with others, make up the agronomy collegiate soil judging team that last year won the Southern Regional Contest at Knoxville, Tennessee, and placed 7th in the National Contest at Colorado. With all "lettermen" returning, hopes are high for a possible national championship at Cornell in the spring.

Victoria Sage also received a \$500 scholarship from the Soil Conservation Society of America. Of 16 scholarships awarded nationally, 2 were awarded to students at Virginia Tech.

Cooperative Soil Survey

Field Studies Underway

- Study Title: Characterization of Physical and Chemical Properties of Piedmont Soils.
 - Objective: To assess the water retention, hydraulic conductivity, texture, and chemistry of major soils of the Virginia Piedmont.
 - Accomplishments: Five sites of the Cecil and **Appling** and four sites each of the Georgeville, Madison, and Nason have been selected for study in Amelia, Pittsylvania, Bedford, Nelson, and Appomattox Counties. Intensive as well as extensive sampling has been completed for Bedford County. Sampling is 65% completed in the other counties with an additional 2 sites each of the following soils sampled: **Hayesville, Tatum, and Cullen.** Water retention **curves** as well as hydraulic properties have been **measured.** Over 1,500 water **desorption** curves have been made. The results thus far indicate that most variation of data for these soil properties is due to short range variability.
 - Future Projection: The intensive sampling will be completed in 1986. The extensive sampling will continue through 1986 and early 1987 until completed. Analyses have been completed for approximately 65% of the project and will be completed by summer 1987 yielding water properties as well as chemistry and textural data for the soils in these counties.
- Study Title: Red Clayey Soils fo the Virginia Piedmont

- a. Objectives: The objective of this investigation is to characterize and classify soils derived from materials ranging from **mafic** rocks to granitic rock in five Southern Piedmont Counties by criteria in soil taxonomy and by numerical taxonomy. These soils typically have red clayey B horizons and have been represented by nearly 20 soil series.
 - b. Accomplishments: Sixty randomly located soil profiles have been described and sampled. Characterization data for chemistry and particle size analyses are completed. Mineralogical analysis of the clay are approximately 50% completed.
 - c. Future Projections: The results are being compiled and will be used to define or redefine soil series pertinent to this large group of important soils in the Southern Piedmont of Virginia. Data will be published as a Virginia Tech research bulletin.
3. Study Title: Flood Plain and Terrace Soils
- a. Objective: The objective of this investigation is to characterize and classify soils in the Ridge and Valley province that occur on low stream terraces or flood plains. The study will encompass a seven county area in western **Virginia** from Page County to Washington County.
 - b. Accomplishments: This sampling phase of this study will begin in October, 1986.

PUBLICATIONS
FY 85-86

Refereed Journal Articles

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- Albrecht, K.A., S. D. Logsdon, J. C. Parker, and J. C. Baker, 1985. **Spacial** variability of hydraulic properties in the **Emporia** series. Soil Sci. Soc. Am. J. **49:1498-1502**.
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- Hatch, D. R., J. E. Belshan, S. M. **Lantz**, G. R. **Swecker**, and D. E. **Starner**. 1985. Soil Survey of Virginia Beach, Virginia. USDA-SCS, U. S. Government Printing Office, Washington, D. C.
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West Virginia Agricultural and Forestry
Experiment Station Report

John C. Sencindiver

Since the last conference, the Soil Conservation Service has published three soil survey reports in cooperation with the West Virginia Agricultural and Forestry Experiment Station. The Soil Survey of Mercer and Summers Counties was issued in July 1984, Upshur County was issued in May 1985, and Putnam County was issued in August 1985.

The Soil Conservation Service has decided to map soil associations in large areas of southern West Virginia. In preparation for the survey, the area was transected and soils were described at over 600 points. The data from the transects indicated that characterization data for classification and correlation were needed. Twenty pedons were sampled in Nicholas, Boone, Logan, Bingo, Wyoming and McDowell Counties. These pedons represented Berks, Dekalb (both loamy-skeletal, mixed, mesic Typic Dystrochrepts), Guyandotte (loamy-skeletal, mixed, mesic Typic Haplumbrepts), and Pineville (fine-loamy, mixed, mesic Typic Hapludults) series. Samples were sent to the National Soil Survey Laboratory for analyses.

Several well-known soil scientists were invited to state meetings during the last two years. Dr. Gary Petersen (The Pennsylvania State University) presented a one-day workshop on remote sensing and geographic data bases. This workshop was co-sponsored by the College of Agriculture and Forestry and the West Virginia Association of Professional Soil Scientists (WVAPSS). Dr. Stan Buol (B.C. State University) and Dr. Roy Simonson (retired, SCS National Soil Survey Staff) participated in the WVAPSS annual meetings and programs in 1985 and 1986, respectively.

After several years of planning, an extension specialist position in land reclamation has been established at YW. Dr. Jeffrey Skousen was hired on January 1, 1986. Dr. Skousen received a Ph.D. in range science at Texas A & M University. He has a strong background in agronomy and soil science. In addition to his extension duties, Dr. Skousen will teach a land reclamation course. He has already established a demonstration/research study of sewage sludge application to mined land.

Studies in land reclamation and utilization of waste products on mined lands continue to be emphasized by the soil science group. Studies are being conducted in the following areas:

1. Abandoned mineland revegetation.
2. Effects of topsoil and vegetation on the production of acid mine drainage from coal refuse.
3. Characterization and classification of minesoils.
4. Hydraulic properties of minesoils.
5. Minesoil mineralogy.

6. Use **of** natural and man-made wetlands to treat acid mine drainage.
7. Use of Florida phosphate by-products to treat acid minesoils.
8. Sewage sludge application on Porest land.
9. Absorption **of** heavy **metals** by soils.
10. Utilization of Ply ash for **crop** growth.
11. Utilization **of** Ply ash and rock phosphate mixtures **for** reclamation of abandoned mine lands.

A list of publications and theses is available upon request.

COMMITTEE REPORTS

Charge 1. Develop a master list of Northeast pedons on which laboratory characterization data are available. This should be a comprehensive list which includes both NSSL and experiment station data.

Charge coordinator: Bill **Waltman**

Other members assigned to Charge 1: L. Quandt, W. Jokela,
D. Wysocki

Accomplishment: Two lists, one for NSSL and one from experimental stations, listed 416 pedons from **NSSL** and 1,864 pedons from experimental stations. Each list includes the series name, state in which it was sampled ID code, data available codes, and taxonomic classification.

Distribution by order (experiment station).

627 Inceptisols	262 Spodosols
479 Alfisols	87 Entisols
313 Ultisols	10 Mollisols
	4 Histosols

Discussion: Since these represent only laboratory data, descriptions should be included in computerized format to be included with the laboratory data.

The **inventory** has value for several **uses including use** for series definitions and identifying data available for testing **Soil Taxonomy**. The complete lists are included here and follow the recommendations for Charge 1.

Recommendations:

1. Standardize soil descriptions and encode for computer storage, storing them at the same place as laboratory data in regional or national data bases.
2. Northeast should establish a regional NCSS data base, with the intent of it becoming part of a national NCSS data base. This should be a relational data base.
3. Forward this list to the National Cooperative Soil Survey Conference as partial justification for establishing a central data base that incorporates agricultural experimental station data. We would recommend that this be **colocated** with other NCSS data base.
4. Forward copies of this to organizers of the other three regional conferences and suggest that they compile **similar lists**, all of which would combine to comprise a national list.
5. Continue updates biannually.

Northeast Soil Characterization Database

Legend

The following universities have provided information for this table:

University of Connecticut	-	CT
University of Massachusetts	-	MA
University of Maryland	-	MD
University of Maine		ME
Cornell University		NY
Penn State University		PA
University of Rhode Island	-	RI

Additionally, a separate file was created for Northeast pedons sampled and analyzed by the National Soil Survey Laboratory from 1975-1985.

The column labeled **#PED** (number of pedons) contains the number of pedons from each **series that have** been characterized in each state.

The column labeled **ID#** contains the sample identification number used by each of the states. The rows containing NA indicate that this information was not provided by the state.

The following entries were used:

ID#

CAES	-	Conn. Agrl. Exp. Station sample number
UMA	-	Univ. of Massachusetts sample number
ss	-	Soil survey sample no. (i.e., S84NY001-01-1)
NA	-	Not available

The column labeled **ACCESS** contains the form in which the characterization data is available. More than one entry per row indicates that the data are available in more than one type of publication or form (i.e., the entry CF, MIR indicates that the given pedon data is available as either a mimeo or an interim report and is also stored in a computer file).

The following **entires** were used.

ACCESS

- MIR - Mimeo or Agronomy Dept. Progress Report
(available for distribution)
- SB - Agricultural Experiment Station Bulletin
- MF - Master File
- SSR - Soil Survey Report
- CF - Computer file

*Indicates that the data compiled and available in the master file only contains pedons up to 1970 and does not include several pedons that have been characterized for thesis studies after that year.

A separte column, CF?, was created to allow old characterization data which has not been entered into a computer file to be separated from newer data which has been entered. A rapid check of the availability of computer files for any given series is also allowed. Entry is either Y (yes) or N (no).

The column labeled DATA AVAIL indicates the type of data available for a given series. More than one entry per row indicates that more than one type of characterization data is available. For example, the entry PSA, CHEM, PHYS, MIN indicates that the particle size analyses, chemical, physical and mineralogical data are available for that given series.

The following entries were used:

DATA AVAIL

- PSA - Particle size analysis data
- CHEM - Chemical characterization data
(pH, CEC, exchangeable bases, etc.)
- PHYS - Physical characterization data
(bulk density, AWHC, etc.)
- MIN - Mineralogical characterization data

The column labeled TAXONOMIC CLASSIFICATION contains the family level taxonomic name for the given series. It has been separated into three columns, the first containing the great group, the second the subgroup and the third the family. This allows any information to be retrieved based on the order, suborder, great group, subgroup or family name of the series in the database.

The database was set-up on an IBM PC-AT microcomputer with commercially available software (R-BASE 5000 series).

SERIES	ST	#PED	ID#	ACCESS	CF?	DATA	AVAIL	TAXONOMIC	CLASSIFICATION
Abbottstown	PA	2	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Aeric	Fragiaqualf	fine-loamy, mixed, mesic
Adams	ME	5	NA	SB	N	PSA,CHEM,PHYS	Typic	Haplorthod	frigid,sandy,mixed
Adams	NY	8	55	CF,MIR	Y	PSA,CHEM,PHYS	Typic	Haplorthod	sandy, mixed, frigid
Adelphia	MD	1	NA	MF*	N	PSA,CHEM	Aquic	Hapludalf	fine-loamy, mixed, usic
Adjidaumo	NY	2	SS	CF,MIR	Y	PSA,CHEM,PHYS	Mollic	Haplaquept	fine, mixed, frigid
Agawam	RI	2	NA	MF	N	PSA,CHEM,PHYS	Typic	Dystrochrept	co.-1. ov. s. or sandy-skeletal
Agawam	MA	1	UMA	MF	N	PSA,CHEM,PHYS	Typic	Dystrochrept	co.-1. ov. s. or sandy-skeletal
Albrights	PA	4	5s	CF,SB	Y	PSA,CHEM,PHYS,MIN	Aeric	Fragiudalf	fine-loamy, mixed, mesic
Alden	PA	2	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Mollic	Haplaquept	fine-loamy,mixed, nonacid, mesic
Alden	NY	3	SS	CF,MIR	Y	PSA,CHEM,PHYS	Mollic	Haplaquept	fine-loamy, mixed.
Allaqash	NY	1	5s	CF,MIR	Y	PSA,CHEM,PHYS	Typic	Haplorthod	
Allaqash	ME	5	NA	SB	N	PSA,CHEM,PHYS	Typic	Haplorthod	
Allenwood	PA	8	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Typic	Hapludult	
Allis	PA	2	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Aeric	Haplaquept	
Allis	NY	1	ss	MIR	N	PSA,CHEM,PHYS	Aeric	Haplaquept	
Altmar	NY	1	ss	MIR	N	PSA,CHEM,PHYS	Aquic	Udipsamment	
Alton	PA	2	ss	CF,SB	Y	PSA,CHEM,PHYS,MIN	Oystric	Eutrochrept	
Alton	NY	3	ss	MIR	N	PSA,CHEM,PHYS	Dystric	Eutrochrept	
Alton	NY	1	SS	CF,MIR	Y	PSA,CHEM,PHYS	Oystric	Eutrochrept	
Alvira	PA	5	ss	CF, 53	Y	PSA,CHEM,PHYS,MIN	Aeric	Fragiaquult	
Amenia	MA	1	UMA	MF	N	PSA,CHEM,PHYS	Aquic	Eutrochrept	
Amenia	CT	2	CAES	MIR	N	PSA,CHEM,PHYS	Aquic	Eutrochrept	
Amenia	NY	4	SS	CF,MIR	Y	PSA,CHEM,PHYS	Aquic	Eutrochrept	
Amenia	Cl	1	CAES	MIR	N	PSA,CHEM,PHYS	Aquic	Eutrochrept	
Andover	NY	1	SS	CF,MIR	Y	PSA,CHEM,PHYS	Typic	Fragiaquult	
Andover	PA	2	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Typic	Fragiaquult	
Angola	NY	4	SS	MIR	N	PSA,CHEM,PHYS	Aeric	Ochraqualf	
Appleton	NY	2	55	MIR	N	PSA,CHEM,PHYS	Aeric	Ochraqualf	
Arendtsville	PA	2	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Typic	Hapludult	
Arkport	NY	2	SS	MIR	N	PSA,CHEM,PHYS	Psammentic	Hapludalf	
Arkport	NY	2	SS	CF,MIR	Y	PSA,CHEM,PHYS	Psammentic	Hapludalf	
Armagh	PA	2	SS	CF, 9	Y	PSA,CHEM,PHYS,MIN	Typic	Ochraquult	
Arnot	NY	2	ss	CF,MIR	Y	PSA,CHEM,PHYS	Lithic	Dystrochrept	
Arnot	PA	2	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Lithic	Dystrochrept	
Ashton	PA	2	5s	CF,SB	Y	PSA,CHEM,PHYS,MIN	Mollic	Hapludalf	
Atherton	NY	1	SS	CF,MIR	Y	PSA,CHEM,PHYS	Aeric	Haplaquept	

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(b)

SERIES	ST	#PED	ID#	ACCESS	CF?	DATA	AVAIL	TAXONOMIC CLASSIFICATION
Athol	PA	2	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN		Ultic
Atkins	PA	2	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN		Typic
Aurora	NY	2	SS	CF,MIR	Y	PSA,CHEM,PHYS		Glossaquic
Bangor	ME	5	NA	SB	N	PSA,CHEM,PHYS		Typic
Barbour	PA	2	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN		Fluentic
Barbour	NY	3	SS	MIR	N	PSA,CHEM,PHYS		Fluentic
Barbour	NY	2	SS	CF,MIR	Y	PSA,CHEM,PHYS		Fluentic
Basher	NY	1	SS	CF,MIR	Y	PSA,CHEM,PHYS		Fluvaquentic
Basher	PA	2	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN		Fluvaquentic
Bath	PA	3	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN		Typic
Bath	NY	7	SS	CF,MIR	Y	PSA,CHEM,PHYS		Typic
Becket	NY	10	SS	CF,MIR	Y	PSA,CHEM,PHYS		Typic
Becket	ME	9	NA	SB	N	PSA,CHEM,PHYS		
Becraft								
Bedington								
Beltsville								
Benevola								
Berks								
Berkshire								
Berkshire								
Bertie								
Bice								
Birdsall								
Birdsboro								
Blairton								
Blairton								
Blandburg								
Blasdell								
Bombay								
Bwthbay								
Boxford								
Braceville								
Braceville								
Brayton								
Brayton								
Brecknock								

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SERIES	ST	#PED	ID#	ACCESS	CF?	DATA	RVAIL	TAXONOMIC CLASSIFICATION
Bridgehampton	NY	1	SS	MF			YS	Typic
Bridgehampton	RI	5	NA	MF	N	PSA,CHEM,PHYS		Typic

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1-8



SERIES	ST	#PED	ID#	ACCESS	CF?	DATA	AVAIL	TAXONOMIC	CLASSIFICATION
Carver	MA	1	UMA	MF	N	PSA,CHEM,PHYS	Typic	Udipsamment	mixed. mesic
Cattaraugus	PA	1	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Typic	Fragiochrept	coarse-loamy, mixed, mesic
Cavode	PA	9	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Aeric	Ochraqult	clayey. mixed, mesic
Cavode	NY	1	SS	CF,MIR	Y	PSA,CHEM,PHYS	Aeric	Ochraqult	clayey. mixed. mesic
Cayuga	NY	1	SS	CF,MIR	Y	PSA,CHEM,PHYS	Glossoboric	Hapludalf	fine. illitic. mesic
Cazenovia	NV	8	SS	MIR	N	PSA,CHEM,PHYS	Glossoboric	Hapludalf	fine-loay, mixed. mesic
Cazenovia	NY	2	SS	CF,MIR	Y	PSA,CHEM,PHYS	Glossoboric	Hapludalf	fine-loamy. mixed. mesic
Chalfmt	PA	2	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Aquic	Fragiudalf	fine-silty. mixed, mesic
Charlton	CT	3	ss	SSR,SB	N	PSA,CHEM,PHYS,MIN	Typic	Dystrochrept	coarse-loamy. mixed, mesic
Charlton	NY	2	SS	CF,MIR	Y	PSA,CHEM,PHYS	Typic	Dystrochrept	coarse-loay. mixed. mesic
Charlton	ME	5	NA	SB	N	PSA,CHEM,PHYS	Typic	Dystrochrept	coarse-loamy,mixed,mesic
Charlton-Canton	RI	4	NA	MF	N	PSA,CHEM,PHYS	Typic	Dystrochrept	coarse-loay. mixed, mesic
Chatfield	NY	1	SS	CF,MIR	Y	PSA,CHEM,PHYS	Typic	Dystrochrept	coarse-loamy. mixed. mesic
Chautauqua	N Y	5	ss	cf ,MIR	Y	PSA,CHEM,PHYS	Aquic	Dystrochrept	coarse-loamy. mixed. mesic
Chavies	PA	2	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Ultic	Hapludalf	coarse-loamy,mixed, mesic
Chenango	PA	4	ss	cf. 58	Y	PSA,CHEM,PHYS,MIN	Typic	Dystrochrept	loamy-skeletal, mixed. mesic
Chenango	NY	2	SS	CF,MIR	V	PSA,CHEM,PHYS	Typic	Dystrochrept	loamy-skeletal. mixed, mesic
Chenango	NY	6	SS	MIR	N	PSA,CHEM,PHYS	Typic	Dystrochrept	loamy-skeletal, mixed. mesic
Cheshire	CT	1	ss	MIR	N	PSA,CHEM,PHYS,MIN	Typic	Dystrochrept	coarse-loamy. mixed. mesic
Cheshire	CT	2	ss	MIR	N	PSA,CHEM,PHYS,MIN	Typic	Dystrochrept	coarse-loamy, mixed. mesic
Chester	PA	8	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Typic	Hapludult	fine-loamy, mixed. mesic
Chester	MD	7	NA	MF*	N	PSA,CHEM	Typic	Hapludult	fine-loamy, mixed, mesic
Chesuncook	ME	9	SS	CF	Y	PSA,CHEM,PHYS	Unclassified	Unclassified	Unclassified
Chillum	MD	1	NA	MF*	N	PSA,CHEM	Typic	Hapludult	fine-silty. mixed. mesic
Chippewa	NY	1	SS	CF,MIR	Y	PSA,CHEM,PHYS	Typic	Fragiaquept	fine-loamy, mixed, mesic
Chippewa	PA	5	SS	CF. 33	Y	PSA,CHEM,PHYS,MIN	Typic	Fragiaquept	fine-loamy, mixed. mesic
Christiana	MD	1	NA	MF*	N	PSA,CHEM	Typic	Paleudult	clayey, kaolinitic. mesic
Chrome	PA	2	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Typic	Hapludalf	fine. mixed, mesic
Churchville	N Y	1	SS	CF,MIR	Y	PSA,CHEM,PHYS	Aeric	Ochraqulf(?)	fine. illitic. mesic
Clarksburg	PA	8	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Typic	Fragiudalf	fine-loamy, mixed. mesic
Claverack	NY	3	SS	MIR	N	PSA,CHEM,PHYS	Aquic	Udorthent	s. ov. c., mixed. mmacid, mesic
Claverack	NY	2	SS	CF,MIR	Y	PSA,CHEM,PHYS	Aquic	Udorthent	s. ov. c., mixed. nonacid, mesic
Clifty	PA	2	ss	CF,SB	Y	PSA,CHEM,PHYS,MIN	Fluventic	Dystrochrept	fine-loamy. mixed, mesic
Clymer	MD	1	NA	MF*	N	PSA,CHEM	Typic	Hapludult	fine-loamy, mixed. mesic
Clymer	PA	5	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Typic	Hapludult	fine-loamy, mixed, mesic
Colbath	ME	5	NA	SB	N	PSA,CHEM,PHYS	Lithic(?)	Dystrochrept	loamy. mixed. mesic

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SERIES	ST	#PED	ID#	ACCESS	CF?	DATA AVAIL	TAXONOMIC CLASSIFICATION
Collamer	NY	4	SS	CF,MIR	Y	PSA,CHEM,PHYS	Glossoboric Hapludalf
Collamer	NY	5	SS	MIR	N	PSA,CHEM,PHYS	Glossoboric Hapludalf
Collington	MD	4	NA	MF*	N	PSA,CHEM	Typic Hapludult
Colonie	NY	10	SS	MIR	N	PSA,CHEM,PHYS	Alfic Udipsamment
Colonie	NY	1	SS	CF,MIR	Y	PSA,CHEM,PHYS	Alfic Udipsamment
Colosse	NY	1	SS	CF,MIR	Y	PSA,CHEM,PHYS	Typic Dystrochrept
Colton	ME	9	NA	SB	N	PSA,CHEM,PHYS	Typic Haplorthod
Colton	NY	2	SS	CF,MIR	Y	PSA,CHEM,PHYS	Typic Haplorthod
Comly	PA	3	SS	CF.58	Y	PSA,CHEM,PHYS,MIN	Typic Fragiudalf
Conant	ME	5	NA	SB	N	PSA,CHEM,PHYS	Aquic Haplorthod
conestoga	PA	2	ss	CF,SB	Y	PSA,CHEM,PHYS,MIN	Typic Hapludalf
Conesus	NY	7	5s	MIR	N	PSA,CHEM,PHYS	Glossoboric Hapludalf
Conneaut	NY	1	SS	CF,MIR	Y	PSA,CHEM,PHYS	Aeric Haplaquept
Conotton	PA	3	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Typic Hapludalf
Cook	NY	1	SS	CF,MIR	Y	PSA,CHEM,PHYS	Mollic Haplaquent
Cookport	PA	13	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Aquic Fragiudult
Cookport	MD	2	NA	MF*	N	PSA,CHEM	Aquic Fragiudult
Copake	NY	1	ss	CF,MIR	Y	PSA,CHEM,PHYS	Dystric Eutrochrept
Cosad	NY	2	SS	CF,MIR	Y	PSA,CHEM,PHYS	Aquic Udorthent
Coveytown	NY	1	SS	CF,MIR	Y	PSA,CHEM,PHYS	Aeric Haplaquent
Covington	NY	2	SS	CF,MIR	Y	PSA,CHEM,PHYS	Mollic Haplorthod
Crary	NY	1	ss	MIR	N	PSA,CHEM,PHYS	Aquic
Creasey	ME	5	NA	SB	N	PSA,CHEM,PHYS	Lithic
Croghan	NY	9	ss	CF,MIR	Y	PSA,CHEM,PHYS	Aquic
Croghan	ME	5	NA	SB	N	PSA,CHEM,PHYS	Aquic
Croton	PA	4	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Typic
Cuba	PA	2	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Fluventic
Culvers	PA	2	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Typic
Culvers	NY	3	SS	MIR	N	PSA,CHEM,PHYS	Typic
Daigle	ME	5	NA	SB	N	PSA,CHEM,PHYS	Aeric
Dalton	PA	2	ss	CF.58	Y	PSA,CHEM,PHYS,MIN	Aeric
Danley	NY	2	SS	MIR	N	PSA,CHEM,PHYS	Glossaquic
Darien	NY	2	SS	CF,MIR	Y	PSA,CHEM,PHYS	Aeric
Darien	NY	10	SS	AIR	N	PSA,CHEM,PHYS	Aeric
Deerfield	NY	2	SS	CF,MIR	Y	PSA,CHEM,PHYS	Aquic
Dekalb	PA	14	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Typic

SERIES

ST #PED ID# ACCESS CF?

DATA AVAIL

TAXONOMIC CLASSIFICATION

SERIES	ST	#PED	ID#	ACCESS	CF?	DATA	AVAIL	TAXONOMIC	CLASSIFICATION
Farmington	NY	1	SS	CF,MIR	Y	PSA,CHEM,PHYS	Lithic	Eutrochrept	loamy, mixed, mesic
Fich	ME	5	NA	SB	N	PSA,CHEM,PHYS	Aeric	Haplaquod	sandy,mixed,frigid,ortstein
Fonda	NY	1	ss	CF,MIR	Y	PSA,CHEM,PHYS	Mollic	Haplaquept	fine, illitic. ma-acid. mesic
Frankstown	PA	2	ss	CF,SB	Y	PSA,CHEM,PHYS,MIN	Typic	Hapludult	fine-loamy, mixed, mesic
Fremont	NY	2	SS	CF,MIR	Y	PSA,CHEM,PHYS	Aeric	Haplaquept	fine-loamy, mixed, acid, mesic
Fremont	NY	1	ss	CF,MIR	Y	PSA,CHEM,PHYS	Aeric	Haplaquept	fine-loamy, mixed. acid, mesic
Fremont	NY	6	ss	MIR	N	PSA,CHEM,PHYS	Aeric	Haplaquept	fine-loamy, mixed. acid, mesic
Frenchtown	PA	4	SS	CF.33	Y	PSA,CHEM,PHYS,MIN	Typic	Fragiawalf	fine-loay, mixed. wsic
Fulton	NY	S	SS	MIR	N	PSA,CHEM,PHYS	Aeric	Ochraqualf	fine, illitic, mesic
Galen	NY	2	SS	MIR	N	PSA,CHEM,PHYS	Psammentic	Hapludalf	coarse-loamy. mixed, mesic
Galway	NY	1	SS	CF,MIR	Y	PSA,CHEM,PHYS	Typic	Eutrochrept	coarse-loamy. mixed, mesic
Gandy	NY	1	SS	CF,MIR	Y	PSA,CHEM,PHYS	Typic	Dystrochrept	loamy-skeletal, mixed, frigid
Gatesburg	PA	1	ss	CF,SB	Y	PSA,CHEM,PHYS,MIN	Entic	Haplorthod	sandy. siliceous, mesic
Georgia Var.	NY	1	SS	CF,MIR	Y	PSA,CHEM,PHYS	Aquic Dystric	Eutrochrept	fine-loamy, mixed, mesic
Gilpin	MD	3	NA	MF*	N	PSA,CHEM	Typic	Hapludult	fine-loamy, mixed. mesic
Gilpin	PA	7	ss	CF,SB	Y	PSA,CHEM,PHYS,MIN	Typic	Hapludult	fine-loamy, mixed. wsic
Glenelg	PA	3	ss	CF,SB	Y	PSA,CHEM,PHYS,MIN	Typic	Hapludult	fine-loamy, mixed, mesic
Glenelg	MD	5	NA	MF*	N	PSA,CHEM	Typic	Hapludult	fine-loamy. mixed. mesic
Glenville	PA	3	ss	CF,SB	Y	PSA,CHEM,PHYS,MIN	Aquic	Fragiudult	fine-loamy. mixed. mesic
Gloucester	RI	1	NA	MF	N	PSA,CHEM,PHYS	Typic	Dystrochrept	sandy-skeletal. mixed. mesic
Gloucester	CT	1	SS	SSR,SB	N	PSA,CHEM,PHYS,MIN	Typic	Dystrochrept	sandy-skeletal. mixed. mesic
Glover	NY	1	ss	CF,MIR	Y	PSA,CHEM,PHYS	Entic Lithic	Haplorthod	loamy. mixed. frigid
Grenville	NY	2	SS	CF,MIR	Y	PSA,CHEM,PHYS	Typic	Eutrochrept	coarse-loamy, mixed. mesic
Gresham	PA	6	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Aeric	Fragiaqualf	fine-loamy, mixed, mesic
Groton	NV	1	SS	CF,MIR	Y	PSA,CHEM,PHYS	Typic	Eutrochrept	sandy-skeletal, mixed, mesic
Guernsey	PA	7	SS	CF.33	Y	PSA,CHEM,PHYS,MIN	Aquic	Hapludalf	Pine, mixed, mesic
Guffin	NY	1	SS	CF,MIR	Y	PSA,CHEM,PHYS,MIN	Mollic	Haplaquept	very-fine, mixed, nonacid, mesic
Hackers	PA	1	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Typic	Hapludalf	fine-silty. mixed, mesic
Hadley	MA	2	UMA	MF	N	PSA,CHEM,PHYS	Typic	Udifluent	co.-si.. nonacid, mixed. mesic
Hagerstown	MD	5	NA	MF*	N	PSA,CHEM	Typic	Hapludalf	fine. mixed, mesic
Hagerstown	PA	22	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Typic	Hapludalf	fine. mixed, mesic
Hailesboro	NY	1	ss	CF,MIR	Y	PSA,CHEM,PHYS	Aeric	Ochraqualf	fine-silty. mixed. frigid
Halcott	NY	1	SS	CF,MIR	Y	PSA,CHEM,PHYS	Lithic	Dystrochrept	loamy-skeletal, mixed, frigid
Halsey	NY	1	SS	CF,MIR	Y	PSA,CHEM,PHYS	Mollic	Haplaquept	co.-l. ov. s. / s.-sk., mix., n-a, mesic
Hamlin	NY	2	SS	CF,MIR	Y	PSA,CHEM,PHYS	Dystric Fluventic	Eutrochrept	coarse-silty, mixed. mesic
Hartland	ME	5	NA	SB	N	PSA,CHEM,PHYS	Dystric	Eutrochrept	coarse-silty,mixed,mesic

SERIES	ST	#PED	ID#	ACCESS	CF?	DATA	AVAIL	TAXONOMIC	CLASSIFICATION
Hartleton	PA	4	ss	CF,SB	Y	PSA,CHEM,PHYS,MIN	Typic	Hapludult	loamy-skeletal. mixed, mesic
Haven	NY	4	ss	MIR	N	PSA,CHEM,PHYS	Typic	Dystrochrept	co.-l. ov. s. or s.-sk., mixed, mesic
Haven	MA	1	UMA	MF	N	PSA,CHEM,PHYS	Typic	Dystrochrept	co.-l. ov. s. or s.-sk.. mixed. mesic
Hazleton	PA	12	SS	CF.%	Y	PSA,CHEM,PHYS,MIN	Typic	Dystrochrept	loamy-skeletal, mixed. mesic
Herkimer	NY	3	ss	MIR	N	PSA,CHEM,PHYS	Dystric	Eutrochrept	coarse-loamy, mixed. mesic
Hermon	ME	13	NA	SB	N	PSA,CHEM,PHYS	Typic	Haplorthod	loamy-skeletal, mixed, frigid
Hermon	NY	2	ss	CF,MIR	Y	PSA,CHEM,PHYS	Typic	Haplorthod	loamy-skeletal. mixed. frigid
Highfield	PA	2	ss	CF,SB	Y	PSA,CHEM,PHYS,MIN	Ultic	Hapludalf	coarse-loamy, mixed. mesic
Hilton	NY	4	SS	MIR	N	PSA,CHEM,PHYS	Glossoboric	Hapludalf	fine-loamy, mixed. mesic
Hinckley	MA	1	UMA	MF	N	PSA,CHEM,PHYS	Typic	Udorthent	sandy-skeletal, mixed. m&sic
Hinckley	NY	2	ss	MIR	N	PSA,CHEM,PHYS	Typic	Udorthent	sandy-skeletal. mixed. mesic
Hogansburg	N Y	1	SS	CF,MIR	Y	PSA,CHEM,PHYS	Aquic	Eutrochrept	coarse-loamy, mixed. mesic
Hogback	NY	3	ss	CF,MIR	Y	PSA,CHEM,PHYS	Lithic	Haplorthod	loamy, mixed, frigid
Holly	PA	2	ss	CF,SB	Y	PSA,CHEM,PHYS,MIN	Typic	Fluvaquent	fine-loamy, mixed. mnacid. mesic
Honeoye	NY	9	SS	MIR	N	PSA,CHEM,PHYS	Glossoboric	Hapludalf	fine-loamy, mixed. mesic
Hornell	NY	1	ss	CF,MIR	Y	PSA,CHEM,PHYS,MIN	Aeric	Haplaquept	fine. illitic. acid, mesic
Hornell	NY	3	SS	MIR	N	PSA,CHEM,PHYS	Aeric	Haplaquept	fine. illitic. acid, nesic
Houghtonville	NY	2	SS	CF,MIR	Y	PSA,CHEM,PHYS	Typic	Haplorthod	coarse-loamy, mixed. frigid
Howard	PA	2	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Glossoboric	Hapludalf	loamy-skeletal. mixed, mesic
Howard	NY	3	ss	MIR	N	PSA,CHEM,PHYS	Glossoboric	Hapludalf	loay-skeletal. mixed, nesic
Howard	NY	2	SS	CF,MIR	Y	PSA,CHEM,PHYS	Glossoboric	Hapludalf	loamy-skeletal. mixed. mesic
Howland	ME	S	NA	Sri	N	PSA,CHEM,PHYS	Aquic	Fragiorthod	coarse-loamy, mixed, frigid
Hublersburg	PA	4	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Typic	Hapludult	clayey, illitic. mesic
Hudson	NY	2	ss	CF,MIR	Y	PSA,CHEM,PHYS,MIN	Glossaquic	Hapludalf	fine. illitic. mesic
Huntington	PA	3	SS	CF	Y	PSA,CHEM,PHYS	Fluventic	Hapludoll	fine-silty. mixed, mesic
Ira	NY	2	ss	RIR	N	PSA,CHEM,PHYS	Typic	Fragiochrept	coarse-loamy, mixed. mesic
Kanona	NY	1	SS	CF,MIR	Y	PSA,CHEM,PHYS	Aeric	Haplaquept	fine. illitic. mnacid. mesic
Kars	NY	1	SS	CF,MIR	Y	PSA,CHEM,PHYS	Glossoboric	Hapludalf	loamy-skeletal, mixed. nesic
Kendaia	NY	2	ss	CF,MIR	Y	PSA,CHEM,PHYS	Aeric	Haplaquept	fine-loamy. mixed, nonacid, mesic
Kendaia	NY	4	SS	MIR	N	PSA,CHEM,PHYS	Aeric	Haplawept	fine-loamy, mixed. nonacid, mesic
Keyport	MD	3	NA	MF*	N	PSA,CHEM	Aquic	Hapludult	clayey. mixed, mesic
Kingsbury	NY	2	SS	CF,MIR	Y	PSA,CHEM,PHYS	Aeric	Ochraqualf	very-fine. illitic, mesic
Kinross	NY	1	SS	CF,MIR	Y	PSA,CHEM,PHYS	Typic	Haplaquod	sandy. mixed, frigid
Klinesville	PA	6	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Lithic	Dystrochrept	loamy-skeletal. mixed. mesic
Kreamer	PA	10	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Aquic	Hapludult	clayey. mixed, mesic
Lackawanna	NY	4	ss	CF,MIR	Y	PSA,CHEM,PHYS	Typic	Fragiochrept	coarse-loamy, mixed. mesic

SERIES	ST	#PED	ID#	ACCESS	CF?	DATA	AVAIL	TAXONOMIC	CLASSIFICATION
Lackawanna	PA	9	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Typic	Fragiochrept	coarse-loamy. mixed. mesic
Laidig	PA	8	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Typic	Fragiudult	fire-loamy. mixed, mesic
Laidig	NY	1	SS	CF,MIR	Y	PSA,CHEM,PHYS	Typic	Fragiudult	fine-loamy. mixed, mesic
Lairdsville	NY	2	SS	MIR	N	PSA,CHEM,PHYS	Typic	Hapludalf	fine. illitic. mesic
Lakeland	MD	3	NA	MF*	N	PSA,CHEM	Typic	Quartzipsamment	thermic, coated
Lakemont	NY	2	SS	MIR	N	PSA,CHEM,PHYS	Udollic	Ochraqulf	fine, illitic. mesic
Lamington	PA	2	SS	CF	Y	PSA,CHEM,PHYS	Typic	Fragiaquult	fine-loamy, mixed, mesic
Lamson	NY	1	SS	CF,MIR	Y	PSA,CHEM,PHYS	Aeric	Haplaquept	coarse-loamy, mixed. nonacid, mesic
Lanesboro	NY	1	SS	CF,MIR	Y	PSA,CHEM,PHYS	Typic	Dystrochrept	coarse-loamy. mixed. frigid
Langford	PA	3	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Aqueptic	Fragiudalf	coarse-loamy. mixed. mesic
Langford	NY	3	SS	MIR	N	PSA,CHEM,PHYS	Aqueptic	Fragiudalf	coarse-loamy. mixed, mesic
Lansdale	PA	4	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Typic	Hapludult	coarse-loamy, mixed, mesic
Lansing	NY	1	SS	RIR	N	PSA,CHEM,PHYS	Glossoboric	Hapludalf	fine-loamy, mixed, mesic
Lawrenceville	PA	6	SS	CF,33	Y	PSA,CHEM,PHYS,MIN	Typic	Fragiudalf	fine-silty. mixed, mesic
Leck Kill	PA	9	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Typic	Hapludult	fine-loamy, mixed. mesic
Leetonia	PA	15	SS	CF.93	Y	PSA,CHEM,PHYS,MIN	Entic	Haplorthod	sandy, siliceous, mesic
Leetonia	MD	1	NA	MF*	N	PSA,CHEM	Entic	Haplorthod	sandy-skeletal, siliceous, mesic
Legore	MD	1	NA	MF*	N	PSA,CHEM	Ultic	Hapludalf	fine-loamy, mixed. mesic
Lehigh	PA	2	SS	CF.33	Y	PSA,CHEM,PHYS,MIN	Aquic	Hapludalf	fine-loamy. mixed, mesic
Leon	MD	1	NA	MF*	N	PSA,CHEM	Aeric	Haplaquod	sandy, siliceous, thermic
Leonardtown	MD	14	NA	MF*	N	PSA,CHEM	Typic	Fragiaquult	fine-silty. mixed, mesic
Letort	PA	2	SS	CF	Y	PSA,CHEM,PHYS	Typic	Hapludalf	fine-loamy, mixed, mesic
Lewisberry	PA	4	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Ultic	Hapludalf	coarse-loamy, mixed. mesic
Library	PA	4	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Aeric	Ochraqult	fine. mixed, mesic
Lima	NY	1	SS	CF,MIR	Y	PSA,CHEM,PHYS	Glossoboric	Hapludalf	fine-loamy. mixed. mesic
Lima	NY	4	SS	AIR	N	PSA,CHEM,PHYS	Glossoboric	Hapludalf	fine-loamy, mixed. mesic
Limerick	MA	1	UMA	MF	N	PSA,CHEM,PHYS	Typic	Fluvaquent	ce.-si., mixed. nonacid, mesic
Linden	PA	6	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Fluventic	Dystrochrept	coarse-loamy, mixed. mesic
Lindsay	PA	2	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Fluvaquentic	Eutrochrept	fine-silty. mixed. mesic
Linlithgo	NY	1	SS	CF,MIR	Y	PSA,CHEM,PHYS	Aeric	Fluvaquent	f.-loamy o.s/sandy-skel, mixed. mesic
Livingston	NY	4	SS	CF,MIR	Y	PSA,CHEM,PHYS	Mollic	Haplaquept	fire. illitic. nonacid, mesic
Livingston	NY	2	SS	MIR	N	PSA,CHEM,PHYS	Mollic	Haplaquept	fine, illitic; nonacid, mesic
Lobdell	PA	2	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Fluvaquentic	Eutrochrept	fine-loamy, mixed. mesic
Lordstown	NY	3	SS	MIR	N	PSA,CHEM,PHYS	Typic	Dystrochrept	coarse-loay, mixed. mesic
Lordstown	PA	2	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Typic	Oystrahrept	coarse-loamy. mixed, mesic
Lordstown	NY	2	SS	CF,MIR	Y	PSA,CHEM,PHYS	Typic	Dystrochrept	coarse-loamy, mixed. mesic

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SERIES	ST	#PED	ID#	ACCESS	CF?	DATA AVAIL	TAXONOMIC CLASSIFICATION
Mohawk	NY	3	SS	MIR	N	PSA,CHEM,PHYS	Mollic
Monadnock	ME	8	SS	CF	Y	PSA,CHEM,PHYS	Unclassified
Monarda	NY	1	SS	CF,MIR	Y	PSA,CHEM,PHYS	Aeric
Monarda	ME	9	NA	SB	N	PSA,CHEM,PHYS	Aeric
Monongahela	PA	3	SS	CF.58	Y	PSA,CHEM,PHYS,MIN	Typic
Monson	ME	8	SS	CF	Y	PSA,CHEM,PHYS	Unclassified
Montalto	PA	2	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Ultic
Morris	PA	5	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Aeric
Morris	NY	3	SS	MIR	N	PSA,CHEM,PHYS	Aeric
Morris	NY	2	SS	CF,MIR	Y	PSA,CHEM,PHYS	Aeric
Morrison	PA	6	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Ultic
Mosherville	NY	3	SS	MIR	N	PSA,CHEM,PHYS	Aquic
mount Lucas	PA	2	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Aquic
Mt. Airy	MD	13	NA	MF*	N	PSA,CHEM	Typic
Mundal	NY	1	SS	CF,MIR	Y	PSA,CHEM,PHYS	Typic
Murrill	PA	6	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Typic
Muskellunge	NY	3	SS	CF,MIR	Y	PSA,CHEM,PHYS	Aeric

SERIES	ST	#PED	ID#	ACCESS	CF?	DATA	AVAIL	TAXONOMIC	CLASSIFICATION
Nunda	NY	1	SS	MIR	N	PSA,CHEM,PHYS	Glossaquic	Hapludalf	fine-loamy, mixed, mesic
Odessa	NY	5	SS	MIR	N	PSA,CHEM,PHYS	Aeric	Ochraqualf	fine, illitic, mesic
Ontario	NY	3	SS	MIR	N	PSA,CHEM,PHYS	Glossoboric	Hapludalf	fine-loamy, mixed, mesic
Onteora	NY	1	SS	CF,MIR	Y	PSA,CHEM,PHYS	Aquic	Fragiochrept	coarse-loamy, mixed, frigid
Opequon	PA	2	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Lithic	Hapludalf	clayey, mixed, mesic
Oquaga	PA	6	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Typic	Dystrochrept	loamy-skeletal, mixed, mesic
Oquaga	NY	2	SS	CF,MIR	Y	PSA,CHEM,PHYS	Typic	Dystrochrept	loamy-skeletal, mixed, mesic
Orpark	NY	1	SS	CF,MIR	Y	PSA,CHEM,PHYS	Aeric	Haplaquept	fine-loamy, mixed, mesic
Othello	MD	4	NA	MF*	N	PSA,CHEM	Typic	Ochraquult	fine-silty, mixed, mesic
Otisville	NY	1	SS	CF,MIR	Y	PSA,CHEM,PHYS	Typic	Udorthent	sandy-skeletal, mixed, mesic
Ovid	NV	1	SS	CF,MIR	Y	PSA,CHEM,PHYS	Aeric	Haplaquept	fine-loamy, mixed, mesic
Palatine	NY	2	SS	MIR	N	PSA,CHEM,PHYS	Typic	Hapludoll	loamy-skeletal, mixed, mesic
Palmyra	NY	2	SS	MIR	N	PSA,CHEM,PHYS	Glossoboric	Hapludalf	f.-l. ov. s. or s.-sk., mixed, mesic
Panton	NY	3	SS	CF,MIR	Y	PSA,CHEM,PHYS	Typic	Ochraqualf	very-fine, illitic, mesic
Papakating	PA	2	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Mollic	Fluvaquent	fine-silty, mixed, mesic
Pawcatuck	CT	1	NA	SE	N	PSA,CHEM	Typic	Sulfihemist	euic, mesic
Paxton	ME	5	NA	SB	N	PSA,CHEM,PHYS	Typic	Fragiochrept	coarse-loamy, mixed, mesic
Paxton	MA	2	UMA	MF	N	PSA,CHEM,PHYS	Typic	Fragiochrept	coarse-loamy, mixed, mesic
Paxton	CT	1	NA	SE	N	PSA,CHEM,MIN	Typic	Fragiochrept	coarse-loamy, mixed, mesic
Paxton	RI	5	NA	MF	N	PSA,CHEM,PHYS	Typic	Fragiahrept	coarse-loamy, mixed, mesic
Penlaw	PA	3	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Aquic	Fragiudalf	fine-silty, mixed, mesic
Penn	MD	4	NA	MF*	N	PSA,CHEM	Ultic	Hapludalf	fine-loamy, mixed, mesic
Penn	PA	8	SS	CF.50	Y	PSA,CHEM,PHYS,MIN	Ultic	Hapludalf	fine-loamy, mixed, mesic
Pequea	PA	2	SS	CF	Y	PSA,CHEM,PHYS	Typic	Eutrochrept	coarse-loamy, mixed, mesic
Perham	ME	5	NA	SB	N	PSA,CHEM,PHYS	Typic	Fragiorthod	fine-loamy, mixed, frigid
Peru	ME	9	NA	SB	N	PSA,CHEM,PHYS	Aquic	Fragiorthod	coarse-loamy, mixed, frigid
Phelps	NY	1	SS	CF,MIR	Y	PSA,CHEM,PHYS	Glossaquic	Hapludalf	f.-l. ov. s. / s.-sk., mixed, mesic
Philo	PA	3	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Fluvaquentic	Dystrochrept	coarse-loamy, mixed, mesic
Pinckney	NY	3	SS	CF,MIR	Y	PSA,CHEM,PHYS	Typic	Fragiorthod	coarse-loamy, mixed, frigid
Pittsfield	NY	2	SS	CF,MIR	Y	PSA,CHEM,PHYS	Dystric	Eutrochrept	coarse-loamy, mixed, mesic
Pittstown	RI	3	NA	MF	N	PSA,CHEM,PHYS	Typic	Fragiochrept	coarse-loamy, mixed, mesic
Plainfield	PA	2	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Typic	Udipsamment	sandy, mixed, mesic
Plaisted	ME	5	NA	SB	N	PSA,CHEM,PHYS	Typic	Fragiorthod	coarse-loamy, mixed, frigid
Platea	PA	4	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Aeric	Fragiaqualf	fine-silty, mixed, mesic
Plymouth	NY	6	SS	MIR	N	PSA,CHEM,PHYS	Typic	Udipsamment	siliceous, mesic
Pocomoke	MD	4	NA	MF*	N	PSA,CHEM	Typic	Umbraquult	coarse-loamy, siliceous, thermic

SERIES	ST	#PED	ID#	ACCESS	CF?	DATA	AVAIL	TAXONOMIC	CLASSIFICATION
Poland	NY	2	SS	MIR	N	PSA,CHEM,PHYS		Unclassified	
Pope	PA	7	ss	CF,SB	Y	PSA,CHEM,PHYS,MIN		Fluentic	
Pope	NY	1	ss	CF,MIR	Y	PSA,CHEM,PHYS		Fluentic	
Potsdam	NY	2	SS	CF,MIR	Y	PSA,CHEM,PHYS		Typic	
Purdy	PA	3	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN		Typic	
Quakertown	PA	2	ss	CF,SB	Y	PSA,CHEM,PHYS,MIN		Typic	
Rainbow	RI	1	NA	MF	N	PSA,CHEM,PHYS		Typic	
Rainbow	MA	1	UMA	MF	N	PSA,CHEM,PHYS		Typic	
Rainsboro	PA	4	ss	CF,SB	Y	PSA,CHEM,PHYS,MIN		Typic	
Ravenna	PA	3	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN		Aeric	
Rawsonville	NY	1	ss	CF,MIR	Y	PSA,CHEM,PHYS		Typic	
Rayne	PA	4	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN		Typic	
Raynham	RI	1	NA	MF	N	PSA,CHEM,PHYS		Aeric	
Raynham	NY	4	SS	CF,MIR	Y	PSA,CHEM,PHYS		Aeric	
Readington	PA	5	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN		Typic	
Reaville	PA	4	ss	CF,SB	Y	PSA,CHEM,PHYS,MIN		Aquic	
Red Hook	NY	1	ss	CF,MIR	Y	PSA,CHEM,PHYS		Aeric	
Relay	MD	1	NA	MF*	N	PSA,CHEM		Typic	
Rensen	NY	1	ss	MIA	N	PSA,CHEM,PHYS		Aeric	
Rhinebeck	NY	5	SS	CF,MIR	Y	PSA,CHEM,PHYS,MIN		Aeric	
Rhinebeck	NY	8	ss	MIR	N				
Ridgebury									
Rimer									
Riverhead									
Riverhead									
Riverhead									
Roanoke									
Ross									
Rowland									
Ryder									
Sassafras									
Sassafras									
Saugatuck									
Scantic									
Scarboro									
Schoharie									

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SERIES	ST	#PED	ID#	ACCESS	CF?	DATA AVAIL	TAXONOMIC CLASSIFICATION
Schuyler	NY	1	SS	CF,MIR	Y	PSA,CHEM,PHYS	Aquic(?)
Scio	NY	1	SS	CF,MIR	Y	PSA,CHEM,PHYS	Aquic
Scio	NY	4	SS	MIR	N	PSA,CHEM,PHYS	Aquic
Scio	RI	1	NA	MF	N	PSA,CHEM,PHYS	Awi c
Sciotoville	PA	2	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Aquic
Scitico	MA	3	UMA	MF	N	PSA,CHEM,PHYS	Typic
Scituate	MA	1	UMA	MF	N	PSA,CHEM,PHYS	Typic
Scriba	NY	1	SS	CF,MIR	Y	PSA,CHEM,PHYS	Aeric
Searsport	NY	1	SS	CF,MIR	Y	PSA,CHEM,PHYS	Typic
Sebago	NY	2	SS	CF,MIR	Y	PSA,CHEM,PHYS	Fibric
Series not	ME	3	SS	CF	Y	PSA,CHEM,PHYS	Unclassified
Series mt	PA	1	ss	CF, 53	Y	PSA,CHEM,PHYS,MIN	Unclassified
Shaker	NY	2	SS	CF,MIR	Y	PSA,CHEM,PHYS	Aeric
Skffield	PA	2	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Typic
Shelburne	MA	1	UMA	MF	N	PSA,CHEM,PHYS	Typic
Shelmadine	PA	4	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Typic
Skerry	ME	9	NA	SB	N	PSA,CHEM,PHYS	Aquic
Sodus	NY	1	SS	MIR	N	PSA,CHEM,PHYS	Typic
St. John's	MD	1	NA	MF*	N	PSA,CHEM	Typic
Stafford	NY	2	SS	MIR	N	PSA,CHEM,PHYS	Typic
Steff	PA	2	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Fluvaquentic
Steinsburg	PA	1	SS	CF	Y	PSA,CHEM,PHYS	Typic
Stissing	RI	3	NA	MF	N	PSA,CHEM,PHYS	Aeric
Stockbridge	CT	2	SS	SSR	N	PSA,CHEM,PHYS	Dystric
Stockbridge	CT	1	CAES	MIR	N	PSA,CHEM,PHYS	Dystric
Stockbridge	CT	2	CAES	MIR	N	PSA,CHEM,PHYS	Dystric
Stockbridge	MA	1	UMA	MF	N	PSA,CHEM,PHYS	Dystric
Sudbury	MA	2	UMA	MF	N	PSA,CHEM,PHYS	Aquic
Sun	NY	1	SS	MIR	N	PSA,CHEM,PHYS	Aeric
S - k	NY	1	SS	CF,MIR	Y	PSA,CHEM,PHYS	Aeric
Sutton	ME	5	NA	SB	N	PSA,CHEM,PHYS	Aquic
Sutton	MA	1	UMA	MF	N	PSA,CHEM,PHYS	Aquic
Swanton	NY	1	SS	CF,MIR	Y	PSA,CHEM,PHYS	Aeric
Swarville	ME	5	NA	SB	N	PSA,CHEM,PHYS	Aquic
Swartswood							
Swartswood							

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1-19

SERIES	ST	#PED	ID#	ACCESS	CF?	DATA	AVAIL	TAXONOMIC	CLASSIFICATION
Sweden	PA	7	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Typic	Hapludult	
Teel	NY	3	SS	CF,MIR	Y	PSA,CHEM,PHYS	Fluvaquentic	Eutrochrept	
Telos	ME	7	SS	CF	Y	PSA,CHEM,PHYS	Unclassified	Unclassified	
Thorndale	PA	3	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Typic	Fragiaqualf	
Tilsit	PA	3	SS	CF,SB	Y	PSA,CHEM,PHYS,MIN	Typic	Fragiudult	
Tioga	PA	4	SS	CF.58	Y	PSA,CHEM,PHYS,MIN	Oystric	FluventicEutrochrept	
Tioga	NY	4	SS	CF,MIR	Y	PSA,CHEM,PHYS	Dvstric	FluventicEutrochrept	
Titusville	PA	2	5s	CF,SB	Y	PSA,CHEM,PHYS,MIN	Aquic		
Tuller	NY	3	SS	CF,MIR	Y	PSA,CHEM,PHYS	Lithic		
Tunkhannock	PA	2	SS	CF	Y	PSA,CHEM,PHYS	Typic		
Tunkhannock	NY	1	SS	CF,MIR	Y	PSA,CHEM,PHYS	Typic		
Turin	NY	2	SS	MIR	N	PSA,CHEM,PHYS			
Tyler	PA	2	SS						
Unadilla	NY.	1	SS						
Unadilla	NY	3	SS						
Upshur	PA	5	SS						
Valois	NY	3	SS						
Valois	NY	4	SS						
Vandergrift	PA	5	SS						
Vanderlip	PA	2	SS						
Vergennes	NY	2	SS						
Vergennes	NY	1	SS						
Vly	NY	1	ss						
Volusia	NY	4	SS						
Volusia	NY	1	SS						
Volusia	NY	1	SS						
Volusia	PA	8	SS						
Wallace	NY	1	SS						
Walpole	RI	1	NA						
Walpole	MA	1	UMA						
Wareham	NY	2	SS						
Warners	PA	2	SS						
Washington	PA	4	SS						
Watchung	PA	2	SS						
Watson	PA	6	SS						
Wayland	PA	3	SS						

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1-20



Exp. Sta.

SERIES

ST #PED ID# ACCESS CF? DATA AVAIL

TAXONOMIC CLASSIFICATION

106

SERIES	ST	#PED	ID#	ACCESS	CF?	DATA	AVAIL	TAXONOMIC	CLASSIFICATION
Ackwater	VA	2	SS	CF	Y	PSA,CHEM,PHYS,MIN	Unclassified	Unclassified	Unclassified
Agawam	NH	1	SS	CF	Y	PSA,CHEM,PHYS,MIN	Typic	Oystrochrept	co.-l. ov. s. or sandy-skeletal
Agawam	VT	1	SS	CF	Y	PSA,CHEM,PHYS,MIN	Typic	Dystrochrept	co.-l. ov. s. or sandy-skeletal
Allegheny	WV	1	SS	CF	Y	PSA,CHEM,PHYS,MIN	Typic	Hapludult	fine-loamy, mixed, mesic
Amenia	VT	3	SS	CF	Y	PSA,CHEM,PHYS,MIN	Aquic	Eutrochrept	coarse-loamy, mixed. mesic
Appling	VA	1	SS	CF	Y	PSA,CHEM,PHYS,MIN	Typic	Hapludult	
Atsion	DE	1	SS	CF	Y	PSA,CHEM,PHYS,MIN	Aeric	Haplaquod	sandy, siliceous. mesic
AU Gres	ME	1	SS	CF	V	PSA,CHEM,PHYS,MIN	Entic	Haplaquod	sandy. mixed, frigid
Au Gres	NH	1	SS	CF	Y	PSA,CHEM,PHYS,MIN	Entic	Haplaquod	sandy, mixed. frigid
Augusta	VA	1	ss	CF	Y	PSA,CHEM,PHYS,MIN	Aeric	Ochraqult	fine-loamy, mixed, thermic
Aura	NJ	1	SS	CF	V	PSA,CHEM,PHYS,MIN	Typic	Hapludult	fine-loamy. mixed, mesic
Bangor	VT	2	SS	CF	Y	PSA,CHEM,PHYS,MIN	Typic	Haplorthod	coarse-loamy, mixed, frigid
Bartley	NJ	1	SS	CF	Y	PSA,CHEM,PHYS,MIN	Typic	Fragiudalf	fine-loamy, mixed, mesic
Bayboro var.	MD	1	SS	CF	Y	PSA,CHEM,PHYS,MIN	Umbric	Paleaquilt	clayey. mixed, thermic
Becket	ME	1	SS	CF	Y	PSA,CHEM,PHYS,MIN	Typic	Haplorthod	coarse-loamy, mixed. frigid
Belgrade	NH	1	SS	CF	Y	PSA,CHEM,PHYS,MIN	Aquic Dystric	Eutrochrept	coarse-silty. mixed. mesic
Belhaven	VA	1	SS	CF	V	PSA,CHEM,PHYS,MIN	Terric	Medisaprist	loamy, mixed, dysic, thermic
Berkshire	NY	2	ss	CF	Y	PSA,CHEM,PHYS,MIN	Typic	Haplorthod	coarse-loamy. mixed, frigid
Berkshire	VT	7	SS	CF	Y	PSA,CHEM,PHYS,MIN	Typic	Haplorthod	coarse-loamy, mixed. frigid
Bernardstown	NH	1	ss	CF	Y	PSA,CHEM,PHYS,MIN	Typic	Fragiochrept	coarse-loamy, mixed, mesic
Bertie	MD	1	SS	CF	Y	PSA,CHEM,PHYS,MIN	Aquic	Hapludult	fine-loamy. mixed, thermic
Blackthorn	WV	1	SS	CF	Y	PSA,CHEM,PHYS,MIN			
Blandburg	MD	1	SS	CF	V	PSA,CHEM,PHYS,MIN	Typic	Haplorthod	loamy skeletal, siliceous. mesic
Bohicket	VA	2	SS	CF	Y	PSA,CHEM,PHYS,MIN	Typic	Sulfaquent	fine. mixed, nonacid, thermic
Bombay	NY	1	SS	CF	Y	PSA,CHEM,PHYS,MIN	Glossoboric	Hapludalf	coarse-loamy. mixed. mesic
Bomoseen	VT	5	ss	a	Y				

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SERIES

ST #PED ID# ACCESS CF?

DATA AVAIL

TAXONOMIC CLASSIFICATION

Canandaigua

Canton

Caribou

Carlisle

Cecil

Cedarcreek

Chagrin

thatfield

Chatfield

Cheshire

Chilium

Christiana

Clarksburg

Claverack

Clymer

Cohos

Collamer

Colrain var.

Colton

Colton

Colton Var.

Colts Neck

Cookport

Covington

Croghan

Crychumod

Cullen

Dekalb

Downer

Dowree

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-23

SERIES	ST	#PED	ID#	ACCESS	CF?	DATA	AVAIL	TAXONOMIC	CLASSIFICATION
Ernest Var.	WV	4	SS	CF					
Evesboro	MD	1	SS	CF					
Fauquier	MD	1	SS	CF					
Fort Mott	MD	1	ss	a					
Frederick	VA	5	SS	CF					
Fullan	VT	2	SS	CF					
Galestown	MD	2	SS	CF					
Gallia	WV	3	SS	CF					
Galway	VT	1	SS	CF					
Georgeville	VA	3	ss	CF					
Georgia	VT	2	SS	CF					
Gilpin	PA	1	SS	CF					
Gilpin	WV	7	SS	CF					
Glebe	VT	1	SS	CF					
Glenelg Var.	MD	1	SS	CF					
Glover	VT	1	ss	CF					
Grange	NH	1	ss	CF					
Greensboro	MD	1	ss	CF					
Groseclose	VA	1	SS	CF					
Groveton	NH	1	ss	CF					
Hadley	MA	1	SS	a					
Hagerstown	PA	1	ss	CF					
Haledon	NJ	1	SS	CF					
Hermon	ME	2	SS	CF					
Hermon Var.	NH	1	SS	CF					
Hibernia	NJ	1	SS	CF					
Hogback	VT	2	SS	CF					
Hollis	NY	1	SS	CF					
Houghtonville	VT	2	ss	CF					
Howland	NH	1	SS	CF					
Hudson	NY	1	ss	CF					
Ipswich	MA	2	SS	CF					
Iredell	MD	1	SS	a					
Kanawha	WV	3	SS	CF					
Kelly	VA	1	ss	CF					
Kempville									

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1-24



SERIES

ST #PED ID# ACCESS CF?

DATA AVAIL

TAXONOMIC CLASSIFICATION

Keyport
 Kingsbury
 Laidig
 Lehw
 Leicester
 Levy
 Lew
 Lima
 Lodi
 Londonderry
 Lyman
 Lyman
 Lyman Var.

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1-25

SERIES

ST #PED ID# ACCESS CF? DATA AVAIL

TAXONOMIC CLASSIFICATION

Niagara
 Occoquan
 Orange
 Othello
 Otwell
 Paxton
 Paxton
 Paxtm
 Perquimaus
 Peru
 Peru Var.
 Pillsbury
 Pineville
 Pittsfield
 Pittsfield
 Pittstown
 Pittstown
 Plaisted
 Pocomoke
 Podunk Var.
 Pomfret Var.
 Ponzer
 Poplimento
 Quonset
 Rapidan
 Rawsorville
 Raybun
 Rhinebeck
 Rhinebeck
 Rockaway
 Saddleback
 Sassafras
 Sassafras
 Scantic
 Scitico
 Scitico

NY 4

1-26

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SERIES	ST #	PED ID#	ACCESS	CF?	DATA AVAIL	TAXONOMIC CLASSIFICATION
Ser. not des.	MD	b	SS	CF	Y PSA,CHEM,PHYS,MIN	
Ser. nt des.	NY	lb	SS	CF	Y PSA,CHEM,PHYS,MIN	
Ser. not des.	VA	2	SS	CF	Y PSA,CHEM,PHYS,MIN	
Ser. rot des.	VT	1	ss	CF	Y PSA,CHEM,PHYS,MIN	
Ser. not des.	WV	27	SS	CF	Y PSA,CHEM,PHYS,MIN	
Sisk	NH	1	SS	CF	Y PSA,CHEM,PHYS,MIN	
state	VA	3	SS	CF	Y PSA,CHEM,PHYS,MIN Typic	Hapludult fine-loamy, mixed, thermic
Stockbridge	V T	2	ss	CF	Y PSA,CHEM,PHYS,MIN Dystric	Eutrochrept coarse-loamy, mixed. mesic
Stratton	VT	2	SS	CF	Y PSA,CHEM,PHYS,MIN Lithic	Cryorthod thiotropic-skeletal
Suffolk	VA	1	SS	CF	Y PSA,CHEM,PHYS,MIN Typic	Hapludult fine-loamy, siliceous, thermic
Sunapee	VT	2	SS	CF	Y PSA,CHEM,PHYS,MIN Typic	Haplaquod
Surplus	NH	1	SS	a	Y PSA,CHEM,PHYS,MIN Typic	Cryorthod thixotropic over loamy
Taconic	VT	1	SS	CF	Y PSA,CHEM,PHYS,MIN Lithic	Dystrochrept
Teel	VT	1	SS	CF	Y PSA,CHEM,PHYS,MIN Fluvaquentic	Eutrochrept coarse-silty. mixed. mesic
Tunbridge	VT	6	SS	CF	Y PSA,CHEM,PHYS,MIN Entic	Haplorthod coarse-loamy, mixed. frigid
Tunbridge	VT	2	ss	CF	Y PSA,CHEM,PHYS,MIN	
Turbeville	VA	1	SS	CF	Y PSA,CHEM,PHYS,MIN Typic	Paleudult clayey. mixed. thermic
Upshur	w	1	SS	CF	Y PSA,CHEM,PHYS,MIN Typic	Hapludalf fine. mixed. mesic
Vergennes	NY	2	SS	CF	Y PSA,CHEM,PHYS,MIN Glossaquic	Hapludalf very-fine, illitic. mesic
Vergennes	VT	1	SS	CF	Y PSA,CHEM,PHYS,MIN Glossaquic	Hapludalf very-fine. illitic, mesic
Vershire	VT	1	ss	CF	Y PSA,CHEM,PHYS,MIN Entic	Haplorthod coarse-loamy. mixed, frigid
Warwick	VT	1	SS	CF	Y PSA,CHEM,PHYS,MIN Typic	Dystrochrept loamy-skeletal, mixed, mesic
Wasda	VA	1	SS	CF	Y PSA,CHEM,PHYS,MIN Histic	Humaquept fine-loamy, mixed. nonacid, thermic
Washington	NJ	1	ss	CF	Y PSA,CHEM,PHYS,MIN Ultic	Hapludalf fine-loamy. mixed. mesic
Westbrook	MA	1	SS	CF	Y PSA,CHEM,PHYS,MIN Typic	Sulfhemist euic, mesic
Westbury	VT	1	SS	CF	Y PSA,CHEM,PHYS,MIN Typic	Fragiaquod coarse-loamy, mixed. frigid
Wethersfield	CT	3	SS	CF	Y PSA,CHEM,PHYS,MIN Typic	Fragiochrept coarse-loamy. mixed. mesic
Wilmington	VT	1	SS	CF	Y PSA,CHEM,PHYS,MIN Typic	Haplaquod coarse-loamy, frigid
Windsor	VT	1	SS	CF	Y PSA,CHEM,PHYS,MIN Typic	Udipsamment mixed, mesic
Winooski	VT	1	SS	CF	Y PSA,CHEM,PHYS,MIN Aquic	Udifluvent coarse-silty. mixed. nonacid, mesic
Woodbridge	NH	1	SS	CF	Y PSA,CHEM,PHYS,MIN Typic	Fragiochrept coarse-loamy, mixed, mesic
Woodstock	VT	1	SS	CF	Y PSA,CHEM,PHYS,MIN Entic Lithic	Haplorthod loamy, mixed. frigid
Worden	VT	1	SS	CF	Y PSA,CHEM,PHYS,MIN Aquic	Haplorthod coarse-loamy. mixed. frigid

1/2
1-27

Charge 2. Compile a list of nonclassification applications from soil survey users.

Charge Coordinator: Bob McLeese

Other members assigned to Charge.2: **Shawn** Reid, Ray Shipp, Bill Wright, Bill Jokela, Ron **Yeck**.

Accomplishment: Summaries were compiled from responses to telephone or mailed surveys conducted by Ray Shipp, Bob **McLeese**, and Bill Wright. They will be attached to the report after the discussion section for Charge 2. The conclusion states that there are hundreds of applications of these data, many of which were indicated in the survey. Also very useful **was** the listing of high potential users and occasional users.

Discussion: The surveys indicate a large demand for site-specific data. Some felt that for occasional users, **nonsite** specific information was already interpreted for the user in soil survey reports. From the list of high priority users, we receive direction for developing further usefulness. Several expressed the need for soil scientists to interact with users for proper use of data. Perhaps we need to educate users to the degree of precision that the data represent.

No recommendations.



United States
Department of
Agriculture

Soil
Conservation
Service

Vermont SCS State Office
69 Union Street
Winooski, Vermont 05404

Subject: XX-1986 NE Cooperative Soil Survey
Conference/Committee 1-Use of
Soil Characterizations Data for
other than Soil Classification
Purposes

Date: May 29, 1986

To:

File code:

✓ Ron Yeck, Chairman Committee 1
Bill Jokela, Charge 2 subcommittee

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The Soil Conservation Service
is an agency of the
United States Department of Agriculture



JUN 2 1986

3. **Agric. Ext. Agents**
 Fertilizer Dealers
 Tax Assessors
 Realtors
 Bankers
 Farmers

Crop productivity, pesticide effective-
ness (pH, CEC, clay, OM), suitability
for variety of on-site waste
util./disposal systems, prime and
unique farmlands

--

- *
1 - **Most** important, potential users
2 - Occasional users, site, specific
3 - **Seldom** users, also site specific

Report fran Bill Wright

P 11 sent out 12 questionnaires (within RI). He received 3 responses. His
findings are summarized

Hydrogeologists	- Permeability, chemical data - PSA, Atterburg limits, Bulk density	sewage disposal foundation stability and slope stability
Foresters	PSA, Bulk density	Tree Productivity
Consulting Engineers		Preliminary site Investigations
Agronomists		Relationship to plant growth
ASCS		Crop productivity
Economists		Soil Productivity models
Groundwater Mgr.	Perm, bulk density, WRD, PSA	hydrological assessment
Greenskeeper		green construction

No report was received from Bill Jokela or Shaw Reid.

Conclusion

A complete list of non classification data applications would show hundreds of applications and would be impossible to compile. Instead a list of potential users might be more appropriate.

High Potential Users

Archeologists
Crop Scientists
Engineers
Foresters
Geologists
Hydrologists
Researchers
Soil Scientists

Occasional Users

Agronomists
Conservationist
Consultants
Planners
Environmentalists
&onanists
Extension Agents
Fertilizer Dealers
Tax Assessors
Realtors
Bankers
Farmers

tie high potential users seem to have an understanding of the data and would not require much training on its use. The occasional user, however, has a hard time understanding and interpreting the data as presented. If they are going to use the information, it needs to be displayed in laymans terms and we need to provide training in its use.

A handwritten signature in black ink that reads "Bob McLeese". The letters are cursive and somewhat stylized, with a prominent "B" and "M".

Bob McLeese
Asst. State Soil Scientist

Department of Agronomy
Agronomy Extension

106 Agricultural Administration Building
University Park, Pennsylvania 16802

Phone
al4 865 2543

May 5, 1986

Mr. Bob McLeese
Vermont SCS State Office
69 Union Street
Winooski, VT 05404

Dear Bob:

In early March I did receive a letter and information from you regarding sub-committee charge 2 which I was supposed to deal with. I failed to send out the letter, questionnaire, and example soil pedon data to potential soil survey users. However, I did a telephone survey (within Pennsylvania) of extension agents, planners, consultants, conservationists, soil scientists and co-workers who I know have had various soils information requests over the years.

In Pennsylvania the single most important potential user of soil classification data, such as pedon data, is the researcher. Such data is seldom, if ever, requested by farmers, fertilizer dealers, ag agents, realtors, bankers, tax assessors or folks in like categories. Such data is occasionally requested by planners, local and state officials (primarily health related--sanitarians, sanitary engineers), conservation district workers, and consultants (primarily engineering/environmental firms). More often than not, these "occasional-use" groups of people need specific, individual parameter measurements, e.g., CEC or PSA, or corrosivity values, or whatever....that are for a specific site and use. Since they need site-specific data I consider it questionable that modal or benchmark type soils data really meets their needs. (My opinion is debatable.)

Another draw-back to the use of such data by others (non-research) is that someone knowledgeable about the data, methods, etc., must help interpret it for them in terms relative to their needs. For example, perhaps soil stability for housing development is a concern--what pedon data is pertinent? COLE, mineralogical....and what do the numbers mean, what is a critical threshold number, etc.?

In the telephone survey I got extreme responses, e.g., "have never been asked for such data except by fellow soil scientists" (SCS worker) to "such data would be extremely useful for larger developments" (planner). Nevertheless, I've attempted to list in summary form the primary, potential users of pedon classification data along with example uses.

<u>Priority</u>	<u>Potential Users</u>	<u>Example Uses</u>
1.	Researchers: EPA/Environmental Foresters and Hydrologists Crop and Soil Scientists USGS/Geological Survey ARS/Watershed Engineers -Construction -Highway -Environmental	Acid Rainfall Studies/Investigations Water Resources Planning Watershed Studies/Investigations Data Base for Expert Systems Data Base for "Modeling" -Crops, Watersheds, Water Quality, Disease and Insect Prediction, Forest Productivity, etc. Environmental Studies/Investigations -Acid Mine Conditions, Drainage -Slide-prone soils, stability Geographic Information Systems -Integrate soils, climate, geologic, hydrologic data bases
2.	Planners/Regional & County Officials/Local & State Conservationists Consultants Environmentalists	Soil stability, corrosiveness, permeability, water holding cap., erosiveness, slopes, bedrock data, water tables, drainage, coarse fragments, optimum density, suitability for waste utilization/disposal (landfills, sewage sludge and effluents, etc.)
3.	Agric. Ext. Agents Fertilizer Dealers Tax Assessors Realtors Bankers Farmers	Crop productivity, pesticide effectiveness (pH, CEC, clay, OM), suitability for variety of on-site waste util./disposal systems, prime and unique farmlands

-
- '1 - Most important, potential users
 2 - Occasional users, site specific needs
 3 - Seldom users, also site specific

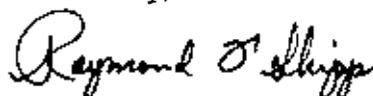
In our recent telephone conversation we talked about a questionnaire survey of some 800 potential users of soil survey information in the states of Pennsylvania and Washington (1995). Four distinct groups of people responded to this survey-- Planners, SCS, Extension & University and Conservation District employees. Please see attached copy of a proposed Poster Paper Abstract by Dr. Carl F. Engle, Washington State University. Dr. Engle gave me permission to send you some of the Pennsylvania information summarized from that survey. Four pages which pertain are attached to the abstract. Keep in mind--this survey addressed the use of county soil survey reports--not the specific use of characterization data as such. Please note, however,, that the "Chemical Properties Tables" did not rate very high in priority by the group of users responding to this survey.. Please note also the differences between or among the groups. The "Physical Properties Tables" rated about midway. There was

much more to the survey, but these selected results have some application to our charge.

Bob, I doubt that this fills the bill but I tried. Perhaps with other states' inputs you can build or expand on these perceptions. I apologize for not putting forth a greater effort and for not providing a more thorough analysis. On the other hand, where were we to get the dollars for extensive questionnaire surveys? Would like to look forward to attending the Soil Survey Workshop but have no travel money left.

Let me know if you feel I can provide any further input.

Sincerely,



Raymond F. Shipp
Extension Agronomist

bbr
Enclosures: Call for Poster Papers
 Tables
cc: C. F. Engle
 R. L. Cunningham

COOPERATIVE EXTENSION
Washington State University

Pullman, Washington 991646412, 509-335-2811

2006
509 335 2811

CALL FOR POSTER PAPERS
Soil Conservation Society of America
August 3-6, 1986. Winston-Salem, NC

TITLE: Clientele Needs and Uses of Automated Soil Survey Data in Pennsylvania and Washington

AUTHORS: Carl F. Engle, Washington State University; and Robert Cunningham and Raymond Shipp, both of Pennsylvania State University

FOCUS OF PAPER

(issues): New technology to achieve conservation goals

ABSTRACT:

Soil surveys are the principal source documents for data used to make interpretations about the uses of soil. These data are in maps and tables that must be put in forms and language usable by clientele of very different training and backgrounds. This transformation is usually done via colored maps and overlays.

Professors at Penn State University and elsewhere have developed software for personal and microcomputers to store, retrieve, interpret and graphically display desired soils data, both separately and in conjunction with other resource data. This is a costly process, but when accomplished, has many advantages for various users, i.e. planners versus Soil Conservation Service personnel, versus Cooperative Extension and university faculty.

A questionnaire was designed and distributed to over 800 potential users of soils information in Pennsylvania and Washington in four distinct groups (planners, SCS, Cooperative Extension and university faculty, and Conservation District employees). The questionnaire sought their input into the need for and potential uses of personal computers for automating uses of soils data.

Because of the limits of personal computers for storing and efficiently processing and displaying data, receivers of the questionnaire were asked to prioritize their user needs from a list of identified uses. They were encouraged to list and prioritize other needs.

The Poster Paper will summarize the findings of the questionnaire on information about the users, their previous use of soil survey information, and needs for computerized processing of soils and other resource data.

-

**EXAMPLES OF HOW SOIL INFORMATION HAS BEEN USED THE
PAST TWO YEARS, EXPRESSED IN PERCENT AND DECLINING USE,**

<u>USE</u>	<u>GROUP</u>
CROP PRODUCTION; FARM OR CONSERVATION PLANNING	46
SOIL PROPERTIES AND SOIL TEST REC,	40
SITE SUITABILITY AND EVALUATIONS	27
PLANNING AND/OR DESIGN (RESOURCE/LAND USE)	24
WASTE DISPOSAL (ALL KINDS)	24
REVIEWS AND PERMITS (SUBDIVISIONS, ZONING)	23
AG AND WOODLAND PRESERVATION	14
DEVELOPMENT (RES-COM,) AND FARM STR,	10
WETLAND AND FLOOD PLAIN IDENT,	10
PURCHASE OF LAND AND FARMS	8

**A, PRIORITIZATION OF SOIL SURVEY USES BY CLIENTELE,
EXPRESSED AS MEAN VALUES OF RATING SCALE,**

USE	GROUP	A	B	C	D
DETAILED RESOURCE PLANNING	3,24	2,32	3,64	3,21	3,51
SOIL DRAINAGE/PERM, NAPS	3,19	3,00	3,31	3,11	3,29
SOIL SLOPE NAPS	3,14	3,11	3,22	2,92	3,35
DEPTH TO BEDROCK- - LIMITING FEATURE	3,12	2,77	3,24	3,24	3,12
PRIME AND UNIQUE LANDS	3,07	2,79	3,33	2,73	3,33
SEASONAL HIGH WATER TABLE	2,99	2,91	3,31	2,49	3,16
ON-SITE WASTE DISPOSAL	2,92	3,45	2,83	2,63	2,94
LAND CAPABILITY GROUPINGS	2,89	2,02	3,18	2,87	3,24
GENERAL/BROAD RESOURCE PL,	2,78	2,77	3,08	2,13	3,16
CROP PRODUCTION GROUPS	2,73	0,72	3,16	3,40	3,08
PHYSICAL PROPERTIES TABLES	2,64	2,30	2,83	2,57	2,73

SCALE

- 0 = NO IMPORTANCE**
- 1 = SOME IMPORTANCE**
- 2 = MODERATE IMPORTANCE**
- 3 = IMPORTANT**
- 4 = VERY IMPORTANT**

- A = Planners**
- B = SCS**
- C = Extension/Univ.**
- D = Conserv. Dist.**

**B. PRIORITIZATION OF SOIL SURVEY USES BY CLIENTELE,
EXPRESSED AS MEAN VALUES OF RATING SCALE,**

USE	GROUP	A	B	C	D
FLOODPLAIN - WETLANDS DEL,	2.62	3.02	2.96	1.67	2.88
SEWAGE SLUDGE DISP,	2.57	2.96	2.53	2.38	2.49
RATING FOR WATER IMPOUNDMENTS	2.51	1.85	2.78	2.30	2.94
LOCATION OF GEOG. FEATURES	2.50	2.23	2.75	2.25	2.65
ROAD BLDG. AND OTHER ENG, PROP,	2.49	2.83	2.73	1.52	3.00
LESA	2.11	1.66	2.98	1.22	2.20
CHEMICAL PROPERTIES TABLES	2.02	1.21	2.33	2.10	2.20
ZONING	2.02	2.83	1.99	1.60	1.84
STONINESS GROUPS	2.00	1.62	2.37	1.52	2.35
TAX ASSESSMENT	1.79	1.51	1.90	1.79	1.86
AG MARKETING	1.25	0.64	1.39	1.46	1.33

10

OTHER POTENTIAL USES?

PLANNING AND ZONING ORDINANCE MODELS - TWPS,
SAND AND GRAVEL RESOURCES
SUITABILITY FOR LANDFILLS
LOCATE ABANDONED CEMETERIES
SOIL LOSS INFORMATION
RECOMMENDED ROTATIONS
SOIL STABILITY
USDA SOIL INTERPRETATIONS (5'S)
CROSS CODE SOIL SURVEY MAPS WITH ASCS MAPS
LOCATION OF MINED AREAS
TIMBER TYPES
SHOULD NOT BE DEVELOPED CRITERIA
SOIL SUITABILITY FOR TILING

Questionnaire were sent to 75 potential users of soil survey information in Vermont.
34 responses were received.

USER	Do you currently use this data?		Would this data be useful?		WHAT DATA AND HOW WOULD YOU USE IT
	YES	NO	YES	NO	
Soil Classifier	✓		✓		Soil Classification
soil Classifier	✓		✓		Soil Classification
Soil Conservationist		✓	✓		Need Training in Use
Soil Conservationist		✓		✓	
Soil Consevationlst		✓	✓		If displayed in different format
Soil Conservationist		✓	J		Site Specific
Soil Conservationist		✓	✓		Site Specific/Particle size for grass seeding Total N for soil fertility
Soil Conservationist		✓		✓	
Soil Conservationist		✓		✓	Site Specific/Particle sfre for water retention and filter bedding
Soil Conservationist	✓		✓		Extractable P far ratershed planning
Soil Conservationist		✓	✓		Soil engineering parameters shrink-swell - bearing cpdcity for foundation stability
Soil Conservationist	✓		✓		Clay mineralogy
Geologist		✓	✓		
Hydrogeologist		✓	✓		
Hydrogeologist	✓		✓		
Hydrogeoglst		✓	✓		
Hydrogeologist		✓	✓		

USER	Do you currently use this data		Would it be useful			
	YES	NO	YES	NO		
Forester		✓		✓		I
Forester		✓		✓	Too much detail	I
Forester		✓	✓		PSA. Bulk density	
Consulting Engineer		✓	✓		General soil data for preliminary site investigating	
Consulting Engineer		✓		✓	Need Unified Soil Classification	
Agronomist		✓	✓		If relationship to plant growth were displayed	
Agronomist		✓		✓		
Extension Agent		✓		✓		
Planner		✓		✓		
Researcher		✓		✓	Site specific for research projects	I
Geography Prof.		✓		✓		
Pesticide Coordinator		✓		✓		I
GIS Program Coordinator		✓		✓		J
ASCS		✓	✓		If simplified and related to crop productivity Developing Soil productivity models Permeability, Bulk density, moisture content for hydrogeological assessment	
Economist		✓	✓			
Groundwater Mgr.	✓		✓			
Greenskeeper	✓		✓		PSA for green construction	

The following did not respond:

Archeologists
Solid waste specialists
Farmers
Realtors

Turf Farm Mgr.
Fertilizer Company Rep.



United States
Department of
Agriculture

Soil
Conservation
Service

April 21, 1983

Dear _____,

Representatives of the National **Cooperative** Soil Survey in the Northeastern states are studying the use of soil characterization data for other than soil classification purposes. Up to this time, the primary use of soil survey lab data have been to answer questions about classification, morphology, and genesis. Over the years we have accumulated a large amount of data. It seems only logical that the data could be used **for** other than soil classification purposes. One of our goals is to compile a list of nonclassification data applications envisioned by various soil survey users.

We need your help! Would you please respond to the attached questionnaire and return it to be by *May 16*

Thank you!

Bob McLeese

SCS

69 Union St.

Winooski, VT 05404



The Soil Conservation Service
is an agency of the
United States Department of Agriculture



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Northeast Cooperative Soil Survey
Nonclassification Data Applications
Questionnaire

Name _____

Position _____

Employer _____

Address _____

Phone _____

National Soil Survey Lab pedon data (example attached) are now accessible by terminal **from** the Nebraska's Statehouse IBM-3081-D mainframe computer in Lincoln, NE.

1. Do you currently use this type of data? If so, how?
2. Would this type of data be useful **to you**?
3. Specifically what data would you use and how?
4. Are you interested in local, statewide, regional, or national data?

HOUGHTONVILLE S B4VT-023 -005 DATE 02/21/86 PEDON NO. 84P 789 NATIONAL SOIL SURVEY LABORATORY

1-- 2-- 3-- 4-- 5-- 6-- 7-- 8-- 9-- 10-- 11-- 12-- 13-- 14-- 15-- 16-- 17-- 18-- 19-- 20--

SAMPLE NO.	HZN NO.	NH4DAC EXTRACTABLE BASES					ACIDITY	EXTR AL	SUM CATS	CEC NH4+ OAC	BASES + AL	AL SAT	BASE SUM	SAT NH4 OAC	CDS <2MM /CM	AS RES. OHMS /CM	COND. /CM	PH	CaCl2 .01M	H2O BC1F
		CA	MG	NA	K	SUM														
B44462	1																		4.3	4.7
B44463	2	2.7	0.8	TR	0.5	5.0	30.9	1.7	35.9	28.8	6.7	25	14	17				3.4	4.0	
B44464	3	0.4	0.1	TR	TR	0.5	9.3	1.8	9.8	7.8	2.3	78	5	6				3.4	3.9	
B44465	4	0.4	0.1	TR	--	0.5	25.7	4.7	26.2	15.7	5.2	90	2	3				4.1	4.5	
B44466	5	0.2	TR	TR	--	0.2	18.3	2.7	18.5	8.8	2.9	93	1	2				4.8	4.9	
B44467	6	0.1	--	TR	0.1	0.2	13.2	1.7	13.4	5.9	1.9	89	1	3				4.9	5.0	
B44468	7	0.1	--	TR	--	0.1	10.8	1.2	10.9	4.6	1.3	92	1	2				4.9	5.0	
B44469	8	TR	--	TR	--	TR	7.0	1.0	7.0	4.9	1.0	100		TR				5.1	5.0	
B44470	9	TR	--	TR	--	TR	3.3	0.5	3.3	1.7	0.5	109		1				5.2	5.0	
B44471	10	TR	--	TR	--	TR	3.7	0.6	3.7	1.8	0.6	100		1				5.2	5.0	

(---SPODIC HORIZON CRITERIA ---)

(--NA PYROPHOSPHATE EXTRACTABLE--) INDEX
 C FE A L FE+AL FE+AL AL+C OF
 (--DIVIDED BY --) ACCUM
 <- PCT OF <2MM-> FE+AL CLAY CLAY

SAMPLE NO.	HZN NO.	6A4A	6CBA	6G10	DI-CI	PCT	PCT
B44462	1						
B44463	2		0.2	0.1	0.4	0.1	
B44464	3		0.2	0.1	0.4	0.1	
B44465	4		1.8	0.6	0.7	0.7	135
B44466	5		0.7	0.6	0.7	0.5	381
B44467	6		0.6	0.6	0.6	0.4	228
B44468	7		0.5	0.5	0.7	0.4	154
B44469	8		0.3	0.3	0.5	0.2	205
B44470	9		0.1	0.1	0.2	0.1	
B44471	10		0.1	0.2	0.3	0.1	

(---MINERALOGY ---)

(---CLAY ---)
 (--- X-HAY ---) (---DTA ---) TOTAL DOM
 RES WEATH
 <- RELATIVE AMOUNTS -> <- ---PCT --->

7A2I	7A2I	7A2I	7A2I	7A3	7A3	7B1A	7B1A

1-46
131

AVERAGES, DEPTH 25-100: PCT CLAY 3 PCT .1-75MM 5.9. SPODIC HORIZON: INDEX OF ACCUMUL 1103

ESTIMATED BULK DENSITY FOR LAYER 2. 3. 4. 10,

ANALYSES: S= ALL ON SIEVED <2MM BASIS

Charge 3. For at least one nonclassification application that should have recurrent utility, develop, demonstrate, and document procedure for using data files.

Charge coordinator: Keith Wheeler

Other members assigned to Charge 3: **Dick** Babcock, Steve Hundley, Henry Mount, Ron **Yeck**.

Accomplishment: A draft paper from Oak Ridge National Laboratory entitled, "Areas Having Characteristics that may indicate Sensitivity to Acid Deposition Under Alternative Forest Hypothesis," with accompanying computer produced maps, was examined as an example of a use of soil characterization lab data. Data used by the authors was from NSSL and Pennsylvania State University. Maps illustrated single soil properties such as pH or CEC and combinations of properties. Three areas are shown--the eastern U. S., the Northeast, and the Adirondack region. Tabular data show forest species and soil great groups thought to be most sensitive to acid precipitation. An abstract of the Oak Ridge Laboratory report follows the Committee 3 recommendations.

Discussion: The examples show how a user can access the data and make interpretations based on soil characterization data. It illustrates a tremendous potential for use but also for potential inappropriate use of these data.

Recommendation: Every effort should be made to educate the public user of NCSS data bases of the limits beyond which generalization is inappropriate.

"Areas Having Soil Characteristics that may Indicate Sensitivity to Acid Deposition Under Alternative Forest Damage Hypotheses*" by R. S. Turner, R. J. Olson, and C. C. Brandt.

ABSTRACT

This draft report was produced by the Environmental Sciences Division of the Oak Ridge National Laboratory by using a Geographic Information System (GIS) data base linked with NRI, SOILS-S, NSSL, and Pennsylvania State University data bases. For purposes of this committee, the most important aspect of these illustrations is the application of the principles and technology for producing maps, rather than assumptions and hypotheses specific to the study.

Maps were computer generated for three areas; for the Eastern United States, the Northeastern United States, and the Adirondack Park area. The soil physical properties data came from the SOILS-5 data base. The chemical data were from the NSSL and the Pennsylvania State University soil characterization laboratories. From representative pedons, means of chemical properties were calculated for series that were considered to best represent the geographic areas for which maps were developed.

The maps illustrate the potential for selecting combinations of soil information, land use, and cultural features in various combinations tailored to the need8 of the user,

Charge 4. Recomend a protocol that would more fully use.

USE OF SOIL CHARACTERIZATION DATA FOR OTHER THAN SOIL
CLASSIFICATION PURPOSES

Charge 4: Recommend a protocol that would more fully use characterization data to its potential for non-classification purposes.

Committee Members: Dick Cronce, Rick Day and Ray Bryant

INTRODUCTION

The purpose of this report is to recommend a preliminary protocol that would more fully use characterization data to its potential for non-classification applications. It is

DATA_FILE_STRUCTURE

1. A standardized file format should be developed, documented and maintained by a single group or agency.
2. The sample format should include information relating the characterization data to its sampling location, the FIPS code, pedon and horizon number, latitude and longitude should be included.
3. The pedon should be identified by both the series which the pedon represents as well as the series that it is mapped as at the sampling location.
4. Decisions on the types and definitions of the variables will have to be made that will accommodate the projected needs of all projected users of the data.
5. The database file structure must be easily expandable.
6. The data structure must be well documented in terms of the sampling location, analytical method used, units of measure, and Expected laboratory variability of the analytical data.

RETRIEVAL_PROGRAMS

1. Programs should be menu-driven and user-friendly for routine tasks such as producing tables, performing simple data search and retrieval operations and for data input and editing.
2. Retrieved data should be easily interfaced with ancillary graphical, statistical and text editing software.

DATA_LOCATION

1. The data base will need to be maintained by selected groups within the National Cooperative Soil Survey to insure data integrity and conformity with designated data base standards.
2. A hierarchy of data maintenance and access locations should be established at national, regional and state levels.
3. Funding for the maintenance and development of the data base should originate through the National Cooperative Soil Survey.

DATA USE GUIDELINES

1. Designated and recognized sources of the data should exist in order to assure the integrity of the data base.
2. Safeguards should be built into the data base to guard against inappropriate use and/or interpretation of the data.
3. The expected variability in the pedon data at various levels of classification will need to be developed.
4. All data in the data base must be correctly classified in the present system of classification and periodically updated as series, and classification concepts change.
5. The characterization data needs to be summarized at the series level resulting in a typical profile with a range in characteristics based on the data within the data base.
6. Clear and concise statements concerning the intent and utility of the characterization data for non-classification uses need to be developed and conveyed to all data users. These statements should give guidance concerning the limits of interpretations and decisions which can be made based solely on the data within the data base.

USE OF SOIL CHARACTERIZATION DATA FOR OTHER THAN SOIL
CLASSIFICATION PURPOSES

Charge 4: Recommend a protocol that would more fully use characterization data to its potential for non-classification purposes.

Committee Members: Dick Cronce, Rick Day and Ray Bryant

INTRODUCTION

The purpose of this report is to recommend a preliminary protocol that would more fully use characterization data to its potential for non-classification applications. It is assumed that such a data system would be developed under the auspices of the Soil Conservation Service and affiliated State Universities within the National Cooperative Soil Survey. This report briefly addresses several of the pertinent considerations of such a proposed data base.

DATA ACCESS SYSTEM

1. Computer hardware should be a DOS compatible MICRO system such as an IBM-AT with an external hard disc.
2. The system should be a well supported and documented commercial
- 3.
- 4.

DATA_FILE_STRUCTURE

1. A standardized file format should be developed, documented and maintained by a single group or agency.
2. The sample format should include information relating the characterization data to its sampling location, the FIPS code, pedon and horizon number
- 3.
- 4.
- 5.
6. in terms of the units of measure, analytical data.

RETRIEVAL_PROGRAMS

1. Programs should be menu-driven and user-friendly for routine tasks such as producing tables, search and retrieval operations editing.
- 2.

DATA USE GUIDELINES

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4. All data in the data base must be correctly classified in the present system of classification and periodically updated as series and classification concepts change.
5. The characterization data needs to be summarized at the series level resulting in a typical profile with a range in characteristics.
6. Clear and concise statements concerning the intent and utility of the characterization data for non-classification uses need to be developed and conveyed to all data users. These statements should give guidance concerning the limits of interpretations and decisions which can be made based solely on the data within the data base.

1986 NCSSC WORKING COMMITTEE 2

Criteria For ^{imits} of Properties for Soil Series

Committee Members:

M. Rabenhorst, Univ. of Maryland, Chairman

F. Gilbert, SCS, NY, Vice Chairmen

C. Eby, SCS, NJ

B. Edmonds, VP IB.3900065167.440024 0 0 8.8800049 141.4399939 567.6000061 11m B

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Committee Report

General :

As stated clearly in Soil Taxonomy and as reaffirmed through the recommendations in the report of Committee 3 at the 1984 NCSSC, the soil series is the lowest category in the classification system. As such, the differentiating criteria for families and other higher categories in the system are super imposed as limits for the series. Therefore, the substance of discussion for this committee is limited to criteria and class limits between series within a given family.

Presently, the guidelines for the criteria to be used in differentiating soil series can be found in Soil Taxonomy and the National Soils Handbook. These guidelines (from Soil Tax. pp.80-81 and 390-393 and parts of section 602 of the NSH) are summarized below.

Summary of Present Guidelines

1. Series limits must not range across limits between two families or two classes at a higher category.
2. Criteria must be based on readily observed or inferred properties.
3. The range in properties must exceed normal error⁵ of measurement, observation or estimation.
4. Criteria must be related to horizon differentiation (if horizons are present), and must be related to either:
 - a) nature of horizons (ie. mineralogy, structure, consistence, texture of sub-horizons, moisture and temperature regimes, color, etc.)
 - b) degree of expression of horizons (ie. thickness, contrast, or boundaries)
5. Each series should be clearly differentiated from other series.
6. The criteria for series differentia should be related to what can be stated about the behavior of the soil (ie. interpretive uses.)

Charge 1.

Determine the need for **establishing** guidelines for defining class limits of soil properties in defining soil series.

Pre-Conference Act i v i t y

Initially, a survey **was** made of the committee in an attempt to identify the **general** thoughts of the members regarding the need for developing **more** detailed guidelines for series Criteria. The **survey** entailed four questions to which written responses were requested. Eight of the fourteen members responded which represented 7 of the 9 states that have people serving on this committee. In typical soil survey **style**, there were somewhat diverging viewpoints on the **issues** addressed. The questions are stated below, followed by a synopsis of the responses. comments of the chairman appear in italics.

Summary of responses to questions

1. What is your personal **feeling** with regard to the need to establish guidelines for defining class limits in defining soil **series**?

The responses fell generally into three groups:

1) No new guidelines are needed. Things are essentially fine as they are now being done.

2) Present guidelines are adequate, but there **is** a need to :a) better understand these guidelines; **b)define** the **series** in more detail **so as** tho be **sure** that each series is clearly differentiated from all other series (**ie.** criteria 5 above) and **c)** update and maintain these descriptions in a" accessible data **base**.

3) There **is** a need for additional guidelines in establishing criteria and class limits for series which address: **a)** clearer definition of class limits; **b)** more uniform application of class limits in series definition.

2. From your own thinking and experience, **has** the present approach of laissez-faire been adequate or sub-optimal.

Responses split along similar lines **as** question 1. Those who felt the guidelines were adequate, **also felt** that the present approach and application of the guidelines **was** also adequate. Those who felt that there should be additional guidelines also felt that the present approach **was** not adequate. It **was** again suggested that more attention should be given to making precise definitions of series and their class limits, and especially in direct relation to competing series.

3. Have you noticed the differentiating criteria for series being applied consistently or inconsistently, and how does this relate to the goals for establishing series criteria as established in Soil Taxonomy or the NSH?

There was general agreement that criteria for class limits have not been applied consistently in the NE (in the sense that the same criteria and limits have not been used in exactly the same way by different states in the N.E.). There were divergent views, however, on the cause and seriousness of the inconsistencies.

One suggested cause of the lack of consistency is the varying levels of landscape complexity.

In the view of the chairman this is one of the causes and indicates that some soil scientists are still trying too hard to tie taxonomic units to mapping units. Such a view would advocate that if soils cannot be delineated into distinct mapping units, they should not be separated into different series. Attention should be drawn to the report of Committee 3 of the 1984 NCSSC where this is discussed in detail. It is true that due to the complex nature of the geology and geomorphology in some areas, certain mapping units must include substantial percentages of soils from more than one series. Because the series in such a unit cannot be mapped out, this does not mean that they do not exist as distinct series nor that they should not be identified as separate series.

A second suggested cause of the lack of consistency in applying class limits is that those class limits do not in all cases reflect real interpretational or behavioral differences in the soils. In such cases, the lack of consistency is of no practical consequence.

Since the guidelines of Soil Taxonomy and the NSH tie series differentiae to soil behavior or interpretations, this may be a valid point. It seems to me, however, that one of the points to be addressed, is whether such interpretive or behavioral considerations should be limited only to the present or dominant land use, or to what degree they should also consider other (likely or remotely) potential land uses.

4. Should series criteria be made more uniform (which in some cases would be more narrowly defined)?

The responses to this question again fit generally into two groups. One group was advocating the need for maintaining flexibility in establishing series criteria and class limits which should be based on interpretive differences when and where they exist, which may allow some series to be very narrowly defined while others would be much more broadly defined.

The other group felt that the criteria for class limits should become more uniform. Much of their concern also comes from experience where series were too broadly defined and did in fact span interpretive differences. It was suggested that if there was a move to make these criteria more uniform, they should be very carefully thought through and then should be specific to some higher categorical level in the system.

This last proposal, I think, is a particularly important one. If there was a move toward greater uniformity in class limits for series, there would need to be a decision as to the categorical level at which the class limits should be uniform - ie. only for those series within a given family - or all of those within a subgroup etc. It seems to me that this approach might alleviate some of the concerns which opponents to a more uniform class limits may have.

Those who were relatively content with the present guidelines and approach appeared not to have had personal experiences which indicated that there was a problem. Those who were advocates of more specific and detailed guidelines, however, were evidently responding out of their personal experience where either 1) application of the present guidelines, or 2) the guidelines themselves, had not been adequate to meet the goals of soil survey. Some people felt, for example, that non-uniform application of criteria for series class limits have resulted in series ranging across interpretive uses or other similar or related problems. Therefore, rather than trying to respond only at a theoretical level, we attempted to examine more specific problem situations in order to better assess the need for guidelines.

Committee members were therefore polled a second time in an attempt to better document the types of problems and situations which have caused some to feel the need for more detailed guidelines. They were asked to respond to the following :

DO you know of instances in the NE region where there are particular problems with the present application of criteria or class limits which you think might be alleviated by more specific or more uniform guidelines? If yes, please describe and explain the nature of the problem. If you are aware of several such instances, please describe as you can so that others can understand both nature and magnitude of the problem.

seven of the nine NE with members on committee. Several respondents indicated that they had not experienced any particular difficulties in applying the present criteria. The problems which were reported are stated below.

Specific Problems Observed

1. The modal value for a given soil property may differ substantially from the mean value (mid value) for the range given in the series description or SCS Form-S. This has caused difficulty in attempting to apply soils information to a soils potential productivity model.

Proposed solutions:

- a) include a modal value in the description and SCS-5 as well as a range for the property

- b) limits could be established, beyond which, properties of a give" soil (or horizon) may not **range** -- suggested possibilities include:

<u>property</u>	<u>suaaested range</u>
soil reaction	two classes or less per horizon
bulk density	up to 0.2 g/cm ³ per horizon
permeability	two classes or less per horizon

2. There may be difficulty in applying series criteria that already exist. For example, identifying the thickness of a spodic horizon -- since lab data is required to know where the spodic horizon ends.

3. There may be a problem with identifying and splitting series when there may be no interpretive basis for the split.

a) Both the **Agawam** series and the **Haven** series occur in the same family and interpret the same. One is in Connecticut and the other is in Massachusetts.

b) The **Enfield** series and **Allard** series are differentiated on the basis of lithology of **coarse fragments** (igneous vs sedimentary origin), however, they are coarse silty soils with very little coarse fragment anyway.

4. There **seems** to be **some** proliferation for establishing new series for soils with only minor differences in properties--too heavy on the literal interpretation of Soil Taxonomy--practical aspect probably needs more emphasis. Examples include:

a) New series are being established for Variants that have very limited extent.

b) New series have been established for frigid Dystrochrepts that are marginal to Haplorthods.

c) New series are being established for very similar floodplain soils that **are** stratified and highly variable anyway--probably too much weight given to individual pedon descriptions.

5. Soil series that have a historical context tend to be maintained **as** distinct from other very similar soils.

6. There is some problem with **broadening** the **range** of a series to encompass the soils in a mapping unit. It may be better to correlate these soils with another close competitor and keep the range from becoming too broad.

7. True differences may exist between series which do not show up adequately in interpretive guidelines. For example, the pairs of series, 'Hinkley - Manchester' and 'Windsor - Penwood', there are differences in lithology which affect their use as an engineering material.

8. There is a need for more guidelines on separating soils by climate (rainfall for example), by MLRA (12B, Southern Appalachian Ridges and Valleys vs 116A and 116B, Ozark Highland and Ozark Border), and by Yields (for example, differences in corn yields of 70 vs 120 bu/ac).

Conference Activity

When the committee convened in Blacksburg, it was to consider those problems listed above (and perhaps others which might be introduced at that time). The questions to be addressed were:

- 1) How do these problem situations relate to the present guidelines for series differentia?
- 2) Are the nature and magnitude of these problems such as warrant additional guidelines?

As the committee discussed the particular problems which were presented, it became apparent that many of the situations really only needed to have the present guidelines applied. There were two problem cases which were discussed in more detail where some people were unsure as to how the present guidelines were to be applied.

A) The range in properties of some series is thought to be too broad. This can happen 1) as a result of requests from other states to extend the range to accommodate the soils they are encountering, and 2) by the effects of man's activities where, for example, due to liming, the range in pH or base saturation may broaden and efforts are made to include these modified properties within the range of the series.

The committee considered the suggestion to include modal values as well as ranges in properties in official descriptions and SCS Forms #5, but it was noted that this provision is already available and is included by way of example in the NSH where a statement such as the following can be included: 'the thickness of the solum is typically 28 inches but ranges from 20 to 40 inches'.

In those problem instances where ranges in properties cross important interpretational lines, a new series can and should be set up under the present guidelines which have narrower ranges in properties and which do not straddle interpretive boundaries.

B) There was some question about what to do in instances where the only apparent differences in series were either 1) climatic

differences (such as temperature or rainfall) or 2) the two soils occurred in two different MLRA's. Since, under the present guidelines, differentiating criteria must be tied to soil properties, the difference cannot simply be stated as one of climate or geography. If in the opinion of the soil scientist, they should be separated, he must look for and identify soil properties to serve as differentia.

Charge 2.

If guidelines are needed, determine specific soil properties to which they should apply and develop ranges and class limits.

Any specific response to this charge was to follow committee recommendations concerning charge #1, and must therefore, follow the deliberations of the committee in Blacksburg concerning charge #1.

While Soil Taxonomy and the NSH provide general guidelines concerning the types of criteria which may be used as series class limits, it was thought that it might be helpful to have a list of specific criteria that are used in the NE region for class limits between series within the same family. This could be helpful regardless of whether the committee moved toward the establishment of more specific or additional guidelines or whether they simply worked toward a better and more thorough application of the present guidelines.

Prior to the conference, each committee member was therefore sent a listing of the soil series (by families) used in his particular state (many thanks to Jim Ware at the NTC for his help in this.) Each member was requested to list, by suborder, examples of the specific criteria used to differentiate series within the same family. Nine responses were received which represented seven of the nine NE states with members on the committee. These criteria were then compiled and appear as an appendix to this report.

Recommendations

- 1) It was the opinion to the committee (as indicated by a unanimous vote of those present) that the present guidelines for series criteria are adequate.
- 2) The committee recommends that those writing series descriptions be encouraged to be thorough and detailed in their writing, including as much pertinent information as is available in order to best record and communicate the concept of that series. Differentiating criteria can be included in the 'range of characteristics.' Other accessory characteristics can be included under 'geographical setting', 'remarks', 'additional data', or where most appropriate. Those writing and reviewing official descriptions should be reminded that thoroughness and not

brevity is the goal. Such information should state or explain the basis as to how, why, and where a particular series is mapped.

- 3) As a result of discussion of criteria 3 and 5 (on page 2), questions were raised about what the 'normal errors of field observation' were. Therefore, the committee suggests that the steering committee for the 1988 NCSSC consider as the charge to one committee, to study and help to clarify the normal errors of field observation (for such properties as color, texture, horizon boundaries and thickness, etc.)
- 4) This committee should not be continued.

APPENDIX A.

Compilation of criteria used in the Northeast region for the differentiation of series within the same family

listed by suborder

Alfisols

Aqualfs

Parent material related

origin or type of P M

- 1) till vs lacustrine over till
- 2) till vs lacustrine
- 3) texture and origin of alluvial materials

lithology

- 1) till dominated by dark shale vs till from sandstone or siltstone,
- 2) residuum from shale and sandstone vs metabasalt or chlorite schist

Physical properties

particle size of fine earth

- 1) texture of Bt: <27%clay vs >27%clay

Chemical properties

- 1) soil reaction

Depth or thickness

- 1) depth to bedrock: mod. deep vs deep or very deep
- 2) solum thickness: 20-40" vs 40-60"

Color or mottling

- 1) color of PM (may reflect mineralogy): redder than 7.5YR vs 7.5YR and yellower

Udalfs

Parent material related

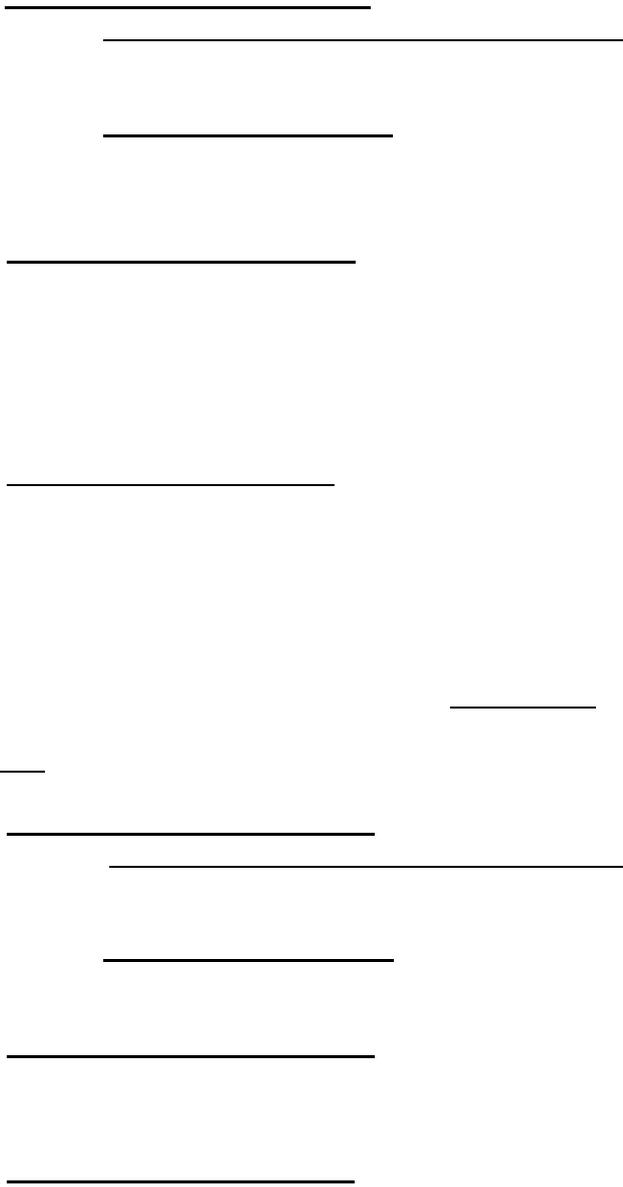
origin or type of P M

- 1) till vs outwash
- 2) colluvium vs residuum

lithology

- 1) till derived from dark shale vs till from siltstone vs till from limestone
- 2) residuum from hornfels or granulite vs triassic and jurassic siltstone and sandstone
- 3) lithology of colluvium
- 4) residuum from calcareous shale and sandstone vs marble vs non-calcareous igneous and metamorphic rocks

- 5) residuum from serpentinite vs triassic shale
- 6) residuum from conglomerate vs triassic shale vs calcareous shale vs chloritic metabasalt vs other mafic rocks
- 7) lithology Of coarse fragments
 - a) greenstone vs sandstone
 - b) phyllite vs basalt
 - c) quartz vs mafics
 - d) sandstone and shale vs chert



Other

- 1) difference in rainfall
- 2) presence or absence of buried A horizon
- 3) length of growing **season**: number of frost free days

Orthents

Parent material related

origin or type of P M

- 1) type of substratum; ie. sandy **outwash over** dense till **vs** sandy **outwash over** very fine sand and silts

lithology

- 1) lithology of **coarse** fragments
- 2) lithology of bedrock
 - a) granite or **gneiss** or schist **vs** red sandstone **vs** dark phyllite and slate
 - b) >65% of one rock type

Physical properties

particle size of fine earth

- 1) texture: fine **vs** coarse subdivision of loamy-skeletal

Chemical properties

- 1) soil reaction: acid **vs** non-acid **vs** extremely acid
- 2) presence or absence of carbonates in C horizon

Color or mottling

- 1) **color**: red **vs** brown

Other

- 1) presence or absence of a **B** horizon in sandy or **sandy-skeletal** families
- 2) 51 ippage tendency

Psamments

Parent material related

lithology

- 1) lithology of coarse fragments

Physical properties

particle size of fine earth

- 1) **sand** size differences

coarse fragment

- 1) amount of coarse fragment in control section

Chemical properties

- 1) soil reaction

Depth or thickness

- 1) thickness of solum
- 2) depth to bedrock

Color or mottling

- 1) color: red vs yellowish brown

Other

- 1) irregular decrease in organic matter with depth
- 2) presence or absence of a 'color B'

Inceptisols

Aquepts

Parent material related

origin or type of P M

- 1) multiple deposits (lithologic break)
- 2) nature of PM or substratum: dense glacial till vs outwash

lithology

- 1) lithology of till: granite vs sedimentary
- 2) presence or absence of limestone fragments

Physical properties

particle size of fine earth

- 1) clay content: > or < 27% clay, > or < 10% clay, sand content

density

- 1) denseness of C horizon: C vs Cr
- 2) denseness of till: C vs Cx

Depth or thickness

- 1) depth to BX: deep vs mod. deep

Color or mottling

- 1) color: red vs brown (10YR or yellower vs 7.5YR or redder)
- 2) solum color: low chroma vs high chroma solum matrix

Ochrepts

Parent material related

origin or type of PM

- 1) till vs residuum vs outwash
- 2) multiple deposits

lithology

- 1) residuum from grey shale vs red shale vs grey slate vs graphitic (black) slate vs red sandstone vs grey sandstone
- 2) alluvium from crystalline vs sedimentary rocks

- 3) alluvium from red vs yellow or brown shale
- 4) lithology of underlying bedrock: greenstone vs sedimentary rocks
- 5) lithology of till or outwash: shale vs phyllite vs limestone vs granite

Physical properties

particle size of fine earth

- 1) texture of solum: > or < 50% silt, silty vs loamy

coarse fragment

- 1) amount of coarse fragment: 0-15 vs 15-35 vs >35%

density

- 1) denseness of C horizon: C vs Cr
- 2) denseness of till : dense till vs loose till

Chemical properties

- 1) reaction of the solum: <or> mod. acid
- 2) presence or absence of lime nodules in C horizon

Depth or thickness

- 1) depth to bedrock: very deep vs mod. deep
- 2) depth to Bx
- 3) thickness of solum: 12 to 24" vs 18 to 72"
- 4) thickness of a loam mantle (sandy families)

Color or mottling

- 1) red vs brown, red vs yellow matrix color of Bw
- 2) depth to low chroma mottles: presence or absence of mottles in the upper part of the B horizon, lower part of B horizon

Other

- 1) presence or absence of stratification in the C horizon
- 2) bisequum vs no bisequum
- 3) presence or absence of stratification in the C horizon
- 4) amount of weatherable minerals

Spodosols

Aquods

Depth or thickness

- 1) depth to bedrock: mod. deep vs deep

Orthods

Parent-material related

origin or type of PM

- 1) origin of materials
- 2) presence or absence of basal till

lithology

- 1) lithology of PM (inferred from lithology of coarse fragments)

Physical properties

particle size of fine earth

- 1) texture differences in control section: clay content, silt content
- 2) texture of substratum

coarse fragment

- 1) amount of coarse fragments: gravel content in PSC section

density

- 1) permeability of C horizon: C vs Cx
- 2) consistence of C horizon:
- 3) denseness of till: loose vs dense

Chemical properties

- 1) soil reaction

Depth or thickness

- 1) thickness of fine sand or loam cap
- 2) depth to rock

Color or mottling

- 1) color of the lower solum
- 2) depth to low chroma mottles

Other

- 1) presence or absence of stratification in the lower part of the control section

Ultisols

Aquults

Parent material related

Lithology

- 1) residuum from sedimentary rocks vs colluvium

Physical properties

particle size of fine earth

- 1) texture of PSC section: silt content > or < 30%

Depth or thickness

- 1) solum thickness: 40 to 80" vs >60"

Udults

Parent material related

lithology

- 1) lithology of coarse fragment: sandstone vs angular quartz

- 2) residuum from red shale or sandstone or siltstone vs greenstone metabasalt vs interbedded quartzite-schist-phyllite
- 3) triassic and jurassic sedimentary rocks vs granodiorites vs alluvial or colluvial materials
- 4) arkosic sandstone or phyllite or 'quartzite or schist vs hornblende gneiss or schist
- 5) granite gneiss vs muscovite schist
- 6) residuum from greenstone and shale conglomerate vs colluvium
- 7) presence or absence quartz fragments in substratum
- 8) colluvium from grey sed. rocks vs colluvium from red sed. rocks vs coastal plain sediments
- 9) residuum from cherty limestone vs gravelly coastal plain sediments
- 10) residuum from quartzite vs grey sandstone vs crystalline rocks vs shaley limestone vs grey shale vs red sandstone vs quartzitic slate
- 11) silty vs glauconite containing coastal plain sediments
- 12) colluvium from greenstone metabasalt vs colluvium from sed. rocks over limestone residuum
- 13) presence or absence of glauconite in coastal plain sediments

Physical properties

particle size of fine earth

- 1) texture of Bt: c or scl or 1 vs s1c1
- 2) presence or absence of clay decrease of >20% of maximum within 60" of surface

coarse fragment

- 1) amount of coarse fragment

Depth or thickness

- 1) depth to bedrock: mod. deep vs deep vs very deep
- 2) depth to Cr: Cr at B-20" vs Cr at 20-40" vs Cr >40" vs no Cr
- 3) depth at which a lithologic discontinuity occurs: within vs below control section, 24-50" vs >50", in Bt vs in C horizon
- 4) depth of solum: 20-40" vs 40-60"
- 5) solum thickness: 30-50" vs 50-85", 20-40" vs >40"

Color or mottling

- 1) color of Bt: 2.5YR and redder vs 5YR and yellower
- 2) presence or absence of low chroma mottles: within 50"
- 3) color of surface horizon: 5YR or redder vs 7.5YR or yellower

Other

- 1) presence or absence of gravelly substratum

APPENDIX B.

General compilation of criteria used in the Northeast region
for the differentiation of series within the same family

Parent material related

origin or type of P M

- 1) till
- 2) lacustrine
- 3) outwash
- 4) colluvium
- 5) colluvium over residuum
- 6) residuum
- 7) texture and origin of alluvial materials
- 8) coastal plain sediments
- 9) type of substratum
 - a) sandy outwash over dense till
 - b) sandy outwash over very fine sand and silts
 - c) dense glacial till
 - d) outwash
 - e) basal till

lithology

- 1) till derived primarily from:
 - a) dark shale
 - b) sandstone or
 - c)
 - d)
 - e)
 - f)
 - g)
 - h)
-

- b) metamorphic rocks
 - 1) schist
 - 2) muscovite schist
 - 3) hornblende gneiss or schist
 - 4) gneiss or schist
 - 5) metabasalt or chlorite schist
 - 6) chloritic metabasalt (greenstone)
 - 7) dark phyllite and slate
 - 8) grey slate
 - 9) graphitic (black) slate
 - 10) quartzitic slate
 - 11) interbedded quartzite-schist-phyllite
 - 12) phyllite
 - 13) quartzite
 - 14) hornfels or granulite
 - 15) granite gneiss
 - 16) marble
 - 17) serpentinite

- c) igneous rocks
 - 1) granite
 - 2) mafic rocks
 - 3) granodiorites

- 3) alluvium derived from:
 - a) crystalline rocks
 - b) sedimentary rocks
 - c) red shale
 - d) yellow shale
 - e) brown shale

- 4) outwash derived from:
 - a) shale
 - b) phyllite
 - c) limestone
 - d) granite

- 5) lithology of coarse fragments
 - a) greenstone vs sandstone
 - b) phyllite vs basalt
 - c) quartz vs mafics
 - d) sandstone and shale vs chert vs rounded quartz gravel
 - e) sandstone vs angular quartz
 - f) limestone
 - g) quartz fragments in substratum

- 6) colluvium derived from:
 - a) grey sed. rocks
 - b) red sed. rocks
 - c) greenstone metabasalt

- 7) nature of coastal plain sediments
 - a) gravelly
 - b) silty }
 - c) presence or absence of glauconite

Physical properties

particle size of fine earth

- 1) texture of Bt:
 - a) <27%clay vs >27%clay
 - b) c or scl or l vs sicl
 - c) > or < 10% clay
 - d) > or < 50% silt (silty vs loamy)
 - e) > or < 30% silt in PSC section
- 2) presence or absence of clay decrease of >20% of maximum within 60" of surface
- 3) fine vs coarse subdivision of loamy-skeletal
- 4) sand size differences
- 5) sand content
- 6) texture and arrangement of stratified materials

coarse fragment

- 1) amount of coarse fragment:
 - a) 0-15% vs 25-80% (in lower part of series control section)
 - b) 0-15 "5 15-35 "5 >35%

density

- 1) denseness of C horizon: C vs Cr
 - 2) denseness of till: C vs Cx
-
-

Color or mottling

- 1) red vs brown (10YR or yellower vs 7.5YR or redder)
- 2) color of surface horizon: 5YR or redder vs 7.5YR or yellower
- 3) solum 10R to 2.5YR vs 10YR to 2.5Y
- 4) solum color: low chroma vs high chroma solum matrix
- 5) red vs yellow matrix color of Bw
- 6) color of Bt:
 - a) 5YR or redder vs 7.5YR or yellower
 - b) 2.5YR and redder vs 5YR and yellower
- 7) color of PM (may reflect mineralogy): redder than 7.5YR vs 7.5YR and yellower
- 8) drainage class: mottles in or above the Bt (well vs mod. well)
- 9) depth to low chroma mottles: presence or absence of mottles in the upper part of the B horizon, lower part of B horizon
- 10) presence or absence of low chroma mottles: within 50"

Other

- 1) difference in rainfall
- 2) length of growing season: number of frost free days
- 3) presence or absence of buried A horizon
- 4) presence or absence of a B horizon in sandy or sandy-skeletal families
- 5) presence or absence of a 'color B'
- 6) slippage tendency
- 7) irregular decrease in organic matter with depth
- 8) bisequum vs no bisequum
- 9) amount of weatherable minerals
- 10) presence or absence of gravelly substratum
- 11) presence or absence of stratification in the C horizon

COMMITTEE 3

ROLE OF THE EXPERIMENT STATIONS IN THE FUTURE

Chairman: J. Sencindiver, WV Univ.

Vice Chairman: D. Hall, SCS, DE

Committee Members

J. Doolittle, SCS, NENTC, PA
L. A. Douglas, Rutgers University, NJ
D. S. Fanning, University of Maryland, MD
E. Gamble, SCS, NE
T. M. Goddard, SCS, NY
N. A. McLoda, SCS, VA
G. W. Olson, Cornell University, NT
G. W. Petersen, PSU, PA
N. K. Peterson, University of NH, NH
S. A. L. Pilgrim, SCS, VT
D. Van Houten, SCS, VT
D. Yost, SCS, Md

Background

Ye have, in the past, had oommittees that examined the role of the soil **scientist** in the post **once-over** mapping era. **These** oommittees focused primarily on the identification of the kinds of work needed to be done. The traditional Items of remapping, **recorrelating, supplemental** mapping, etc., were discussed as well **as** the **need** for newer approaches and techniques **such as digitization** and **soil** data base management. The conclusions **reached** by all committees were that there will be plenty of work to do **once** the mapping is completed. Much of **this work relates to** providing services to **users**. Obviously, **this** will require somewhat different skills than those obtained through the traditional role of field mapping. As **we wind down with mapping, it is also apparent that soil scientists just coming into the work foroe will not have the opportunity to become**

2. Make **specific recommendations.**

committee Action

Committee members **were** asked to respond to both **charges.** The responses were compiled and distributed to the members for review before the **conference.** **Discussion** at the conference resulted in modifications to the responses and **recommendations** for action.

Response to Charge in: a r y

It **was** recognized that the universities and the experiment stations are and will continue to be the major **source** of training for soil scientists. It was also **recognized** that although most soil scientists are being well trained at the universities, different skills may be required in the future. Universities and experiment stations must continue to be active in the following **areas:** (1) training, (2) public education and **awareness,** (3) recruitment, (4) **research,** (5) other **NCSS** related support.

1. Training - Soil scientists in the Northeast will continue to make some interpretations for agricultural land uses, and a **few** soil scientists will continue to do some soil mapping. A greater number of **soil** scientists, however, will be placed in non-mapping positions where the primary land **uses** are non-agricultural, These soil **scientists** will be developing interpretations for urban uses, waste management, land reclamation, etc. They must be trained in **the** environmental **aspects** of soil **science.** After the "**once-over**" mapping is **completed** soil scientists will be spending more **time** with the public and less time alone in the field. The Soil Conservation **Service (SCS)** will be hiring fewer soil scientists, but it is envisioned that a greater number of soil scientists will be hired by private **consulting** firms and state and **local** governments. These soil scientists will not **have** had the opportunity to gain soil mapping. skills through SCS training. They must acquire **these** skills through on-the-job training, through specially designed **courses** or workshops, or at the **universities.**

To meet future needs of the public, the following **courses** should be emphasized in **undergraduate** and/or **graduate** soil **science** programs:

- Remote sensing and digital cartography
- Soil mapping
- Interpretations of soils data
- **Geotechnical** procedures
- Plant science
- **Public** relations
- Computer science
- Speech
- Technical and journal writing
- Environmental law and regulations
- Continuing education programs should be developed to keep field soil scientists up-to-date on new ideas and **techniques.**

2. Public Education and Awareness - Soil **science** and **agronomy** must be defined for the public. People must be informed that these scientific

areas relate to **aspects** of our **society** and environment other than farming or traditional agriculture. The public must be made aware of the types of soils information available, why it is important to **use** this information, and that **soil scientists** are available to generate **and interpret** the information. Soil is a **resource** that society is using, so students and the public must be trained to think of soil as a **landscape** entity. **Multi-media** presentations should be developed to present soils information to the public.

3. Recruiting - Enrollment is declining in most **agricultural** colleges, so recruitment programs either have been or will be developed. Soil scientists should become involved **in** these recruitment efforts. Job opportunities in soil science, **especially** environmentally **related** positions, should be emphasized. High school science teachers and guidance counselors should be informed of these opportunities. Since computers and high technology are being emphasized, **recruitment** programs should emphasize the use of computers in soil science to develop maps, land use interpretations, geographic information systems, etc.

4. Research - **Research** must **continue** in at least two important areas. **Basic** soil genesis and morphology studies will **continue** to be needed to assist in the **acquisition** of knowledge for a better understanding of soils. Research to develop and improve soil interpretations for land use is also needed. Cooperative studies with engineers and scientists in other **disciplines** should be developed to provide data on which environmental decisions will be based.

5. _____

station in the Northeast for distribution to high schools.

6. A letter should be sent to experiment station directors and Deane of **agricultural** colleges listing our priority **research areas**.
7. Although **we** are not suggesting uniform undergraduate and **graduate** soil science programs at all colleges and universities in the Northeast, new ideas **can** be generated if course outlines and suggestions for training aids are shared. It **is recommended that this** committee develop a **packet** of materials **including undergraduate** and graduate curricula requirements, **course** outlines, and suggested training aids. A packet of these materials will be sent to each northeastern experiment station representative to the NCSS.

COMMITTEE 4

SOIL-WOODLAND INTERPRETATIONS

Committee Members:

K. Langlois, SCS, NENTC, PA - Chairman
R.L. Cunningham, PSU, PA - Vice Chairman

T. Arnold, FS, VA
K. Bracy, FS, VA
D. Childs, SCS, WV
P. Craul, State University of NY at Syracuse
L. Daniels, VPI&SU, VA
P. Johnson, FS, PA
R.V. Joslin, SCS, ME
G.H. Lipscomb, SCS, PA
O. Rice, SCS, NENTC, PA
W. Russell, FS, WI
R. A. Shook, SCS, CT
E. Stuart, SCS, RI
R. Weismiller, University of Maryland, MD
D. Welsch, SCS, NENTC, PA

Background

Soil-Woodland **interpretations** are basic to forest management needs. To ensure coordinated woodland interpretations, we need to prepare suitable rating guides for use throughout the Northeast. Tentative guidelines occur in the National Forestry Manual (NFM) but these need to be tested and modifications made, if needed. In addition to the guides contained in the NFM, the guides may need to be developed for such things as bog landings, haul roads, logging **areas** and skid trails, and equipment limitations for site preparation and planting.

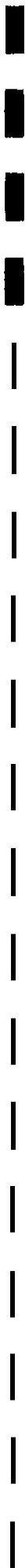
Committee Charges:

1. Review , test, and modify, if needed, tentative rating guides contained in the National Forestry Manual.
2. Identify additional kinds of soil-woodland interpretations needed and develop appropriate guides.

Committee Report

The committee chairman sent tentative guidelines from the National Forestry Manual to committee members, state soil scientists, and SCS state foresters. Comments about the National Forestry Manual guidelines were requested and any new new guidelines needed in the Northeast were also requested.

The chairman then developed interpretations from the comments. The interpretations were **sent** to the committee members for their review. Also sent were the comments received and their disposition, and some topics for discussion at the conference.



There were major inconsistencies in information received on the amount of rock outcrop, stones, and boulders covering the surface for various equipment uses. This was discussed at the conference and the conclusion was that the percent of rock outcrop, stones, and boulders should be developed by the committee. It was suggested that the committee chairman meet with several committee members and various others associated with logging operations. This committee would discuss the equipment used during the following logging operations and make recommendations for the percent of rock outcrop, stones, and boulders covering the surface:

Equipment Limitation (Limitation of Soils for Harvesting Using Ground Based Equipment)
 Equipment for Mechanical Site Preparation
 Soil Limitation for Haul Roads and Skid Roads

The Soil-Woodland Interpretations developed by the committee are not part of this report because they were not approved by the committee at the conference. It was recommended that the committee be continued, resolve the percent of rock outcrop, stones, and boulders covering the surface, and submit the report at the next Northeast Cooperative Soil Survey Conference.

Recommendations

1. The National Forestry Manual contains the following guides for rating soils for forest use:

Seedling Mortality
 Erosion Hazard
 Windthrow Hazard
 Equipment Limitation
 Plant Competition

These five ratings are currently used on the Soil Interpretation Record (SCS-SOI-5). It is recommended that these five guides continue to be used and that Equipment Limitation should only include the "Limitation of Soils for Harvesting Using Ground Based Equipment".

2. The following additional guides would be **beneficial** in the Northeast and it is recommended that they be developed.

Equipment Limitation for Mechanical Site Preparation
 Soil Limitation for Haul Roads and Skid Roads
 Soil Compaction

3. The committee was not able to determine the percent of rock outcrop, boulders, and stones on the surface for slight, moderate, and severe ratings for Equipment Limitation. Also the committee did not complete the criteria for the additional rating guides. It is recommended that the committee be continued.

4. It is recommended that the committee chairman:

- a. Set up a meeting with soil scientists, foresters and equipment operators to determine an acceptable percent of rock outcrop, boulders, and stones on the surface for ratings for equipment limitations.
- b. Complete the rating guides.

c. Distribute the rating guides for comment and testing.

5. It is recommended that the chairman be changed from Karl **Langlois** to Dave Van **Houten**.

**1986 NORTHEAST COOPERATIVE
SOIL SURVEY CONFERENCE**

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**BY-LAWS OF 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: Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Virginia, Vermont, West Virginia, and the District of Columbia.

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

Head, Soils Staff, Northeast National Technical Center, Soil Conservation Service.

National Soil Survey Laboratory Liaison to the Northeast.

Cartographic Staff Liaison to the Northeast.

Three representatives from the soils staff of the USDA - Forest Service as follows:

- One from the Eastern Region, National Forest System
- One from the Southern Region, National Forest System
- One from the Northeastern Area, State and Private Forestry

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

III. Organization and Management

A. 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 chairmen and vice-chairmen. The Steering Committee consists of the following four members:

Head, Soils Staff, NENTC, SCS (chairman)

The conference chairman

The conference vice-chairman

The conference past chairman

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

2. Meetings and Communications

A planning meeting is to be held about 1 year prior to the conference. Additional meetings may be scheduled by the chairman if the need arises.

Most of the committee's

The Steering Committee is responsible for the formulation 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 State Directors, (h) The Northeastern State Conservationists, SCS, (c) Director of Soils 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.

4. Chairman's Responsibilities

- a. Call a planning meeting of the steering committee about 1 year in advance of and if possible at the place of the conference to plan the agenda.
- h. Develop with the steering committee the first and final drafts of the conference's committees and their charges.
- c. Send committee assignments to committee members. The committee assignments will be determined by the Steering Committee at the planning meeting. The proposed chairman and vice-chairman of each committee will be contacted personally by the conference chairman or vice-chairman and asked if they will serve prior to final assignments. SCS people will be contacted by a SCS person and experiment station people will be contacted by an experiment station person.
- d. Compile and maintain a conference mailing list that can be copied on mailing labels.
- e. Serve as a member of the editorial board of the Northeast Cooperative Soil *Survey Journal*.

. **Conference Chairman and Vice-chairman**

An experiment station representative and a SCS state soil scientists alternate as chairman and vice-chairman. This sequence may be altered by the steering committee for special situations. The vice-chairman named 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. Send out a first announcement of the conference about 3/4 year prior to the conference (see Appendix 1 for an example).
4. Send written invitations to all speakers or panel members. These people will be contacted beforehand by phone or in person by various members of the Steering Committee.
5. Send out written requests to experiment station representatives to find out if they will be presenting a report at the conference.
6. Notify all speakers, panel members, and experiment station representatives in writing that a brief written summary of their presentation will be requested after the conference is over. This material will be included in the conference's proceedings.
7. Preside over the conference.
8. Provide for appropriate publicity for the conference.
9. Preside at the business meeting of the conference.
10. Serve as a member of the editorial board of the Northeast Cooperative Soil Survey Journal.

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. Develop the program agenda 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. Notify all persons attending the meeting of the arrangements for the conference (rooms, etc.). Included in the last mailing will be a copy of the agenda.
5. Compile and distribute the proceedings of the conference.
6. Serve as a member of the editorial board of the Northeast Cooperative Soil Survey Journal.

C. Past Conference Chairman

The past conference chairman's responsibilities are primarily to provide continuity from conference to conference. In particular, his responsibilities include the following:

1. Serve as a member of the Steering Committee.
2. Assist in planning the conference.
3. Serve as the editor of the Northeast Cooperative Soil Survey Journal. This responsibility encompasses gathering information with the other editorial board members, printing the Journal, and distributing it.

D. Administrative Advisors

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

E. Committee Chairman and Vice-chairman

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

IV. 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**

The SCA representatives are usually selected by the Director of Soils and SCS, in consultation with the NENTC Director and state conservationists.

One member of the Steering Committee will represent the Northeast region at the Southern, North Central and Western Regional Soil Survey Conference. If none of the members of the Steering Committee can attend a particular conference, a member of the conference will be selected by the Steering Committee for this duty.

VII. Northeast Cooperative Soil Survey Journal

The Northeast Cooperative Soil Survey Conference will publish a journal on soil survey and related topics at least once each year. The journal will be governed by an editorial board made of the Steering Committee for the Northeast conference. The editor of the journal will be the past conference chairman. His responsibility will be to assist in gathering information for the journal, as well as printing and distributing the journal.

VIII. Northeast Soil Taxonomy Conittee

Membership of the standing committee is as follows:

Head, Soils Staff, NENTC. 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 Experiment Station conference chairman or vice-chairman is responsible for overseeing the selection of state representatives.

IX. Silver Spade Award

The award will be presented every two years at the conference meeting. It will be presented to a member of the conference who has contributed outstanding regional and/or national service to soil survey. One or two individuals can be selected for the award every two years. The selection committee will be made up of past award winners with the last award recipient acting as chairman of the selection committee. If multiple awards were given at the previous meeting, the chairman of the selected committee will be elected by the committee. The recipients of the award will become members of the Silver Spade Club.

X. 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
By-Laws Amended June 25, 1982
By-Laws Amended June 15, 1984
By-Laws Amended June 20, 1986

Re: PROCEEDINGS OF THE 1986 CONFERENCE

As most of you know, the proceedings of our conference are assembled and distributed by the vice-chairman. The vice-chairman does not print the proceedings. Thus, we ask you to type, reproduce, and send to James Baker, vice-chairman, your talk, committee report or experiment station report. I should receive the report by July 4, 1986.

In order to get continuity in the proceedings, please follow the instructions given below in preparing your materials.

All Information (Talks, Committee Reports and Expt. Station Reports)

1. 8-1/2 x 11 inch paper.
2. Single space typing.
3. Printed on both sides (front and back).
4. One-inch margins right and left.
5. 110 copies.

Talks (Papers, etc.)

Format as indicated under "All Information" plus at the top of the page:

1. Title of talk.
2. Followed by author and organization of the author (SCS, Washington, D.C.; Pennsylvania State University, etc.).
3. Followed by body of the talk or paper.

Committee Reports

1. Format as indicated under "All Information" plus at the top of the 1st page:
 - a. Committee number.
 - b. Committee title.
2. Followed by committee members (indicate chairman, vice-chairman, and committee charges).
3. Followed by the committee report plus recommendations.
4. Pagination:
Paginate the committee reports with the committee number in the bottom center of the page. For example, 2-1, 2-2, etc.

Experiment Station Reports

1. Format as indicated under "All Information" plus at the top of page one:
 - a. Name of the Agricultural Experiment Station. For example, Massachusetts Agricultural Experiment Station Report.
 - b. Author.
2. Followed by the Report.
3. Pagination:
Paginate the report using the Post Office abbreviation of your state plus the page number (in lower center of page). For example, MD-1, MD-Z, etc.. MA-1, **MA-2**, etc.

James C. Baker
Conference Vice-Chairman

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LIST OF PARTICIPANTS

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NATIONAL COOPERATIVE SOIL SURVEY

Northeast Regional Conference Proceedings

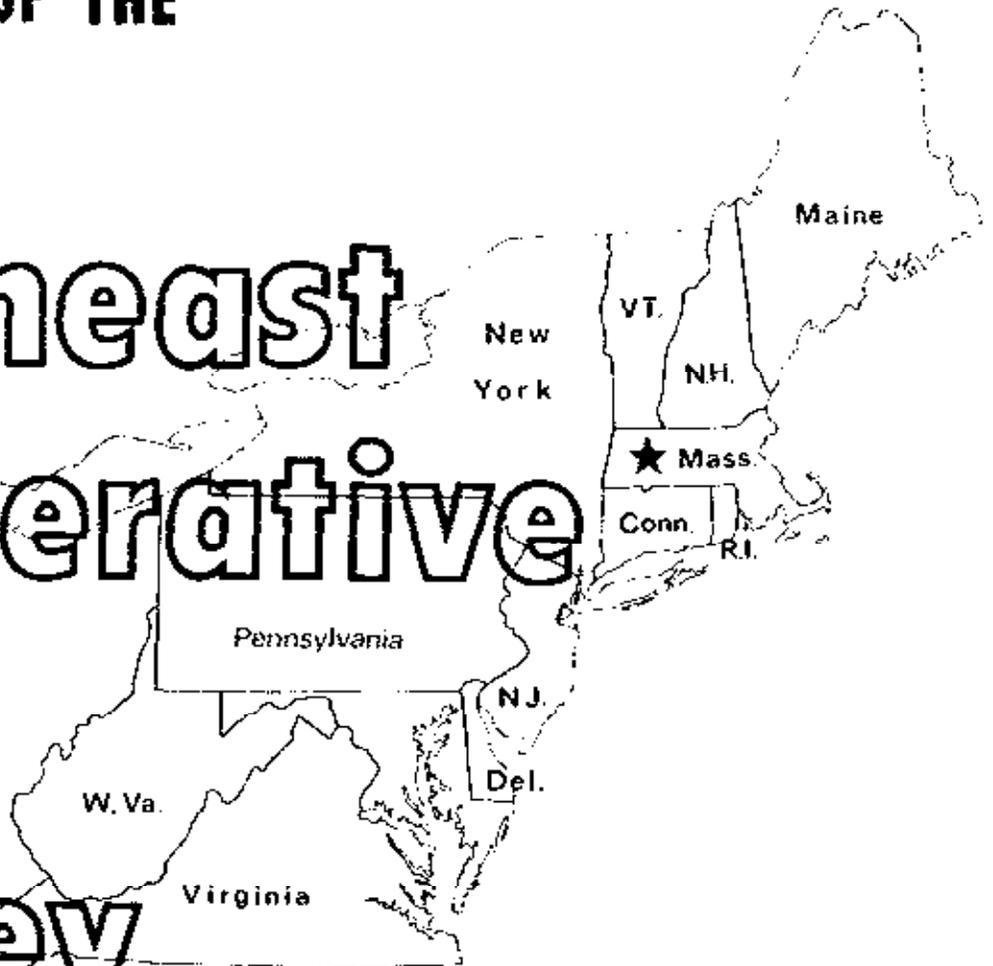
Amherst, Massachusetts
June 11-15, 1984

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PROCEEDINGS OF THE

**Northeast
Cooperative
Soil
Survey
Conference**



UNIVERSITY OF MASSACHUSETTS
AMHERST, MASSACHUSETTS

JUNE 11-15, 1984

Proceedings of the

1984 NORTHEAST COOPERATIVE SOIL SURVEY CONFERENCE

held on June 10-15, 1985 at the
University of Massachusetts at Amherst

Sponsors

Massachusetts Agricultural Experiment Station
Cooperative Extension Service
Society of Soil Scientists of Southern New England

Assembled by

Peter L.M. Veneman, University of Massachusetts, 12A Stockbridge Hall,
Amherst, MA 01003

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- National Cooperative Soil Survey, Tommie J. Holder (Program Development Specialist, SCS National Office)
- International Soil Activities, Terry D. Cook (Soil Management Specialist, SCS, Washington D. C.)
- Northeast Cooperative Soil Survey, F. Ted Miller (Head, Soil Survey Staff, SCS, NENTC)
- National Soil Survey Laboratory Activities, Ron D. Yeck (Liaison to the Northeast, NSSL)
- Sludge Application in Massachusetts, Fifi Nessen (Massachusetts Dept. Environmental Duality Engineering)
- Spodic Horizon Classification, Chang Wang (Land Resource Research Institute, Ottawa, Canada)
- Soil Resource Data Base Development, Gordon L. Decker (National Leader, SDBD, SCS, Cartography and Geographic Information Systems)
- Soil Resource Information System, David Anderson (Specialist, SCS, Colorado State Soil Survey Staff)
- Computers in Soil Survey, Keith A. Young (Specialist, SCS, Cartography and Geographic Information Systems)
- Modeling and Soil Survey, Klaus W. Flach (Special Assistant for Science and Technology, SCS, Washington, D. C.)
- Application of Ground Penetrating Radar in Soil Survey, Jim Doolittle (SCS, Florida State Soil Survey Staff)
- National Wetlands Inventory, Ralph W. Tiner (Regional Coordinator, U.S. Fish and Wildlife Service)

General Reports

1982 NECSSC committee follow-up reports

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Evaluating Soil Map Quality, Willis E. Hanna (New York State Soil Survey Staff)

Reports from Canada and Regional Meetings

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Western Regional Soil Survey Report, LeRoy A. Daugherty (New Mexico State University, Las Cruces)

Report on the 1983 National Soil Survey Conference, James C. Baker (VA Polytech. Inst. & State Univ., Blacksburg)

Report on NEC-50, John C. Sencindiver (West Virginia University, Morgantown)

State Agricultural Experiment Station Reports

Connecticut, Harvey D. Luce (University of Connecticut, Storrs)

Maine, Robert V. Rourke (University of Maine, Orono)

Maryland, Martin C. Rabenhorst (University of Maryland, College Park)

Massachusetts, Peter L. M. Veneman (University of Massachusetts, Amherst)

New Hampshire, Nobel K. Peterson (University of New Hampshire, Durham)

New York, Ray B. Bryant (Cornell University, Ithaca)

Pennsylvania, Robert L. Cunningham (Pennsylvania State University, University Park)

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Rhode Island, William R. Wright (University of Rhode Island,
Kingston)

Virginia, James C. Baker (Virginia Polytechnic Institute and
State University, Blacksburg)

West Virginia, John C. Sencindiver (West Virginia University,
Morgantown)

Committee Reports

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Bryant, chairperson

Committee 2. Soil Survey Training Course, James C. Baker,
chairperson

Committee 3. Role of Soil Series in Taxonomy, Horace Smith,
chairperson

Committee 4. Interpretations of the Northeast General Soil Map,
Oliver W. Rice, chairperson

1984 Northeast Cooperative Soil Survey Conference

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Instructions for NECSSC Proceedings

List of Participants

CONFERENCE AGENDA

AGENDA

NORTHEAST COOPERATIVE SOIL SURVEY CONFERENCE

LINCOLN CAMPUS CENTER
UNIVERSITY OF MASSACHUSETTS AT AMHERST

JUNE 10-15, 1984

SUNDAY- JUNE 10, 1984

4:30-8:00 p. m	Registration	Lincoln Campus Center 3rd Floor Lobby
5:00-8:00 p. m	Social	402/402 Lincoln Campus Center

MONDAY- JUNE 11, 1984

	<u>General Sessions</u>	101 Lincoln Campus Center
8:00-8:20 a. m	Opening Remarks	Frederick L. Gilbert Conference Chair
8:20-8:30 a. m	Announcements	Peter L. M. Veneman Conference Vice-Chair
8:30-8:50 a. m	Welcome	Rex Tracy State Conservationist
8:50-9:10 a. m	Massachusetts Agriculture	E. Bruce MacDougall Dean, College of Food and Natural Resources
9:10-9:45 a. m	National Cooperative Soil Survey	Tommie J. Holder, SCS. National Soils Staff
9:45-10:15 a. m	Coffee Break	
10:15-10:45 a. m	International Soil Activities	Terry D. Cook, SCS, National Soils Staff
10:45-11:15 a. m	Regional National Cooperative Soil Survey	F. Ted Miller, Head, Soils Staff, NETSC
11:15-11:45 a. m	National Soil Survey Laboratory	Ronald D. Yeck, Liason to the Northeast
11:45-12:15 p. m	Soil Taxonomy	Terry D. Cook, SCS, National Soils Staff
12:15-1:15 p. m	LUNCH	

	<u>General Sessions</u>	101 Lincoln Campus Center
1:15-2:00 p. m	Sludge Application to Agricultural Lands in Mass.	Fifi Nessen, Mass. Dept. Env. Qual. Eng.
2:00-2:45 p. m	Spodic horizon classification	Chang Wang, Agriculture Canada
2:45-3:15 p. m	Coffee Break	
3:15-5:15 p. m	<u>Committee Meetings:</u>	
	Committee 1, Regional Erosion-Productivity Studies	Ray B. Bryant, Chair 174-76 Lincoln Campus Center
	Committee 2, Soil Survey Training Course	James C. Baker, Chair 168 Lincoln Campus Center
5:15-7:30 p. m	DINNER	
7:30-9:30 p. m	NEC-50 Business Meeting	Experiment Station Representatives 174-76 Lincoln Campus Center

TUESDAY- JUNE 12, 1984

	<u>General Sessions</u>	101 Lincoln Campus Center
8:00-8:15 a. m	Data Base Management	John Safley, Data Specialist Information Resources Management Division
8:15-9:00 a. m	Computers	Gordon Decker, SCS, Cart. and Geo. Inf. Systems
9:00-9:45 a. m	Computers	David Anderson, SCS. Colorado State Soils Staff
9:45-10:15 a. m	Computers	Keith Young, SCS, National Soils Staff
10:15-10:30 a. m	Coffee Break	
10:30-11:15 a. m	Remote Sensing and Digital Mapping	G. W Petersen, Penn. State Univ.
11:15-12:30 a. m	Computer Demonstration	18, 14 Stockbridge Hall
12:30-1:30 p. m	LUNCH	
	<u>General Sessions</u>	101 Lincoln Campus Center
1:30-2:15 p. m	Computer Modeling	Klaus Flach, Assoc. Dep. Chief, USDA-SCS

2:15-3:00 p.m. Ground Penetrating Radar Jim Doolittle, Florida State Soils Staff

3:00-3:15 Coffee Break

3:15-5:15 Committee Meetings:

Committee 3, Role of Soil Series in Taxonomy Horace Smith, Chair
174-76 Lincoln Campus Center

Committee 4, Interpretations of NE Soils Map Oliver W. Rice, Jr. Chair
168 Lincoln Campus Center

WEDNESDAY- JUNE 13, 1984

General Session 101 Lincoln Campus Center

8:00-9:00 a.m. Reports from Other Regions and Canada Regional Representatives

9:00-10:00 a.m. Committee Meetings:

Committee 1 174-76 Lincoln Campus Center
Committee 3 168 Lincoln Campus Center

10:00-10:30 a.m. Coffee Break

General Sessions 101 Lincoln Campus Center

10:30-11:15 a.m. Reports 1982 NECSSC committees (15 minutes each)

Spodosol Classification Robert V. Rourke
Standards for Soil Maps Willis E. Hanna
Criteria for Land Capability Classification Frederick L. Gilbert

11:15-12:00 a.m. Geology of the Connecticut River Valley Richard Little, Dept. of Geology, Greenfield Community College

12:00-12:45 p.m. LUNCH

12:45-5:30 p.m. Field trip

Soils and geomorphology of the Connecticut River Valley (Meet at Campus Circle) UMass and SCS staff

5:30-8:30 p.m. Picnic at the UMass Horticultural Research Center

THURSDAY- JUNE 14, 1984

General Sessions

101 Lincoln Campus Center

8:00-9:45 a. m

Experiment Station Reports (15 minutes each)

Virginia
West Virginia
Maine
New York
New Jersey
Connecticut
Connecticut

James C. Baker
John C. Sencindiver
Robert V. Rourke
Ray B. Bryant
L. A. Douglas
David E. Hill
Harvey D. Luce

9:45-10:15 a. m

Coffee Break

10:15-11:00 a. m

Experiment Station Reports (15 minutes each),

Pennsylvania
Rhode Island
Vermont

Edward Ciolkosz
William R. Wright
Richmond J. Bartlett

11:00-11:15 a. m

Report on National Soil
Survey Conference

James C. Baker

11:15-11:30 a. m

NEC-50 report

John C. Sencindiver

11:30-11:45 a. m

NE Soils Bulletin

Edward J. Ciolkosz

11:45-1:15 p. m

LUNCH

General Sessions

101 Lincoln Campus Center

1:15-2:00 p. m

Experiment Station Reports (15 minutes each)

Maryland
Massachusetts
New Hampshire

Martin C. Rabenhorst
Peter L. M. Veneman
Nobel K. Peterson

2:00-3:00 p. m

Committee Meetings:

Committee 2
Conittee 4

174-76 Lincoln Campus Center
168 Lincoln Campus Center

3:00-3:30 p. m

Coffee Break

General Sessions

101 Lincoln Campus Center

3:30-4:15 p.m.

National Wetland Survey

Ralph W. Tiner, Jr., U.S. Fish
and Wildlife Service

4:15-5:00 p.m

Committee Report

Committee 1
Erosion-Productivity
Studies

Ray B. Bryant

FRIDAY-JUNE 15, 1984

General Sessions

101 Lincoln Campus Center

8:00-9:30 a.m

Committee Reports (45 minutes each)

Committee 2, Soil Survey
Training Course

James C. Baker

Committee 3, Role of Soil
Series in Taxonomy

Horace Smith

9:30-10:00 a.m

Coffee Break

10:00-10:45 a.m

Committee 4, Interpreta-
tions of NE Soils Map

Oliver W Rice

10:45-11:30 a.m

Business Meeting

Frederick L. Gilbert

Plans for Next Conference
Election of Vice-Chair
Other Items

11:30-12:00 a.m

Conference Summary

F. Ted Miller

GENERAL PRESENTATIONS

OPENING REMARKS

Frederick I. Gilbert
Soil Conservation Service
Conference

1
in-depth thought
conferences have
presentations of
Cooperative Soil
tee to present a

A major intent of this conference is for us to have the opportunity to inter-act with each other. We have set aside time and activities to encourage discussion during both day and evening sessions. Our conference has a full schedule and it is necessary that the speakers adhere to the agenda. With your cooperation we will stay on schedule and yet have adequate opportunity for discussion. Let us plan meaningful work for the Northeast Cooperative Soil Survey.

National Cooperative Soil Survey

Tommie J. Holder
Soil conservation service
Washington, D.C.

The National Cooperative Soil Survey (NCSS) is really just a collection of individuals who represent the various agencies and institutions that have responsibilities and interests in the production and use of soil surveys. We are people involved in the collection, assembly and distribution of a lot of valuable information. That information is needed by a lot of other people who make all kinds of decisions about the use and management of soils (lands). Many of those people who have great need for the information contained in soil surveys don't know just what kind of information they need or the extent of their need.

The work of the NCSS won't be completed as long as there are people who want to do different things with soils and those of us involved in making soil surveys learn more things about soils. We may come close of the completion of a "once-over" soil survey covering the nation by the end of this century. However, there are still questions in the minds of some responsible people as to whether we need a "soil survey" on all lands or some other kind of inventory of the soil resource. When we consider the rather major deficiencies in needed information in some publications currently identified as "modern" soil surveys it seems unlikely that we will arrive at the point where no project soil mapping is necessary in the near future.

Activities undertaken in what has come to be called Basic Soil Services designed to evaluate, supplement, revise and help use soil survey information should help to both identify and describe the scope and magnitude of the work that needs to be done by the NCSS.

You have the opportunity to hear my remarks in this conference because Dr. Arnold is attending an international meeting in Thailand. I am here with his permission, even after he was warned that my remarks would include reference to my observations on his unusual style of management and its application in the operation of the soil survey program in the Soil Conservation Service.

Interest in the management of the activities of NCSS is the real reason why I wanted to be here today. I came to warn you that we will ask you to take yet another in-depth look at the document you have or need to have that is identified as a multi-year or long-range plan of operations. All of us attending this meeting have a vital interest in being able to use these documents to clearly describe what we do and what we need to do. Further, we need to identify and describe more precisely the resources in terms of both people and things that are needed to enable us to do our jobs.

This is an invitation, insistent though it might be, for you to start soon-now wouldn't be too soon, to accurately and thoroughly describe the workload in your area of concern. You will feel constrained by the obvious lack of resources currently available to handle the immediate workload. We've all experienced the frustration that comes from writing plans with the full realization that the resources needed to implement them would not be available. That adds emphasis to the fact that we must carefully consider the relative importance of all of the things we need to do.

Start now to think about how you might better tell the story about what you do and the things you need to help you get your job done. What you do, how you do it and what it costs is not only of great concern to you; all of us have a need to know. The risk you take by not telling all of us what you want to do is that we may not only be unable to help you; our lack of knowledge may cause us to do things to detract you.

INTERNATIONAL ACTIVITIES
OF
SOIL MANAGEMENT SUPPORT SERVICES

Northeast Cooperative Soil Survey Conference
Amherst, Massachusetts
June 10-15, 1984

Terry D. Cook, Soil Management Specialist
SCS, Washington, D.C.

Introduction

Agricultural development efforts throughout the world, especially in the less developed countries (**LDC's**), call for more and accurate information on soils and land use. **The** urgency for such information is highlighted by various scenarios for global food supplies and population **in** the next few decades. Economic inflation, arising in large part from oil price hikes, is a major stimulus to efforts of **LDC** governments to seek selfsufficiency **in** food **and** fiber production at a rate faster than in previous decades. Many **LDC's** realize that they **cannot** wait for local research efforts to provide **answers**. Their immediate and urgent requirement is for technology transfer from other **LDC's** with similar agro-ecological conditions or from other sources.

Two Federal agencies-the Soil Conservation Service (**SCS**) of the United States Department of Agriculture and the State Department's Agency for International Development (AID)-have **played** a small but significant role in projects for agricultural technical assistance to **LDC's**. In September 1979, SCS and AID entered into a participating agency service agreement

Dr. John Kimble. Dr. Richard Arnold serves as the principal investigator for the SCS. Dr. Ray Meyer supervises the program in the Science and Technology Branch of AID.

The Purpose of SMSS

Agro-technology transfer should be site specific and even soil specific. Consequently, the purpose of **SMSS** is to develop the prerequisites for soil-based agrotechnology transfer. Effective international transfer of technology requires a common language, and **SMSS** uses Soil Taxonomy (Soil Survey Staff, 1975) as the vehicle for this international transfer.

General Objectives of **SMSS**

Keeping in mind the overall goal of increased food production leading to self-sufficiency in the **LDC's**, the two general objectives of **SMSS** are (1) to provide technical assistance in soil survey and interpretation and (2) to assist in technology transfer by refining the classification system of Soil Taxonomy for more effective use in the intertropical countries and by encouraging its greater use in these countries.

SMSS technical assistance is provided at no cost to the recipient countries and is normally for a period not exceeding 6 weeks. This assistance includes:

- a. Helping the countries establish policies and programs for solving problems in land use and food and fiber production;
- b. Helping plan, carry out, and evaluate soil surveys and soil **conservation** programs;
- c. Providing laboratory and field testing services;
- d. Publishing soil management information that is needed in land use planning and for food and fiber production;
- e. Conducting seminars and other training sessions on improving soil management and on classifying soils;
- f. Interpreting soil properties to determine the potential of the soils for agriculture and predict their response to management; and
- g. Disseminating new ideas for increasing soil fertility, improving plant nutrition, and controlling soil erosion and sedimentation.

Requests for technical assistance originate from the countries, and are transmitted **by** the AID country missions through AID headquarters in Washington, D.C.. to **SMSS**. A technical specialist is nominated for the task according to the nature of the request. **The** search for the specialist is conducted in SCS, universities in the United States, or from other U.S. agencies or abroad. A file of interested individuals is maintained by the **SMSS** staff for this purpose. On completion of the assignment, the specialist prepares a report that is transmitted to the **country** through AID. Any recommended follow-up activities are coordinated by AID or **SMSS**.

SMSS Activities for Fi 1984 and FY 80-84

1. Technical Assistance

<u>Country</u>	<u>No. of TDYs</u>	<u>M/D</u>	<u>Country</u>	<u>No. of TDYS</u>	<u>M/D</u>
Brazil	2	12	Lesotho	1	4
Burundi	2	12	Malaysia	1	4
Costa Rica	2	14	Nigeria	1	4
Djibuti	1	46	Pakistan	3	58
Guam	1	4	Philippines	1	4
India	2	6	Rwanda	2	14
Indonesia	2	26	Senegal	1	11
Jamaica	1	13	Somolia	1	31
Jordan	3	20	Thailand	2	29
Kenya	1	2	Zambia	1	31

Totals for Technical Assistance

	<u>FY 84</u>	<u>Total</u>
No. of countries	20	45
No. of TDYs	32	152
No. of M/D	350	2084

Soil samples have been described and sampled for an International reference data base and for the benchmark **soils** project from many countries. Samples have also been collected for use during the training forums and International Soil Classification Workshops. Complete characterization has been completed as follows:

	<u>FY 84</u>	<u>Total</u>
No. of countries	6	30
No. of pedons	127	450
No. of samples	700	2000

The soil characterization program supports the Workshops and Forums, which, in turn, provide the data base for refining Soil Taxonomy according to the **soils** of the tropics. Countries participating in this program use the opportunity to compare data for quality control in their own labs.

The laboratory program **is** supported by a budget of about \$200,000 from AID. The total budget for SMSS varies from \$950,000 to 1.250.000 annually.

2. Technology Transfer

The VI International Soil Classification Workshop on Andisols (ICOMAND) was held in Chile and Ecuador in January 1984. A final conference on volcanic soils will be held in July 1984 in The Canary Islands.

The VII International Soil Classification Workshop on wet soils (ICOMAQ Aquic Moisture regimes) was held in the Philippines in April 1984.

The VII International Training Forum was held in the Philippines in March 1984.

The VIII International Training Forum was held in Jordan in May 1984.

The Workshops and Forums provide an opportunity for scientists of LDC's and other national and international organizations to meet and exchange information and experience. They form the basis for effecting agrotechnology transfer.

Publications

To keep the soil scientists and institutions of LDC's abreast of recent advances, an objective of SMSS is to publish a newsletter, Soil Taxonomy News. There have been 7 STN's with No. 7 in January 1984. No. 8 should be distributed in the near future.

There have been 8 Technical Monographs published by SMSS with the cooperation of universities and institutions, both nationally and internationally.

- No. 1 Soil Resource Inventories and Development Planning
- No. 2 Soil Moisture Regimes of South America
- No. 3 Soil Moisture Regimes of Africa
- No. 4 Guidelines for Soil Resource Inventory Evaluations
- No. 5 Keys to Soil Taxonomy
- No. 6 Spanish Translation of Soil Taxonomy

Slide sets and movies

Soil Taxonomy: A Technical Language of Soil Science
This is a 105 slide set with a cassette tape.

INTERNATIONAL COMMITTEE ACTIVITIES

A Report to be presented at
Northeast Cooperative
Soil Survey conference
Amherst, Massachusetts
June 10-15, 1984

Terry D. Cook, Soil Management **Spec.**, **SCS**, Washington, DC
John M. **Kimble**, Res. Soil Sci., **NSSL**, **MNTC**, **SCS**, **Lincoln**, NE

I was asked to give a brief report on the activities of the international committees (**ICOM's**) dealing with soil Taxonomy. The eight international committees are as follows: (see Appendix A for addresses)

ICOMLAC -- International Committee on Classification of Soils with Low Activity Clays. Chairman: Dr. Frank **Moorman**, The Netherlands.

ICOMOX -- International Committee on Oxisols. Chairman: Dr. Stanley Buol, North Carolina.

ICOMMORT -- 'International Committee on Soil Moisture Regimes in the Tropics. Chairman: Dr. **Armand** Van Wambeke, New York.

ICOMAND -- International Committee on Andisols. Chairman: Dr. Michael **Leamy**, New Zealand.

ICOMERT -- International Committee on Vertisols. Chairman: Dr. Juan **Comerma**, Venezuela.

ICOMAQ -- International Committee on Aquic Soils. Chairman: Dr. Frank **Moorman**, The Netherlands.

ICOMOD -- International **Committee** on **Spodosols**. Chairman: Mr. Ted Miller, Pennsylvania.

ICOMID -- International Committee on Aridisols. Chairman: Dr. **Ahmad** Osman, Syria.

The committees' work is done through circulars, memos, letters and meetings. There is no set committee other than the chairman. The committee consists of any persons **interested** in the activity of a given committee. Initially members are selected both nationally and internationally for their expertise and interest in the ICOM. Those who are not on the mailing list of an ICOM may do so by writing the chairman. If no comments are received from several circulars, an individual may be dropped **from** the mailing list by the chairman. Because of the diverse background and interest of the people who respond to the circulars, the activity of a committee may seem very "circular" in nature.

However, with time, a concensus view is reached. Once a proposal is developed, the recommendations are sent to the Soil Conservation Service who will evaluate these recommendations and send out a proposal for field testing. The proposal for testing changes to Soil Taxonomy is not completely developed. A mechanism for testing proposals has been written by Richard **Fenwick** (see Appendix B). Many of you were involved in the development and testing of Soil Taxonomy in its present form and any comments on **how you** feel future testing should be conducted are appreciated. These comments should be sent to Dr. Arnold, Director, Soil Survey, USDA, SCS for consideration. The actual testing of Soil Taxonomy has never really stopped even with the publication of the "Green Book" in 1975 (Agricultural Handbook 436). The activities of the committees are just a continuation of what has always been going on with the development of Soil Taxonomy. There have been many complaints that the international community is dictating and controlling the changes in Soil Taxonomy. It must be remembered that Soil Taxonomy is a dynamic system, and it will always be **undergoing** change as new soils are mapped and new knowledge about soils is gained. Many times we will not agree with a specific change, but complaining without action is not enough. Action on our part needs to be taken to express our views to the committee chairman and to the regional and national committees. Along with our opinions, supporting evidence on soil descriptions, lab data, and areal extent need to be submitted.

Appendix B states that once a proposal is sent out for testing, examination is restricted to examining the validity of the proposal. The chance for input and comments is during the life of the committee before a proposal is finalized. All comments regarding the validity of the proposal are welcome. However, the idea is to test what has been proposed and not to continue the activity of the committee. Once the testing period has been completed, the proposal may well be dropped or modified based on the comments received. Changes will not be made while it is undergoing evaluation.

As was stated, the major part of the work of the committees is through circulars. However, periodically national and international meetings are held where many members of the committee get together to discuss proposals that have been developed. These meetings have both formal presentations and discussions of the current ideas and field studies where there is an opportunity to test the proposals.

In the last few months, two international meetings were held. In January 1984, a meeting was held in Chile and Ecuador to test the **Andisol** proposal and, in April, a **meeting** was held in the Philippines reviewing wet soils for ICOMAQ. A meeting is planned for ICOMOX in 1986 in Brazil.

A brief summary of each committee's activity follows:

ICOMLAC:

This is the oldest committee and has submitted its final proposal to Dr. Arnold. In December 1983, a final meeting was held in Washington, D.C. and a proposal for field testing was developed. This proposal is undergoing final editing. It is hoped that the proposal will be distributed for field testing under the procedure outlined in Appendix B by the first of July.

The major changes to Soil Taxonomy in this proposal is the introduction of the **kandic** horizon which adds "**Kandic**" and "**Kanhapl**" great groups to the Alfisols and Ultisols.

Briefly, a kandic horizon is a subsurface horizon with a significant higher percentage of clay than the overlying horizon or horizons and has an **ECEC** < 12 (sum of bases plus **KCl** extractable Al) or a **CEC** < 16 meq per 100 g clay (by **NH₄OAc pH 7**). The clay fraction is composed predominantly of **1:1** layer lattice silicate clays, mainly kaolinite, with varying amounts of oxyhydroxides of iron and aluminum. Clay skins may or may not be present.

The properties of a kandic horizon are summarized as follows:

The kandic horizon is recognized by:

1. A vertical continuous subsurface horizon which has a thickness of 30 cm or more within 100 cm from the point where the clay increase requirements are met and has **ECEC** of < 12 meq per 100 g clay (sum of bases plus **KCl** extractable Al) or **CEC** of < 16 meq per 100 g clay (**NH₄OAc pH 7**).

2. It underlies a coarser textured surface horizon. The minimum thickness of the surface horizon is 18 cm after mixing, or 5 cm if the textural transition to the kandic horizon is abrupt and if there is no lithic, paralithic, or petroferric contact within 33 cm.

3. More total clay than the overlying coarser textured surface horizon and the increased clay content is reached within a vertical distance of 15 cm or less as follows:

- a. If the surface horizon as defined above has less than 20 percent total clay, the kandic horizon begins where some subhorizon contains at least 4 percent more clay absolute than the overlying horizon.
- b. If the surface horizon as defined above has 20 to 40 percent total clay, the kandic horizon begins

where some subhorizon has at least 1.2 times more clay than the overlying horizon.

- C. **If** the surface horizon as defined above has more than **40** percent total clay, the kandic horizon begins where some subhorizon has at least 8 percent more clay absolute than the overlying horizon.

4. A thickness of at least **30** cm, or if a lithic, **para-**lithic, or petroferric contact occurs within 33 to 68 cm of the mineral soil surface, then the thickness of the kandic horizon should be at least 60 percent of the vertical distance between 18 cm and the contact.

5. A texture of loamy fine sand or finer.

The proposed changes in the keys will not be discussed. The complete document may be studied in detail as soon as it is distributed.

ICOMOX:

There have been 12 circular letters **for** this committee. The last circular was in February 1984. Revised keys to the Oxisol order were in the last circular. Dr. Buol is chairman and circulars can be obtained from him.

The projected schedule for ICOMOX is to send the next circular out in July 1984. This one will include an extensive number of pedons which will have been tested according to circular No. 11. Anyone with data comments should send them to Dr. Buol as soon as possible so it can be incorporated into the next circular. Tentative plans have been made for a final International Soil Classification Workshop on Oxisols for the Fall of 1986 in Brazil. At that time, a completed draft of a proposal will be developed for worldwide testing.

ICOMAND:

An International Soil Classification Workshop on Andisols was held in January 1984, in Chile and Ecuador. The fifth circular of this committee was the basis for most of the discussion. This circular was a proposed revision of the 1978 Andisol proposal by Dr. Guy Smith. Dr. **Leamy** emphasized the point that the items to be discussed were just proposals and one of the major outcomes of the workshop was revisions to the proposal after reviewing the descriptions and data from 26 pedons. Nine pedons in Chile and 7 in Ecuador were examined in the field. A sixth **cir-**cular has been written and was distributed in April 1984.

The criteria for allowing a soil into the Andisol order is discussed. The Andisol definition is as follows:

Andisols are mineral soils that do not have an argillic, **natric**, spodic, or **oxic** horizon unless it is a buried horizon occurring at a depth of 50 cm or more and which have soil material beginning at, or with within 25 cm of the surface, in which all subhorizons have andic and/or **vitric** soil properties throughout a **continuous** thickness of 35 cm or more.

The definitions of andic soil properties have been revised in circular 6 to the following:

1.
 - a. Acid oxalate extractable aluminum is 2% or more, or 4M **KOH** extractable aluminum is 1.5% or more,
 - b. Bulk density of the fine earth, **measured**, in the field moist state, is less than 0.9 g/cm^3 , and
 - c. Phosphate retention is more than 85%.
2.
 - a. Acid oxalate extractable aluminum is 0.4% or more, or 4M **KOH** extractable aluminum is 0.3% or more, and
 - b.
 - (1) The sand fraction is at least 30% of the fine earth, and there is more than 30% by weight volcanic glass (or crystals coated with glass) in the sand fraction, or
 - (2) More than 60% by volume of the whole soil is volcanic **clastic** material coarser than 2 mm.
3.
 - a. Acid oxalate extractable aluminum is between 0.4% and **2%**, or 4M **KOH** extractable aluminum is between 0.3% and **1.5%**,
 - b. The sand fraction is at least 30% of the fine earth, and
 - c. There is enough glass in the sand fraction that the percentage of glass, when plotted against the percentage of acid oxalate extractable aluminum, gives a point within the shaded area of Figure 1.

The definition of andic material is to replace the properties listed in Soil Taxonomy for, "**an exchange complex dominated by amorphous material.**" The ICOMAND committee intends to have a proposal out for testing early in 1985. This proposal would undergo the same testing as suggested in a proposed draft of the key to

soil orders, the Andisols will key out after the Histosols. Additional testing and information on the proposed Andisols will be at the International meeting on volcanic soils on the Canary Islands in July 1984.

ICOMOD:

The first circular for this committee was distributed in May 1984. The chairman hopes this will stimulate a lot of discussion. This first circular is a list of pedons and descriptions with some comments that will serve as a reference point for the discussions of the committee. The points that are of interest are: Why do some soils fail when they seem to have the required field morphology and vice versa? What modifications do you feel are needed to accommodate additional soils into the Spodosol order? Tea Miller would like comments and recommendations supported by data. One of the major problems will be with the soils in the West where there are both **andic** and spodic characteristics. Also, some soils have the chemical and morphological properties of a **spodic** horizon except they are loams and clay loams. A lot of effort has been expended to prepare this first circular. What happens from now on will depend on how much of a contribution others make to the committee.

ICOMERT:

The first circular was distributed in February 1981. **Items** addressed by this committee are:

1. The difference between poorly drained and well drained vertisols; i.e., the difference between "**Pell**" and "**Chrom.**"
2. The use of Aquic moisture regimes in Vertisols.
3. The use of calcareous and acid families.
4. Aluminum saturation and its effects.
5. Vertisols with low base saturation.
6. Vertisols with high amounts of sodium and salts.
7. Soils with vertic properties but less than 50 cm thick to a lithic or paralithic, contact or a duripan, **petro-calcic**, petrogypsic, or petroferric horizon.
- 8.

9. Structure and consistency in surface horizons. Because of its agronomic importance, the need has been raised to reconsider the use of massive or granular structured upper layer C "**Maz**" vs "**Grain.**"

A total of three circulars have been distributed. The third one in October 1983. The 5th International Soil Classification Workshop in Sudan in November 1982, was primarily on the classification and management of Vertisols. In April 1984, Dr. **Comerma** visited Central and Northern Queensland in Australia to test and discuss the latest proposals for ICOMERT. Australia has the largest area of Vertisols in the world, about **100,000,000** hectares. In July 1984, Dr. **Comerma**, Dr. Wilding, Texas A&M University, and I will test the ICOMERT proposals as they apply to soils in Xeric moisture regimes in Northern California and southern Oregon. The conclusions and proposals should be ready in a fourth circular by later this summer.

ICOMMORT:

There have been two circulars for this committee. Circular No. 2 was distributed in October 1980. At the workshop held in Sudan in 1982, Dr. Van Wambeke summarized the work of the committee and concluded his responsibilities as chairman by submitting the final proposal to Washington, D.C. The committee reviewed both soil moisture and soil temperature regimes. The committee reviewed many comments on the definition and criteria for the moisture control section. There is an absence of guidelines to determine the limits of the moisture control section in the field. **Others** have questioned the accuracy of determinations of the three conditions: completely moist, partly moist, or completely dry.

A tentative **proposal** for subdividing moisture regimes as currently defined in Soil Taxonomy has been submitted. A brief outline is as follows:

Aridic		Extreme Typic Weak
Xeric		Dry
Ustic	Tropustic	Typic Aridic
	Tempustic	Typic Udic Xeric Wet
Udic	Contudic	Dry Haplic
	Tropudic	Minimal Medium Maximum
	Tempudic	Minimal Medium

Other questions and comments included the marked changes on the measurement of soil temperature at 50 cm depth when the soil cover is modified by different kinds of crops. Crops significantly change soil temperature from **dryland** and irrigated grain crops to dense avocado or mango orchards. Estimation of soil temperature from air temperature is still not a reliable method in many parts of the world. Computer models by **Newhall** and Van Wambeke have helped to identify moisture regimes on the basis of atmospheric data. SMSS has published models for South America and Africa and is contracting to publish Central America, the Caribbean, and part of Asia. Additional information may be obtained from Dr. Van Wambeke, NENTC or SMSS.

All of the material has been sent to the Soils Staff in Washington, and Dr. Van Wambeke feels they should send this material out for testing.

ICOMID:

There have been three circulars distributed by Dr. Osman. Circular No. 3 of this committee came out early in the winter of 1983. Dr. Osman would like comments on the material in the circular. **He** plans to get another circular out this spring. Some of the questions raised are: the presence of gypsic and petrogypsic horizons in **xeric** or aridic SMR; how to recognize **andic** or **vitric** material in aridisols; aridisols with very intense biological activity in the upper 100 cm: fluventic characteristics in some Calciorthis; and soils that have aquic moisture regimes but are moist for less than 90 days; lack salic horizons, and are aridic (dry more than $1/2$ the time when the temperature is $>5C$.)

ICOMAQ:

This is the newest of the committees and, to date, no circulars have been sent out. This committee is concerned with the aquic moisture regime and the difficulty and misinterpretation of it. An international workshop was held in April that dealt with this committee in the Philippines. If you are interested in a detailed discussion of the meeting, contact Ron **Yeck** from the NSSL who was present at the meeting, and he can give you a first hand expression of the ideas discussed. The first circular covering the proposals made at this meeting should be out shortly. Under consideration at present are two alternatives. The first is a major modification of the aquic moisture regime definition. This would bring about the introduction of different kinds of aquic regimes such as endoaquic, epiaquic and anthraquic. These different kinds of aquic moisture regimes could be used at any categoric level. The second

alternative is to make only minor changes to the present definition of the aquic moisture regime.

Soil Taxonomy states "For differentiation in the highest categories of soils that have an aquic moisture regime, the whole soil must be saturated. In the subgroups, only the lower horizons are saturated." (This is contradictory to the criteria given in the keys to subgroups that allow, in some cases, the soil to be saturated to the surface.) Implicit in the definition is the fact that soils are saturated by ground water. The concept does not consider the surface gleys or soils which are saturated from the top. As a result, many of the latter soils are generally misclassified or are improperly placed in the system. Aquic moisture regimes fit the soils saturated by ground water, but not some **others**, which the following specific kinds of aquic regimes are introduced. The limits and terms are suggestions, and it is hoped they will generate a discussion concerning the problems with the aquic moisture regime.

Briefly the terms being proposed are:

ORTBAQUIC. Wet reducing throughout; **i.e.**, the true **ground-water** gley soils. **Would** add they be wet **1/12** of the time.

PERAQUIC. Ground water is always at or near the surface.

ENDOQUIC. Horizons below 50'cm are wet and reducing. The **wetting is** natural and the **specific** conditions of the soil is generally due to its situation in the landscape between better drained soils and lower soils with an aquic regime in the valley bottoms. These are the aquic subgroups.

EPIAQUIC. These are the surface water gley soils where the wetting proceeds from the top downwards. A layer 50 cm or more thick in the upper part of the profile is wet and reducing. This layer is underlain by another, which is at least 20 cm thick, occurs between 50 and **125(?)** cm and has a nonreducing condition. These soils occur mostly in flat or slightly sloping positions where external drainage by runoff is slow. When situated on sloping land, the poorly permeable subsoil usually is formed by a different lithological material. These are the **pseudogleys** or surface water gleys.

ANTHRAQUIC. The morphological properties and other attributes are similar to the epaquic conditions. The origin of the wet condition is man-induced. The differences between this and the epiaquic have not yet been defined.

One other condition that exists and was not covered in the summary of the meeting is one that was seen during the Andisol workshop in Chile. This is where the soil is

saturated but shows no evidence of reduction that prevents the use of aquic at the suborder level. The soil in question was said to have standing water on it for 5 months of the year. The consensus of opinion was that the water was highly oxygenated which prevented reducing conditions from forming. However, when a soil is flooded for up to 5 months a year, it would have similar problems associated with an aquic moisture regime in my mind.

This is a brief summary of the activities of the international committees. If you have any specific comments **and/or** questions, I will be glad to answer them during the rest of the week. I would like to again encourage everyone who has an interest in any of the committees to send in their comments to the committee chairman with copies to Dick Arnold and SMSS. Something that should be remembered is: In the circulars, the views expressed are not always those of the chairman but a summary of views of many people. You may agree or disagree in many cases but the function of the committee is to reach a consensus which in soil Taxonomy is hard. Do not just say you agree or disagree but state why. Present data to support your views. Views without supporting data are just that--views. They cannot be tested unless you give something for the testing. The pedons selected to support new or revised changes should reflect model sites with a central concept and represent significant acreages of mapped soils.

The last point to be stressed is that the final authority on the acceptance or rejection of the recommendations is not the responsibility of the **ICOM'S** but the responsibility of the Soil Taxonomy policy committee. All changes to Soil Taxonomy above the series level are made by this **committee**. This committee will consider the recommendations of the ICOM'S and the material generated during the testing period. The Committee chairperson is the Director of Soils and is made up of the National leader (U.S.) Soil Taxonomy, one soil scientist representing all U.S. Regional Technical committees, one soil scientist representing **ICOM's**, one soil scientist representing SSSA, and one soil scientist from national organizations outside the U.S. that have adopted Soil Taxonomy as there primary system.

I would like to thank you for the opportunity to speak to your group. If you have any questions, I will be most happy to talk to you during the rest of the week. Thank you for inviting me to participate in your conference.

APPENDIX A

INTERNATIONAL SOIL CLASSIFICATION COMMITTEES
June 1984

**ICOMLAC -
International Committee
on Low Activity Clays**

**Chairman: Or. Frank Moormann
Institute of Earth Sciences
University of Utrecht
4, Budapestlaan,
3508 Ta Utrecht
NETHERLANDS**

**ICOMDX -
International Committee
on Oxisols**

**Chairman: Or. Stan Buol
Dept. of Soil Science
North Carolina
State University
P.O. 80x 5907
Raleigh, N. C. 27650**

**ICOMERT -
International Committee
on Vertisols**

**Chairman: Or. Juan Comerma
Dept of Soil & Crop Sciences
College Station, TX 77843-2474
OR
CENIAP, MAC
Apartado 4653
Maracay 2101
VENEZUELA**

**ICOMAQ -
International Committee
on Aquic Soils**

**Chairman: Or. Frank Moormann
Institute of Earth
Sciences
University of Utrecht
4,**

**ICOMANO -
International Committee
on Andisols**

**Chairman: Or. Mike Leamy
Director, Soils Bureau
OSIR
Private Bag, Lower Hutt
NEW ZEALAND**

ICOMOD -

**ICOMIO -
International Committee
on Aridisols**

**Chairman: Or. A. Osman
Director, Soil Science Division
ACSAO
P. O. Box 2440
Damascus
SYRIAN ARAB REPUBLIC**

Guidelines for Testing Proposals to Amend Soil Taxonomy

Introduction

Eight international **committees (ICOMs)** are currently working to refine and improve Soil Taxonomy. Most of their work is accomplished through correspondence. International Soil Classification Workshops have been organized for discussions among **committee** members of some ICOMS. The work of the **ICOMs** has been long and tedious and their conclusions and recommendations, which are now being distributed for testing, have been extensively debated.

We are still open to new proposals at this stage of testing the proposals of **ICOMs**. The guidelines provided here are designed to enable you to test these proposals and make **recommendations** for their incorporation into Soil Taxonomy.

Amending Soil Taxonomy

A small change in one part may affect other parts of the system. In making the draft proposal, we have attempted to make all of the necessary changes throughout the system.

TEST No. 1. Ensure that necessary changes have been made in the relevant parts of Soil Taxonomy.

When class limits are changed, the possibility is that some soils may not have a place in the system if classes are not mutually exclusive.

TEST No. 2. Ensure that all soils known to you have a place in the system.

Chapter 2 in Soil Taxonomy gives the principles for selecting differentiae and the attributes desired in the classes. Please read this carefully to ensure that these principles have not been violated.

TEST No. 3. Ensure that the fundamental concepts and principles of Soil Taxonomy are not violated.

The purpose of amending a system is that as a consequence of the change, the system is significantly improved. "Our goal has been a blending of many views to arrive at an approximation of a classification that seems as reasonable as we can hope to reach with our present knowledge." This statement from Soil Taxonomy (page 11) continues to apply. The following tests enable you to decide on the usefulness of the change.

TEST No. 4. Ensure that there is no ambiguity in the meaning of the definitions.

TEST No. 5. Ensure that the new **taxa** are concepts of real bodies and that the proposal provides **taxa** for all soils in a landscape.

TEST No. 6. Ensure that the modifications have resulted in a significant improvement in the interpretative capability of the system.

Testing for ICOMLAC Proposal

The **proposal** of the International Committee on Classification of Soils of **Low Activity Clays (ICOMLAC)** is the result of about eight years work under the leadership of Dr. Frank **Moormann** of the University of Utrecht, Naderland. More than 100 soil scientists from all over the world have contributed to produce this draft proposal. We would appreciate your **comments** on the proposal.

Testing a proposal is difficult, and it is for this reason these guidelines are provided. Although there are eight independent **ICOMs**, we have tried to coordinate **their** activities so that proposals of one do not conflict with that of the other. In this case, **ICOMLAC** proposals affect the Oxisols (**ICOMOX**), but the Chairmen of these two **ICOMs** have tried to merge their ideas. A tentative key to Orders is included to show the position of the LAC soils in relation to **others**, particularly the Oxisols.

Specific Items to test and/or check

- a. **Summary** of properties (pages 9-10).
- b. Orders - Proposed key to orders.
- c. Suborders - There are no changes in the definition of the suborders.
- d. Great groups and particularly the proposed new great groups - in each suborder, test the keying out of the great groups.
- e. Subgroups - check the usefulness of each subgroup, and if **necessary**, suggest others.
- f. Color requirements for Rhodic great groups have been changed.
- g. The depth to plinthite has been changed.

Procedure for Testing

Existing soil maps, soil survey reports, journal articles, bulletins and soil characterization data are the tools for testing. Suggested steps in testing are:

1. Classify your soils according to Soil Taxonomy (1975).
2. Classify your soils **according** to the new proposal.

3. **Make a table** showing the old and new classifications and giving series names or pedon identification. (Submit this with your report.)
4. Determine if the new classification (if changed) is an improvement. You need to base the decision on your experience. In your report, we would like to know both if you approve or disapprove of the changes, and in either instance, the reason(s) why.
5. If you propose alternatives,
 - a. make detailed justification,
 - b. provide pedon data,
 - c. provide any other information, particularly management information.
6. Submit your report to the Director of Soil Survey Division.

Northeast Cooperative Soil Survey Conference
F. Ted Miller
Head, Soil Survey Staff
Soil Conservation Service
Northeast NTC

I don't want to bore you with a lot of figures but I think it appropriate to at least bring you up-to-date on some of our activities and **the status** of the soil survey program in the Northeast.

First, a few words about staffing. SCS personnel changes here in the Northeast have been quite minimal since we last met. Our soils staff at the NTC is essentially the same. We have added an editor, Gabriel **J. Hiza**, on my staff in Chester. Cabe comes to us from the **NHQs** editing staff located in **Lanham**, Maryland. Also, we were fortunate this past winter to have Bob Rourke's able assistance at the NTC. Bob spent the better part of his sabbatical helping us out with our Spodosol studies as well as some of our regional Soil Taxonomy problems. At the state level, we have three new state soil scientists. Dave Van **Houten** who replaced Bruce Watson in Vermont; Richard Babcock who just recently replaced John **Ferwerda** in Maine; and Dick Hall who filled the new position of state soil scientist in Delaware. There are also changes on state staffs. Steve **Hundley** replaced **Karl Langlois** on the Massachusetts staff and Lawson **Spivey** replaced Walter **Ellison** in West Virginia.

I will take the next few minutes to briefly review **some** of our accomplishments, recent activities, current concerns and future plans in the Northeast.

Accomplishments

As of the beginning of **FY'84** (October 1, 1983) we had mapped **112,343,072** acres, or 73 percent of the 13 states comprising the Northeast region. It is also interesting to note that we now have **88% (20,269,640** acres) of the **cropland** in the Northeast mapped. We have published 201 of the 374 soil survey areas within the region. We have an additional 55 survey areas completed but as yet not published.

I **am** sure that many of you **will** question me for talking about the next items under the general heading of "accomplishments." However, I do want to briefly review **some** of the action taken on recommendations made in our last (1980) conference committee reports.

Committee 1 - Spodosol Classification - The **committee** recommended a number of changes in Soil Taxonomy as well as additional evaluation of certain criteria (**i.e.**, cracked coatings, **smeariness**, lowering limits of ratios). All **recommendations** are currently being considered by International Committee on the Classification of **Spodosols (ICOMOD)**. Bob **Rourke** will be reporting in more detail on Wednesday.

Committee 1 (from 1980 Soil Survey Conference) Criteria for Land Capability Classification - Recommended that the flow chart which was developed by the **committee** be adopted for use in the Northeast and also that it be **forwarded** to the National Headquarters of the Soil Conservation Service, Action - The flow chart was to be tested by all states in the Northeast. It was also sent to

SCS, National Headquarters. The flow **chart was** also provided to the Land Capability Committee in the 1983 National Work Planning Conference. No action or recommendations were made by this committee. More on this committee by Fred Gilbert on Wednesday.

Committee 2 - Post Mapping Role of Soil Scientists - Recommendations centered around soil data base management and computers. Although the recommendations were not followed precisely, our program on Tuesday on Data Base Management and Computers is a direct outcome of their recommendations.

Committee 3 - Evaluating Soil Map Quality - Recommended specific states test methods of assessing map quality and that committee be continued. Will **Hanna** will report actions on Wednesday.

Committee 4 - Improving Descriptions of Map Units - The outline for writing map unit descriptions and the examples of map unit descriptions developed by the committee were distributed in the Northeast as recommended. We will also be publishing several soil surveys in the near future using the tabular format for map unit descriptions as **recommended.**

Committee 5 - General Soils Map and Bulletin of the Northeast - The successful completion of a joint effort that we can all feel proud about. My congratulations to all of you.

Committee 8 - Northeast Soil Characterization Study. This committee reported on the completion of a 4 year study on variability in soils data within and between labs. A very significant contribution to the NCSS program not only in the Northeast but nationally as well.

Maybe we have not made accomplishments in the sense of Webster's definition, i.e. , "to execute fully," but we have made progress. I have often wondered. as I am sure many of you have, who pays attention to what we do in our regional committees? What action, if any, is taken? What do we accomplish? If you look at it strictly in respect to Webster's definition, it is easy to become discouraged. However, if you look at what we do in the spirit and interest of the conference as discussed in our by-laws, you get a much better perspective. I refer to the purpose of our conference, as explained in item I of the by-laws. We are **here to** exchange and **dissiminate** ideas, to explore new areas, and to work together for common goals. In doing these things we in fact accomplish what we set out to do.

Activities

President Reagan's private Sector Survey (**PPSSCC**) to reduce cost and improve programs in the federal government made three basic recommendations concerning the soil survey program. They are as follows:

1. Improve management of soil survey operations.
 - Implement critical path management system to replace CASPUSS
 - Revise schedules for completing each phase of the soil survey
 - Install automated entry-order system at NCC
 - Balance number of soil surveys and available personnel
 - Prepare 3-year plan for reducing backlog

2. **Improve** cartographic services and products to ensure quality soil surveys
 - Furnished rectified color IR imagery for all soil surveys on time
 - Improve current map finishing procedures
 - Increase use of orthophotography and computerized map processing
 - Use outside contacts more **effectively** for map finishing
3. Change manuscript editing process
 - Transfer major editing responsibilities to **NTC's**
 - Install automated text editing equipment
 - Improve capability of word processing equipment
 - Seek changes in authorities and procedures for working with GPO

A plan has been developed for implementing the recommendations. Some actions have already taken place. Recommendation 3 concerning the manuscript editing process has already impacted our operations at the NTC. Since January 1984 all soil survey manuscripts have been edited at the **NENTC**. In addition, the final editorial approval for manuscripts is at the NTC. i.e., no editorial **review** of manuscripts is done at the National Office. In October 1983 the Soil Survey Staff received an IBM Displaywriter, on which we can receive and send manuscripts via telephone modem. We are awaiting shipment of a second Displaywriter, sometime early in **FY'85**. We **are** in the process of justifying the purchase of a disk-to-disk converter that will enable us to enter and use soil survey information in the Displaywriter even though information is on diskettes not compatible with the Displaywriter. Thus, much of the rekeying at the NTC will be eliminated.

Just a few words about the on-going Soil Survey Program **Evaluation**. Soil Conservation Service policy in accordance with legislation requires that programs be systematically evaluated with respect to meeting SCS goals and objectives. The Soil Survey program is currently being evaluated. The evaluation centers around the following five issues,

1. What should be soil survey program balance for the Soil Conservation Service?
 - Basic Soil Services **vs** Project Mapping; National **vs** State priorities; International Program
2. Are soil survey program activities consistent with current policies and objectives?
 - Does adequate quality control exist? - Proper design to get adequate information at minimal cost. What are effects of non-SCS funds on the program?
3. Does the soil survey program operate efficiently?
 - Examine overall **organizational** structure; training. etc. Management of project mapping.
4. Do soil surveys address the needs of users?
 - Do soil surveys provide needed information to SCS and non-SCS users? Does the soil survey program educate its users?

5. Does the soil survey program develop and/or adopt new approaches to serve current and future needs?
 - Information adequately presented to users?
Do development and research **activities** in soil survey program provide adequate support for quality products?

Soil Survey Manual - Work on the Soil Survey Manual continues. All chapters except for chapters **8** and **11** are now out for review and testing. Chapter **8** deals with soil investigations and chapter **11**, soil interpretations. Chapter **11** is currently being edited and should be out for review in **2 or 3 weeks**. Major work on chapter **8** is being done by the folks at our NSSL. Perhaps Ron **Yeck** can fill us in later on the status of that chapter. Current plans are to get revised drafts of chapter **4** and **5** out soon and revised drafts of all chapters out within 1 year.

The National Soils Handbook was issued late last fall. The National office will update, probably within a year. When you find errors and omissions, let us know.

Areas of Concern

All of you State Soil Scientists heard Dr. Arnold's presentation on "The National Soils Handbook - How to Use It" which he gave at the State Soil Scientists' meeting this past February. His presentation was later transmitted to you under National Bulletin No. 430-4-14. Dr. Arnold presented this discussion because of his concern that the National Soils Handbook was being translated by too many people into a set of rigid **rules** and regulations. He stressed the fact that the NSH provides guidelines and flexibility. Unfortunately, he did such a good job that some folks have **mistakenly** taken this to mean that now we don't have to pay attention to the NSH at all. If we disagree with something that's in it, we just won't do it. The fact that there are currently numerous discrepancies between the NSH and the Soil Survey Manual doesn't help. This obviously was not Dr. **Arnold's** intent. As he states in his paper, it is important to use standards for describing and defining soils: the NSH is a set of guidelines and suggested procedures that work; and doing these things makes us effective and helps us get our jobs done. So, we will be following these guidelines. As to discrepancies, where there **is** a discrepancy between the NSH and the manual, the NSH will take precedence. As revised chapters of the manual are released they will agree with the NSH.

Updating older published soil surveys is receiving more and more attention. It will continue to do so as we complete the once-over mapping. If you stop to think about the statement we've made that "a published soil survey is good for about 25 years," then **we** have a much bigger need for updating than you might first realize. For example, of the 201 published soil surveys here in the Northeast, 21 of them are currently 25 years or older.. **In just** slightly over 10 years (1995) we will have 75 of them over 25 years old. Nearly all of these surveys require some form of updating in order to satisfy the needs of users, The question is how much? That "how much" can range anywhere from only updating the interpretations to **recorrelating**, redrafting, and in a few **cases**, to complete remapping of the area. The idea is to know precisely what is to be done and if the usefulness of the soil survey will be increased enough to justify the expenditure. Your evaluation must accurately identify and document

needs. **The** evaluation **must** be extremely thorough if we are to successfully **compete** for our limited financial **resources**.

Program **Emphasis** in the Northeast

Improve evaluations of updating needs for older published soil surveys.

Increase efficiency of project soil mapping.

Improve our soil data base.

Increase the use of soil resource data.

Continue to work on improving packaging and presentation of soils information in targeted areas.

NATIONAL SOIL SURVEY LABORATORY ACTIVITIES
R. D. Yeck, NSSL Liaison to the Northeast
SCS, Lincoln, Nebraska

Introduction

My remarks will address three general topics today. First, I will discuss activities in which NSSL has been involved in the Northeast during the 2 years since we last met. Next I'll talk about national activities of the NSSL because they affect the Northeast in varying degrees. Finally, I plan to look ahead at the changing role of laboratory data within the NCSS.

Activities in the Northeast

In the last 2 years the NSSL has analyzed 440 samples from 70 characterization projects in the Northeast. Additionally, there were 134 samples from reference projects for a total of 574 samples from June 1982 through June 1984. This averages to about 6½ and 4 horizons per pedon for characterization and reference samples, respectively. This represents about 6 percent of the overall NSSL analytical workload. Samples were from 10 of the 13 states, and 7 states had more than one project. About 20 to 30 percent of the characterization effort in the Northeast is from the NSSL with the bulk of the analyses from experiment station laboratories.

We are involved in some work in addition to pedon characterization. We recently analyzed samples from New York to use as part of the study to verify and calibrate the DRAINMOD, a computer model used throughout SCS by engineers to determine maximum moisture utilization. In a cooperative project with the NENTC Soils Staff and the ARS Appalachian Soil and Water Conservation Research Laboratory located near Beckley, West Virginia, we are doing some clay mineralogy analyses. Also, Dr. Bob Grossman of our staff has been carrying out some soil moisture studies, including some in the Northeast. Some of you may have been involved in those. Both characterization analyses and interagency cooperation will remain an important part of the NSSL work in the Northeast. For future years, we need to think together of the need to shift into other areas of assistance as well. I'll touch on that again when I talk about looking ahead.

General NSSL Activities

Now let me talk about NSSL activities that are not restricted to but are of interest to the Northeast.

The lead-cadmium study is essentially finished. The results will be published as an SSIR. If you need data from the project prior to its publication, contact Dr. George Holmgren at the NSSL. Several of you were involved in that study, and I thought you would be interested in its status.

Spodosols remain a topic of interest not only here but also nationally and internationally. Late last year, representatives of each soil staff, the National Office, and several others met at the NSSL with the objective of deciding how best to use the spodic horizon data set at NSSL and also list highest priority items for addressing needed changes to Spodosol criteria in soil taxonomy. Bob Rourke will discuss this later in the program. One result of that meeting was an International Committee on Spodosols (ICOMOD) circular sent

out by Ted Miller, ICOMOD chairman. Bob Rourke did much of the assembling and editing of this circular while he was working at the NKNTC in Chester. Also, a set of papers that include the procedures for the spodic horizon field kit are in the final editing for publication in the Soil Science Society of America Journal. The titles and authors are as follows:

Field estimation of **amorphus** aluminum with 4N KOH. G. G. S. Holmgren and J. M. Kimble.

Field identification of Spodic horizons with KOH-extractable aluminum and humic acid color. G. G. S. Holmgren and R. D. Yeck.

An evaluation of KOH-extractable aluminum in Aandepts (**Andisols**). J. M. Kimble, C. S. Holxhey, and G. G. S. Holmgren.

A simple **colorimetric** measurement for humic acids in spodic horizons. G. G. S. Holmgren and C. S. Holxhey.

Publication of these papers will make the material on the spodic horizon field kit more accessible and also provide the rationale for this procedure.

Recently, distribution was made to each state of printouts of data analyzed at the NSSL since 1978. **Composite** printouts were also sent to each NTC along with an index of data sent to states within their region. By now, states have already also received computer generated Soils-8 forms based on the same data as the printouts. The intent is to verify the Soils-E's in each state and indicate those data that do not merit indexing in the Soils-8 file. A draft to modify procedures for handling Soils-E's as outlined in the NSH has been sent to the National Headquarters Soils Staff. We are still searching for a data management system to accommodate all Soils-8's and make **them more** easily accessible. Also available, upon request, for NSSL projects, are interpretative data sheets reformatted to provide engineering data and more detailed soil moisture and coarse fragment information as well as several other properties.

While we are on this general topic of computer generated materials, I should also again mention the availability of programs for microcomputers to store and produce pedon descriptions. The programs were developed by Dr. Maurice Mausbach. That information was included as a news item in the last NKCSSC newsletter. As indicated in that article, the programs are now written for Apple and Radio Shack microcomputers.

Changing topics now, let me discuss some modifications being considered for the structure of courses **taught by** NSSL for using and understanding laboratory data. I would welcome any comments you have about this. Briefly, two courses are presently taught. One, called Soil Laboratory Data--Procedures, is designed mainly for Soil Survey party members with just a few years experience. In addition to the topics dealing with understanding data, emphasis is on use of field kit measurements to supplement lab data. The second course, Soil Laboratory Data--Use, also deals with understanding data interrelationships but is directed more toward experienced party leaders and state office level staff. There is more emphasis in the latter course on project planning and administrative procedures, and management aspects of laboratory data gathering and use. Proposed modifications would add a fundamentals correspondence course as a prerequisite to the classroom courses. It would deal with topics such as plotting data, weighted averages, etc. The second two courses would be much as

presently configured but with less topic overlap and the more advanced one would be taught only at NSSL. More effort would be made to have participants receive the training in the planned sequence. In addition, an advanced training program would be individualized for a soil scientist, working together with an NSSL staff member, for in-depth analysis of data from his or her area, primarily for interpretations. Plans are to implement the modified approach for the 1985-1986 sessions.

Looking Ahead

We have more data available now than ever before, partly because we are benefactors of active **characterization** programs, some of which have been ongoing for over 30 years. In addition, analytical efficiency and production has increased in recent years because of new technologies. This is exciting but it also requires more planning for handling the data than before. We need to take the time to structure our local data bases to build in as much flexibility as possible. That usually means involving the available ADP experts, as a minimum, and ideally other discipline leaders such as agronomists, foresters, engineers, etc.

With the availability of more data, we have the opportunity to generalize data more. One of the ways data are generalized now is using them as part of computer models, such as DRAINMOD, EPIC, and many more. Part of our obligation is to advise those who use our data for models. They need to understand how the **pedons** for the data were selected and something about the different analytical procedures. Generally, we need to help them understand limits beyond which they should not extrapolate the data. The ability to handle more data allows us to make more complete use of the characterization data. I think it opens up some new possibilities for soil survey interpretations. I feel our emphasis should now shift in that direction. The individualized training that I mentioned earlier also moves us in that direction.

Part of **our** agenda this week is to talk about undergraduate preparation for career soil scientists. For a number of years, we've talked **about the** changing role of soil scientists in the NCSS. As soil scientists move more quickly to positions primarily involving basic soil services, their understanding of landscapes and field techniques from on the job training may be much more limited. As a counterbalance, we may need to include more field work as a requirement for undergraduate degrees in soil science.

Finally, a word about future analytical capability of the NSSL. Because of the 1985 staffing plan, we may lose most of our student help. They do a major part of our analytical work. I mention this because if it happens, it may decrease the turnaround time on projects to which we are already committed and may reduce our future commitments. You need to know of that possibility. We are studying a number of alternatives to maintain our present production level, and hope one of those will work out. If any of you want to talk specifically about any of the topics I've mentioned, I shall be happy to do that.

Synopsis of Comments
Made at the 1984 Northeast
Cooperative Soil Survey Conference, June 11, 1984
by Fifi Nessen, DEQE Sludge and Solid Waste Program Manager

Massachusetts's Regulations for the Land Application of Sludge and Septage were promulgated in November, 1983. The major provisions of the regulations are:

1. The Department must approve sludge and septage as being suitable for beneficial use **prior** to land **application**.
 - a. The responsibility for obtaining such approval lies with owner or operator of sludge and septage facilities.
 - b. Sludge and septage must meet specific standards of quality, based upon the category of intended use. Standards which include criteria for level of pathogen reduction and for concentrations of heavy metals and **PCBs**, are based on USDA and EPA recommendations with some modifications. Of particular significance are the Massachusetts standards set for cadmium, lead, and **PCBs** which are more protective of public health than EPA's regulations.
 - c. There are three categories of intended use:
 - Type I Sludge and sludge products for unrestricted public use.
 - Type II Sludge and septage suitable for agricultural use, subject to D.E.Q.E. approval of the site.
 - Type III Sludge and septage suitable for only non-agricultural use, subject to D.E.Q.E. approval of the site.(see Attachment A for Criteria for Suitability)

2. The use of Type II or Type III sludge or septage requires DEQE approval of the method of application and the site of application in the form of a Land Application **Certificate**. (Quality standards for Type I are so high that the material can be used safely in the same manner as a commercial fertilizer or soil conditioner). The Department will seek local board of health concurrence as a prerequisite for approval.
 - a. The site must meet certain criteria including **soil** texture and drainage, slope, depth to groundwater and to bedrock, and buffer distances to public and private water supplies. Of particular interest to soil scientists is DEQE adoption of USDA's soil texture classifications and the use of mottles as a means of identifying drainage suitability of soils. DEQE's intent is to enable project proponents to use **SCS's** Soil Survey data as a preliminary source of information about a site followed by field investigation after initial DEQE review of site suitability.
 - b. The rate of application of sludge or septage is limited by either the nitrogen needs of the crop or specified amounts of heavy metals or **PCBs** added to the soil, the lowest amount being the limiting factor. Limits for heavy metals and **PCBs** have been determined on a worst-case basis. (See Attachment B for Application Rates)
 - c. Special requirements are prescribed for surface application of sludge or septage, application prior to planting crops for direct human consumption, application at the time when crops are growing, grazing cattle, public access, and times of year when application can occur.

CRITERIA FOR SUITABILITY

TYPE I

TYPE II

TYPE III

PATHOGENS REDUCTION

PSRP*
PFRP*

HEAVY METAL CONCENTRATION
(P.P.M.-DRY WEIGHT)

CADMIUM
LEAD
NICKEL
ZINC
COPPER
CHROMIUM (TOTAL)
MERCURY
MOLYBDEUM
BORON

2
300
200
2500
1000
1000
10
10
300

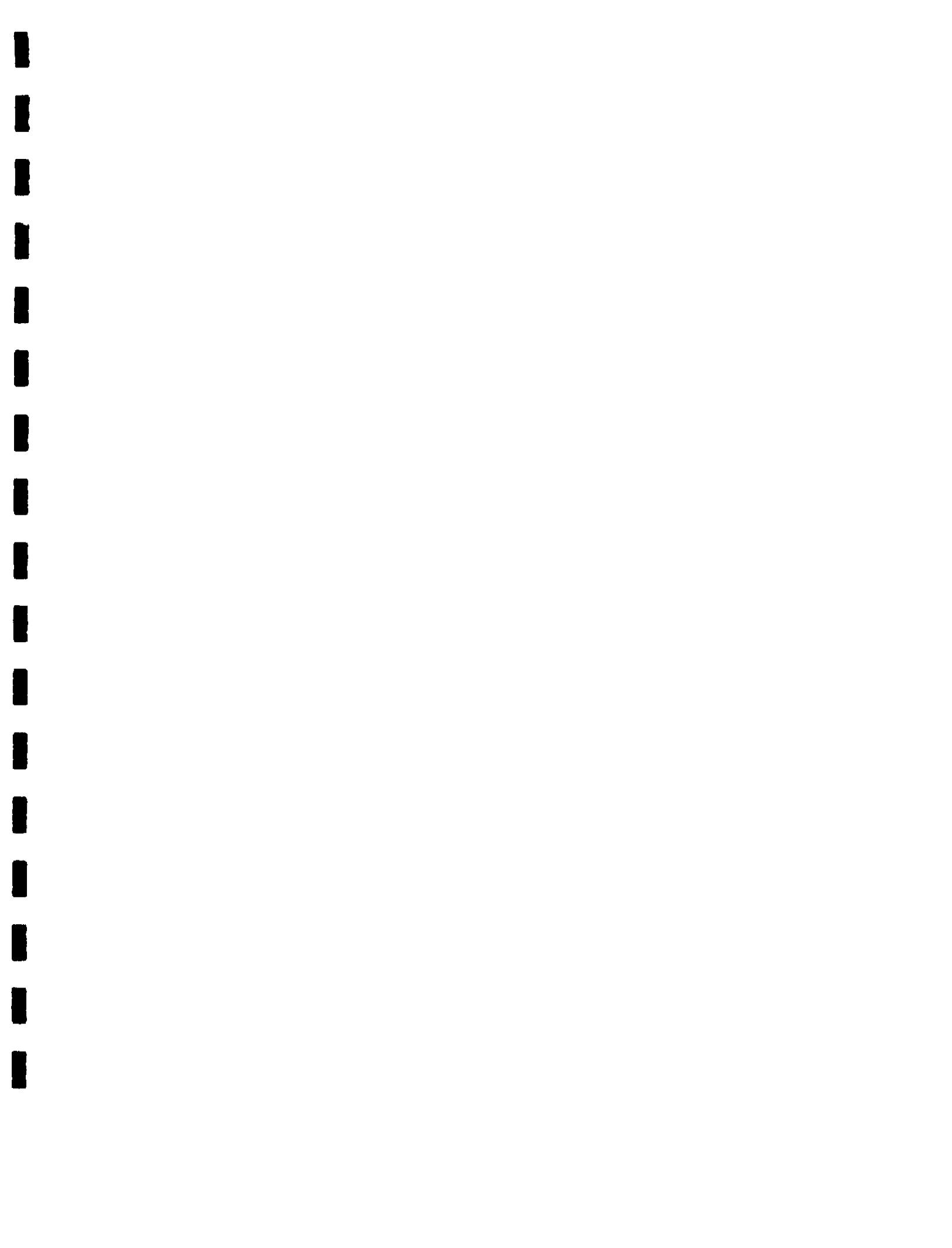
25
1000
200
2500
1000
1000
10
10
300

~~PSRP~~

2
1

10
10

REQUIRED



Spodic Horizon Classification

C. Wang

Land Resource Research Institute, Ottawa, Canada

Contribution No. LRRI 84-34

Introduction

Soils with high illuviated amorphous **Fe** and **Al**, **commonly** complexed with organic carbon, having properties such as high P fixation capacity, very strongly acid **sols** and very high **pH** dependent CBC are recognized at the order category **in** Soil Taxonomy. This logic behind spodic horizon classification is well accepted by other countries in the world including Canada. We are debating some of the details of the current criteria, not the basis of them.

Problems with our current classification criteria

1. The ratios of $(\text{Fe}+\text{Al})_{\text{p}}/\text{clay}$ and $(\text{Fe}+\text{Al})_{\text{p}}/(\text{Fe}+\text{Al})_{\text{d}}$.

Podzolic soils are a major soil order in Canada. In our 1983 note (McKeague, et al.) more than 200 pedons of **Podzolic** soils from coast to coast were studied. More than 60% of the studied pedons were excluded from Spodosols because of the above mentioned **ratios**. We feel that the ratio of $(\text{Fe}+\text{Al})_{\text{p}}$ to clay should be lowered from 0.2 to 0.1, as many Podzols have illuviated clay in conjunction with amorphous materials in the B horizons. For example, 50 sandy Podzols of the province of New Brunswick had an average clay content of 3% in the **B** and **C** horizons and 10% in the **Bf** (**Bs**) horizons (Wang and Rees, 1980). Much of the clay in Bf horizons was illuviated (Wang and McKeague, 1983). Due to the high clay content in B, none of these soils met the $(\text{Fe}+\text{Al})_{\text{p}}$ to clay ratio of 0.2. But nearly all of them met the ratio of 0.1. A paper by Stanley and Ciolkosz, 1981 also expressed similar concern. We also believe that the ratio of $(\text{Fe}+\text{Al})_{\text{p}}$ to $(\text{Fe}+\text{Al})_{\text{d}}$ of 0.5 or higher should be dropped. Citrate-dithionite solution extracts fine **crystalline** iron oxides which are inherited from parent material **rich** in red shales and sandstone. An example was given by McKeague, et al. 1983.

2. Pyrophosphate extraction method

Some fine particles may remain in suspension in pyrophosphate extracts even after the treatment of **superfloc** and low speed **centrifugation**. Schuppli et al. 1983 indicated that for spodic-like horizons the fine particles **in** suspension can be satisfactorily removed by high speed **centrifugation** (>20,000 g) or by the combination of superfloc and high speed of **centrifugation** as is done in New Zealand.

3. Inorganic amorphous materials

Farmer et al. 1980 reported the occurrence of imogolite (Al silicate) in several podzolic B horizons (similar to spodic B) in Scotland. There was more inorganic Al+Fe than organic Al+Fe in these podzolic B horizons. Inorganic amorphous materials are estimated by the difference between amounts extracted by oxalate and pyrophosphate. For example, amorphous inorganic Al is estimated by $Al_i - Al_p$. Organic amorphous material is estimated by extracting soil with pyrophosphate solution.

Farmer thinks that the imogolite in the podzolic B horizons is pedogenic and is formed from illuviated inorganic, amorphous Al and Si complexes. He believes that the illuviation of inorganic amorphous materials is a major process in podzolization.

In a recent study (Wang et al, 1984) we found that many Spodosols in northern Quebec have a ratio of inorganic to organic amorphous Al of more than 3 in the lower B horizons and that these horizons contain imogolite. For the Spodosols of southern Québec this ratio was around 0.5 in spodic B horizons and no imogolite was found. The ratio of Inorganic to organic amorphous Fe in spodic B horizons varied from 0.5 to 6, similar to Al. No imogolite was found below the solum in any of these soils in Québec.

It is clear that inorganic amorphous materials is common in many of our podzol-like soils. Our current pyrophosphate method which extracts only organic amorphous material is not an adequate method in classifying podzol-like soils with high inorganic amorphous material.

Some recently proposed methods

1. McKeague, et al. 1983
We have briefly discussed this.
2. Mokma, 1983

Main criteria are:

- 1) Have more $C_p + Al_p + Fe_p$ than E horizon or A_p if E is absent.
- 2) Have $C_p + Al_p + Fe_p \geq 0.5\%$
- 3) Have C_p to $(Al+Fe)_p$ atomic ratio between 5.8 and 25.
- 4) Illuviation index ≥ 5.0

We found that criteria 1,2 and 4 can be easily met by all of our podzolic B horizons tested. In fact, these criteria were also met by a number of argillic and cambic horizons tested. However, the 3rd criterion, i.e. have atomic ratio of C_p to $(Al+Fe)_p$ between 5.8 and 25, was not met by most of the podzolic B horizons we tested. We reworked some published data (McKeague, 1968) and summarized in Table 1. Only three of these podzolic B horizons meet the 3rd proposed criterion for spodic horizons although seven of them do meet the current chemical criteria. Lowering the atomic ratio will not help since many argillic and cambic horizons also met all other criteria.

Table 1. Some Chemical Properties of Podzol B horizons

Horizon	% Organic c	% Pyro. Ext.			Atomic Ratio
		Cp	Fep	Alp	Cp/Alp+Fep
Bhf*	6.7	4.6	3.1	0.91	3.8
Bfh	3.7	3.4	1.3	1.4	3.0
Bhf*	a.3	6.9	2.3	1.8	5.3
Bfhcg	4.0	2.8	0.75	1.0	4.6
Bh**	1.6	1.5	0.00	0.31	11
Bhc**	3.5	3.2	0.00	0.68	11
Bhf**	7.8	6.4	1.5	0.65	10
Bhfc*	11.6	10.8	9.7	1.8	3.8
Bfh'	4.3	3.4	1.7	0.88	4.5

- end ** meet the current criteria of spodic B horizon.
- * meet the proposed criteria (Mokma, 1983) of spodic B horizon.

In a recent report of International Committee on the classification of Spodosols (ICOMOD, 1984). there is detailed information of some 28 Spodosols of the United States including 7 Aquods, 5 Humods and 16 Orthods. We randomly evaluated 4 pedons each of the three suborders according to the proposed criteria by Mokma (1983). We found that all Humods met the proposed criteria but only half of the Aquods and Orthods met the proposed criterion of having $Cp/(Al+Fe)p$ atomic ratio between 5.8 and 25. Clearly, the proposed spodic chemical criteria (Mokma, 1983) are inadequate for the Spodosols we have tested.

3. Field testing method by Holmgren and Yeck, 1984

The proposed field tests include two parts; estimate pyro Al by KOH extract; and estimate humic and fulvic acid by first extracting with KOH solution then acidifying with HCl to precipitate humic acid. We tested the methods in both the laboratory and the field. The estimate of Alp by KOH extract worked well, but the method for organic acids yielded turbid extracts and resulted in poor replication even in laboratory. A modified method using HCl.HF solution as extractant was better for distinguishing podzolic B horizons from others (Schuppli and McKeague 1984). In our view the proposed field testing methods have one of the following two intentions: A. intended

to estimate our current chemical criteria; and B. intended to replace our current chemical criteria. Let **us** take a closer look at these two possible intentions. There is a lack of adequate information to estimate our current chemical criteria by the proposed field methods. Values such as Pep, Ald, Fed and percent clay are not available. If the intention is to replace our current chemical criteria with the suggested field criteria, we feel the field methods is not adequately **quantitative**. For example, the bulk density of **spodic** B horizons **commonly** varies from 0.8 to 1.3 **g/cm³**. This will greatly affect the weight of the samples used in the field test. One of the most significant improvements in Soil Taxonomy over the previous soil classification **systems** is that the class limits are clearly and precisely defined. However, we do believe the proposed field methods can be used to enhance the uniformity in mapping of Spodosols by the **pedologists** of a region.

Possible new approaches in the future

As mentioned earlier, more and more we realize that the inorganic amorphous material plays an important role in **podzolization** or the formation of Spodosols. A method which can better estimate both organic and inorganic amorphous material will likely replace the current pyrophosphate method. Following are two methods which may be used to estimate total amorphous materials.

1. Oxalate method, **(NH₄)₂C₂O₄ pH≈3**, with 2 to 4 hr. shaking.

Oxalate is **commonly** used by soil scientists to estimate total amorphous material (i.e. Al, Fe and **S₁**). The drawback of this method is that it **also** dissolves magnetite and attacks some ash materials.

2. **Hydroxylamine** method **NH₂OH.HCl, pH≈1**, overnight shaking.

This method was proposed recently by Chao and **Zhou**. 1983. geologists, for extracting amorphous Fe in sediments. **We** first thought that the extremely low **pH** may result in dissolution of **some** crystalline Fe from chlorite and somewhat weathered mica. But our recent study of 4 minerals and 25 soil samples (Ross et al. 1984) indicated that the hydroxylamine and the **oxalate** methods extracted similar amounts of Al and Fe. However, hydroxylamine **did** not attack magnetite. A test based on a broader range **of** soils will be needed before we can evaluate this method better.

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SOIL RESOURCE DATA BASE DEVELOPMENT 1/

G. L. Decker 2/

Introduction:

The National Cooperative Soil Survey (NCSS) coordinates a joint effort to map soils, collect data, interpret the maps and data, and promote their use. The soil survey program is carried out by field and laboratory investigations. The field investigations are usually of counties, parts of counties, or similar areas. When they are completed, the results are published in a soil survey. The published survey contains soil maps and a text that describes, classifies, and interprets the soils. The laboratory investigations are site specific. They provide basic data to help field investigators describe, classify, and interpret the soils. The basic data are also used to show the relationships between soil properties and soil performance.

The goals of the NCSS are to make soil surveys that inventory the Nation's soil resources, record their locations, predict their performance under defined use and management, enable the transfer of soil information from one location to another, and contribute to the knowledge and understanding of our land resources. One goal of the SCS is to make the data more available to the users. A workshop was held in April of 1982 to identify data problems, data accessibility, and future data and user needs. The workshop participants also developed short- and long-range plans for designing and implementing an integrated, user-accessible natural resource data base. Two subsequent workshops have been held to monitor progress and to outline new tasks.

We currently have several large data bases located in different places, as shown in figure 1.

1/ This paper was presented at the Northeast Cooperative Soil Survey Conference, University of Massachusetts. Amherst, Massachusetts - June 11-15, 1984.

2/ National Leader, Soils Data Base Development; Cartography and Geographic Information Systems Division, SCS, Lanham, Maryland

Soil Interpretations:

The soil interpretations record data base contains estimated data for more than 25 soil properties for the **more** than 14,000 soil series recognized in the NCSS soil mapping program. Data given for each major layer of the soil include particle size distribution, **bulk** density, available water capacity, soil reaction, salinity, organic matter, and other layer characteristics. Data on soil characteristics relating to flooding, water table, bedrock, subsidence, and other characteristics are also given. The data base also contains interpretations for uses such as: sanitary facilities, building site development, recreation development, important crops, woodland, wildlife habitat, and rangeland.

The data base is located at the Iowa State University Computing Center, Ames, **Iowa**. The data are available on tape upon request from SCS. Tabular printouts are available to SCS users via RJE equipment.

The data base is also accessible from the U.S. Army Corps of Engineers, Construction Engineers Research Laboratory (**CERL**) Computer located **at** the University of Illinois, Urbana, Illinois. The data are available to all users in an interactive user friendly mode. Users may search for and list soil series with **common** properties or a combination of **common** properties. Tabular output similar to that available from Iowa State University is also available from CERL via an interactive terminal.

A subset of the soil interpretations data base for the State of Colorado and Indiana is also available to USDA users in an interactive mode using the System 2000 data base management system (DBMS) at the Fort Collins Computing Center (FCCC). Many kinds of user-specified table outputs are possible using the DBMS natural language.

Between July 1983 and May 1984, SCS completed procedures to: (1) reformat the soil interpretations data so that they are more compatible for data processing, (2) enhance the retrieval of data from the CERL computer, (3) merge the soil interpretations data base with the map unit use data base on the CERL computer and (4) provide search capability for the merged CERL data base.

In June 1984, the interpretation data for the whole U.S. will be loaded into the System 2000 DBMS at the FCCC, and into the Relational Information Management (RIM) DBMS at the University of Minnesota.

Map Unit Use File:

The map unit use data base contains data for more than 1,600 soil survey areas. Soil mapping has been completed in these areas and meets the current needs of the local people who use the information. The data base includes the name and symbol of each map unit, the counties and major land resource areas where each is mapped, the acreage of each unit, the percent composition of **multi-taxa** units, and a soil interpretation record number and appropriate phase data that will be used to link the map units to the soil interpretations record data base.

The map unit data base is located at the Iowa State University (ISU) Computing Center, Ames, Iowa. The data are available on tape upon request from the SCS and tabular output is available to SCS via RJE equipment.

A subset of the data base for the State of Colorado and Indiana is available to USDA users in an interactive mode using the System 2000 DBMS at the FCCC. This DBMS can be linked to other System 2000 DBMS's such as the Colorado soil interpretations DBMS. Many kinds of user-specified tabular outputs are possible using the DBMS natural language.

Between June 1983 and May 1984, SCS completed the editing and the addition of new information for over one half of the 1600 soil survey areas and the remaining areas will soon be completed. The edited soil survey area data has been loaded into the RIM DBMS at the University of Minnesota.

Short-range plans are to: (1) continue to enhance the map unit use-soil interpretations data base search capability at the CERL computer; and (2) load the data for the U.S. into the System 2000 DBMS at the FCCC.

Soil Descriptions:

Site specific data for NCSS official series descriptions and soil survey area series descriptions are stored by word processing equipment and are printed out to provide hard copy.

About 2,000 official series descriptions and an undetermined number of soil survey area descriptions have been stored using word processors at the SCS national technical centers (NTC's) and State offices.

In December 1982, SCS completed procedures to store these 2,000 series descriptions in text form at the USDA Washington Computing Center (WCC). Once stored at the WCC, the data can be retrieved via RJE equipment.

In July 1983 through May 1984 SCS developed procedures to: (1) search the series descriptions by computer, find unique phrases, convert the phrases to National Cooperative Soil Survey (NCSS) codes, and create a data base compatible with the site-specific laboratory description data base; (2) scan all the original typed descriptions available with an optical character reader (OCR) and search the results to create a data base; (3) capture description data that was coded on mark sense forms several years ago and never read because of the mark sense reader's mechanical failure; and (4) input description data by use of a microcomputer.

Short-range plans are to: (1) propose and send out for review new field description output formats that can be generated by computer from the coded data, (2) investigate other procedures to input descriptions, and (3) propose procedures for automating the non-site specific data (e.g., range in characteristic) associated with soil series descriptions.

Laboratory Data:

Data on the physical, chemical, engineering, and mineralogical properties of many soil series are stored in computers at the National Soil Survey Laboratory (NSSL)

The cell soil map files are organized as 80 column card-image files for each soil survey encoded. The cell-size is generally 10 acres but ranges from 2½ acres to 160 acres. The 80 column record includes codes identifying the soil survey project, state, column and row number, and abbreviated two character soil symbol. The data is stored at the **SCS** South Technical Center in Fort Worth, Texas, and is available on tape to users upon request.

Short-range plans are to: (1) update the working draft standards to include special soil map features, latitude-longitude coordinate file exchange, and more complete header records; (2) develop a more complete inventory of digitized soils data, by SCA and by others, and make general **districution** of such an inventory; (3) investigate and evaluate the accuracy of line-segment procedures for soil maps on non-ortho aerial photographic bases; (4) develop a procedure for contracting for line-segment digitizing.

Long-Range Plans:

Long-range plans are to: (1) develop procedures to aid SCS field offices in filling data voids, correcting errors in the data bases and applying data to the automation of field office and field tasks; (2) document and define the soil data items and develop a data dictionary for all the soil data collected, (3) document relationships between soil data attributes; (4) identify and document linkages and relationships between soils data and other natural resource data; (5) determine the appropriate combination of DBMS software and computer hardware that will be available to SCS and other users; (6) determine and document the most efficient way of storing the attribute data in the selected DBMS, and coordinate data in the geographic data base; (7) develop software to link the attribute data with the geographic information system; and (8) to load the data into computer systems for trail, use, and evaluation and then implement the integrated system.

Data Management:

A normal step in the evolution of processing data in an organization is "going data base." To some, going data base simply means using a data base management system (DBMS), which is a commercially available software product. To others, it means the integration of several independently developed application systems that have overlapping data requirements. To still others, it means the ability to get reports by issuing commands rather than by writing programs. Going data base for the SCS includes all three.

The American National Standards Institute (ANSI) has developed a three-level model of data base systems that is useful in understanding our task. A part of that model is depicted in figure 2. For each program or human user, there are separate view, or schema, of the data stating what types of data are available. At the logical or conceptual level, there is a single view of schema stating what types of data there are. This view is essentially a union of all the user views. An important characteristic of these two levels is that they do not show how the data is stored. That function is reserved for the physical level where there are a set of file organizations each of which positions, orders, and, in some cases, indexes a set of data.

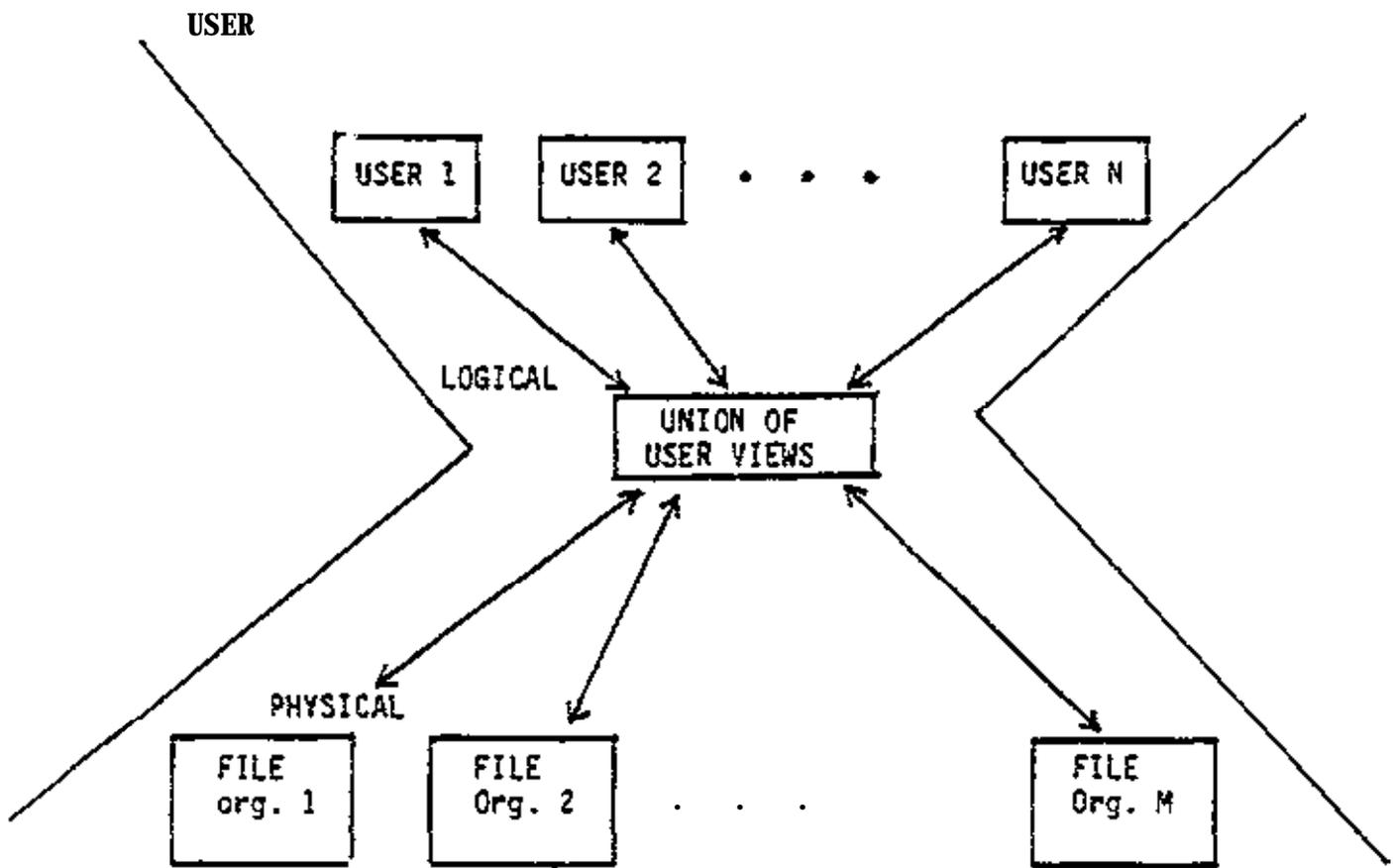


Figure 2.--Three-level model of a data base system (1).

Going data base has several advantages. Data independence is one. Data independence means that the DBMS insulates application programs from changes in how the data is stored. A second important advantage is increased speed and ease of use by two types of users--programmers don't have to write file manipulation routines and non-programmers can use a high-level command language to define, update, and retrieve data. Other, secondary advantages are: redundancy control, inconsistency control, standards enforcement, security and integrity capabilities, and lower overall cost,

These benefits are achieved at some price. DBMS have overhead costs: they take up space and time in the computer, they require competent support people, and they require the intellectual effort of designing an integration system by people, in this case soil scientists, knowledgeable in the uses of the data.

To obtain the above benefits, the first step is to determine what types of data exist and how they are named and related. We are identifying, documenting, and communicating knowledge about data through a graphic form called a logical data structure (LDS). An LDS is simple, consisting of only five major notions: entity, attribute, relationship, relationship descriptor, and identifier. Figure 3 is a graphic representation of an LDS for a simple management application.

An entity is a generic group of objects about which information is maintained. An entity instance is a unique occurrence of an entity. In figure 3, "employee" is an entity and an individual employee would be a entity instance.

Entities are described by attributes and relationships with other entities. Attributes are characteristics of the entity. Attributes of an employee are the person's name, employee number, age, etc. Relationships are structural associations; in the LDS in figure 3, "employee" has a relationship with the "department" because employees work in departments. An attribute is a single valued descriptor of exactly one entity. A relationship is binary; two entities participate in a relationship. Each entity in a relationship both describes and is described by the other; thus, there are exactly two descriptors for each relationship. The degree of a relationship descriptor is the number of instances of the describing entity that are associated with a single instance of the described entity. Relationship descriptors may be either single-valued (degree is one) or multivalued (degree, or average degree if it is variable, is greater than one.) At most, however, only one descriptor of a relationship may be multivalued. In figure 3, there are both employees-of-department and department-of-employee. Since there are many employees in a department, the degree of employees-in-departments is greater than one. Since each employee is in only one department, the degree of department-of-employee is equal to one. Multivalued relationship **descriptor** are represented by "chicken feet" in figure 3.

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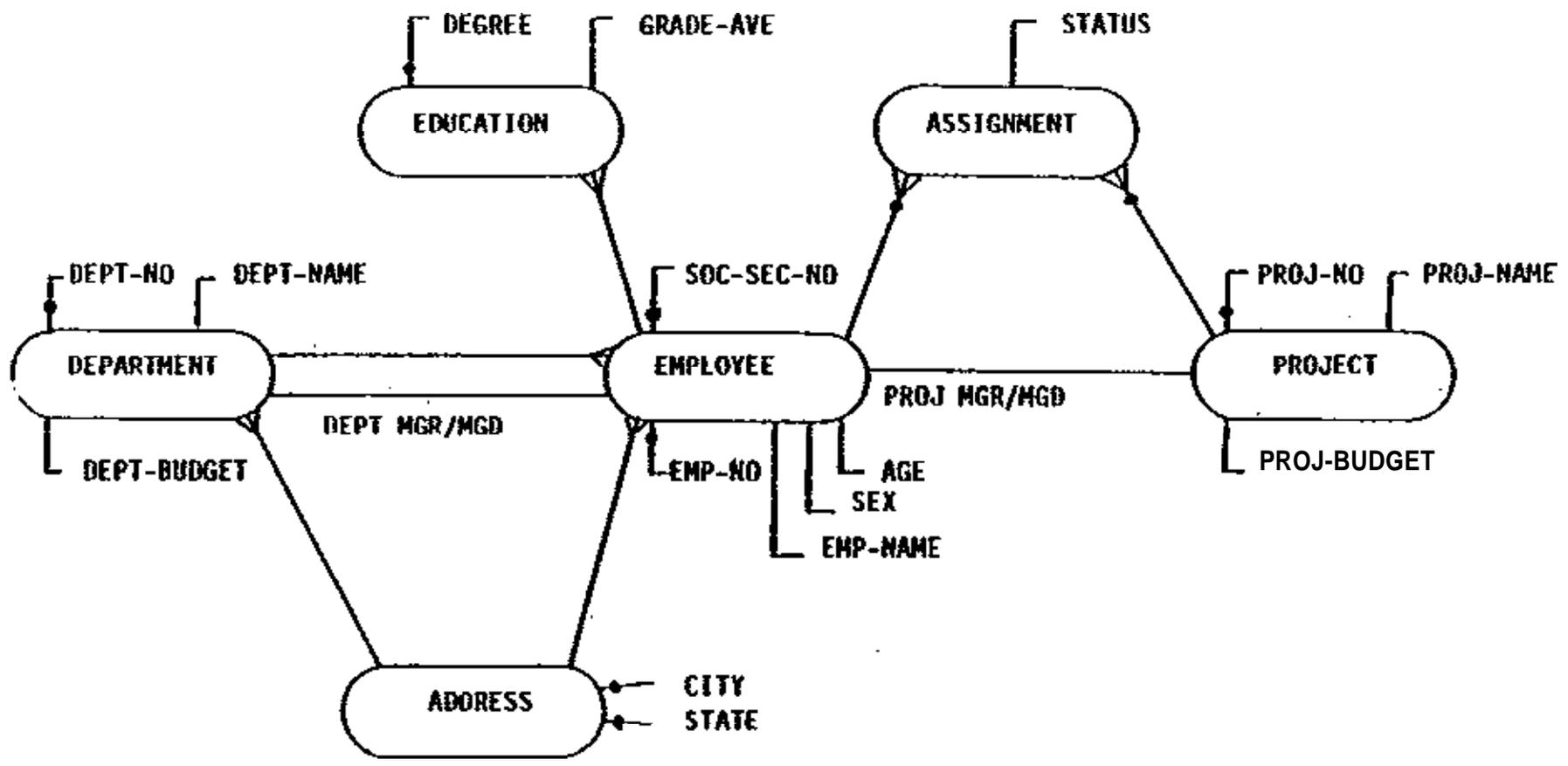


Figure 3.--Logical Data Structure (LDS) for typical employee, department, and project relationships.

The fifth LDS notion **is** the identifier. An identifier is a subset of attribute or relationship descriptors whose values are unique for each entity instance. Each entity has one or more identifier; the first subset is termed the primary identifier. For the example in figure 3, the primary identifier for the entity "employee" is the attribute "employee number," and a secondary identifier is the attribute "social security number."

The intent of the LDS is to capture unambiguously the data's semantics. To do this, the LDS must be well formed, that is, attributes must be single valued and every entity must have at least one identifier. The data must be homogenous--every instance of an attribute must have the same meaning. An example of non-homogeneity is the FIPS code, in which a value may refer to a state or (almost) a continent. Given that the LDS is well formed, the proper way to judge its quality is its fidelity of meaning. Does it express the **user** community's view of the world? Does it use **meaningful words**? A poor choice of words means that the LDS won't communicate. A poor structure won't capture the meaning and therefore can't store useful data.

An LDS can be developed by examining existing documents and programs and by interviewing **users**. Documents exist for each application system but are of varying quality. Names of data and encoding schemes differ for different applications. Program source coding may be the only accurate repository of how data gets transformed. For manual systems and especially when integrating independently developed applications, interviews with real people (here, soil scientists) are absolutely necessary for uncovering subtleties in the data and for recognizing and resolving conflicts in the different definitions and user applications of the data.

The Soils LDS:

The Logical Data Structure (**LDS**) approach to data base management system design has been used for several years on management-type data. The SCS is applying the LDS approach to data base management system design on natural resource data. Figure 4 illustrates how LDS data types relate to soil data. "Soil series" is an entity. "Soil series name" is one attribute of the entity "soil series." Relationships between entities **are** identified by a line connecting the entities; and each relationship has two relationship descriptors. There are both (many) soil series-of-taxonomic classification and taxonomic classification-of (one) soil series. There are many soil series in one soil taxonomic **classificatin** but only one taxonomic classification of a series. Each entity has one or more unique subsets of identifiers. The entity "soil series" is identified by both the soil series name and the taxonomic classification. The entity "taxonomic classification" is identified by a code as the primary identifier and by a name as the secondary identifier.

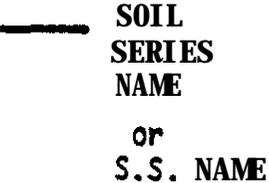
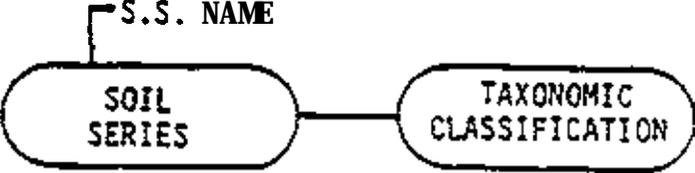
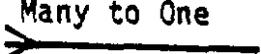
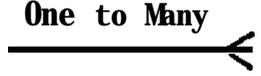
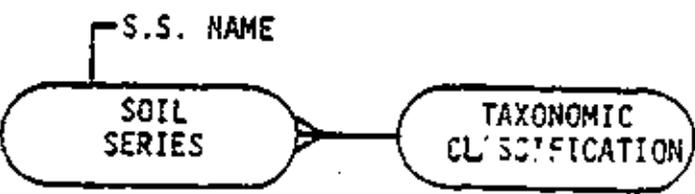
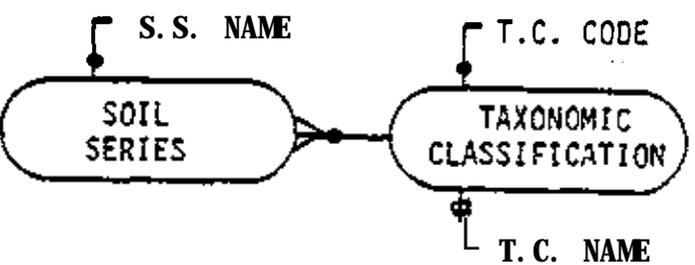
LDS DATA TYPES		
NAME	GRAPHIC REPRESENTATION	AGGREGATE EXAMPLE
ENTITY		
ATTRIBUTE	 SOIL SERIES NAME or S.S. NAME	 S.S. NAME
RELATIONSHIP		 S.S. NAME
RELATIONSHIP DESCRIPTOR	One to One <hr/> Many to One  One to Many 	 S.S. NAME
IDENTIFIER	<ul style="list-style-type: none"> • Primary ◻ Secondary 	 S.S. NAME T.C. CODE T.C. NAME

Figure 4.--Logical data structure (LDS) notions as they apply to soils data.

The LDS for the primary SCS soil survey data is being developed as the first step in "going data base" with SCS's natural resource data. The documentation of this data knowledge has been acquired through the use of existing documents and through meetings and workshops with soil scientists, economists, and other **resource** scientists who are familiar with natural resource data. There have been many discussions and disagreements over data definitions, data collectors and users to look at the whole and come to an agreement on definitions and relationships. This is essential for all DBMS's and for obtaining consistent results in any evaluation and analysis of the resources.

Figure 5 illustrates an LDS for **some** of the soils data that have been documented thus far. The first component of the LDS developed was for the soil series-soil taxonomy relationships. This relationship is simple compared to relationships for the other soil data components. For example, starting with the soil series, there are many soil series **in** one family, many families in one soil subgroup, and so on through each higher level in the classification **system**. There is only one of each soil family attribute, such as taxonomy particle size, for each soil family; but there are many soil families that have the same taxonomy particle size.

The second component of the LDS shown in figure 5 is the geographical relationships of the soil map unit. There are many soil map units in one soil survey area, but each soil map unit is in only one soil survey area. Note that there is a county-soil survey area combination entity between the county and the soil survey area entities. This is required because one county may contain more than one soil survey area, and one soil survey area may contain **more** than one county. A direct relationship between county and survey area would represent a many-to-many relationship, which is not allowed in a LDS.

The third component of the soils LDS is the soil map unit-soil composition relationships. The reality here is that one soil map unit may have no or many soil components, no or many miscellaneous land types, and/or no or many soil **inclusions**. One soil component, one miscellaneous land type, or one soil inclusion may occur in **more** than one soil map unit. This requires us to put in three combination (assignment) entities so that we can document that the appropriate soil component et al. is in combination with the appropriate soil map unit. Note that the soil component and the soil inclusion entities are identified by both the soil series entity and the soil phase entity.

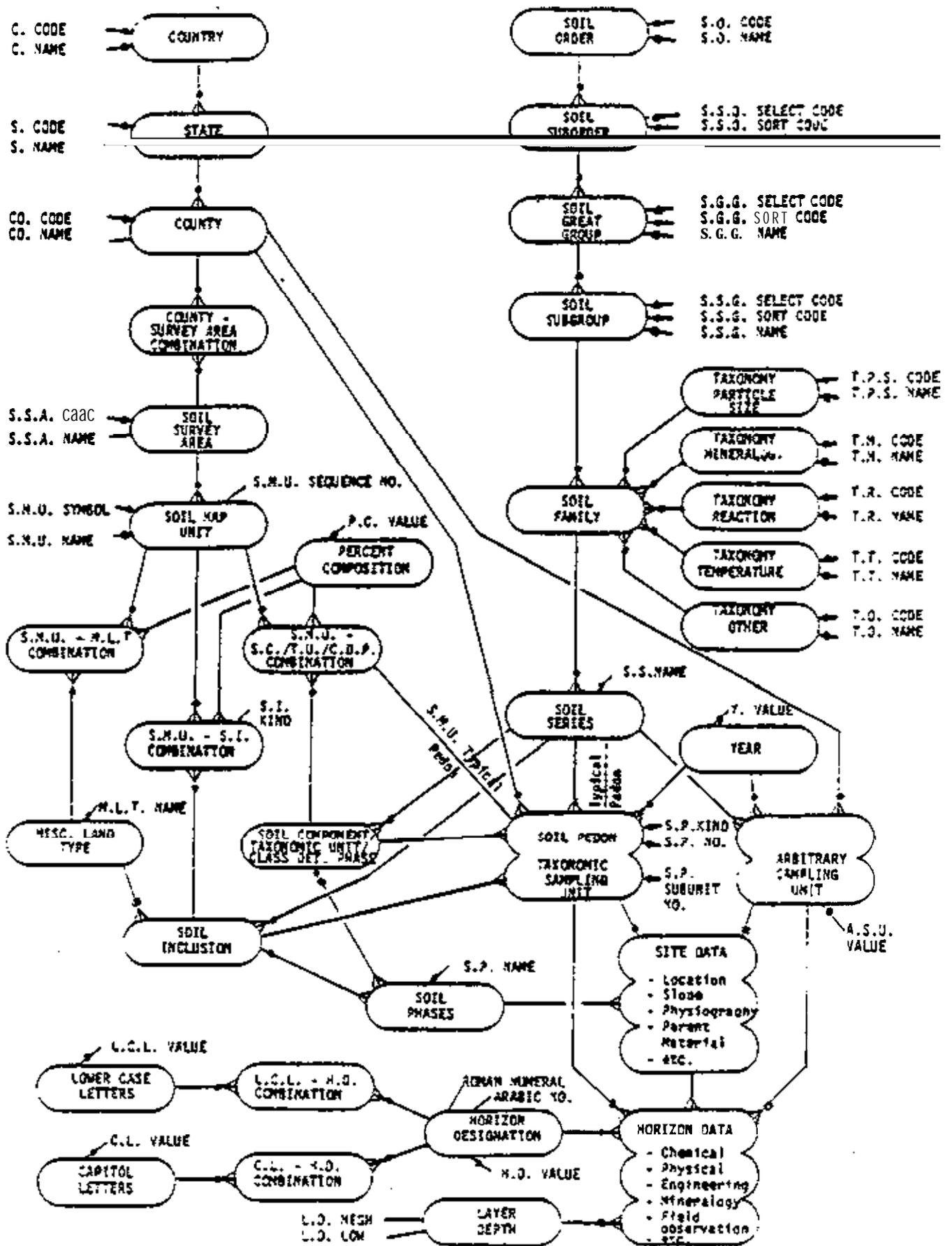


Figure 5.-- Abbreviated Logical Data Structure for some soils data relationships. Included are the Soil Series - Soil Taxonomy relationships, the soil map unit-geographic location relationships, the soil map unit-component relationships, and the soil pedon data relationships.

The last component shown on figure 5 is the sampling unit-site and horizon data relationships. This illustrates that one soil series may have many soil pedons, which we call taxonomic sampling units, and may have many arbitrary sampling units. One sampling unit has one set of site data such as location, parent material, etc., and one site may have many sets of horizon data such as field-observed data (color, texture, structure), chemical and physical data, etc. Note that the horizon data primary identifier is horizon designation if the data are from taxonomic sampling units and the horizon data secondary modifier is layer depth if the data are from arbitrary sampling units.

Also note the one-to-one labeled relationships between the soil pedon entity and the soil series and the soil map unit soil **component/taxonomic** unit/class determining phase combination entities. This relationship reflects the typical pedon that represents the official series description of the soil series and the typical pedon for the soil components in the soil map unit.

The LDS for all the soil attributes associated with the sampling unit site and horizon data have been developed. This structure accounts for most of the kinds of soil attributes collected. We will continue to expand the LDS until all the soil data are documented. The complete LDS will include all the other resource data, such as data for yields, land use, etc. that have been collected on sites where the kind of soil has been identified.

The completed LDS will enable us to determine the kind of DBMS that would be the most efficient and cost effective for managing our natural resource data. The step following the selection of the proper DBMS will be the development of the physical data structure (**PDS**).

After the implementation of the total integrated soils system in 1985, the SCS will be able to retrieve all textual and quantitative properties of a given soil phase; perform searches on specific properties of soils; specific classification or taxonomy of soils; and, if the soils map has been digitized, go from location to soils to interpretation. The long-range goal of the effort is to provide electronic graphic display of soils at the field survey level to assist in both survey operations and land use decisions.

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SOIL **RESOURCE** INFORMATION SYSTEM (**SRIS**)
AUTOMATED **RESOURCE MANAGEMENT** PLANNING SYSTEM (**ARMPS**)

BACKGROUND

The USDA-Soil Conservation **Service** in Colorado is developing **two** major computer assisted systems designed to assist in natural resource planning. The

DEVELOPMENT METHODS

SRIS DATA SOURCES

TABLE 1

The first table is a **summary** of map unit data extracted **from** the SRIS data bases, the **second** displays the **calculated USLE** output.

SOIL EROSION FACTOR TABLE
DAVID ANDERSON FARM

SERIES NAME	SURFACE SLOPE %		CAPAB. USLE FACTORS							WIND ERO. C WEG	SOILS5 NUMBER
	TEXTURE	RANGE	COMP	NIR	IR	K	T	R			
1) RIO10 COLBY SILT LOAM, 1 TO 3 PCT SLOPES											
COLBY	SIL	1- 3	85	4E	2E	.43	5	90	85	4L	KS0024
2) KIO4 BACA-WILEY COMPLEX, 0 TO 2 PCT SLOPES											
BACA	CL	0- 1	50	4E	2E	.28	5	90	85	6	C00004
WILEY	SIL	1- 2	40			.37	5			4L	C00055

8/24/83
DAVID ANDERSON FARM

SOIL LOSS TABLE

TILLAGE PRACTICES

HAPPING UNIT SUMMARY	UP & DOWN CROSS SLOPE CONTOUR			CROSS SLOPE CONTOUR WITH STRIPS
	HILL	WO STRIPS	FARMING	
KIO10 COLBY SILT LOAM, 1 TO 3 PERCENT SLOPES				
K= .43	R= 90	L= 200	# SEG= 2	
T= 5	C= .55	S=		

COMPUTERS
in Soil Survey

by Keith K. Young
Soil Information Systems Specialist
June 12, 1984--9:45-10:15

Computerized Data Available Now

You have heard much on plans for the future. Here are some things you can do now. You need a microcomputer, a word processor, or a terminal and the communications to hook into the soils data bases. You also need to know where to get the information to make it all work.

National Soils Handbook (NSH)

Most of the information you need to get going is in part 606 of NSH. Computer programs are available to assist in soil survey management, soil mapping, soil classification, soil interpretations, and soil investigations. You in SCS will also need to rely on your IRM coordinator, your Harris equipment operator, or someone from the NENTC on the IRM or SOILS staff.

Soil Survey Management

Computer assisted scheduling for published soil surveys (CASPUSS) provides operations, manuscript, and cartographic schedules listing all soil survey areas in a state, region or NTC. As you may have noticed, NTC and NHO rely heavily on the dates you enter into CASPUSS. Make sure you record your schedule changes.

Map Unit Use File (MUUF)

Continue to enter the data needed for the MUUF. You will be pleased with the ease with which additional data can be accessed.

Soil Interpretations Data

The SOI-5 data are available from several sources. They are available from Ames via the Harris or a word processor that has bisynchronous communications. They are also available from Champaign, IL through CERL with asynchronous communications via a microcomputer, a word processor, or terminal. An Interactive Soils Information System Users Manual has been sent to SCS state offices for distribution to NCSS cooperators. Logon and passwords are now available to SCS, contact the IRM coordinator. Other NCSS cooperators can get assistance to access this program by calling Bill Goran, US Army Corps of Engineers, CERL at (217) 352-6511.

Soil Classification Data

The soil classification file currently stored at Washington Computer Center (WCC) is accessible for retrieval via Harris computer terminal equipment or word processors with communications. You can select soils by state or region, and either in alphabetical or family groupings.

Soil Series Descriptions

Official soil series descriptions are available from WCC via Harris equipment or word processing equipment with communications. Work with the NENTC soils staff to enter the official series descriptions for which you are responsible.

Soil Investigations Data

Much of the laboratory data is now on tape and is accessible by personnel in the NSSL at Lincoln. If you have need for lab data call Ron Yeck and have it retrieved for you. Eventually these data will be in a data base that you can access from your own terminals.

Field Office Communications and Automation System (FOCAS)

The SCS plans to automate its 2,761 field offices, area offices, project offices, state offices, NTC offices and the NHD offices that support field offices. Field offices will be equipped with microcomputers having local data storage, stand alone computing capability, a printer and communications. State offices will be getting minicomputers that have greater data storage and will be able to communicate with the micros or the mainframes. Figure 1 shows a schematic of this configuration.

The long range objective is to create in each field office the capability for electronic mail, word processing, local data base management, electronic spreadsheet, business graphics, remote access, data entry and edit. The benefit is to allow SCS soil conservationist more time to work with farmers, ranchers, and other land users in stepping up planning and applications of soil conservation systems. The cost is approximated at \$150 million over 5 years at a benefit-cost ratio of 1.47.

Software will be available for special purpose applications such as conservation planning, soil interpretations, erosion analysis, irrigation management/water conservation, engineering planning and design, economics of conservation systems, impact and progress analysis, and natural resource data abase access.

On June 1, 1984 the Department decided that SCS and FmHA would join together for the procurement of the hardware and software needed to automate the two agencies. A market survey determined that at least 5 vendors are interested in bidding on this procurement. If all goes well, the first of the computers should be arriving in the field offices next June.

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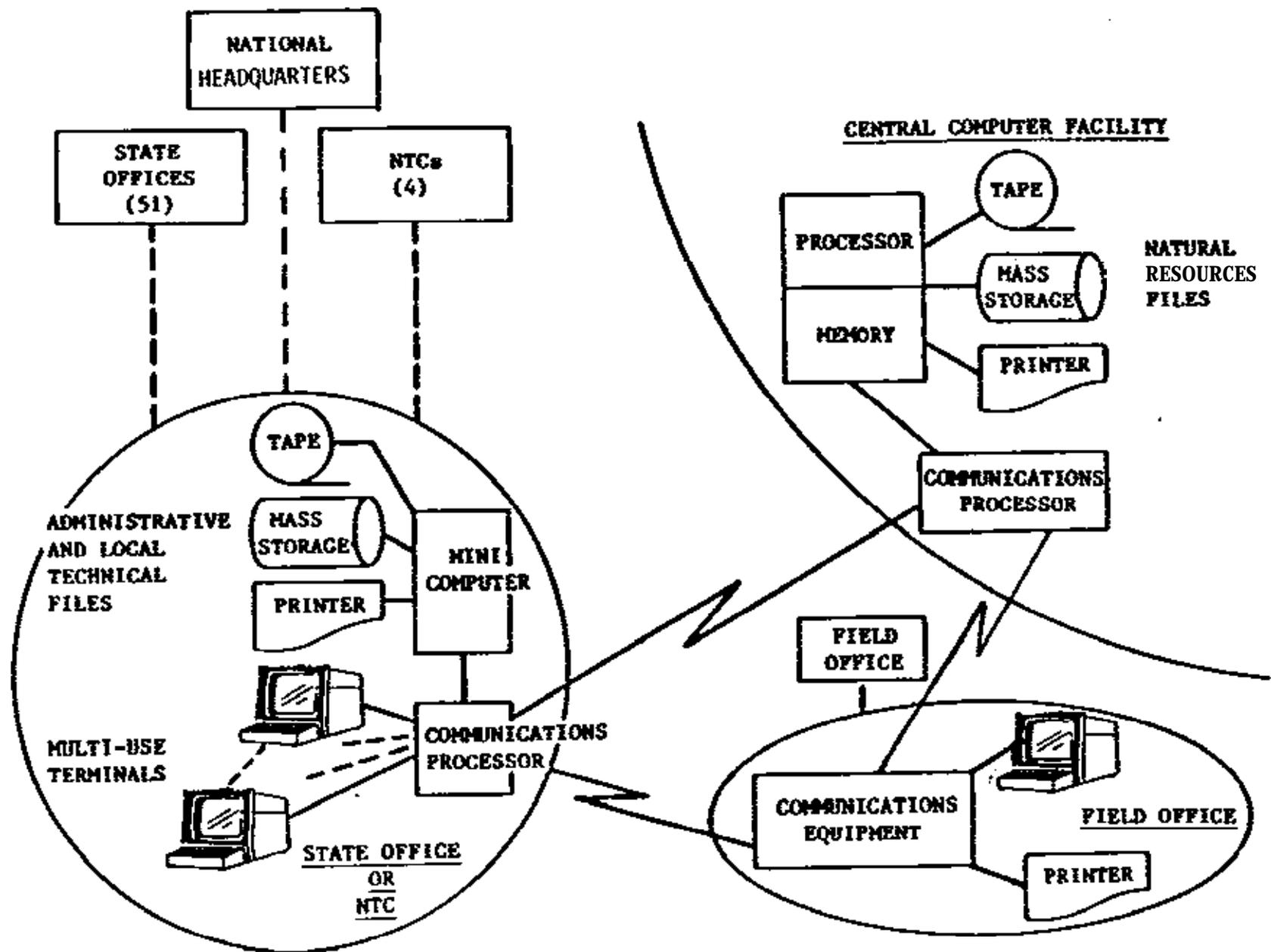


FIGURE I.--Field Office Communications and Automation System (FOCAS)

Modeling and Soil Survey.

Klaus W. Flach
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We have paid a lot of attention to modeling in the last few years and modeling has been important in malting new uses of soil **survey** information, **Like** most new and rapidly evolving developments in any science, modeling has its fervent supporters and its equally fervent detractors. Personally, I stand firmly in both camps. Modeling has been badly misused by many people in government and in the universities. Models are being used for purposes for which they had never been intended and model predictions are being treated as facts where they are nothing better than fancy guesses.

But I also hold the opinion that modeling represents one of the most exciting developments in soil science and that through models we will gain truly basic understanding of soils and unprecedented use of soil survey information.

Modeling is nothing new to soil science. Any good soil mapper develops a model of the relationship between Kinds of soils and the landscape and he 'maps ahead" using this **model**..**He** usually has difficulties when he tries to verbalize such a model, let alone putting it into quantitative terms, but he could not function effectively without it. Our classification systems are essentially **based** on classes superimposed on more or less intuitive models of the relationships among soils; the development of Soil Taxonomy was perhaps the most systematic and conscious effort along such lines.

Kinds of Models.

Models may be classified into two broad groups, stochastic or statistical models and process or physical models.

In stochastic models relationships among experimental observations are put into mathematical form through statistical techniques. Parameters may be based on Known physical relationships or they may be more or less arbitrarily chosen. Stochastic models can only be used within the limits of the universe in which they have been developed. Within these limits ~~they~~ commonly give reasonably realistic results.

In process models mathematical expressions of quantitatively established physical or chemical processes and measured or predicted forces that drive these processes are used. If the processes and the forces driving them are sufficiently well understood, a process model can be used anywhere where the processes used in the model describe the system that is being modeled. In soil science, process models can be applied anywhere, but results may differ greatly from the real world if the processes are **incompletely** understood.

Most models we are using now, e.g. the USLE, are a mixture of stochastic and process models.

Computers allow us to develop more complex models and to execute them faster than **was** possible before. In fact, many if not most of the models that we are using now in soil science would be of only academic value if it were not for computers. The remainder of this paper will be restricted to computer processed models.

Computer science is developing rapidly in ways that will **make** modeling a very practical tool to the soil scientist in the near future. At the one extreme, large main frame **computers** are getting so fast and are getting such large memories that incredibly **complex** models of the three dimensional soil universe can be developed. At the other extreme, portable micro's can be **taken** to the field and answer reasonably **complex** problems on the spot. An exciting relatively recent development is Expert Systems or Artificial Intelligence which **take** much of the drudgery out of **programming** and make it possible to merge different models with reasonable effort.

Some Existing or Almost Existing Models Related to Soil Survey.

The heading of this paragraph reflects the author's longstanding association with modelers. Models will be **o.k.to-morrow**; they are rarely perfect to-day. Numerous models have been developed that serve soil survey or that use soil survey information. The following are a few examples:

1. Soil Moisture Regimes (Newhall) Model. A very simple but useful model to estimate soil moisture regimes as defined in Soil Taxonomy. Originally developed for manual execution, it was adapted to computer processing later. The model was developed by SCS and later rewritten for FORTRAN by Or. **VAN WAMBEKE** of Cornell University.
2. Chemical, Runoff, and Erosion of Agricultural Management Systems (CREAMS 1 and CREAMS 2). A field scale model to assess non-point source pollution and the effects of alternative management practices. **CREAMS1** is operational, **CREAMS2** will be soon. Primarily a process model. Soil information is used in terms of hydrologic classification of soils, curve numbers, and the K value for the **USLE**. Developed by **ARS**.
3. Erosion Productivity Impact Calculator (EPIC). This is a process oriented model to calculate the effect of erosion on potential soil productivity. The model is operational and is being used to prepare materials for the **1985** RCA report. It uses detailed pedon data for representative soil series as well as data on slope length, percent slope, etc. from the Natural Resource Inventory (**NRI**). The model is driven by a "Weather Simulator" that simulates daily weather conditions over long periods of time. A diagram, showing the interaction of the various components of EPIC is **shown** in figure 1. It was developed by **ARS** scientists with strong support from **ERS** and **SCS**. An advanced version of this model, **ALMANAC**, is being developed for facilitating **technology** transfer between experiment stations and farmers in developing countries.

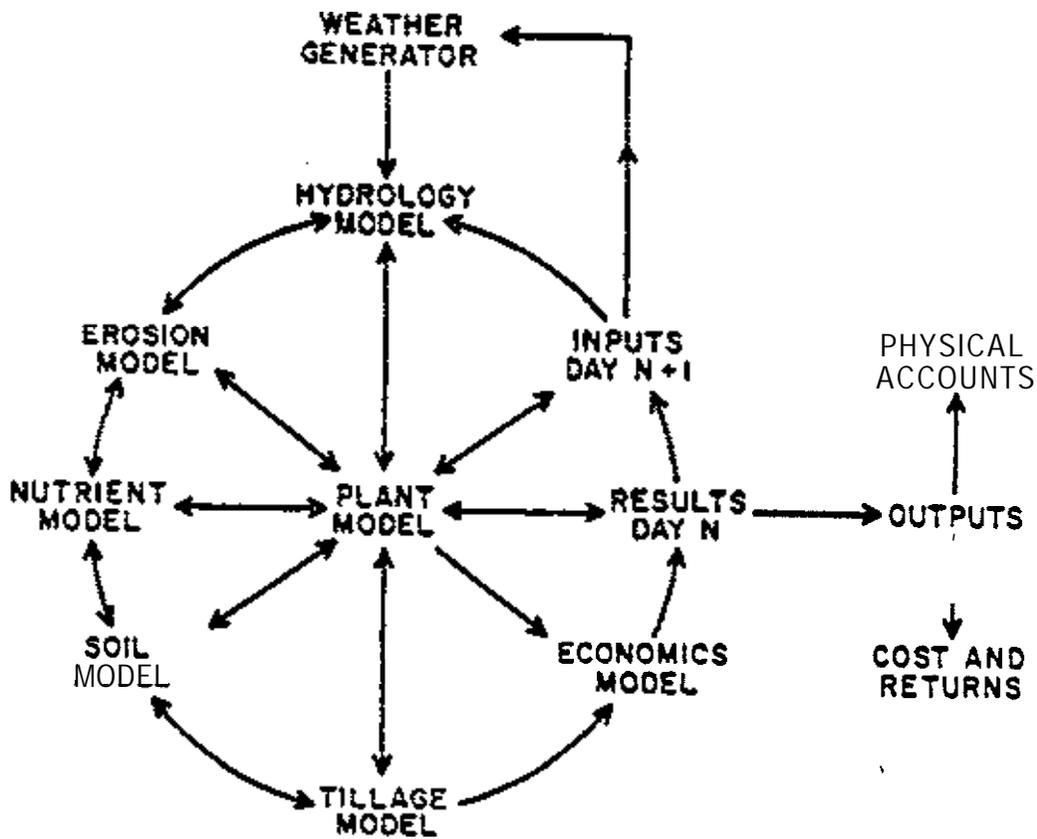


Figure 1 - System Linkage Diagram - EPIC

4. Productivity Index Model. (Larson Model) Like EPIC, this is a model to simulate the effect of erosion on productivity. Primarily a statistical model using relationships between soil properties and productivity that had been developed for a number of Missouri soils. The model uses soil information from the **NRI**, and means of ranges and other parameters from **SOILS 5**. The model has been used extensively to simulate the effect of erosion on soil productivity in the Mid-West and in various other parts of the world. It was developed by an **ARS/University of Minnesota** team.

5. The SOILEC model. This model has been developed at the University of Illinois to calculate economic costs of erosion for designated kinds of soils and the costs and benefits of various conservation alternatives. The model uses information from **SOILS 5** and from field observations. The model is operational and can be run on a **IBM** personal computer.

Numerous other models are being developed by **ARS** or by various Agricultural Experiment Stations. Some of them are operational in a research setting.

What Soil Survey can do for Modeling.

One of the most important contributions of modeling, so far, has been to demonstrate to soil scientists in other disciplines and to many potential users the value and importance of soil surveys. Most renewable natural resource models need the kind of data soil survey can **supply**. At this point in time the **SOILS 5** data base is used extensively by many groups of

modelers. But there is increasing demand for more detailed data bases both in terms of soil properties and in terms of the distribution of soils on the land surface. **Early** modelers attempted to **develop** systems that they thought would give the best approximation of the real world without much concern for the availability of data bases that would allow the use of such models over large areas of land. This situation is changing rapidly now; modelers **know** that they must produce systems that can be used easily and this means **using** an available data base. And they have discovered that Soil Surveys are about the only **base** available.

What Modeling can do for Soil Science.

We should be grateful that **modeling** has contributed to a new appreciation of the value of soil surveys, but modeling can do much more than that for soil survey and, **looking** at it more broadly, for soil science.

For **one** thing, modeling will allow us to **make** much better and more sophisticated interpretations for many uses of soil surveys. Modeling will also help us to generate more precise data on such soil attributes as moisture and temperature regimes. Actually, we have done much of this kind of thing already when we developed "**computerized** interpretations" to help us **complete** SOILS **5's**. Those are models, simple perhaps, but they are.

Far beyond this, **I** believe that models will help us to **make** soil science into a quantitative science. Lord Kelvin said many years ago that a science must be able to define **things** quantitatively to deserve being called a science. Until recently, the systems we were dealing with seemed to be much too complicated for exact quantitative expression but computer modeling has changed this situation drastically. Using weather generators **like** the one developed for EPIC, and using models of water movement in soils that have been developed for the various hydrologic models, we should begin to be able to model processes of soil formation. There should be no difficulty in simulating **5** or 10 thousand years of soil formation. We should be able to explain why certain soil horizons occur in certain positions in the soil profile and why the distribution of organic matter or of bases in the soil profile is different under different kinds of **vegetation**. And after we **have** answered some of the relatively simple questions of the one dimensional soil profile, we should be able to start addressing the interactions between three-dimensional soils with their three-dimensional environments.

Some of these things may appear rather academic but **I** believe that they are not. We will be **asked** more and more to predict how man's action is going to affect the environment. We are being **asked now**, whether and how no-till, where we no longer incorporate residues in the soil, will affect run-off and leaching as well as organic matter content, soil temperature and soil moisture regimes. Some of these changes may **take** many years and when we see the consequences, it may be much too late to do anything about them. We have learned in **working** with EPIC that simply running a model for a **long** enough time is the best way to find errors in the data base or errors in the mathematical formulation of processes. And, the only way to judge the adequacy of models for predicting the future is the modeling of pedologic history.

What Models can't do.

Models can never **give** perfect answers to all **questions** in all places. They can only reflect processes, conditions and interactions that the creator of the model anticipated. And we all know that the real world is much too complex for us **ever** to be able to anticipate everything. A model may predict, let's say the trends and average values for base saturation across a landscape excellently; but at the spot where the glacier dumped a calcereous erratic, or the farmer a load of lime, it will be dead wrong. We may still use a model for site predictions, simply because the actual measurement may be too costly and time consuming, but we must **never** forget that we are using estimates from a model and not actual measurements.

Unmet Needs in Concepts and Information.

We need better information on how water enters the soil profile; infiltration rates and how they change with time between planting and harvest; and we need better information on how water is likely to move across the soil landscape. **In other** words, we need much better information on the characteristics of the surface soil and how they change with time, and we need better map unit descriptions. Slope length, slope shape, and what soil occurs where in the landscape. There needs to be discussion between modelers and soil surveyors how to obtain and how to quantify **this** kind of information.

We also need to work on our data bases. For one thing we need to improve their quality. Our SOILS **5** data base, for example, was plenty good enough for the purposes for which it had been intended. **But** when modelers tried to use it, they found it **very** difficult to cope with missing data. The same is true for our pedon data. A bulk density value determined by a non-standard method made the best soil in California totally **unproductive** **as** far as EPIC was concerned. It is **very** difficult to find all these little errors. The people working with EPIC finally decided just to run the model and look for errors in the data base if they got impossible results.

I believe we need a data base of rather detailed data, such as the data in the Pedon Data File, consisting of pedons that in our best judgment represent the central concept of the 4 or 5 most important kinds of soils, phases of **taxa**, of map units. And we need this information for map units of detailed soil surveys when dealing with individual farms, for map units of county soil association maps for county wide studies as well as for state and national maps. For most of these studies, the accuracy of the soil boundaries are relatively unimportant as long as we don't distort areas seriously, but the composition of the map units and the quality of the soil selection are **very** important.

Summary.

1. Models quantify; they help make a science out of a discipline.
2. Models test the state of the art.
3. Models force interdisciplinary cooperation.
4. Models are only as strong as their weakest **link**.
5. Models can be no better than their data base.
6. Stochastic models cannot be extended beyond the universe from which **they** were developed.
7. Process models cannot be better than the understanding of the processes on which they are based.
8. Modeling of renewable natural resources requires **a** high quality soil survey data base.
9. **Modeling** tests and improves our understanding of what controls the nature and distribution of soils.
10. Current soil survey data are inadequate to model the movement of water into the soil and in the soil landscape.
11. Modelers need a data base representative of soil map units at various levels of generalization.

APPLICATION OF GROUND PENETRATING RADAR (GPR)
to the NATIONAL COOPERATIVE SOIL SURVEY PROGRAM

SUMMARY

In recent years increased attention has been focused on a unique radar system which produces a continuous profile of subsurface conditions. Known as Ground Penetrating Radar, this new technology has been specifically designed and used as an efficient reconnaissance and investigative tool. Investigators working in earthen materials have found that this new technology permits meaningful observations to be made in many kinds of soils. In 1978 the Soil Conservation Service (SCS), in cooperation with the National Aeronautics and Space Administration (NASA), and Technos, Inc. of Miami, FL, investigated the potential of using Ground Penetrating Radar in soil surveys. The Ground Penetrating Radar was found to have the ability to detect, range and trace the lateral extent of many soil horizons.

On the basis of these studies, the Soil Conservation Service purchased a Subsurface Interface Radar (SIR) System-S from Geophysical Survey Systems, Inc. of Hudson, NH. The Subsurface Interface Radar System-8 consists of a control unit, a power distribution unit, an EPC Laboratories, Inc. Model 2208S graphic recorder, and a Hewlett-Packard Model 3964 tape recorder. Three antennas, having center carrier frequencies of 120, 300, and 500 MHz are being used by the Soil Conservation Service to investigate earthen materials. An 80 MHz antenna has been added to facilitate geologic and sedimentological studies. This system was located in Gainesville, FL in 1981. Subsequently, a second similar system has been purchased and is also located in Florida.

Ground Penetrating Radar data is obtained by transmitting electromagnetic pulses into the soil and then receiving the reflected pulses from a subsurface interface. The data is displayed on the graphic recorder or can be stored on tapes for future use. Profiles are developed by towing the antenna across the ground surface. Depth of penetration is governed by the dielectric constant and conductivity of the medium. As a general rule, the more abrupt the interface and the greater the differences in electromagnetic properties across the interface, the stronger the reflected signals. Detection and identification of soil horizons has proven to be and still is extremely site specific depending on a number of soil properties. These properties include electrical conductivity, clay content, clay mineralogy and content of coarse fragments.

Soil interfaces which produce strong reflections in mineral soils include the following: alhic, argillic and spodic horizons: lithic, paralithic and water tables, roots and lamellae in some coarse-textured soils. In organic soils Ground Penetrating Radar technology is being used to: determine the depth and thickness of organics, characterize and profile sediments at the base of organic deposits, estimate the degree(s) of humification, and classify organic soils.

Interfaces which produce weak reflections include the following calcic and peteocalcic horizons, zones of plinthite and reticulate mottling, and contacts between moderately fine or fine-textured argillic horizons and limestone bedrock. Subtle boundaries, such as a slight or gradual increase or decrease in texture, color or organic matter content, also produce weak reflections.

The actual depth to soil horizon interfaces is easily determined and their lateral continuity defined by correlating a limited number of soil borings with the graphic printout. Usually, one soil boring and description will suffice to identify and determine the depth to major subsurface interfaces along an entire transect.

Since the Soil Conservation Service purchased its first Ground Penetrating Radar in 1981, the system has been used primarily as a quality control tool to document the composition of soil map units and to verify soil profile characteristics. The Ground Penetrating Radar requires less personnel and time than conventional methods to obtain infinitely more transect data, since a record is made of the entire transect length, not just at specific sites along the transect. An excellent opportunity to compare the results of the Ground Penetrating Radar with those obtained by conventional transect methods has been afforded by the soil survey updates in Hillsborough, Orange, and Sarasota Counties in Florida. In each of these counties, the composition of the map units were redefined and recorrelated on the basis of random transects. Data were collected by conventional methods in Sarasota County with an average crew size of five soil scientists. In Hillsborough and Orange Counties, the Ground Penetrating Radar crew consists of either two soil scientists or a soil scientist and a soil conservationist.

The Ground Penetrating Radar decreased the cost for each transect by 70%, while increasing productivity per man hour by 210%. Expenditures on salaries, per diem, and travel (one vehicle used instead of two or three) are drastically reduced with the Ground Penetrating Radar system. The Ground Penetrating Radar has recorded 400 KM of continuous transect data in Hillsborough and Orange counties. With the Ground Penetrating Radar, estimates of the composition of map units are based on records of continuous observations, rather than being restricted to inferences based on a limited number of site specific observation points.

The potential uses of Ground Penetrating Radar are still being tested and discovered under varying soil types and conditions in different regions of the United States. Ground Penetrating Radar has been applied to archaeological, engineering, **geologic**, sedimentation and soil investigations in Alabama, Florida, Louisiana, Minnesota, Oklahoma and Tennessee. Ten states have been selected by the Soil Conservation Service National Office for Ground Penetrating Radar field work during FY-84. Three states, Minnesota, Missouri, and Ohio have been selected from the Midwest.

The U. S. Fish and Wildlife Service's
National Wetlands Inventory Project
by
Ralph W Tiner and Bill O. Wilen^{1/}

Purpose

The purpose of this paper is to present an overview of the U. S. Fish and Wildlife Service's National Wetlands Inventory Project (NWI). Special attention will be focused on the status of wetlands mapping and the major findings of a study of wetland gains and losses between the mid-1950's and the mid-1970's. For discussion purposes, this paper is divided into three sections: (1) Overview of the National Wetlands Inventory Project, (2) Status of National Wetlands Inventory Mapping, and (3) National Wetlands Status and Trends Report Findings.

Overview of the National Wetlands Inventory Project

Introduction

The Fish and Wildlife Service (Service) has always recognized the importance of wetlands to waterfowl and other migratory birds, since 10-12 million ducks breed annually and millions more overwinter in the United States. Consequently, the Service has a direct interest in protecting wetlands, especially the breeding and overwintering wetlands.

Wetlands, however, also provide a wealth of other values for the public including:

- (1) fish and shellfish production - in the South Atlantic and Gulf of Mexico, 88% of the commercial fisheries landings and 70% of the recreational catch are fishes which depend on coastal marshes for spawning or nursery grounds;
- (2) furbearer and other wildlife production;
- (3) habitats for threatened or endangered plants and animals;
- (4) flood control through temporarily storing flood waters to prevent downstream loss of property and life;

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- (5) water quality maintenance by removing silt load, filtering pollution and absorbing water-borne chemicals and nutrients;
- (6) erosion buffers to protect upland areas;
- (7) groundwater recharge and stream flow maintenance;
- (8) saltwater intrusion control • freshwater inflow creates groundwater pressure that holds back saltwater thereby protecting public water supplies; recent diversions of freshwater have led to contamination of drinking water in many areas;
- (9) timber production;
- (10) coastal storm damage reduction • the value of mangrove wetlands is so important to reducing storm wave height and associated coastal property damage and erosion that their alteration is prohibited by the Federal Insurance Administration; and
- (11) open space for aesthetic appreciation and a host of recreational activities, such as hunting, fishing, hiking, nature observation and photography.

Because of their public values, wetlands represent one of the Nation's most important natural resources and should be regarded as highly as clean air and clean water.

Need for a National Wetlands Inventory

In 1954, the Service conducted a nationwide survey of wetlands which focussed on important waterfowl wetlands. This survey covered roughly 40% of the lower 48 States, being most concentrated in the Mississippi Flyway. Although not a comprehensive wetlands inventory by today's standards, it was instrumental in stimulating public interest in the conservation of waterfowl wetlands. These findings were published in a well-known Service report • "Wetlands of the United States" • which is commonly referred to as Circular 39.

Since this survey, however, wetlands have undergone many changes, both natural and man-induced. This, coupled with our increased understanding of all wetland values, led the Service to establish the National Wetlands Inventory Project (NWI) in 1975. The NWI aims to generate and disseminate scientific information on the characteristics and extent of the Nation's wetlands. The purpose of this information is to foster wise use of the Nation's wetlands and to provide data for making quick and accurate resource decisions. Decisionmakers cannot make informed decisions about wetlands without knowing how many, of what type, are where.

Need for Two Types of Wetland Information

Two very different kinds of information are needed: (1) detailed maps and (2) status and trends reports. First, detailed wetland maps for geographic areas of critical concern are needed for impact assessment of site-specific projects. These maps serve a purpose similar to the Soil Conservation Service's soil survey maps, the National Oceanic and Atmospheric Administration's coastal geodetic survey maps, and the Geological Survey's topographic maps. Detailed wetland maps are used by local, State and Federal agencies as well as by private industry and organizations for many purposes, including comprehensive resource management plans, environmental impact assessments, permit reviews, facility and corridor siting, oil spill contingency plans, natural resource inventories, wildlife surveys and other uses. Secondly, national estimates of the current status and trends (i.e., losses and gains) of wetlands are needed in order to provide improved information for reviewing the effectiveness of existing Federal programs and policies, for identifying national or regional problems and for general public awareness.

Designing the Inventory: Pre-operational Phase

Prior to actually beginning wetlands mapping, the NWI initiated a pre-operational effort to determine the best way to inventory wetlands. During this pre-operational phase, the NWI reviewed existing State and local wetland inventories and existing classification schemes and then selected a remote sensing technique for the inventory. All this work was done prior to full-scale wetlands mapping (the operational phase) in 1979.

Reviewing Existing Wetland Surveys

The first step of the pre-operational phase was to review existing wetlands inventories. The NWI consulted with Federal and State agencies to learn: (1) where and when wetland surveys had previously been completed, (2) what inventory techniques were employed, (3) where to obtain copies of any wetland maps that may have been produced, and (4) the status of State wetlands protection. Only a handful of States had inventoried their wetlands and most of these had only mapped coastal wetlands. These results were published in the Service's report "Existing State and Local Wetlands Surveys (1965-1975)."

Developing a New Wetlands Classification System

Before the inventory could begin, the NWI had to decide how to classify wetlands. Thus, in 1975, the Service brought together 15 of the country's top regional wetland scientists to evaluate the utility of existing wetland classification schemes for the National Wetlands Inventory. They determined that none of the existing systems could be used or modified for this purpose and that a new classification must be created.

The Service's wetlands classification system (Cowardin, et al. 1979) was developed by a team of wetland ecologists, with the assistance of local,

State and Federal agencies as well as many private groups and individuals. It went through four major revisions and extensive field testing prior to its official adoption on *October 1, 1980*.

The purpose of the classification system is: (1) to describe ecological units having certain **common** natural attributes; (2) to **arrange these** units in a system that will facilitate resource management decisions; (3) to furnish units for inventory and mapping; and (4) to provide uniformity in wetland concepts and terminology throughout the United States.

The classification defines the limits of wetlands according to ecological characteristics and not according to administrative or regulatory programs. Three key attributes define *the term* "wetland": (1) the presence of wetland plants (hydromphytes) or (2) the presence of wet soils (hydric soils) or (3) soil saturation or flooding. Wetlands are naturally extremely diverse and complex. The classification system presents a method for **grouping** ecologically similar wetlands and is the **state-of-the-art** in wetlands classification today.

The classification system is hierarchical (Figure 1) with wetlands divided among five major systems at the broadest level: Marine, Estuarine, Riverine, Lacustrine and Palustrine. Each System is further subdivided by Subsystems which reflect hydrologic conditions, e.g., **subtidal vs. intertidal** in the Marine and Estuarine Systems. Below Subsystem is the Class level, which describes the appearance of the wetland in terms of vegetation (e.g. Emergent, Aquatic Red, Forested) or substrate where vegetation is inconspicuous or absent (e.g., Unconsolidated Shore, Rocky Shore, Streambed). Each Class is further subdivided *into* Subclasses. The classification also includes modifiers to describe hydrology (water regime), water chemistry (pH, salinity and halinity) and special modifiers relating to man's activities (e.g., impounded, partly drained, farmed, artificial).

Selecting a Remote Sensing System

Due to the magnitude of a national inventory, remote sensing was the obvious technique for inventorying the Nation's wetlands. In 1975, the basic choice was between high-altitude photography and satellite imagery (LANDSAT). After comparing LANDSAT's capabilities with the Service's and other agencies' needs for wetland information, it was evident that LANDSAT could not accurately detect or classify wetlands. A comparison between wetland maps produced by the Corps of Engineers through LANDSAT and by the NWI through high-altitude photointerpretation for an area in the Prairie Potholes revealed that LANDSAT did **not** detect 61% of the wetlands identified by NWI and could only separate 3 crude wetland types, while NWI separated 15 types. This and other studies have shown specific problems with LANDSAT including: (1) fixed orbit prevents opportunity to capture optimum water conditions for wetland detection, (2) detection of linear and small wetlands, (3) identifying forested wetlands, (4) identifying ditched, diked and impounded wetlands, and (5) separating natural ponds from impoundments. Recognizing *these* drawbacks, the Service chose high-altitude photography as the source for the NWI.

The Service participates with 1.2 other Federal agencies in the Federal High-Altitude Photography Program. These agencies all need the detailed information obtained from the Program's 1:50,000 color-infrared photography. With this imagery, NWI is mapping wetlands generally between 1-3 acres in size, although in the Prairie Potholes the minimum mapping unit approaches 1/10 of an acre. A major advantage of the photointerpretation method is that the skilled photointerpreter has the ability with a stereoscope to view wetlands in 3-dimensions, while the computer for LANDSAT processing can only measure reflectance. Thus, the photointerpreter can identify trees from shrubs, and is not confused by slope, aspect or condition of the vegetation, shadows, or variations in flooding.

New Remote Sensing Technologies

While the NWI Project has selected high-altitude photography as its primary remote imagery source, the NWI continues to keep abreast of evolving new technologies. LANDSAT 4 - the latest generation of satellites - or future satellites, like France's SPOT, may eventually provide sufficient resolution and accuracy to meet NWI's requirements. Preliminary results of LANDSAT 4 showed improvements in spectral and spatial resolution over previous LANDSAT satellites. At this time, however, LANDSAT 4's thematic mapper is producing a limited amount of data for research studies only and is not ready for a large-scale operational effort such as the National Wetlands Inventory. In fact, full processing of LANDSAT 4's thematic mapper data is not planned until January 1995. Moreover, LANDSAT 4 must be tested in different parts of the country to assess its effectiveness at mapping wetlands which vary regionally. The NWI is coordinating with NASA on experimental applications of LANDSAT 4 for wetlands mapping, such as Ducks Unlimited's wetlands inventory feasibility study this summer in Canada. Within 2-5 years, the results of regional pilot projects should demonstrate whether or not LANDSAT 4 can be used to accurately map wetlands in all parts of the country. LANDSAT 4 or future satellites, like France's SPOT, may provide the NWI with a useful tool for monitoring wetland losses and gains, updating our wetlands maps, and even for new mapping efforts in the future.

Organization of NWI

To conduct the NWI, the Service employs a small staff of 26 biologists (assembled into two basic groups: NWI Central Control Group and Regional Wetland Coordinators) and hires contractors to do photointerpretation, field work and map production. The NWI Project Leader works out of the Washington, D.C., Office and coordinates budget, annual work plans and strategic planning.

The NWI Central Control Group at St. Petersburg, Florida, is the focal point for all operational activities of the Inventory. It acquires all materials necessary for performing the survey, provides technical assistance and work materials to the Regional Coordinators, and produces the wetlands maps. A private service support contractor is responsible for all map production and supplies needed personnel (about 100 technicians and professionals). Representatives of the Army Corps of

Engineers and the Geological Survey are part of the Group, while the Soil Conservation Service participated for the past six years.

Regional Wetland Coordinators, located at the Service's seven Regional Offices, are totally responsible for inventorying wetlands within their Regions and ensuring that NWI products meet Regional needs. They manage contracts for wetlands photointerpretation, coordinate interagency review of draft maps, secure cooperative funding from other agencies, and disseminate NWI products.

Photointerpretation and essential field checking are performed by contractors having regional wetland expertise. Contractors are equally divided between universities, State agencies and private consulting firms, with a couple of Federal agencies included. These contractors photointerpret wetlands using stereoscopes, and conduct field surveys and examine existing information on a given area's wetlands to ensure accurate identification of wetlands.

Conducting the Inventory: Operational Phase

The operational phase of the NWI Project involves two main efforts: (1) wetland mapping and (2) wetlands status and trends analysis. In addition to the wetlands maps and the trends report, other products are produced to compliment the mapping effort, including lists of hydric (wet) soils and wetland plants (hydrophytes), wetland reports, and a wetland values database.

National Wetlands Inventory Maps

Two series of wetland maps are being prepared: (1) small-scale (1:100,000 or 1:250,000) and (2) large-scale (1:24,000). The 1:100,000 scale maps cover approximately 1700 square miles and include 32-1:24,000 map areas. They are used chiefly for watershed and regional planning and are now being produced in only limited areas, where user-funded. The primary map product is the large-scale map which shows the location, shape, and characteristics of wetlands and deepwater habitats on a USGS base map. These detailed maps are excellent for site-specific project evaluation and are the most sought-after map product.

To produce final MI maps, seven major steps must be completed: (1) preliminary field investigations, (2) photointerpretation of high-altitude photographs, (3) review of existing wetlands information, (4) quality control of interpreted photos, (5) draft map production, (6) interagency review of draft maps, and (7) final map production. A recent evaluation of NWI maps by the University of Massachusetts (Swartwout 1982) determined that these maps had accuracies above 95%. This high accuracy was achieved because of the NWI technique which involves a combination of field studies, photointerpretation, use of existing information and interagency review of draft maps.

Wetlands Status and Trends Report

The national wetlands status and trends analysis study arose from the need for national estimates *on the* Current extent of our Nation's wetland resource in the lower 48 States and on corresponding losses and gains

over the past two decades. A statistical survey of U.S. wetlands in the mid-1950's and mid-1970's was conducted through conventional air photo-interpretation techniques. The status of wetlands in the mid-50's and mid-70's was determined and estimates of losses and gains during that interval were computed. The results of this study were published in the Service's report "Status and Trends of Wetlands and Deepwater Habitats in the Contiguous United States, 1950's to 1970's" (Frayer, et al. 1982).

Hydric Soils List

To clarify the meaning of "hydric soils," a list of the Nation's hydric soils is being prepared by the Soil Conservation Service (SCS) in cooperation with the NWI. Hydric soils are defined by soil saturation for significant periods or by frequent flooding for long periods during the growing season. The list includes both hydric soils (essentially always associated with wetlands) and soils that exhibit hydric conditions under certain circumstances. The hydric soils list will be most useful for making wetland determinations in the field or in the office through use of soil survey maps. Interim lists for each State are available from Soil Scientists at

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will continue to distribute maps to our primary users - Federal and State agencies - at no cost.

Computer Mapping

NWI is at the forefront of computer mapping technology. Although not presently cost effective on a nationwide basis, computer mapping is being alternately pursued and advanced by the NWI through the fields of digitization, computer graphics and analytical photogrammetry. In working with groups such as the Defense Department's Computer Assisted Photo Interpretation Lab, NWI will insure that it moves operationally into these fields as soon as cost effective. Computer mapping products include computer-generated maps and wetland statistics for project areas. Computer mapping is completed for the State of New Jersey, the Lower Columbia River Basin, and the hard rock mining areas of Minnesota, while work in progress includes the State of Delaware, the Gulf Coast and an area adjacent to the Great Salt Lake of Utah.

National Wetlands Status and Trends Report Findings

Introduction

A statistical sampling study was undertaken to develop national estimates on the status of U.S. wetlands and deepwater habitats (in the lower 48 States) in the mid-1970's and mid-1950's and on their losses and gains since the mid-50's. The study was designed and conducted by a team of Colorado State University researchers; while NWI produced the essential survey data.

A stratified random sample of 3,635 plots (each four-square miles in size) was used. Mid-50's and mid-70's aerial photography were interpreted for all study plots. All changes to wetlands and deepwater habitats within these areas were identified as either natural or man-induced, area measured and prepared for computer analysis. The results of this investigation are presented in "Status and Trends of Wetlands and Deepwater Habitats in the Conterminous United States, 1950's to 1970's" (Frayer, et al. 1982). Key points of this report follow.

Status of U.S. Wetlands in the Mid-1970's

In the mid-1970's, the United States (i.e., the lower 48 States) had a total of 99 million acres of wetlands - 5.2 million acres of coastal wetlands and 93.7 million acres of inland wetlands - which amounts to only 46% of our original wetland acreage.^{2/} Wetlands now represent only about 5X of the total land surface of the United States. In the mid-70's, the U.S. wetland resource consisted of 5.2 million acres of coastal wetlands, 600 thousand acres of inland flats, 4.4 million acres of ponds, 49.7 million acres of forested wetlands, 10.6 million acres of shrub wetlands and 28.4 million acres of inland marshes. Deepwater habitats in the

^{2/} By the most reliable accounts, the original wetland acreage of the United States is estimated at 215 million acres (Roe and Ayres 1954).

mid-70's amounted to 15 million acres of coastal bay bottoms and 57.9 million acres of lakes and reservoirs.

Gains and Losses Since the Mid-1950's

Comparing *these mid-70's figures* with mid-50's acreages, we found net gains in deepwater habitats - 200 thousand acres of coastal bay bottoms and 1.4 million acres of lakes - and in two wetland types - 200 thousand acres of inland flats and 2.1 million acres of ponds.

Losses between the mid-50's and mid-70's, however, prevailed in vegetated wetlands - 400 thousand acres of coastal marshes and mangroves, 6 million acres of forested wetlands, 400 thousand acres of shrub wetlands and 4.7 million acres of inland marshes. The average rate of wetland loss over the study period was 458,000 acres/year, consisting of 440,000 acres/year of inland wetland losses and 18,000 acres/year of coastal wetland losses.

These changes are net changes over a 20 year period. Net changes reflect the combination of a number of wetland changes both losses or gains and natural or man-induced, as shown in the *shrub wetland* example (Figure 4). From a natural succession standpoint, we see a large loss in shrub wetlands to forested wetlands and a tremendous gain in shrub wetlands from inland marshes. We also can see substantial losses in shrub wetlands from agricultural and urban developments and a modest gain from *other* land. All these changes have led to a net loss of 400 thousand acres of shrub wetlands between the mid-50's and the mid-70's.

Gains in Lakes and Ponds

while large losses in vegetated wetlands took place, lakes (deepwater habitats) and ponds (wetlands) increased substantially. Lake acreage increased by 1.4 million acres, with most of the gain occurring in the Atlantic and Mississippi Flyways (50% and 44%, respectively) and small gains of 3% in the Pacific and Central Flyways. These new lakes and reservoirs were mostly created from uplands, with vegetated wetlands also altered.

Pond acreage nearly doubled from 2.3 million acres in the mid-1950's to 4.4 million acres in the 1970's. Ponds increased mainly in the Central, Mississippi and Atlantic Flyways. These ponds were mostly created from uplands.

Causes of Wetland Losses

Agricultural development (e.g., drainage) was responsible for 87% of wetland losses, while urban development and other development caused 8% and 5% of the loss, respectively.

Losses from Agriculture

Agriculture had the greatest impacts on forested wetlands and inland marshes, with losses of 6.2 and 4.6 million acres, respectively. In addition, 1 million acres of shrub swamps were converted to agricultural use by the mid-1970's.

Inland Harsh Losses

Comparing important waterfowl breeding and overwintering areas with the areas of greatest loss of inland marshes, we find heavy losses in the Potholes, Nebraska and Florida (Figure 5).

The glacially formed wetlands of the Prairie Potholes in U.S. and Canada are the principle breeding grounds for migratory waterfowl in North America. They provide more than fifty percent (50%) of the annual production of important waterfowl, such as mallards, canvasbacks and blue-winged teal. The continued loss of pothole wetlands through agricultural development has serious implications on waterfowl populations.

Nebraska's sandhills and rainwater basin have also lost many wetlands. These wetlands are used by millions of cranes, ducks and geese on their annual migrations.

Florida's inland marshes are also subject to large-scale agricultural conversion, particularly the Everglades. These wetlands provide feeding areas for many migratory birds and are the breeding grounds for such birds as rails and the Everglades kite. Besides losing these and other wildlife values, destruction of the Kissimmee River wetlands from channelization has accelerated deterioration of water quality in Lake Okeethobee.

Forested and Scrub-Shrub Wetland Losses

Looking at areas of greatest losses of forested wetlands, we find major destruction of bottomland hardwood forests in the Lower Mississippi Valley and of North Carolina's pocosin wetlands.^{3/} (Figure 5)

The Lower Mississippi bottomland wetlands are important overwintering areas for 2.5 million of the 3 million mallards of the Mississippi Flyway and nearly all of the 4 million wood ducks. Moreover, numerous finfish utilize the flooded hardwoods as spawning and nursery grounds, including gamefish, like basses and pickerels. In 1977, only 5.2 million acres of bottomland forests remained in the Mississippi Delta, which amounts to about 20% of the original acreage. Heavy losses of these wetlands to agriculture continue today.

The pocosin (forested and scrub-shrub) wetlands of coastal North Carolina are under tremendous pressure from agricultural and peat mining interests. These wetlands are most important as regulators of freshwater inflow into productive coastal estuaries. By ensuring a relatively steady flow of fresh water, pocosins help maintain the salinity balance of estuaries and the profitable commercial and recreational fishing in coastal North Carolina, which generated \$325 million in 1978 and employment of 23,000 people.

^{3/} "Pocosin" is an Algonquin Indian word for freshwater wetlands. These forested and scrub-shrub wetlands are prevalent along the southeastern coastal plain.

Agricultural development of these wetlands also leads to further degradation of estuarine water quality through the introduction of chemical fertilizers and pesticides.

Coastal Wetland Losses

Since the mid-50's, coastal wetland losses were most significant in three States: Louisiana, Florida and Texas. In Louisiana, submergence of coastal wetlands had converted nearly 200 thousand acres to bay bottoms by the mid-70's. The causes of this change are numerous and complicated, but were treated as natural causes for this study. Considering direct man-induced losses, urban development caused 92% of these losses, while agriculture with 6% and other development with 2% made up the remainder.

States With Significant Losses

The trend analysis study found 19 states with statistically significant net losses in wetland (1) in the Northeast • Delaware, Maryland, and New Jersey; (2) in the Midwest • Illinois North and South Dakota, Minnesota, Nebraska and Wisconsin; (3) in the Southeast • all States, except Virginia, Tennessee and Kentucky; (4) Texas in the Southwest; and (5) California on the West Coast (see Figure 6).

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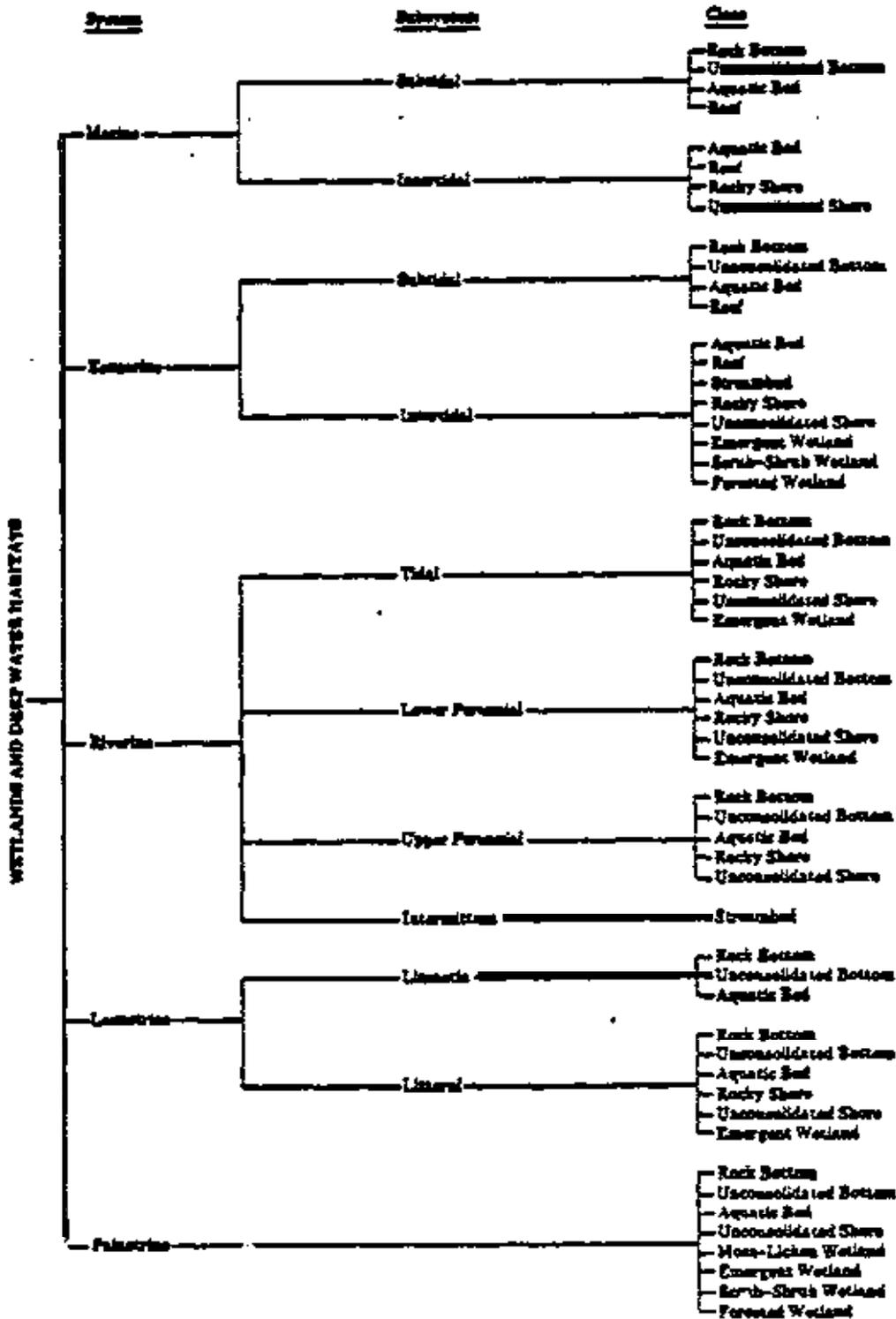


Fig. 1. Classification hierarchy of wetlands and deepwater habitats, showing systems, subsystems, and classes. The Palustrine System does not include deepwater habitats.

STATUS OF NATIONAL WETLANDS INVENTORY

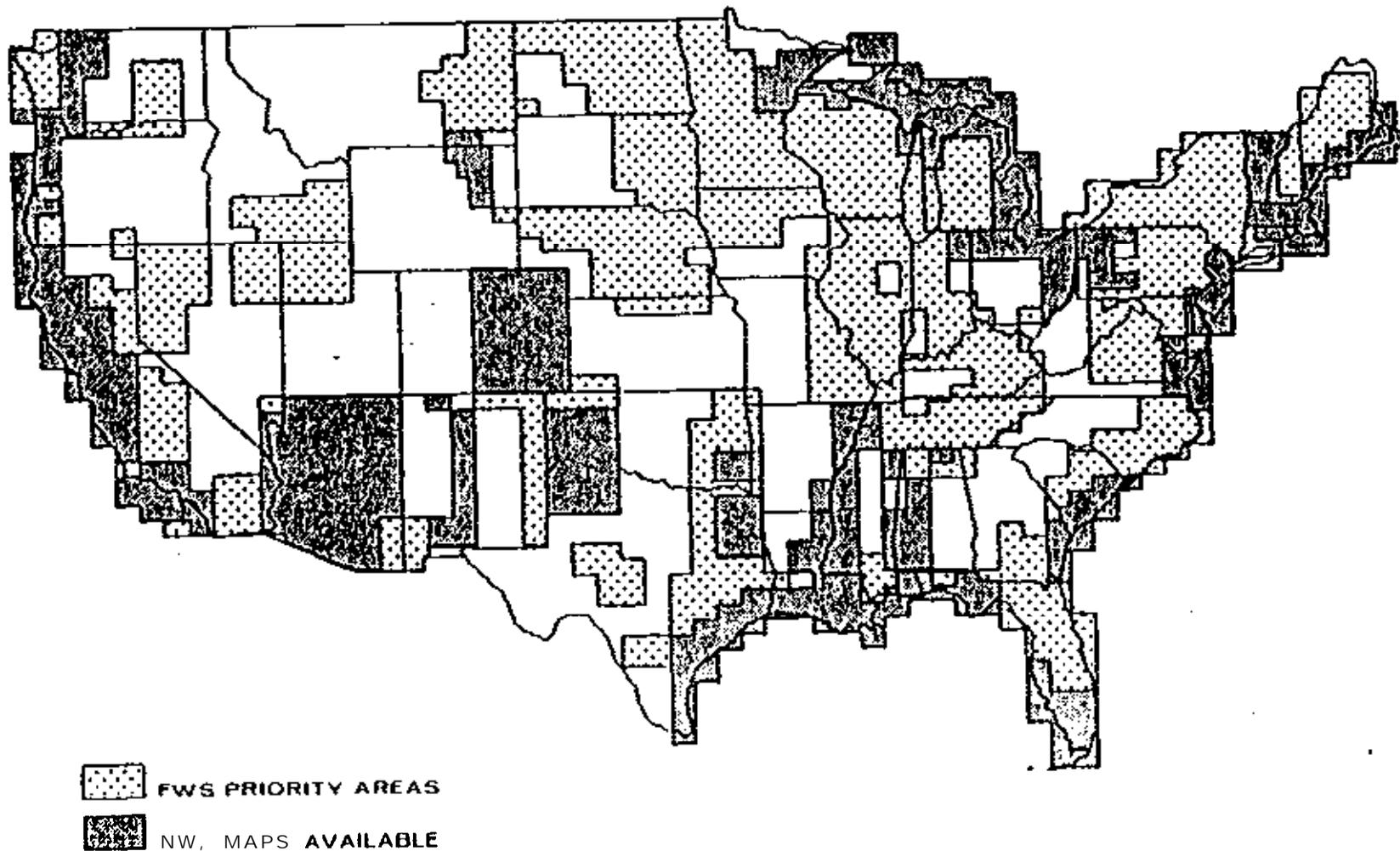
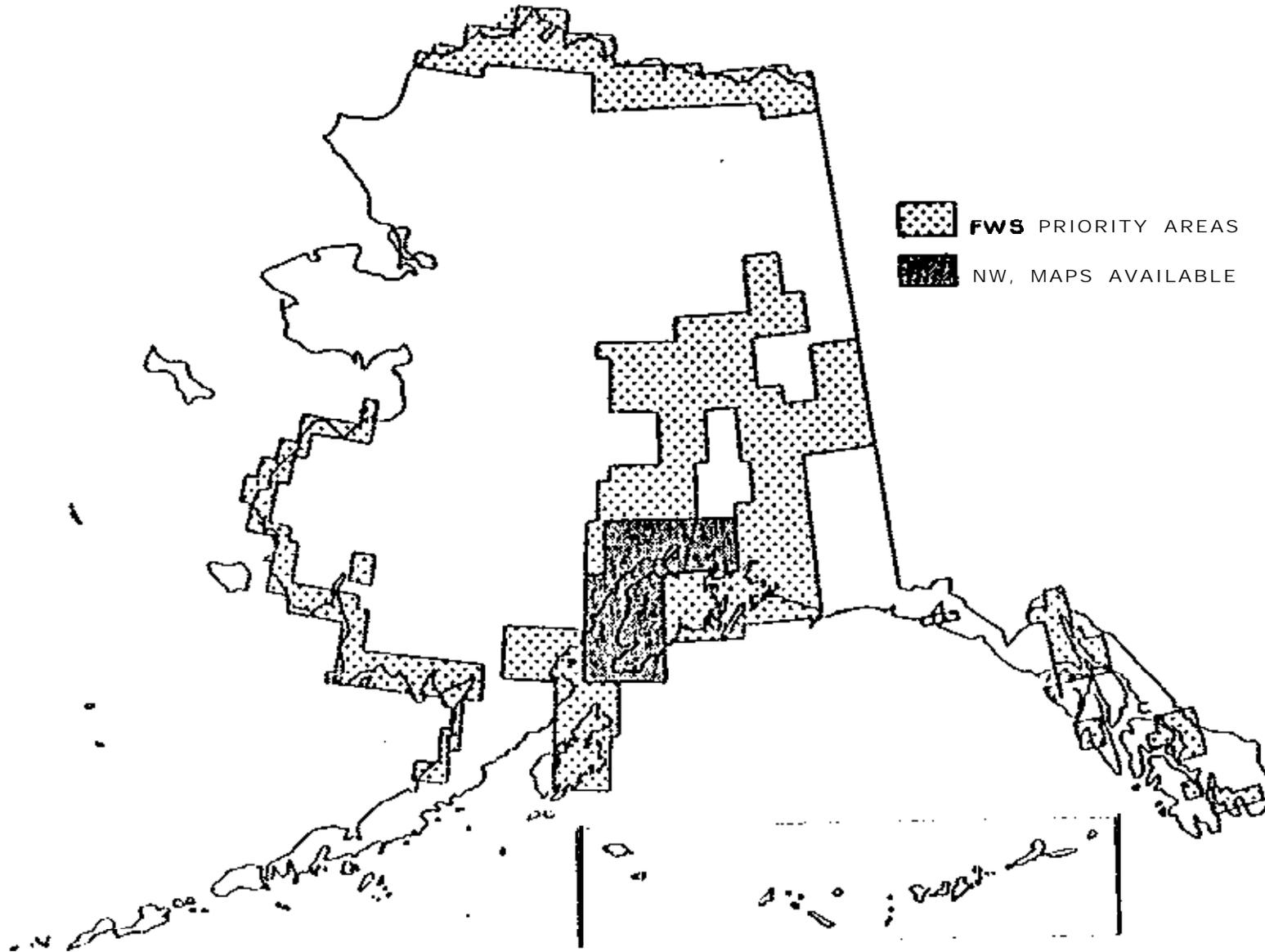


FIGURE 2

STATUS OF THE NATIONAL WETLANDS INVENTORY IN ALASKA



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FIGURE 3

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NET CHANGES IN SHRUB WETLANDS MID 1950's TO MID 1970's

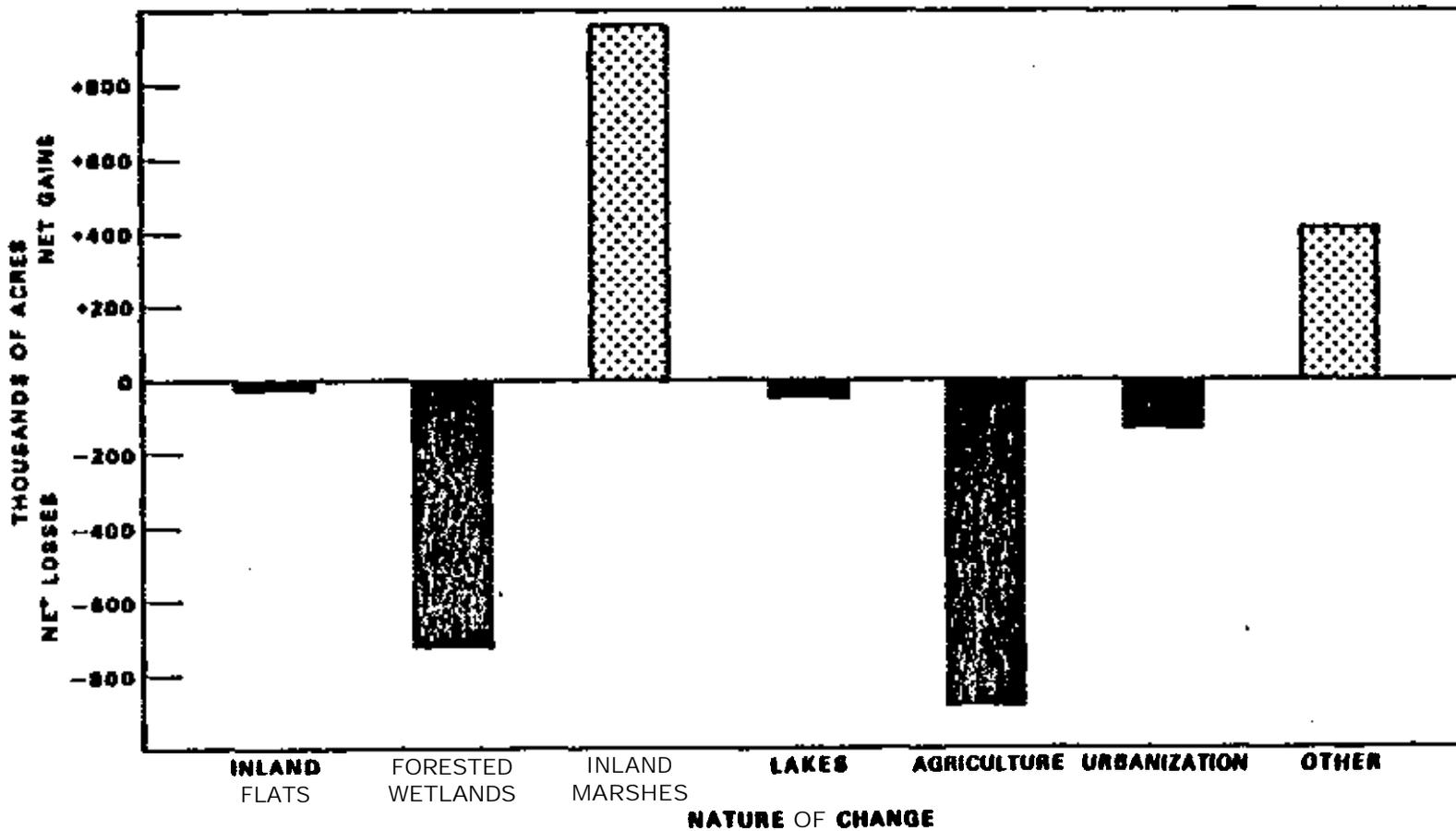
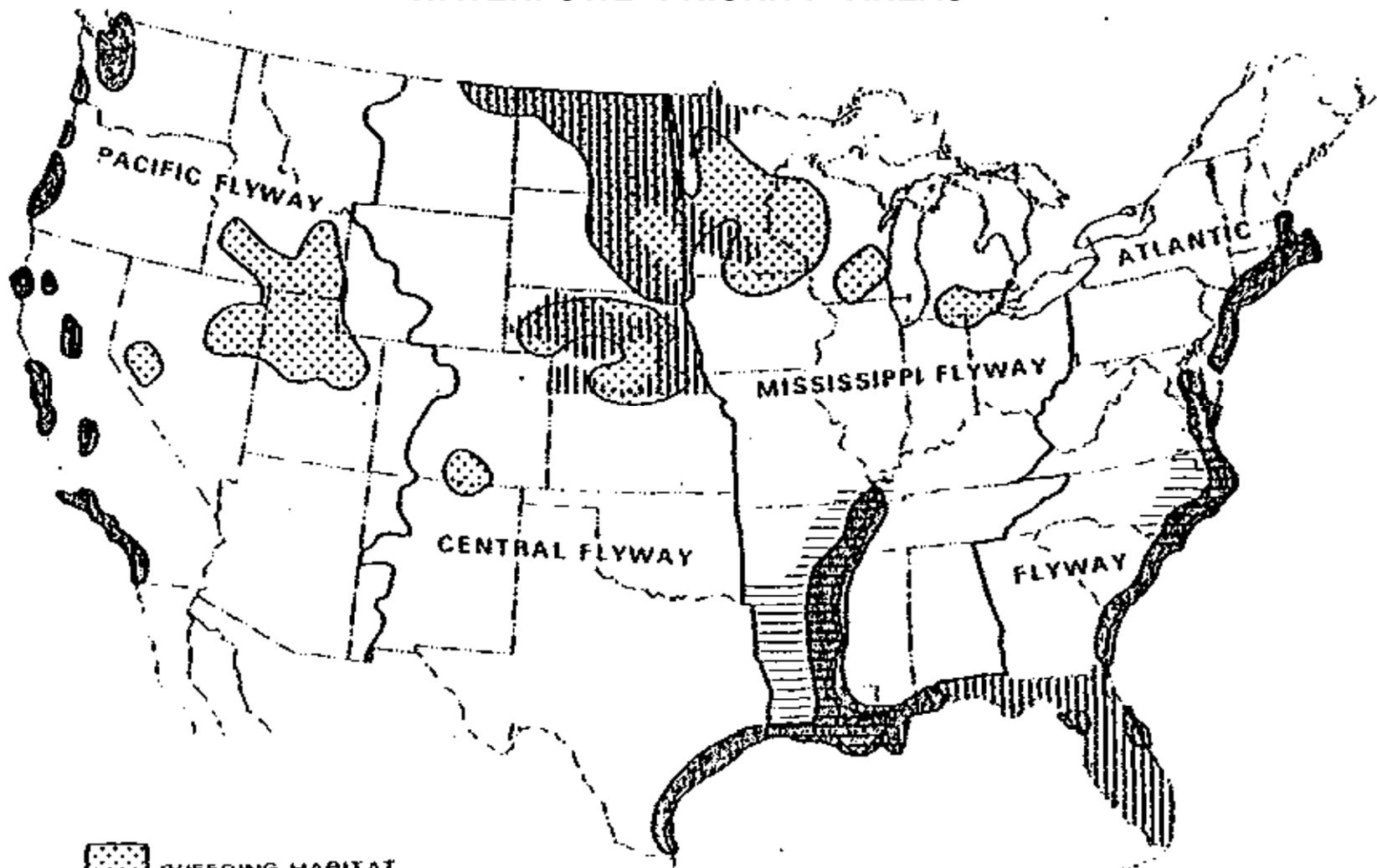


FIGURE 4

WATERFOWL PRIORITY AREAS



-  BREEDING HABITAT
-  WINTERING HABITAT
-  GREATEST LOSS OF INLAND MARSHES
-  GREATEST LOSS OF FORESTED WETLANDS

FIGURE 5

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STATES WITH SIGNIFICANT NET LOSSES IN WETLANDS

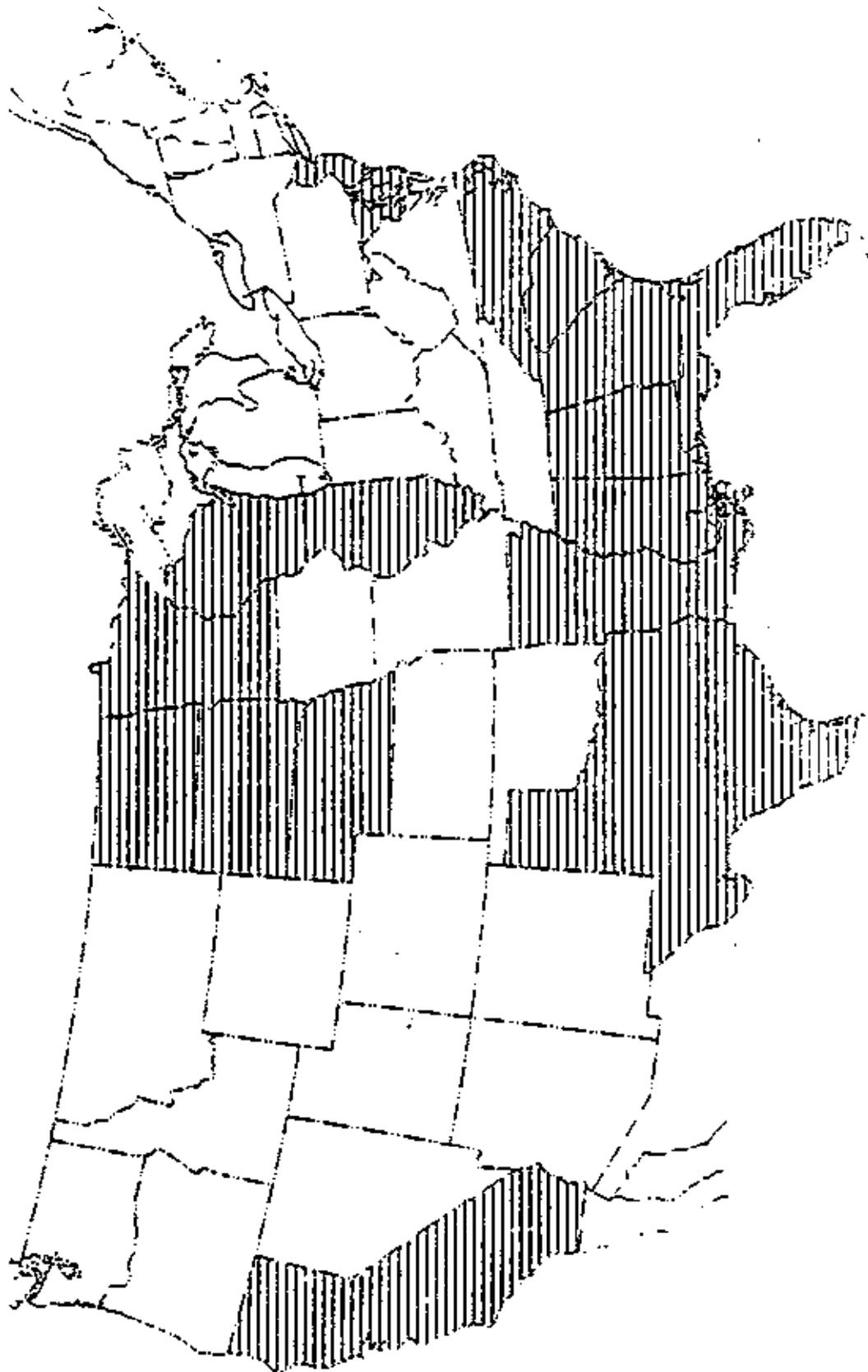


FIGURE 6

GENERAL REPORTS

Spodosol Classification

Robert V. Rourke, University of Maine

A group interested in improvement of spodic horizon recognition met in Lincoln, Nebraska on December 3, 1983 to discuss and initiate activity to improve the definition of spodic horizons. The question was reviewed and a plan of action developed that would first define the problem and secondly develop morphologic and chemical criteria of the order Spodosols.

The problem has been put forth in published form in Circular 1 of the International Committee on the Classification of Spodosols (ICOMOD). This report circulates to all spodosol committee

two illuvial horizons, one transitional horizon and the C horizon. The most frequent occurring horizon was the B₁ or B₂ followed by the C horizon and E or A₂ horizon.

The six groups of horizons selected were analyzed separately to obtain a frequency distribution of their various properties. Each group had the hue (numeric and alphanumeric), value and chroma summarized. Soil texture of the less than 2 mm size was arrayed with the most frequent texture in the two surface and two illuvial layers being a silt loam. The frequency of this texture decreased as depth below the surface increased. Soil structure was treated in a similar manner. Subangular blocky and granular structures were the predominant types described in the spodic horizons. In all instances the frequency distribution was continued until sufficient variables had been included that 95% of the population had been assessed.

Future plans are to continue to work with the data until it is possible to construct a morphologic "typifying profile" within each suborder or, if necessary, each great group. There is also the opportunity to develop predictive equations that could lead to a reduction in the number of observations necessary for taxonomic placement and an improved understanding of soil genesis. Areas of interest would include thickness of development of spodic layers as related to soil texture; and horizon color relationship to horizon designate, thickness, and texture. This work currently continues as an effort on the part of Ronald Yeck, Benny Brasher and Robert Rourke.

The evaluation of chemical criteria is being continued by the SCS laboratory at Lincoln. Methodologies are being tested and compared. Techniques used for spodic or podsol B identification from many countries and regions within the U.S. are being used. This work is ongoing with results expected over the next year.

FOLLOW-UP TO
REPORT OF **COMMITTEE 3**
(1982 Soil Survey Work Planning Conference)

EVALUATING SOIL **MAP QUALITY**

Chairperson - Will Hanna

Introduction:

The Committee 3 changes for the 1982 **Northeast** Cooperative Soil Survey Conference were to:

- (1) Determine what the necessary characteristics and attributes are of a high quality soil survey and;
- (2) Determine how to measure and express with a quantitative standard the degree that soil **surveys** conform to those attributes and characteristics.

1982 Committee Report and Recommendations:

The Committee Report that was presented to the conference at Cornell in 1982 provided the following:

- (1) Summation of responses to a questionnaire by the Committee members indicating the kind of map quality standard that would be desirable.
- (2) A narrative outline of the attributes of a high quality survey with the recommendation that it be accepted as partial fulfillment of Change 1.
- (3) Identification of 4 quantitative methods for assessing map quality; the Maine method, New York method, Cornell-SCS method and Virginia method.
- (4) Recommendations that: (a) Committee 3 be continued and the 4 methods be field tested and evaluated by 5 states; (b) the states, New York, Maine, Pennsylvania, New Jersey and Connecticut provide their evaluations to the Committee Chairperson prior to the 1984 Conference; (c) the Committee Chairperson **summarize** the results in a report to the 1984 Conference; and (d) that Change 1 be made more specific in relation to a "acceptable quantitative standard.

Follow-up to the 1982 Recommendations:

Two of the previously mentioned methods were forwarded to each of the five states in 1982-83 for evaluation. Responses were received from 3 states, and 1 state is currently testing 2 methods but this data is not yet available. Summation of the evaluations is as follows:

1. Cornell-SCS Method

General - This method was developed by the Cornell Agronomy Department for the Soil Management Support Services (SMSS) section in SCS to aid developing counties in assessing the quality of various Soil Resource Inventories. This method utilizes a random sampling technique which provides a binomial test of the purity (level of similar soils) of soil maps and the magnitude of strongly contrasting soils. At least 30 sample or map points are required per map sheet for reliable, statistical inference.

Evaluated by - Connecticut

Area Tested - This method was tested in Middlesex County on Atlas Sheet 33 of the County's 1979 published soil survey. The area is primarily upland, wooded, nonurbanized and dominated by shallow to deep glacial till soils. Most of the map units are soil complexes or soil-rock outcrop complexes. The scale of mapping is 1:15,840 with about 6,000 acres on 2,400 hectares represented on the field sheet.

Procedure - The procedures outlined in Chapter 4 of the Cornell-SMSS Tech. Monograph #4 (Guidelines for Evaluating the Adequacy of Soil Resource Inventories) were followed. Ground truth criteria or soil properties to be measured were selected for a specific land use and for a more generalized land use. Two soil scientists, one using the criteria for the specific land use and the other using the criteria that covered most major land uses, made the evaluation. Sample points were randomly selected using procedures in Appendix C of the SMSS monograph.

Results - Evaluation for a specific land use (Major Urban Interpretations) resulted in a purity rate of 60% and a strongly contrasting rate of 3%. For general land use (Major Common Interpretations) the purity was 80% and the strongly contrasting score was 7%. The SMSS monograph suggests that at a 90% probability level that at least 50% purity and less than 15% strongly contrasting soils be required for acceptability. Thus, Atlas Sheet 33 would be in the acceptable range. Appendix 1 provides an example of the scoring method and ground truth criteria for rating the map.

Time - To make this evaluation 2 days were required preparing for the field work, 4 days of field work and 4 days evaluating the results. With experience, preparation and evaluation time could be reduced.

Advantages of the Method -

- (1) Evaluates both the purity level and error rate of the soil **map**.
- (2) Has a strong statistical standard.
- (3) Quantifies those soil qualities evaluated for a **specific** purpose or land "se.

Disadvantages and Comments Concerning this Method -

- (1) Does not evaluate the accuracy of the soil map **boundaries**, although boundary error is somewhat combined with classification error, since, if the boundary is incorrect, the land areas in the wrong delineation will be incorrect and thus potentially caught in the classification evaluation.
- (2) Reliability of the map evaluation results is dependent on the soil properties on ground truth criteria chosen for measurement.
- (3) Time to complete the random sampling and evaluation may be prohibitive for a single map sheet. However, use of a stratified sampling method may not be prohibitive for evaluating an entire survey area (e.g. to detect the types of errors made by each soil survey or in a particular survey, etc.).
- (4) Depending on the cultural features and base map, locating sampling points may be all but impossible for anyone with less experience than a soil scientist in working with maps. Also, the data gathering process may require the expertise of a soil scientist.
- (5) This is a **user** oriented system based on point truth and is **not designed** to evaluate soil-landscape relationships, map unit **composition**, and it does not evaluate how well the soil **map unit** description documents the soil-landscape features.
- (6) The **sample point** selection method may bias the evaluation toward the **larger** map units -- points in small or narrow units are often rejected because they fall too close to the boundary.

New York Method

General - This method provides for an evaluation of soil maps based on the magnitude of error and the number of errors per minimum size delineation. An approximate one square mile area is evaluated per map sheet. The soil features rated apply to most major land uses on interpretations.

Evaluated by - Pennsylvania and New York

Area Tested - The area evaluated was in Saratoga County, New York in an ongoing survey. This area has a mixed land use of farms, woods and idle land. It is dominated by glacial till soils interspersed with pockets of lacustrine soils and flood plain soils. It is a second order soil survey being mapped at 1:15,840 scale. Three field sheets were randomly selected for evaluation.

Procedures - Each of the three field sheets were transected using common field techniques for assessing soil map adequacy. Each map unit crossed was examined. A form was developed to record the class on properties of the predetermined soil features. Obvious inclusions were avoided. Areas where soil boundaries appeared to be inaccurate were also examined. Estimates were made, based on the landforms, of the number of acres deviating or at variance with the class norm. Prior to the field work the areas were stereoscoped. About 15 percent of each field sheet was evaluated.

Results - Based on the table developed by New York that indicates the number and size of variances allowed for each soil feature class, two field sheets were found acceptable and one sheet unacceptable. Appendix 2a and 2b illustrate with examples the soil properties record form and allowable variance table.

Time - Approximately seven hours was spent on each field sheet including field time and evaluation.

Advantages of this Method -

- (1) Can be applied in the field in just a little more time than common map adequacy checks.
- (2) May have some value as a training aid in identifying those areas where soil scientists have a weakness in properly classifying a certain soil property.
- (3) Evaluates those soil features that are important to the functional quality of a soil map.

- (4) Evaluates both boundary errors **and** classification errors.
- (5) Provides a " acceptable-unacceptable answer to **map adequacy**.

Disadvantages of this Method -

- (1) Has a weak statistical reliability basis. The number of samples per map sheet and method of sampling may require **expansion** and revision, respectively.
- (2) Allowable variance table is too restrictive for the number of minimum **size** delineations outside the norm for some soil properties. **Some** revision of the table will be required.
- (3) The "umber of minimum size delineations allowed **to** be at variance for each soil feature class or property rated is based on subjective **judgements**. For more specific **land uses** or interpretations the present number of allowable minimum size delineations may not be realistic.
- (4) Map Unit Composition and Cartographic quality are not considered in this evaluation method.

Maine Method

General - This method provides a " error rate per square inch of the map sheet. Ten items are evaluated and weighted for the seriousness of the error. A 10 to 20 percent area of the map is randomly selected for evaluation. The error score is totaled and **compared to** a previously established tolerable error limit score.

Evaluated By - Connecticut and New York

Procedure - The field procedure notes for the New York method were applied to **this** method. In addition, cartographic items and map unit descriptions (Evaluation Items 4 through 10) were reviewed in the office. The field sheets were "**rescored**" for this method. See Appendix 3 for items evaluated and scoring method.

Results -

Advantages of the Method -

- (1) Relatively quick and easy to apply with present methods for assessing map quality.
- (2) Combines a cartographic and map unit description **evaluation** with the map unit identification and boundary placement evaluation made in the field.
- (3) Can be applied to any scale map.
- (4) Evaluates field sheets of ongoing survey.

Disadvantages of the Method -

- (1) Requires subjective **judgements** to make a rating.
- (2) Lacks statistical reliability. The sampling procedure could probably be altered to include more sampling points and an orderly transect on random sampling procedure.
- (3) Magnitude of map unit errors and boundaries **is** not accounted for.
- (4) In its present form, the method is not designed for published soil surveys.
- (5) Does not account for detail on intensity of the field sheet. The number of errors are not weighted against the total number of map units or soil boundaries.
- (6) Does not provide acceptability-unacceptability answer.

Summary:

Based on the 1983 field evaluations of the three quantitative methods, it is not conclusive that one method is superior to the others. Each has merit for a particular situation on evaluation objective. New York intends to continue testing and refining the method it has proposed for both evaluations of older published surveys and ongoing surveys.

Recommendations:

It is recommended that the head of the NENTC Soils Staff request that all states in the region **use** and test one of these methods or some other appropriate quantitative method when assessing soil map quality. At least one survey area in those states with ongoing **surveys or anticipated up-dates of** older surveys be tested with a **quantitative approach**. In fact, National Bulletin 430-4-4 related to updating published soil surveys, strongly suggests that update requests be accompanied with **quantative**

CORNELL - SCS METHOD

SRI Evaluation For Major Urban Interpretations

Middlesex County, Connecticut - Atlas Sheet 33

A, B, C, D, and E Predicted Soil Properties -- () Observed Soil Properties

COMPONENT SOILS	DEPTH	STONINESS	FLOODING	SCORE
1. Hollis - Charlton	A (A)	B (C)	A (A)	2
2. Charlton - Hollis	c (C)	E (B)	A (A)	3
3. Charlton - Hollis	A (A)	B (B)	A (A)	1
4. Hollis - Rockoutcrop	C (C)	B (C)	A (A)	2
Etc.				
25. Charlton - Hollis	A (A)	E (E)	C (A)	4
Etc.				
30. Hollis- Rockoutcrop	C (C)	C (C)	A (A)	3

SCORE: C o r r e c t

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Transect # 1

NEW YORK METHOD

Evaluated by: Work.

MAP ACCURACY CHECK

Silverman, Hanna

Date: 9/28/83

Mapped by: Silverman

0 - No deviations 1 - One deviation from normal 2 - Two deviations from normal

stop No.	Map Unit	Depth to Rock	Drainage Class	Family Texture	Slope	Acres Deviating
1	32	0	0	0	0	
2	24	0	0	0	0	
3	25	0	0	2	0	5 ac
4	157	0	0	1	0	3 ac
5	161B	0	0	0	0	
6	157	0	0	1	0	5 ac
7	62B	0	0	0	0	
e	27	0	0	1	0	2ac
12	156	0	1	1	0	3 ac
13	60	0	0	1	0	3 ac
15	158	0	0	1	0	3 ac
20	150A	0	0	0	0	

SOIL MAP ADEQUACY TABLE
(NEW YORK METHOD)

Class Variances and Size of Variances Allowable
(in 1 sq. mile area) for Common Soil Feature Classes

Area Evaluated - Saratoga County, New York, S.S.

Soil Feature Class	Class Variances	Maximum Number of Equivalent Minimum- Size Delineations Having Indicated Variance to be Acceptable	Field Sheet 2JJ-87	Field Sheet 2JJ-7
Depth to Bedrock or Impervious Layer	1	5	—	—
	2	2		
	3	1	—	
Natural Drainage Class	1	5	1	2
	2	2	—	—
	3	1	—	—
Flood Hazard	1	2	—	(5)
Family Textural Class	1	8	7	8
	2	2	2	
	3	1	—	—
Slope Class	1	8		4
	2	3	—	
	3	1	—	
(Reaction, stoniness and surface texture also evaluated.)			Acceptable (20 obs.)	Unacceptable (16 obs.)

M A N E M E T H O D

AREA EVALUATED - SARATOGA COUNTY, NEW YORK, S.S.

Item	Weight	No. of Errors		Score	
		Per Sq. Inch		87	7
		2JJ-87	2JJ-7		
1. Map units not correctly identified.	2.6	.13	.25	32	.63
2. Map unit boundaries inaccurate.	2.5	.19	.25	48	.63
3. Detail on map not adequate.	1.2	—	—	—	—
4. Map unit delineations and symbols not neat or not legible.	1.8	—	.18	—	.32
5. Soil boundaries not joined with adjacent sheets.	0.2	—	—	—	—
6. Cultural features not in legend.	0.2	—	—	—	—
7. Incorrect location of civil boundaries or cultural features.	0.2	—	—	—	—
8. Inaccurate labeling of streams, rivers, etc., and cultural features.	0.2	—	—	—	—
9. Map scale, N. arrows, acreage, mapper's name, etc., missing or inaccurate.	0.2	—	—	—	—
10. Map unit description inadequate.	1.0	.24	.24	24	.24
TOTALS	10.0			13.4	18.2

Current Progress in the Canadian Soil Survey Program

Herbert W. Rees

Soil Survey Unit, Agriculture Canada, Fredericton, N.B.

I very much appreciate and value the Opportunity to attend this the Northeast Cooperative Soil Survey Conference. In the past, Mr. John Day, National Soils Correlator and Head of our Agriculture Canada Land Resource Research Institute, Soil Inventory Section, had attended many of your regional and national work planning conferences. Last spring (1984), John retired after completing a most successful career spanning 35 years of service with the Canadian Government. John contributea substantially to the development of strong international relations between the Canaoa and U.S. soil survey groups. Regionally, however, dialogue between Eastern Canada and the Northeastern States is not strongly developed. As a representative from the Provlrrce of New Brunswick in Atlantic Canada, I look forward to this as the beginning of increasea communications between our two regions, with continued representation at these conferences from Eastern Canaoa.

Now, down to the business at hand, a report on the Canaoian Soil Survey Program

As many of you may not be acquainted with soil survey activities in Canada, I would like to start with a brief overview of our organizational structure. [This text draws substantially from the Soil Survey Handbook (for Canada) which is presently being prepared by the Expert Committee on Soil Survey.]

Soil survey programs are actively conducted in all ten provinces and two territories. These inventory programs are usually shared by the federal Canada Department of Agriculture, a provincial Department of Agriculture or Forestry (or equivalent) and, where present, a University Department of Soil Science. Both informal and formal agreements exist. Formal tripartite agreements have been negotiated in four provinces (Alberta, Ontario, Quebec, Saskatchewan), resulting in the establishment of Institutes of Pedology which coordinate provincial inventory programs.

The shared activities differ from province to province. In some provinces, the survey parties work together in the same project area, whereas in others, they work on separate projects.

As land use decision-making powers are vested in the provinces, requirements for soil inventories are aetermined primarily by provincial agencies. Survey and research priorities are established by soil survey steering committees,

Provincial and national plans are integrated via a committee system whereby provincial committees forward recommendations on requirements for soil science research and services to national coordinating committees. Our Expert Committee on Soil Survey (ECSS) closely approximates your Cooperative Soil Survey Conferences. The ECSS provides scientific coordination for soil survey and land evaluation in Canada. It maintains this scientific and technical role through the use of "working groups" which are assigned responsibility for providing recommendations or advice for the solution of problems.

Current efforts continue to emphasize and encourage research on soil classification and land evaluation and to develop and standardize appropriate classification systems and operational procedures for use on a national basis. Fourteen ECSS working groups are presently active in operations directed towards these goals. They deal with: agronomic, forestry and other interpretations; soil climate evaluation, soil water regime classification (SWIG) and irrigation suitability; taxonomy, correlation, laboratory quality control, documentation of soil survey procedures used in Canada (soil survey handbook) and examination of alternate mapping methods: CanSIS--the Canada Soils Information System; and generalized soil landscape maps and soil degradation. More specifically, the following progress has been made over the past year.

A. Standardization of methodologies for soil data collection and analyses continues to be a priority.

1. The Canada Soils Information System (CanSIS) Manual for describing soils in the field (including the new Canadian Soil Water Regime Classification Scheme--SWIG) has been revised and published.
2. Draft copies of method manuals were documented for (a) the establishment of soil water investigation sites; (b) irrigation suitability; and (c) soil temperature measurement.
3. Major soil degradation causes have been addressed, including: erosion, salinity, acidification, compaction, contamination and organic matter loss. Small scale provincial or regional maps displaying the extent of various land degradations and conservation needs have been identified as a prerequisite for public awareness. Work has started on a number of such "overview" maps. A list of tentative soil degradation identification methods has also been prepared and partially evaluated. The importance of soil and water conservation in Canada is such that a Standing Senate Committee on Agriculture, Fisheries and Forestry has been appointed to examine the subject-matter throughout Canada.
4. Improved control of quality and accuracy (correlation) in soil survey mapping remains a concern. The application of the transect method with stratified random transects for routine soils mapping has met with considerable acceptance and success.

5. **Quality control in soil survey labs is maintained through the incorporation of standard samples in routine analysis. Unknown samples have also been distributed for analysis as a check on quality of the data. Methods of analysis are being reviewed. Error values for methods are also being determined.**

B. **Soil classification and correlation procedures continue to receive considerable attention.**

1. **Problems relating to the classification of Gleysols, Folisols, humus forms, organic horizons and the definition of contrasting horizons continue to be documented. Other problems concerning the classification of clay soils in the Prairies have been raised and await documentation.**

2. **Soil Survey Form 1--the Project Plan--was published and used extensively for documenting new project plans. It is designed to provide a convenient record of the decisions that are taken in planning for a soil survey project to ensure consistency and continuity. Soil Survey Form 2--the Correlation and Monitoring Record--has also been brought into use. Soil Survey Form 2, referred to as Correlog, is designed to ensure consistent methods of observation and measurement and consistent conventions and terminology.**

3. **Compilation of the Canadian Soil Survey Handbook continues. Sections 100 through 400 have been drafted. Preliminary distribution of these sections is set for later this summer. Three sections remain to be written. Guidelines provided in the Handbook become increasingly important in light of the growing tendency to contract soil surveys.**

4. **A Soil Mapping System Working Group has been reconstituted to recommend procedures that can improve the efficiency and cost effectiveness of soil survey. To date, discussions have centered around: interpretations**

At its annual meeting in November, 1983, the Expert Committee on Soil Survey (ECSS) reviewed its working group priorities. The following Working Groups (or topics) were established as priorities for the next three year period:

1. Soil Degraaation - small scale map preparation and improvement of soil degraaation assessment.
2. Mapping Systems - means of expeaiting routine survey.
3. CanSIS - Computer Applications - micro-computers, hand held computers for aata collection in the field.
4. Agronomic Interpretations - crop-soil requirement guiaelines.

All of the aforementioned activities of the ECSS are supportive of the soil survey inventory program. Intensity of surveys, objectives of surveys and levels of soil survey staff and related scientists vary from province to province and territory to territory.

1. Work is progressing on a project to provide aastanaaraizea set of "Generalizea Soil Landscape Maps" tor Canada. To date, generalized map compilation has been completed for all of Manitoba and the agricultural regions of Saskatchewan, Alberta arid Ontario.
2. The soil resource inventory program in Northern Canada has expanded. Selected areas of the Northwest Territories nave been mapped at an exploratory level (1:250 K). These projects are airectea from national heaaquarters in Ottawa. A full time functional soil inventory unit was established at Whitehorse to service the Yukon Territory. Field work is to begin on detailed (1:30 K) soil surveys in selected areas relative to agricultural capability and resiaential development.
3. In most provinces artailea re-surveys of areas under intensive and/or competitive use are being stressed, or carried out simultaneously with reconnaissance level surveys of more remote areas. Mbre specific to the interests Of this group might be progress in Eastern Canada: Prince Edward Island is completely mapped in aetail--application of soil survey and related resource information is the present mandate; New Brunswick, Nova Scotia and Newfoundland have, for the most part, completea reconnaissance coverage and are initiating detaileo re-surveys of agricultural areas; Quebec is conducting both detailed re-survey of agricultural lands in conjunction with Completion of provincial coverage at the reconnaissance level. Ontario is concentrating on aetailea re-surveys of intensively used agricultural lands.

In most regions of Canada, there still remains a need for more detailed and up-to-date information to meet the requirements for managing agricultural production, not to mention other land based industries. Acceleration of the soil survey program with expansion of data handling and land evaluation capabilities will, however, have to be as a result of the application of technological advances or modifications in procedures. Existing levels of staff are unlikely to increase.

So, as you can see, we in Canada are facing very similar challenges to those found in the United States.

NORTH CENTRAL REGION REPORT

Neil E. Smeck, The Ohio State University

Some of the benefits derived from an exchange of representatives at the regional soil survey conferences include: a) a source of new ideas, b) aids in avoiding duplication of efforts, and c) provides an opportunity to become acquainted with colleagues from other regions.

The North Central Cooperative Soil Survey Conference was held in Manhattan, Kansas in April. Special reports presented at the conference include: a) Soil potentials for rangeland, b) Erosion - productivity relationships (EPIC process model), c) Ground penetrating radar, and d) Utilization of soil surveys by a farmer. Six committees convened to consider their charges during the conference. Committee 1 (Improving Soil Survey Techniques and Modernizing Soil Surveys) discussed the use of the evaluation form for updating soil surveys, the coordination of habitat types and map units, and the preparation of guidelines for range management statements in map unit descriptions. Committee 2 (Soil Interpretations) considered the reformatting of Soil-5's. Committee 3 (Soil Water Relations) discussed how to gather, store, and use available soil moisture information and encouraged collection of needed soil moisture information where data are lacking. Committee 4 (Educational Activities for Soil Resources and Land Use) compiled a list of publications useful for educating groups about the uses of soil survey information. Committee 5 (Soil Correlation and Classification) discussed horizon nomenclature; in particular, the need for more definitive definitions and the proper use of **kn**, n, r, and d subordinate distinctions. The Committee also considered evaluations of soil surveys, classification of disturbed lands, timeliness of series revisions, and quantification of hardness and water availability of paralithic materials. Committee 6 (Classification, Interpretations, and Modifications of Soils on Mine Spoils and Disturbed Lands) identified important properties for reclamation activities and their variability and discussed ways of achieving uniform implementation of rules and regulations for restoring mined land.

Activities of NCR-3 (regional experiment station soil survey committee) include the preparation of a regional organic carbon content map; the development of a set of standard soil samples for use by characterization laboratories; voluntary participation of ten characterization labs in a study of consistency among labs (SSSAJ 1983 47:566-569); and revision of the soil association map of the North Central Region which is currently in progress.

The projected completion of initial mapping in the North Central Region is shown in the following table. Nine of the eleven states are projecting initial completion dates between 1987 and 1994.

**Status report of soil surveys in the North Central Region,
April, 1984.**

State	Counties					Field Soil Survey Scientists			Est. Compl. Date
	Total	Pub-lished	In Press	In Prog.	Waiting ¹	Federal		State & Local	
						scs	Non-SCS		
IL	102	46	11	21	24	38	0	27	1991
IN	92	59	25	8	0	16(4) ²	0	11	1907
IA	99	61	13	20	5	47(21) ²	0	0	1988
KS	105	84	8	10	3	23	0	0	1987
MN	87	41	9	18	19	30	2	24	1992
MO	107	34	16	23	34	25	0	24	1994
NE	92	61	14	15	2	21	0	13	1987
ND	53	23	3	10	17	28	0	5	2000
OH	88	55	14	16	3	23	0	16	1990
SD	67	44	9	13	1	30	5	0	1988
WI	73	46	3	10	14	24	3	1 ³	2004

¹ Includes planned updates of entire county.

² Number of SCS field soil scientists (or FTEs) whose salary is granted to SCS from state and local funds.

³ Contract mapping for U. S. Forest Service.

1



1. Methods of Use of Laboratory Analyses.

Charges:

- (a) Formulate suggested methods for computer formatting and cataloging of available laboratory data.
- (b) Identify and evaluate new laboratory methods or techniques for characterization of soils, microfabric analysis, and soil mineralogy.

2. Quality of Soil Surveys.

Charges:

- (a) Identify computer programs that are applicable for use with microcomputer for determining soil variability.
- (b) Discuss applicability of geostatistics for soil survey analysis and pedological studies.
- (c) Case examples of quality control procedures used in defining map unit compositions.

3. Soil Survey Interpretations.

Charges:

- (a) Recommend formatting for soil interpretations in updating of older soil surveys.
- (b) Identify methods of recorrelation in MLRA's or multi-county areas where published surveys are available and in need of updating soil interpretations.
- (c) Current research to identify soil erosion impacts on crop yields.

4. Diagnostic Horizons.

Charges:

- (a) Is a modification of the definition of a calcic horizon needed?
- (b) Should the thickness requirements of the petrocalcic horizon be re-evaluated?

- (c) Should the **natric** horizon in the presence of gypsum and/or with high exchangeable aluminum contents be revised?
- (d) Identify concerns in application of new horizon designation. Recommend the optimum number of subscripts symbols to be used on a horizon. Should subscripts be used on transition horizons?

5. Soil Water.

Charges:

- (a) Identify properties of soils that are related to the aquic moisture regime.
- (b) Evaluate applicability of current concepts of aquic moisture regimes.
- (c) Evaluate problems in measuring soil water content and retention in clayey soils. (Bulk density changes, cracking, slow discharge rates, etc.)

6. Use of Soil Survey in Research and Management of Forestland.

Charges:

- (a) Identify methods to evaluate soil productivity in Forestland.
- (b) Identify soil productivity data held by various agencies and recommend a feasible interface of this data base with a soil data base.
- (c) Current status of research in forestland.

Although these committee's findings, recommendations and reports were outlined at the Northeast Regional meeting they are not summarized here but will be available in the Proceedings of the Conference. (Contact either Dr. L. P. Wilding, Department of Soil and Crop Sciences, Texas A and M University, - College Station, Texas 77843 or C. M. Thompson, State Soil Scientist, Soil Conservation Service, 101 South Main, Temple, Texas 76501).

During the meetings, the Southern Regional Group agreed to develop a newsletter to be published and distributed in a manner quite analogous to the one being published by the Northeast Group. Dr. Brian J. Carter, Agronomy Department, Oklahoma State University, 160 Agriculture Hall, Stillwater, Ok 74079 agreed to assume initial responsibility for getting the newsletter out. I'm sure he would welcome any appropriate members of the Northeast Region might like to have included.

New members elected to the Southern Regional's Soil Taxonomy Committee during the meeting are G. W. Hurt, State Soil Scientist, Soil Conservation Service, P. O. Box 1208, Gainesville, FL 32602 and Dr. W. H. Hudnall, Agronomy Department, Louisiana State University, Baton Rouge, LA 70803.

Two areas with potential for increased interregional exchange in future meetings have been identified by a number of those attending the joint conference. One suggestion is that some or all of the working committees be interregional in membership. A second suggestion is that any field trips be planned so that the **composition** of participants is interregional.

I can not report a consensus of the Southern Regional Group concerning the desirability, or undesirability of interregional conferences in the future. The great majority of those contacted so far have responded in favor of **such** meetings on an alternate meeting or possibly less frequent basis. Among the reasons given for limiting the frequency of interregional meetings are logistics of location, planning and conducting the meetings, limitations on time that can be devoted to those interests that are mostly regional in nature, and travel considerations for meetings held outside the region.

In my own view, there is a potential for the Cooperative Soil Survey Program to accrue a number of benefits from **inter-regional** meetings. Increased communication and exchange among individuals **and groups** from different regions is one such example. This is especially true for those associated with different organizations **such** as for example, Experiment Stations and the Soil Conservation Service. A broader perspective and input to problem solving is another example. Readily identified threads of current common interest in the Northeast, Southern and Western regions include soil moisture regimes, quality of soil surveys, computer application to soil survey, restrictive soil horizons, training of soil scientists, effects of erosion on crop yields, and the role and direction of the Cooperative Soil Survey upon completion of the "once-over" mapping.

WESTERN REGIONAL SOIL SURVEY **CONFERENCE** REPORT

by
L. A. **Daugherty**
New Mexico State University

The Western Regional Work Planning Conference met the week of May 21-25, 1984 in El Paso, Texas. The Western Region held their conference jointly with the Southern Region. There were 144 **registered** attendees at the conference with "near equal representation from both regions. Most of the representatives from the two regions agree that the joint meeting was beneficial.

The Western Region is **made** up of representatives from states west of and including the states of Montana, Wyoming, Colorado and New Mexico. The region stretches all the way to Guam. The permanent membership of the conference includes the following:

1. The 13 state soil scientist of the Soil Conservation Service;
2. The 14 university or experiment station soil survey leaders;
3. The principal soil **correlator** or representative;
4. Representative of the soil survey laboratory;
5. **Representative** of the Cartographic Staff;
6. Representative of the Engineering staff;
7. Seven Forest Service Regional Representatives;
8. Representatives from the Bureau of Indian Affairs" Area Offices;
9. Representative from the Bureau of Land Management Regional Office;
10. State soil scientists from the Bureau of Land Management

Much of the conference was **joint** with the southern region. Two days of the conference were scheduled for separate regional meetings or field trips. Joint sessions were a mixture of panels and individual presentations. Examples of individual presentations are: "Report on International Committees"; "IBSNAT Project in Hawaii"; "NCSS Steering Committee Report"; "Northeast Region Report"; "Highlights of the National Scene"; "National Resource Perspectives"; "Report on ICOMERT"; "The Soil-Range Team Approach"; and the "EPIC Model". Three special panels **gave** presentations: "Special Investigations"; "Quality of Soil Surveys"; and "Education, Training and Professionalism for Soil Scientists".

Much of the conference work was done prior to the El Paso meeting with correspondence between members of assigned committees. seven committees were assigned by the steering committee in December of 1982. The deliberations of the committees were presented at El Paso for discussion by the conference as a **whole**. Three discussion groups were formed from the western membership. Each committee chairman presented his committee report to each of the discussion **groups**. The following deals with the seven committee reports.

Committee 1 considered application of field procedures for different orders of soil survey. They were to evaluate results of field tests conducted in 1982 and 1983. They revised guidelines, procedures, and definitions as necessary based on these evaluations. They examined the variety of methods available for describing procedure intensity and are in the process of revising a "Kinds of soil surveys" document.

Committee 2 dealt with application of laboratory methods to soil classification and agronomic interests. The committee reviewed current methods of soil analysis. Cooperative testing was organized between 10 western labs. ASTM procedures will be examined.

Committee 3 considered soil rating for off-road vehicles. Proposed guidelines were distributed to members for field testing and review.

Committee 4 reviewed and considered educational requirements to meet future NCSS needs. An idealized **curriculum in** soil science was developed. The committee recommends contact with the office of Personnel Management to make soil scientist evaluation criteria known to universities. The OPM should also be advised as to the adequacy of the criteria. The committee recommends more management courses during university training.

Committee 5 on form 5's completed their work prior to the 1983 National Work Planning Conference. Their results were presented to the national conference.

Committee 6 dealt with correlation of ecological sites. The objective was to develop a framework of guidelines for the process of correlating ecological sites among themselves and to soils. They recommended that a National Cooperative Ecological Site Survey be established. They suggested that a formal system for review and certification by an authorized body is essential to correlation. The committee made recommendations concerning the development of a taxonomy for ecological sites.

Committee 7 **examined** coordination of data base systems. The objective was to determine the "state of the art" of data bases and data soil management technology in the western region and how this fits with current and future needs. The committee was also to determine if our own efforts are interfacing with what is being done nationally in the development and implementation of data base technology.

In addition to the seven rotating committees, there are two standing committees of the conference: The soil taxonomy committee and the newly formed research priority committee. The soil taxonomy committee membership is elected **from** the Soil Conservation Service, Forest Service and Experiment Stations. Approximately 10 proposals were examined by the committee. A special subcommittee has been set up to develop criteria for Cryic Aridisols. Another subcommittee is proposed to work on a proposal to recognize the subgroup of Aquic Humitropepts.

The Western Regional Coordinating Committee on Soil Survey (WRCC-30) meets with the work planning conference. This coordinating committee is the experiment station representatives. At the request of this committee, the new standing committee on research priorities was formed. The conference passed a resolution that the highest priority research area for soil survey is in **soil-plant-climate** relationships. There is much disagreement in using natural vegetation as indicators of soil climate.

The next western regional soil survey conference is scheduled for the summer of 1986 in Portland, Oregon.

National Technical Work-Planning Conference
Cooperative Soil Survey

James C. Baker
Virginia Polytechnic Institute and State University

The 1983 National Technical Work-Planning Conference of the National Cooperative Soil Survey was held during the week of March 28-April 1 in Washington, D. C. After welcoming and opening remarks, the following standing committee reports were given: Moisture in Soils--Bob Grossman and Confidence Limits--Larry Wilding. Lead speakers then introduced each of the following national issues: Update Strategies, National Geographic Data Bases, National Cooperative Soil Survey Image, and Soil Taxonomy-Soil Fertility. Discussion groups met and each issue received a final report.

The technical committees that met and gave conference reports were those concerned with: soil taxonomy, land capability, soils form 5's, soil interpretations, and horizon designations.

In addition to technical and national issue committee reports, international activities were summarized.

Soil scientist from outside the United States reported on soil survey and related activities in France, New Zealand, Canada, the United Kingdom, and Brazil. Groundpenetrating radar as a tool in soil survey investigations was presented and discussed. The results look promising for its use in soil survey under certain conditions. A field trip to northern Maryland was conducted by the cartographic and Geographic Information Systems staff where remote sensing systems and methods for digital cartography were presented.

From the view point of this participant, some of the most interesting and exciting discussion with respect to promise for future soil survey activities were with the data base systems that are now operable and those that will become operational, the committee on soil taxonomy-soil fertility where productivities and fertility can be directly tied to soil taxa (especially important in third world countries), and the committee which was concerned with update strategies.

Committee Report
Northeast Soil Survey (NEC-50)

John Sencindiver, Chairman
West Virginia University

Until 1983 NE experiment station representatives to the National Cooperative Soil Survey met informally at the NE Soil Survey Conference. In 1983 an official NE **coordination** or discussion committee was established with the following objectives:

1. To increase communication and cooperation among NE Experiment Stations.
2. To identify and promote needed soil survey reseamh.
3. To encourage regional soil survey projects.
4. To promote cooperation in the National Cooperative Soil Survey.

This committee will meet in even numbered years with the NE Soil Survey Conference and in odd numbered years at a location selected by the committee.

Membership of the committee is composed of one person from each of the NE experiment stations, including Virginia, an SCS representative from the NENTC and a representative from **CSRS**. The experiment station advisor to the committee is Dr. Charles Krueger, Penn State University.

The committee is currently working on several projects:

1. An annual soil genesis field trip for graduate students. The first trip is scheduled for July 11-13, 1984 In Maryland and Virginia. The second trip (1985) will be held in New England.
2. A list of research **needs**.
3. A list of available pedon data. This list will present the kinds of data available and the location of the data, but it will not present the actual data.

The 1986 meeting will be held at Cornell University. These meetings are open to all interested persons, but voting privileges are reserved for designated representatives, only.

STATE **EXPERIMENT** STATION **REPORTS**

Storrs Agricultural Experiment Station (Connecticut) Report

Harvey Luce

Soil Parent Material Studies: Soils of the Cheshire and Wethersfield series (both coarse-loamy, mixed, **mesic** Typic **Dystrochrepts**) and the less well drained analogs of these soils are formed in tills derived from the Mesozoic rocks (primarily sandstones, shales and **basalts**) of the central lowlands of Connecticut and Massachusetts. Originally, the Wethersfield and related series were differentiated from the Cheshire soils and related series on the basis of the presence of what was perceived to be fragipans in the former group and their absence in the latter group. It is **now** generally accepted that the fragipan-like qualities of the Wethersfield and related soils are inherited from the tills from **which** they are derived. Our study indicates the presence of a compact, fissile (**platy** structure), loamy till having characteristics typical of lodgement or basal melt-out tills and a second distinctly separate till unit. This latter unit, which exhibits greater horizontal and vertical variability than the former, is nonfissile and varies in consistence from friable to very firm and in texture from loamy sand to silt loam. The fissile till appears to be analogous to the compact tills of the Connecticut highlands that have been described as either lodgement or basal **meltout** tills. The nonfissile unit does not appear to be analogous to any of the tills observed by the author in the Connecticut highlands. Chemical and physical evidence suggests that these tills differ in **mode** of deposition but not in age. Horizontal variations in the texture of the bedrock is mirrored in both till units and subsequently, in the soils. A thin (<60 cm.) eolian mantle appears to be present in some places but not in others. This fissile till unit appears to exclusively "yield" soils of the Wethersfield topo-drainage sequence. It is suggested that, in field mapping, separation of Cheshire and Wethersfield soils is difficult and more prone to error in areas underlain by this latter till unit.

Soil-water Quality Studies: An interdisciplinary study, involving faculty of the Departments of Chemistry, Geology and Geophysics, and Plant Science of the University of Connecticut landfill is in progress. The University's landfill is an example of a landfill in a complex geohydrological setting that discharges aperiodic flushes of leachate. Detection of these flushes requires a high **frequency** of groundwater sampling. **Contamination** of soils downgradient from the landfill serves as a permanent "record" of these flushes which are easily missed by conventional groundwater monitoring programs. **Down** gradient soil **pedons** are being **analyzed** for major cations, heavy metals and certain toxic organic chemicals. A second interdisciplinary study involving faculty in Agricultural Engineering, Microchemistry, Plant Science, and Sanitary Engineering is directed toward the assessment of the significance of household products containing toxic organic chemicals on groundwater quality as a result of their disposal in on-site sewage systems. The results of a recently completed study involving **the** monitoring of a **septage** pit in glacial-fluvial **sand** and gravel were published in the spring, 1984 issue of Groundwater Monitoring Review, Vol. **4(2)** pp.45-50.

Maine Agricultural Experiment Station Report

Robert V. Rourke

Soil research activities at the University of Maine range across a broad array of subject matter but are intricately entwined with the soil survey and its use in the state. Topics of research interest include forest practices, heavy metals, sludge utilization, climatic effects, microbiologic activities and soil characterization.

Forest soil research under the direction of Professor I. Fernandez is concerned with two major areas. He conducts research to examine the relationship between soil properties and the growth of commercial tree species in Maine. He is concerned in measuring growth by both site index and biomass methods. His work, includes evaluation of soil drainage effects on tree growth and soil chemistry, the quantification of soil variability in space and time, and improved methods of forest soil fertility evaluation as well as nutrient movement. He is also concerned with heavy metal levels in the forest floor as possibly being effected by changes in elevation.

Professor J. Risser's interests center upon soil solution composition and dynamics. The application of this research range from soil testing and soil property determinations through the effects of additions of waste materials to soils. It includes the mineral degradation and synthesis that occurs under natural and induced environmental conditions. These processes are those influenced by agricultural, chemical, microbiological or plant activities in the soil environment.

Professor L. Zibilske has research activities addressing questions concerning the agricultural usefulness of pulp and paper mill sludges. There are three sludges being evaluated as a source of increasing organic matter contents in Maine soils. He is also determining carbon loss and nitrogen transformations associated with their decomposition. He is using legume forage and grain to determine soil productivity in sludge amended soils. Specific soil microbial populations stimulated in sludge-amended soil are being evaluated for impacts upon Rhizoctonia disease potential.

Professor M Goltz is investigating the areas of plant environmental physics that are involved with soil heat and moisture. Soil temperature is of primary importance in evaporation, aeration, rate of chemical reactions, as well as influencing plant and microbiological processes. In terms of soil moisture, he is interested in the efficiency of Maine soils as plant water reservoirs, in the limit to which soil water can continue to support plant growth, and in how transpiration is determined by the interaction of soil, plant, and meteorological factors. He and his associates are also interested in potato productivity as it is affected by soil moisture stress and they are working on developing a computer simulation of potato growth, development and yield based upon inputs of soil moisture and meteorological variables.

ME-1

Soil characterization studies continue, under the guidance of Senior Soil Scientist, R. Rourke, to support the cooperative soil survey in Maine. The studies review the various chemical and physical soil properties of the soil mapping units and assist in the interpretation and taxonomic placement of them. Added studies are done on selected pedons to improve in the taxonomic placement of recently developed soil mapping units. These efforts are supported in part by the Soil Conservation Service. The Maine Agricultural Experiment Station cooperation is also expressed by attendance and active participation in progress reviews of the various progress soil surveys in the state.

ME- Z

Maryland Agricultural Experiment Station Report
Martin C. Rabenhorst

We at Maryland are back to full force after having vacancies on the staff for nearly two years. In January, 1983, Marty Rabenhorst joined the staff to replace John Foss who left in September 1981 for a position as Soils Department head at North Dakota State University. Then, in June 1983, Richard **Weismiller** came on board to fill the vacancy left by Fred Miller when he went to serve as Agronomy Department Head at the University of Arkansas in July 1982. Dick received degrees in Soil Chemistry and Soil Mineralogy from Purdue and Michigan State Universities. After a stint with the Air Force, he worked at the **LARS** Institute of Remote Sensing housed at Purdue for 9 years. During this stay, Dick worked closely with the SCS in several projects designed to utilize **remote** sensing in soil survey. Dick is now serving as Associate Professor and Extension Specialist in soil and water resources.

There are a growing number of labs in the country, and in the N.E., which have recognized the value of soil micromorphology as a tool in pedological research. We are pleased that during the last two years, we have acquired the equipment for preparing thin sections on a fairly routine basis. In conjunction with this, we have received on loan, a **Quantimet 720 image** analyzer which we are presently working to install and get operative. We have also succeeded in upgrading our X-ray equipment this year.

Status of Mapping

The publication of the Kent County report in 1982 marked a "once **over**" mapping of Maryland in "modern" soil surveys. There have, however, been major changes in land use in Maryland resulting in the demand for additional and more suitable soil interpretations. Also, with the development of Soil Taxonomy, some concepts in soil survey have changed. There are, therefore, two counties in Maryland where the soil surveys are presently being revised. The mapping in Dorchester contains many outdated and extremely broad delineations. Additionally there are nearly 100,000 acres of tidal marsh which had previously been undifferentiated. There has been a party of 1 working in Dorchester County since mid 1983. Montgomery County is located just north of Washington D.C. When the field work **for this** county was done in the **1950's**, the area was still largely agricultural. Since then it has experienced tremendous pressures due to urbanization, which requires **substantial** revision of the report. The party leader in Montgomery County began work this spring and will hopefully be joined by an additional person this fall.

Highlights 1982-84

The last two years have found Maryland host to several soil activities including NEBASA in June and **ASA** in August 1983. Associated with these meetings were field trips on the soils, **geomorphology** and land use in Maryland. We were pleased to have many of you participate in those trips. Then in the fall of 1983, Maryland was host to the NE regional soil judging contest. We are currently preparing to co-host with Virginia, the first of what we hope will be an annual **pedology** field trip for graduate students in the **NE** region. This trip is scheduled for mid July 1984.

Dan Wagner studied a **number** of soils in Maryland found in sediments (primarily Tertiary and **Cretaceous**) which contained sulfides. Often the zone of

active sulfuricization is quite deep in the profile. Features occurring higher in the profile such as jarosite mottles may still persist, indicating that acid sulfate weathering was an active process at an earlier time. Earth moving activities can expose sulfide bearing materials which may result in serious land use problems.

In his study of the soils of the Mall in Washington D.C. John Short described and classified 100 pedons. He found that 96 of the profiles contained object artifacts (pieces of brick, glass, concrete etc.) in the particle size control section. This suggests the feasibility of using such diagnostic features to define "urbic" subgroups. Presently, many of the pedons classify into "fluv" categories due to the irregular distribution of C with depth.

The oyster shell middens studied by Jim Luzader might intuitively be classified with anthropic epipedons since North American Indians were responsible for these features. Initial measurements of extractable I' gave misleadingly low values due to the nature of the extractant. Subsequent measurements using citric acid extracts did confirm the epipedons to be anthropic.

In an attempt to map and delineate soils to a depth of 2-3 meters, Dill McMahon utilized geophysical techniques not commonly used in soil survey. While he found a portable seismographic unit helpful in identifying materials below normal augering depths, electrical resistivity measurements were not especially useful and were more difficult to interpret. In this process, he developed a scheme for identifying delineations on the map which provide information on the soil and substratum to a depth of 3 meters.

Maura McMullen has been studying the reclamation of active acid sulfate soils formed in dredged material from Baltimore Harbor. The most serious initial problem is with high concentrations of soluble salts. These salts come both from the brackish estuarine water of the harbor (mainly chlorides) and from the oxidation of sulfides (sulfate salts). After salts are somewhat leached, low pH remains a serious problem. This can be somewhat ameliorated by liming, but continual acid generation makes maintaining a higher pH difficult. One of the most useful amendments in establishing plant species has been lime stabilized, composted, Washington D.C. sewage sludge. If this sludge were to be mixed with the dredged material, such a mixture might be called "drudge". This type of operation would no doubt be described as "drudgery."

Present and Ongoing Research

Genesis of acid sulfate soils in dredged materials: This work addresses the translocation and transformation of sulfur compounds and heavy metals along with the development of profile characteristics in these soils. Problems related to classification and mapping of these and associated soils are also being explored.

Sulfur cycling and sulfide accumulation in Maryland tidal marshes: This work will relate the effects of tidal activity and soil properties to rates and processes of sulfate reduction and sulfide accumulation.

Characterization, hydrology, and genesis of closed upland depressions on the Eastern Shore of Maryland: While similar features have sometimes been termed "Carolina Bays," we prefer to describe them as "Delmarva bays." The origin of these features will be considered in relationship to hydrology and soil

properties. Attempts will be made to identify those pedogenic processes now active in these soils.

Lime incubation study for dredged materials: Laboratory and field experimentation is being done to estimate lime rates necessary for reclamation of acid sulfate soils forming in dredged materials.

Publications

- Allen, B.L. and D.S. Fanning. 1983. Composition and soil genesis. pp. 141-192. In Pedogenesis and Soil Taxonomy. I. Concepts and Interactions. L.P. Wilding, N.E. Smeck and G.F. Hall (eds.) Elsevier Science Publishers. Amsterdam, The Netherlands.
- Burt, E.A. 1983. Mineralogy and chemistry of some soils of temperate and tropical regions. M.S. Thesis, Univ. of Maryland, College Park, MD. 93 pp.
- Demas, G.P. 1982. Recent erosion rates and their relation to climatic and cultural change in three Maryland watersheds. M.S. Thesis, Univ. of Maryland, College Park, MD. 93 pp.
- Fanning, U.S. 1984. book Review of Proceedings of the Bangkok Symposium on Acid Sulfate Soils. H. Dost and N. van Breemen (eds.) Proceedings of Second Int. Symposium on Acid Sulfate Soils, Bangkok, Thailand, 18-24 January, 1981. International Institute for Land Reclamation and Improvement/FLRI Publication 31, Wageningen, 1982, 450pp. Geoderma 32:71-73.
- Fanning, D.S., M.C. Rabenhorst, D.P. Wagner, and P.A. Snow. 1983. Soils-Geomorphology Field Trip in Maryland, Aug. 12-13, 1983, Guidebook. sponsored by S880 Committee of Soil Science Society of America and Dept. of Agronomy, Univ. of Maryland. 119 pp.
- Luzader, J.D. 1983. Characterization of soils developed on oyster shell middens in Maryland. M.S. Thesis. Univ. of Maryland, College Park, MD. 71 pp.
- McMahon, W.J. 1984. Soil/Substratum mapping utilizing soil survey and geophysical techniques. M.S. Thesis. Univ. of Maryland, College Park, MD.
- McMullen, M.C. 1984. Adaptability of selected conservation plant species in relation to pH and electrical conductivity of Sulfaquepts on dredged material in Baltimore, Md. M.S. Thesis. Univ. of Maryland, College Park, MD.
- Miller, F.P., J.E. Foss, and D.C. Wolf. 1982. Soil Surveys: Their synthesis, confidence limits and utilization for corrosion assessment of soil. Special Tech. Pub. 741. Am. Soc. for Testing Materials.
- Short, J.R. 1983. Characterization and classification of highly man-influenced soils of the Mall in Washington, D.C. M.S. Thesis. Univ. of Maryland, College Park, MD. 126 pp.
- Wagner, D.P. 1982. Acid sulfate weathering in upland soils of the Maryland Coastal Plain. Ph.D. Thesis. Univ. of Maryland, College Park, Maryland. 171 pp.

Massachusetts Agricultural Experiment Station Report

Peter L. M. Veneman

The soil morphology program at the University of Massachusetts encompasses the following 3 research areas: pedology, waster disposal, and commodity oriented research.

Activities in the pedological area include:

Spodosol Studies

The effectiveness of the current Spodic horizon criteria was evaluated for 27 Massachusetts soil profiles. The criteria appeared quite effective separating Spodosols from non-Spodosols when soil characterization pedons were used. A survey of soils intergrading from Dystrochrepts to Haplorthods indicated a greater discrepancy between morphological field criteria and chemical laboratory data. It also appeared that the extent of Spodosols in Massachusetts has been somewhat overestimated. Evaluation of the Holmgren Spodosol test kit in Massachusetts indicated that the kit identifies well expressed spodic horizons. The test appeared less useful in distinguishing spodic from non-spodic intergrades. A method, employing extraction with 5% Na-pyrophosphate and color comparison of the supernatant with Munsell color charts, showed over 90% agreement with chemical laboratory results. This rapid and simple method seems, at least for Massachusetts, an effective means to identify those Spodosols which will meet the chemical diagnostic criteria.

Moisture Regimes and Associated Mottling

A Paxton drainage-toposequence was monitored for several years to study soil moisture potential, level of the water table, soil temperature, moisture content and associated mottling phenomena. Position of low chroma mottles tends to underestimate the actual highest levels of the water table, especially during the early spring. This effect is most pronounced in the well and moderately well drained members of the sequence. Further field studies are being continued in glacial outwash (Agawam catena) and red triassic parentmaterials (Wethersfield catena). Laboratory experiments studying mottle formation in selected parentmaterials under controlled conditions are currently carried out as well.

Strength Characteristics of New England Hardpans

Most hardpans are difficult to detect during the moist New England springs. A study was undertaken to evaluate 2419 eld



New Hampshire Agricultural Experiment Station

Nobel K. Peterson

Since the last meeting of the Northeast Cooperative Soil Survey Conference, several changes have taken place in administration at the University of New Hampshire. We have a new President - Dr. Gordon Baaland, a new Dean of the College of Life Sciences and Agriculture - Dr. Stephen Yleinrchter, and a new Department for UNH Soil Scientists headed by Dr. Harold Rucker. This is the fourth group I have been in since joining the faculty at UNH. The first unit was the Agronomy Department, the second was called the Soil and Water Department (also called Hud Department), the third was not a Department but the Institute of Natural and Environmental Resources. Two Departments were formed when I.N.E.R. was declared defunct by our former Dean. Currently I am a member of the Department of Forest Resources which includes foresters, wildlife experts, a hydrologist, soil scientist and one or two people Labeled Environmental Conservations. This could turn out to be the best arrangement.

In January of this year a new status of Soil Surveys for New Hampshire was published. Copies are available from Mr. Pilgrim, the State Soil Scientist. A copy of the Sullivan County soil survey report was presented to the Governor of New Hampshire by the State Soil Scientist, assisted by the State Conservationist and the Representative from N.H. Agricultural Experiment Station.

The physical and chemical properties of five soil series collected in northern New Hampshire were determined in the UNH Soils Laboratory in the summer of 1983. Samples collected in the fall of 1983 will be analyzed this

EXPERIMENT STATION REPORT--NEW YORK

R. B. Bryant

Department of Agronomy

Cornell University

I. Personnel and Programs

Bill Waltman is the new assistant soil survey leader at the Cornell University Agricultural Experiment Station. Bill is finishing a Ph.D. program at Pennsylvania State University under the direction of Dr. Edward Ciolkosz.

Warren Philipson was tenured in Agronomy and appointed director of a newly organized Center for Remote Sensing. Dr. Philipson, formerly in the School of Civil Engineering, and Dr. Ernest Hardy of the Resource Information Laboratory, will combine research efforts in the application of remote sensing techniques.

II. Soil Characterization Activities

Approximately 120 pedons were characterized in 1983-84 in support of the soil surveys in Essex, St. Lawrence, Greene, Columbia, Chautauqua, and Oneida Counties. Approximately 200 pedons are now stored on computer in the R-Base data management format. Approximately 150 soil monoliths have been collected in support of the soil survey. Capabilities of the Soil Characterization Laboratory have been expanded to include mineralogical analysis.

III. Research

A. Soil Genesis, Classification, and Survey--Ray Bryant

Kent Snyder (Ph.D. candidate) is investigating colluvial processes and pedogenesis on slopes of the unglaciated Salamanca reentrant in western New York.

Dennis Timlin (M.S. thesis) has completed a computer simulation model which calculates water budgets and predicts corn grain yields under soil and climatic conditions of the Northeast. Continued work on the model is directed toward simulation of the effects of hydrological partitioning of precipitation.

Steve Major (M.S. thesis) is studying soil morphology, classification, landscape, and vegetative relationships in Spodosols of the Adirondack wetlands.

Brad Iman (M.S. thesis) is assessing the role of soil physical ripening in fragipan formation.

Jamil Macedo (M.S. thesis) is studying iron mineralogy, soil forming processes, and soil color relationships occurring in Oxisols with restricted drainage in Brazil. He is also investigating remote sensing techniques for identifying these soils in the Carrado region.

Janis Boettinger (undergraduate) is developing a quantitative laboratory technique for measuring soil color using the UV-visible scanning spectrometer.

Kent Snyder and Steve Major are making a comparison of the type and amount of iron and aluminum extracted by KOH with that extracted by other spodic extractants.

Duane Lenhardt (Ph.D. thesis) completed characterization and strength analysis of representative fragipans of New York State.

Tamara Warner (undergraduate) completed an evaluation of the French remote sensing satellite (SPOT) simulation data for use in soil and land-use evaluation.

B. Soil Interpretations and Land Use--Gerald Olson

The Soil and Land Use Tours that are published for completed soil surveys in New York State were featured in the May issue of SOIL AND WATER CONSERVATION NEWS. One of the more recent publications is a Soil and Land Use Tour of Central Park.

The book, Field Guide to Soils and the Environment, will soon be available. It is designed as a field laboratory manual to supplement Soils and the Environment.

Research is ongoing in using the computer for producing interpretive maps.

C. Soil Survey Digitizing--Shaw Reid

Camera digitizing is being adapted for use in digitizing soil surveys in hilly terrain. Algorithms are being developed to correct for photographic distortion.

THE PENNSYLVANIA STATE UNIVERSITY
AGRICULTURAL EXPERIMENT STATION REPORT

Robert L. Cunningham

The Experiment Station provided the leadership and editorial action necessary to publish the "Soils of the Northeastern United States," Bulletin 848. The map included in the Bulletin was prepared, published, and provided by the Soil Conservation Service, NE NTC in Chester, PA. Early distribution has been made. Penn State is the source for any additional copies. The editors wish to thank the authors from the Northeast who wrote the chapters and therefore made the bulletin possible.

Ed Ciolkosz continues to support the Cooperative Soil Survey program in the Northeast and Nationally. Ed participated in the National Soil Survey Work Planning Conference in Washington last year and attended the joint Western and Southern Soil Survey Work Planning Conference this past May. The Pennsylvania strength in soil genesis should start showing up soon around the country.

Characterization: The 650 pedons sampled in Pennsylvania have been coded as to location so that selected spatial analyses can be displayed. The data will also be summarized to determine the variance of Pennsylvania soil properties, to determine the relationships among pedons, and to direct further sampling and analyses.

The soil surveys of York, Berks, Clinton, and Potter Counties are presently being evaluated by the SCS for possible updating. The Penn State characterization laboratory is assisting in determining the adequacy of mapping and survey information. The survey in Elk-Cameron and Bedford Counties is continuing. The Experiment Station contributes to the reviews of all these surveys.

Soil Information System The delineations from 3 atlas sheets of the Centre County soil survey were used to demonstrate the microcomputer capability to deliver soil interpretative maps. Research is in progress to include ownership boundaries and elevation data in the computer data base. Soil management programs based on models that use slope and soils can be written for individual land tracts. Computer land use planning requires additional attention. Rick Day, a computer programmer and system analyst, will be developing land use and management programs that use soils information.

Digitized soil maps will be available for six surveys in Pennsylvania in the near future.

Soil Genesis: Soils up to 65 percent slope developed in sandstone were investigated. The results indicated that soils on the southwest aspect showed a linear decrease in the mean thickness and clay content of the B2 horizon with increasing slope gradient. The depth of solum decreased linearly with increasing slope gradient for soils on the southwest

aspect but increased linearly on the northwest aspect. Differences in soil properties between slope aspects were apparent at slope gradients of greater than 20 percent.

Preliminary results from studies in soils near the advance of the glacier in Pennsylvania indicate that some stable surfaces show deep, intense weathering in the subsoil. Across a toposequence at Algerine Swamp Natural Area, paleosol horizons were traced from the uplands to the bog areas. A stoneline marks the surface of the paleosol that sometimes occurs beneath a fragipan. The red paleosol horizon is considered to be the result of interglacial (Sangamon) weathering and has since been covered by Wisconsinan-age colluvium

An on-going study is examining the conditions of soil mottle formation in Pennsylvania soils. Laboratory samples have been treated with organic matter and various temperatures. The mottle development has been monitored.

An acid-rain model has been developed to describe the impact of acid rain on soil development processes. This model contributes to the understanding of soil formation in Pennsylvania and has revealed several deficiencies in our soil data base. Areas of acid-rain sensitive soils were determined for Pennsylvania, improving considerably on previous estimates.

Research is nearing completion on the study of soils developed under grass vegetation. Phytoliths and pollen counts are sources of evidence pointing to the influence of the biotic factor in soil formation.

A toposequence of soils developed in the dolomites of the Nittany Valley is being investigated to better understand the genesis of these important soils.

Sites in colluvial soils in the Valley and Ridge Province in Pennsylvania indicated that most of these soils were developed in two ages of colluvium. The intensely weathered, buried colluvium corresponds to preWisconsinan aged materials. The upper horizons correspond to Wisconsinan aged materials. This study emphasized the common occurrence of multiple aged materials in the side slope soils of the Ridge and Valley.

Remoteg: _____ The SCS is cooperating to develop base maps with slope classes delineated as an aid in soil survey mapping. The pilot study in Potter County uses digital elevation model data. The product would improve mapping efficiency.

Soil temperature maps were created from remotely sensed data collected over Utah. Several additional studies are utilizing reflectance and emitted radiation to determine characteristics of earth resources.

Personnel: Dr. William R. Wright, Rhode Island, studied at Penn State during his 1982-1983 sabbatical leave year. Dr. Carl Engle, Washington State University, plans to study microcomputers in agriculture, sludge disposal on land, and small farm agriculture during his 1984-1985 sabbatical leave.

Dr. Michael Hoover has graduated and is now at North Carolina State University. Dr. Brian J. Carter also received his Ph.D. degree and is at Oklahoma State University. John D. Hudak is Party Chief with SCS in Potter County and William Waltman is soil characterization laboratory director at Cornell University.

Publications: A list of publications and theses is available upon request.

1

Rhode Island Agricultural Experiment Station Report

W. R. Wright

Reorganization has been the name of the game at the University of Rhode Island. Effective July 1983, a new department of Natural Resources Science was established, combining the departments of Forest and Wildlife Management and the Soil Science Section. The nine faculty together with approximately 70 support staff and graduate students brings together a unique interdisciplinary group of professionals that are concerned with the conservation and management of our natural resources and the quality of our environment. I have been appointed Chairman of the Department, however, I will continue to teach and conduct research in the areas of soil genesis, classification, and land use in a limited capacity.

I had the privilege of spending the 1982-83 academic year on sabbatical leave at The Pennsylvania State University. Although I had the opportunity to interact with the entire soil genesis and morphology staff, most of my efforts involved taking courses and working with Gary Petersen in the area of remote sensing.

I also had the opportunity to spend the month of June, 1983 in the Azores on an AID project. Our primary objectives were to develop a legend and initiate soil mapping at a scale of 1:50,000 and to set up a soil characterization lab at the University of Azores.

Proposed and Current Research Projects

Development of a" Integrated Natural Resource Information System

W. R. Wright and D. Walters

The primary objective of this research is to place existing natural resource information, specifically soils data, into computers for integration, analysis, retrieval, and display purposes. Data obtained from the R.I. Soil Characterization Laboratory and interpretive data obtained from USDA SCS Form-5, will be coded into the URI mainframe computer. This information will be down-loaded to a micro-computer and techniques will be developed to spatially project the soils data. Commercially available hardware and software will be evaluated as to their ability to digitize and graphically display soil survey data. Attempts will be made to use currently available Geographic Information Systems on Micro-Computers.

Heavy Metal Contents in Rhode Island Soils

W. R. Wright and P. S. Schauer

This research was initiated to provide quantitative baseline data on residual heavy metal levels in soils of Rhode Island. This data is not only needed as a baseline against which further sampling can be compared but also to assess the potential contaminants that already exist in the soil under various land use practices. Therefore the objectives of this research are threefold: 1) to develop methodology for assessing contamination within land use classes; 2) quantitatively determine baseline levels of heavy metals (Cu, Cd, Cr, Ni, Pb, Zn, Fe, Mn, Hg, As) in various land use classes; and 3) to correlate heavy metal levels with selected soil properties.

Soil Properties in the Transition Zone of Forested Wetlands

F. C. Golet and W.R. Wright

The proposed research project will analyze the interrelationships between water regime, vegetation, soils, and other features such as micro-relief along a broad transition zone bordering areas mapped as forested wetlands. We aim to quantify the biological, physical, and chemical characteristics of this zone, and to attempt to develop a multivariate technique for the field identification of forested wetland boundaries. Specific objectives are: 1) to describe the changes in soil properties that occur along the transition zone of forested wetlands in southern Rhode Island; 2) to relate these changes in soil properties to changes in Vegetation, ground elevation, and the elevation of the water table across the transition zone; and 3) to suggest criteria for the field Identification Of hydric soil conditions In forested areas.

Field Evaluation of a Nitrogen Control System for Individual Sewage Disposal Systems

A. J. Gold and W.R. Wright

This study was initiated to field evaluate a denitrification "RUCK" system as a means of reducing nitrogen input to groundwaters from Individual sewage disposal systems. Specific objectives are: 1) to determine the fate of nitrogen in each component of the RUCK system; 2) to evaluate grey water as a source of organic carbon for denitrification; and 3) to quantify the nitrate load to the groundwater from a RUCK system.

Effects of Simulated Acid Precipitation in the Pine-Oak-Hinckley Ecosystem

J. H. Brown and A. J. Cold

This greenhouse and field research project will investigate the effect of various levels of simulated acid precipitation on the germination, growth, and development of the dominant forest species that are found on Hinckley soils in southern New England. In addition, this study will evaluate the influence of simulated acid precipitation on the concentrations of soluble aluminum, manganese, and iron in these coarse-textured soils.

Recent Graduate Student Theses

- Chmura, Gail L. 1982. Morphological, physical, and chemical characteristics of ditched and unditched tidal salt marsh soils. M.S. Thesis.
- Morneault, Philip. 1982. Factors influencing the variability of field percolation rates of glacial till soils. M.S. Thesis.
- Loomis, George W. 1983. Vertical migration and attenuation of sewage sludge landfill

Virginia Agricultural Experiment Station Report

James C. Baker

This report will focus on the soil survey program in Virginia and Virginia Tech's role in the National Cooperative Soil Survey.

Soil Genesis, Morphology, and Soil Survey Personnel

J. C. Baker - Project Leader and Soil Survey Coordinator
W. J. Edmonds - Soil Survey Field Coordinator
D. F. Amos - International Programs (Nepal)
T. W. Simpson - Extension Agronomist - Soil and Land Use
W. L. Daniels - Resident Instructor - Mine Land Reclamation
K. W. Molten - Computer Application Specialist
15 Field Soil Scientists
3 Interpretative Soil Scientists - County
2 Interpretative Soil Scientists - State Health Department

Present Status

Modern soil survey information is available for approximately 14 million acres of Virginia's 25.4 million acres. To date 52 counties have modern soil surveys, 19 counties have surveys in progress, and 26 counties have old or no survey information. All surveys presently underway are on a cost sharing basis with the county contribution ranging from 10 to 25 percent of the cost of the soil survey.

The current Virginia Tech soil survey program has 9 progressive soil surveys underway involving 15 field soil scientists. The surveys cover all the physiographic provinces and include: Accomack, Appomattox, Charles City, **Greensville**, King William, Nelson, Patrick, Washington, and Wythe Counties. One soil scientist is assigned to an S.C.S. field party in Amelia County, and one soil scientist is assigned at Blacksburg to work with manuscripts, map compilation, and data analysis. This makes a total of 17 soil scientists.

The soil characterization laboratories at Blacksburg provide characterization data on chemical, physical, and mineralogical properties of soils for both federal and state soil surveys in Virginia. The major benefit of these laboratory facilities, coupled with an active participating field program, operating under the supervision of the Department of Agronomy, is that research can be controlled and directed that will best serve the needs of Virginia and also contribute to regional and national programs that are a part of the National Cooperative Soil Survey. Several of our research efforts will have impact on the rules that govern operation of the National Soil Survey program. Thus under the umbrella project entitled "Investigation,

Characterization, and Soil Survey of Designated Counties in Virginia", many separate investigations have been made, many more are currently underway, and several are planned for the future. The following investigations are examples of the kinds of research that are now a part of the Virginia Tech soil survey classification and genesis research program.

Current research emphasis

i. Study Title: Groupings of Soil Profiles in Three Mapping Units by Conventional and Numerical Classifications

Objectives: The objective of this research was to study relationships between groupings of soil profiles produced by soil surveyors, Soil Taxonomy, and numerical taxonomy.

ii. Study title: Marsh Soils Investigation

Objectives: The objective of this investigation is to characterize and classify soils in salt marshes in Virginia on a regional basis.

iii. Study Title: Limestone Derived Soils Investigation

Objectives: The objective of this investigation is to characterize and classify soils developed in materials weathered from carbonate rock in six counties in Southwest Virginia by criteria in Soil Taxonomy and by numerical taxonomy.

iv. Study Title: Virginia Tech Research Farm - Giles County

Objectives: The objective of this study is to evaluate the prediction of soil properties evaluated by soil testing for crop production by classes produced by soil surveyors, by Soil Taxonomy, and by numerical taxonomy.

v. Study Title : Influence of Aspect and Vegetation on Soil Development

Objectives: The objective of this study is to use nonparametric statistical methods to study the influence of aspect and vegetation on soils developed in materials weathered from a very heterogeneous parent material.

vi. Study Title: Soil Genesis Studies on Ultisol Landscapes with Alkaline Seeps.

Objectives: To describe the genesis of high base-high pH soils **occurring** in predominantly Ultisol upland landscapes in the Virginia Piedmont.

vii. Study Title: Regional Classification and Characterization of **Sassafras Soils**

Objectives: To objectively characterize and classify the Typic Hapludults (Sassafras, a Benchmark and Hall of Fame Soil) on the Delmarva Peninsula.

viii. Study Title: Shale Soils Investigation.

Objectives: The objectives of this investigation are (i) to characterize and classify soils developed in materials weathered from shales in Virginia, and (ii) to mineralogically analyze the silt, sand, and rock fragment portions of these soils to evaluate these materials as a residual source of plant nutrients.

ix. Study Title: Rooting depths in agriculturally important soils.

Objectives: The correlation of rooting depths in agriculturally important soils with chemical and physical soil properties.

x. Study Title: Selection and testing of simulation models of water movement and corn yields in a soil plant atmosphere continuum.

Objectives: To select simulation models for (1) water movement in a soil plant atmosphere continuum using a 1-dimensional *energy* balance approach, and (2) corn yield which models both vegetative and root growth. These two models will be interfaced in order to study potential water stress conditions of corn in Virginia.

Publications since 1982

Refereed Journal Articles

1. Edmonds, W.J. and J. B. Campbell. 1984. Spatial estimates of soil temperature. Soil Sci. (in press).
2. Campbell, J. B. and W. J. Edmonds. 1984. The missing geographical dimension to Soil Taxonomy. Ann. Assn. Am. Geog. 74(1) pp. 83-87.

3. Harris, W. G., L. W. Zelazny, and J. C. Baker. 1984. Depth and particle size distributions of talc in a Virginia Piedmont Ultisol. *Clays & Clay Minerals* (in press).
4. Harris, W. G., L. W. Zelazny, J. C. Parker, J. C. Baker, R. S. Weber, and J. H. Elder. 1984. Engineering properties of soils as related to mineralogy and particle size distribution. *Soil Sci. Soc. Am. J.* (in press).
5. Hodges, R. L., J. C. Baker, and D. Darling. 1984. Contour lined photobase maps for soil mapping. *Soil Sci. Soc. Am. J.* 48:420-422.
6. Daniels, W. L., D. F. Amos, and J. C. Baker. 1983. The influence of forest and pasture on the genesis of a humid temperate region Ultisol. *Soil Sci. Soc. Am. J.* 47:560-566.

Experiment Station Bulletins

1. Edmonds, W. J., P. B. Sabo, and C. D. Peacock. 1984. Supplemental data for soil survey report of Greensville county, Virginia. *Virginia Agric. Exp. Stn. Bull.* 84-2. 408p.
2. Parker, J. C., D. F. Amos, and J. C. Baker. 1983. Engineering properties of selected soils of the Virginia Piedmont. *Virginia Virginia Agric. Exp. Stn. Bull.* 83-b. 78p.
3. Wilson, M. A., L. W. Zelazny, and J. C. Baker. 1983. An investigation of soils within the Tatum and Elioak mapping units in the Virginia Piedmont. *Virginia Agric. Exp. Stn. Bull.* 83-1. 190p.

Technical Reports

1. Baker, J. C. and D. S. Fanning. 1984. Ultisols, In R. L. Cunningham and E. J. Ciolkosz (eds.) *Soils of the Northeastern United States.* Pennsylvania State Univ., Agric. Exp. Stn., University Park, Pa. Bull. 848, p. 31-39.

Soil Survey Reports

1. Hodges, R. L. In Press. Soil Survey U. S. Naval Supply Center, Cheatham Annex, Williamsburg, Virginia. Virginia Poly. Inst. and State Univ. and U.S. Dept. of Navy.
2. Hodges, R. L. In Press. Soil Survey U.S. Naval Weapons Station, Yorktown, Virginia. Virginia Poly. Inst. and State Univ. and U.S. Dept. of Navy.
3. Edmonds, W. J. and J. Stiegler. 1982. Soil Survey of Clarke County, Virginia. USDA, scs. U.S. Government Printing Office, Washington, DC.

West Virginia Agricultural and Forestry Experiment Station Report

John C. Senoindiver

Surface mine reclamation continues to be the major research effort of the soil **science** group in the West Virginia **Agricultural** and Forestry Experiment Station. A smaller effort is being devoted to other soils related projects.

Current Research

1. Abandoned mine land **revegetation**.
2. Mineral concentration of forage grown on reclaimed surface mines.
3. Studies of **mycorrhizal** fungi in minesoils.
4. Utilization of fly ash for crop growth.
5. Utilization of fly ash and rock phosphate mixtures for reclamation of abandoned mine lands.
6. Absorption of heavy metals by soils.
7. Evaluation of various P extraction methods on **minesoils**.
8. Evaluation of alternative "topsoil" materials on abandoned and new mine lands.
9. Assessment of pesticide residues in surface and groundwater from a commercial size strawberry field.
10. Soil climate in an Appalachian watershed.

Other Projects

1. Senoindiver continues to represent WW on the Surface Mine Drainage Task Force and the Acid Mine Drainage Technical Advisory Committee.
2. Continued support of **RAMP** projects by analyzing **minesoil** samples and making **recommendations** for reclamation of abandoned lands.
3. Worked closely with SCS to develop five soil series for mined lands.
4. **Senoindiver** represented the soils group on the planning committee for the NE Forest Soils Conference to be held in West Virginia, July 22-24, 1984.

Theses and Publications

1. **Boyles, Robert.** 1983. Analysis of Stoniness and Rockiness in a Forested Catchment in North Central **West** Virginia. **MS** Thesis. **West** Virginia University.
2. Clokosz, E. J., T. W. Gardner and J. C. **Sencindiver.** 1984. Geology, Physiography, Vegetation and Climate. p. 2-14. **In** Soils of the Northeastern United States. Bulletin 848. The Penn. State **Uiv.**, Coll. of Agric., Agric. Exp. Sta. Univ. Park, PA.
3. **Codling, Eton.** 1893. **Limpoggrass** Yield as Affected by Lime Rate and Types of P. **MS** Thesis. West Virginia University.
4. **Dilliplane, Timothy.** 1983. Site and Soil Evaluation for **Onsite Waste-**water Disposal in **Monongalia** County, West Virginia. **MS.** Thesis. West Virginia University.
5. Elkhatib, **Elsayed.** 1983. Arsenic in **Fluidized** Bed Waste and Fly Ash. **Ph.D.** Dissertation. West Virginia University.
6. Jencks, E. **M.**, E. H. **Tryon** and **M. Contri.** 1982. Accumulation of Nitrogen in **Minesoils** Seeded to **Black Locust.** **Soil Sci. Soc. Amer. J.** 46:1290-1293.
7. **Kanu, Sori.** 1983. The Effects of Four Sources of P and Fly Ash in Controlling **Mn** and **Al** Availability on Native and **Mine** Soils. **MS** Thesis. West Virginia University.
 - a. **Keefer, R. F., R. N. Singh, O. L. Bennett** and **D. J. Horvath.** 1983. Chemical Composition of Plants and Soils from Revegetated **Minesoils.** p. 155-161. **In Proc.** of Symposium on Surface Mining, Hydrology, **Sedimentology,** and Reclamation. Univ. of KY, Lexington.
9. Nonoa, **Salima.** 1983. Nitrogen and Phosphorus Fertilization of Maize on Two Soils of Togo. **MS** Thesis. West Virginia University.
10. Robinson, Neil. 1984. Chemical and Physical Properties of a **Minesoil** Five Years After Lime and Fertilizer Treatment. **MS** Thesis. West Virginia **Universtiy.**
11. **Sencindiver, J. C., N. C. Thurman** and **A. Fugill.** 1983. Effects of Selected Reclamation Methods **on Minesoil** Properties: A Progress Report. 11 p. **In Proc.** of Symposium on Surface Mining and Water Quality. WV Surface Mine Drainage Task Force and WV Surface Mining and Reclamation Association, Charleston.
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COMMITTEE 1

REGIONAL EROSION - PRODUCTIVITY STUDIES

CHAIRMAN: R. B. Bryant, Cornell University, NY
VICE CHAIRMAN: K. H. Langlois, NENTC, SCS, PA

COMMITTEE MEMBERS

R. D. Babcock, SCS, ME
D. F. Childs, SCS. W
R. L. Cunningham, PSU, PA
R. E. Francis, SCS, NENTC
R. L. Googins, SCS, VA
w. c. Kirkham, SCS, NJ
G. H. Lipscomb, SCS, PA
H. D. Luce, Univ. of CT., CT
T. W. Simpson, VPI & SU, VA
E. C. A. Stuart, SCS, RI
R. A. Weismiller, Univ. of Maryland, MD

BACKGROUND

Scientists in recent years have become increasingly aware of the effects of soil erosion and the resulting losses in soil productivity. Unfortunately, there is significantly little hard data available to adequately assess the magnitude of these losses. Studies and proposals for studies are in various stages of development throughout the country. Obviously, soil scientists must play a significant role in these studies. They must not only be aware of the kinds of studies that are in progress, as well as those that are being proposed, but they must be prepared to actively participate in these studies. Most certainly, the use of soil surveys and Soil Taxonomy in these studies would contribute substantially to their success.

COMMITTEE CHARGE:

1. Summarize all soil erosion-productivity studies currently in progress and those being proposed within the Northeast region.
2. Review procedures and designs of these studies and the role of soil scientists in them
3. Make recommendations as to improved methodologies; standardized procedures, if applicable; and ways in which soil scientists may become more involved.

COMMITTEE ACTION:

Members were requested to report on research efforts in their home states. The responses were condensed, compiled, and distributed to committee members for review. Discussion at the committee meetings in Amherst resulted in recommendations.

RESPONSE TO CHARGE 1: SUMMARY:

Soil erosion-productivity studies currently in progress and those being proposed within the Northeast region are as follows:

1. VPI--J. C. Baker, T. W. Simpson, and P. J. Thomas are initiating an erosion-productivity study in which multiple regression techniques will be used to develop a model capable of predicting corn grain yields. Inputs will be those soil physical and chemical properties most affected by the erosion process.
2. VPI and SU--Piedmont Bright Leaf Erosion Control project is a 10-year program designed to: estimate the relationship between crop yields and soil erosion, management decisions, and physical characteristics of the soil; estimate the long-term impacts of soil erosion on agricultural productivity and net farm income; and examine alternative program implementation strategies for the area. Production functions will be developed and used to develop a simulation model for predicting the effects of erosion on productivity.
3. URI/SCS--Inventory Monitoring Program--Plan for Inventory of Erosion Sensitive Soils is a 29-month project designed to describe the relationship between long term soil erosion, crop yield and agricultural productivity. Major soil groups will be identified. Cropping and management history will be documented. Complete crop management profiles from the soil-crop environment will be obtained. Complete pedological descriptions in the soil-crop situations will be obtained. The variation in important chemical and physical properties of the soil in the soil-crop situation will be determined. Models will be developed to provide forecasting capabilities as to the erosion-productivity implications of future management decisions.
4. Maine--Field Appraisal of Resource Management Systems (FARMS) is a 3-year statistical and economic analysis of crop production in Aroostook County, Maine. Statistical sampling procedures are being used to collect data on crop history, soils information, Universal Soil Loss Equation, crop management, and crop yields.
5. Cornell and SCS--R. B. Bryant, V. A. Snyder, and R. J. Wagenet are modeling corn grain yields and the decline in soil productivity in relation to soil erosion in the Northeast. The model assumes a high level of management and uses a water budget to calculate moisture stress during the growing season. Soil water holding capacity and climate data are required as inputs. An equation for predicting yields is obtained by regression.

6. USDA--Several models that relate to soil erosion and productivity are being developed, tested, and refined. Of these, the EPIC (Erosion/Productivity Impact Calculator) and the CREAMS (Chemicals, Runoff and Erosion from Agricultural Management Systems) models are operational. Model inputs include weather, hydrology, erosion, nutrients, plant growth parameters, tillage, and economics.
7. Other models to predict soil erosion and productivity relationships include the SOILEC model and the Productivity Index model.
8. An extensive literature review on the subject of soil erosion and productivity research is found in "Soil erosion effects on soil productivity: a research perspective" in the March-April 1981 issue of the JOURNAL OF SOIL AND WATER CONSERVATION.

Response to Charge 2: Study Design and Role of Soil Scientists.

All of the above projects are aimed at model development and/or data collection for calibration and testing. Soil scientists are involved in all phases of research to include: project planning, site selection, soil identification, profile description, landform description, soil characterization, yield measurements, site history evaluation, model development, and prediction.

Recommendations to Charge 3:

Improved Methodologies--The committee concluded that the non-destructive modeling approach is a valid and feasible means of studying the effects of soil erosion on soil productivity. However, much of the field data used for model development is being adapted from studies designed for other purposes. Field studies designed specifically to test the relationship between soil erosion and soil productivity are needed.

Standardized Procedures--Standardized procedures for data collection are needed in order to establish a collective data base useful for model development and testing.

The committee recommends that a task force be appointed and charged as follows:

1. Identify the types of data that are presently being used as input for model development and testing.
2. Identify existing soils/yield/climate data bases at experimental plots that may be useful for model development and testing.
3. Review the Soil-Crop Yield Data form (Soils form 1) and make suggestions for revision and/or supplementation to improve the usefulness of this data base for model development and testing.

Committee #2

Soil Survey Training Course

Committee Members:

J. C. Baker, VPI & SU, VA - Chairman
S. A. L. Pilgrim, SCS, NH - Vice Chairman
E. J. Ciolkosz, PSU, PA
L. Cotnoir, Univ. of Delaware, DE
P. Craul, Syracuse Univ. NY
L. A. Douglas, Rutgers Univ. NJ
R. L. Hall, SCS, DE
W. E. Hanna, SCS, NY
K. J. LaFlamme, SCS, ME
H. Mount, SCS, NH
W. Palkovics, Delaware Valley College, PA
J. C. Patterson, National Park Service
L. A. Quandt, SCS, NENTC
M. Rabenhorst, Univ. of Maryland, MD
D. D. Rector, SCS, VA
L. Spivey, SCS, WV

Background:

Our Universities are generating large numbers of graduate students at the masters and doctorate levels who have had very little field mapping experience. Many of these graduates are employed in the private sector as consultants, etc, and have little opportunity for additional on the job training in field mapping. There is a definite need for these graduates to have adequate field mapping training in order to carry out their work and to succeed in their professions.

Committee Charges:

1. Survey existing soil survey courses.
2. Define minimum training needs in soil survey at the graduate level.
3. Make recommendations as to how these needs can be fulfilled.

Committee Report

General :

There are no courses offered routinely that can substitute for daily field mapping experience. Those courses that are field based, i.e. soil survey, soil genesis, classification, soil judging, and field trips are all quite valuable but can only serve as an introduction to field study. If the research portion of a student's graduate program is a field study, this probably comes closest to mapping as anything. Study trips of several days duration can help but they cannot replace day to day field mapping.

Charge 1. Survey existing soil survey courses.

A questionnaire was designed to gather information to assess what courses relating to soil survey, soil genesis, land use, etc. were available through universities and colleges in the Northeast Region. In addition, questions were added to get the opinion of those involved at these universities and on the committee as to what soil survey field experience is needed, how much should be required, what opportunities exist within or outside the university system in a particular state, the levels of field training upon graduation from northeast universities within the past five years, where these individuals went to work, and the levels of soil survey field training of faculty at universities in the northeast region. The results of the questionnaire are included as Appendix A. Some of the conclusions from this survey are as follows:

- Course offerings:

- (a) Although six universities reported graduate level courses in soil genesis and morphology, no soil survey courses were offered for graduate credit.
- (b) Only four of those offering undergraduate soil survey courses included an outside (out of doors) laboratory or practicum.
- (c) There were eight universities that offered courses that involved utilization of soil survey information, but none included an out-of-doors activity.
- (d) There were six offering graduate level soil genesis courses, five with some kind of outside laboratory or field trip.
- (e) Soil evaluation (soil judging) was offered by seven universities.

- All responses indicated field mapping experience was desirable for graduates majoring in the subject matter area.
- 8 of the 13 responses indicated field mapping was necessary for adequate job performance upon graduation.
- 5 of 12 responses indicated field mapping experience would give graduates in other phases of soil science an advantage in the job market.
- 4 of 10 responses indicated an opportunity for field mapping experience beyond normal course work and research.
- 63% (22/35) of the recent M. S. graduates had no field mapping experience beyond normal course work and research.
- 45% (5/11) of the recent Ph.D. graduates had no field mapping experience beyond normal course work and research.
- 37% (13/35) of the recent M. S. graduates had at least one *summer* equivalent of field work.
- 45% (5/11) of the recent Ph.D. graduates had at least two summers field mapping experience.
- 15% (7/46) of all advanced degree graduates were field trained equivalent to a GS-9 soil scientist.
- The employment of the advanced degree graduate was about evenly split among university, Federal, and private employment and those continuing on with graduate studies. - A consensus opinion was that one summer's field experience was appropriate for an M. S. graduate and two summers were appropriate for a Ph.D. graduate.
- Of the faculty members at surveyed institutions, 81% (17/21) of the responses indicated at least 2 summers equivalent of field mapping experience when they entered the job market.
- It appears that faculties now on university campuses had more field training when they began their careers than do current graduates now entering the job market.
- General concern was that some level of field mapping experience should be required for M. S. and Ph.D. graduates in the subject matter area.

Recommendations:

Charge 1:

- (1) That this data gathering questionnaire be made available to the Northeast Steering Committee where upon their discussion it could be sent to other regional conference steering committees as a way to assess the training situation in these regions.
- (2) That the questionnaire be forwarded to ARCPACS for their information.
- (3) That a paper concerning the results of this questionnaire be presented to ASA.

Charge 2. Define minimum training needs in soil survey at the graduate level.

The following comments are from committee members concerning minimum training needs:

A graduate should have some grasp of the following:

- (1) The ability to recognize the geology and parent materials and their origin from field observations. The level of competency should be such that a variety of parent material systems are recognized.
- (2) A recognition and working knowledge of landforms and geomorphic units.
- (3) Some degree of appreciation of ecosystems, both flora and fauna, and micro and macro climatic systems.
- (4) A working knowledge of soil morphology and nomenclature. The ability to recognize soil features, know what these features imply, and the ability to write a detailed soil description.
- (5) The ability to integrate the above into soil-landscape-units to the extent that cause and effect can be ascertained based on soil features.
- (6) The practice, or experience, of describing item 5 in narrative form, i.e. map unit descriptions.

The minimum training based on comments from committee members is three months field training for M. S. students and six months for Ph.D. students.

"The more (field training) the better within limits of completing programs without undue amounts of time."

"--a common problem with some people is their lack of understanding of how the soil surveys are made and the limitations of this information. They often have difficulty going from a soil series concept to a map unit concept ----- The tendency is to think more in terms of separate holes in the landscape. For the people that have experience in soil mapping, this is less of a problem and thus their ability to accurately use and interpret the soil survey information is greatly improved."

"Soil judging with peers will sharpen the student's ability to remember and compare observations of soil characteristics by competition and repetition. Therefore, students should have an active role in soil judging."

Recommendations:

- (1) It is desirable to obtain a minimum of 3 months (or equivalent) field mapping experience for M. S. candidates and 6 months for Ph.D. candidates in addition to normal degree requirements.

Charge 3. Make recommendations as to how these needs can be fulfilled.

The following are suggestions from committee members with regard to recommendations for fulfilling training needs.

- The student trainee program with SCS is ideal - the problem is limited funds for the program on any continuing basis. This is normally available only to undergraduates but graduate students that were once employed by SCS may apply.
- A regional summer camp for soil survey training, similar to ones that foresters and geologists attend, could be set up and jointly taught by university and SCS personnel.
- Universities could develop a field mapping course but this would probably be difficult because of limited enrollment for each individual school, and if enrollments were small, university administrations

woul284 T484 7.2h SCS is ideal

- Require students applying for advanced degrees in soil genesis, survey, etc. to have field experience prior to being admitted into the graduate program.
- SCS has a volunteer program for anyone who wishes to participate which can serve as an alternative for universities that do not offer mapping experience opportunities.
- Marty Rabenhorst - Outlined a regional summer field course program to meet the needs. Suggested a 4-6 week program. Perhaps structured as a senior/graduate level course. Four credits? It is suggested the program be on a regular basis. The first camp could be held during the summer of 1986. The question of students paying for the course credits remains to be worked out. Some prerequisites should be listed. Faculty reimbursement could be paid from enrollment fees.
- Bob Rourke - Maine is offering a similar course now. This is a three week course with student work based on eight-hour, five days a week. The course is divided into two phases. The first part is on soil morphology, and the second part is on field mapping. The course is open to undergraduates as well as graduate students.
- Will Hanna - It would be desirable to get out a letter to deans of the agricultural colleges to solicit their support in the concept of this course.
- Jim Baker - Ph.D. students would probably take this course only once. The students can supplement with more detailed projects, i.e. make soil maps.

Problems or drawbacks with implementing any summer training course:

- (1) There will be additional time required for degree completion with field training as a part of the requirement especially with M. S. students.
- (2) The expense for the student.
- (3) The expense covering the teaching of such a course. University personnel on 12 month appointment likely have summers already full of research or teaching activities. Such a course would require intensive training and supervision. What about faculty reimbursement?
- (4) What physical accommodations would be available if held away from a campus.
- (5) Usually the first few months for a soil mapper is not conducive to acreage production and can, in addition, reduce the productivity of a party leader because of time involved in training and reviewing the trainee's initial maps.

Goals

- (1) A summer trainee course should serve to develop an appreciation of the complexity of soil-parent material-landscape situations.
- (2) After goal one has been realized, a second goal would be to gain practical experience in soil mapping and interpretations.

Recommendations

- (1) A regional field course should be established running from four to six weeks duration. This would be a graduate level course (including senior undergraduates) and would be taught by university and/or SCS personnel. Graduate credit of four hours would be carried with this course and administered through each university whose students are involved. Prerequisites would be established.
- (2) This committee (#2) should pursue ways of making this field course come together such that it could be implemented by 1986.

Appendix A

Results
Soil Survey Field Training

Questionnaire

NOTE: 14 questionnaires were returned, not all questions received a response.

1. Which of the courses or their equivalents, are offered at your institution.

	Undergrad Level	Graduate Level	Outside (out of doors) Laboratory
Soil Survey	6	0	4
Soil Genesis & Morphology	6	6	5
Utilization of Soil Survey Information	8	1	0
Soil Evaluation (Soil Judging)	7	0	7
Geomorphology	6	3	0
Other (_____)	0	0	0

2. Do you think that field mapping experience is desirable for graduate students majoring in the above subject matter areas.

Yes 13
No 0

Comments:

- (a) "Even though we don't train specifically for that objective here."
(b) "Essential for field evaluation, sample collection and interpretation."
(c) "Not only desirable but probably should be mandatory."
(d) "But how desirable?"

3. Do you think that field mapping experience is necessary for adequate job performance after graduation for these students.

Yes 8
No 5

Comments:

- (a) "But would be a big help."
(b) "Helps maintain field evaluation skills."
(c) "Highly desirable but can be picked up post graduation if willing to apply oneself."
(d) "Always desirable, but not absolutely necessary in all cases, it depends on the direction of their professional careers."

- (e) "Particulariy if they work for someone other than SCS."
 (f) (yes) "But only if the individual is involved in mapping."
 (g) "Without mapping experience, our students have had adequate job performance. Maybe they could have done better with some mapping experience."
4. Do you think field mapping experience would give graduate students majoring in other areas (i.e. soil chemistry or soil physics) an advantage in the job market?
 Yes 5
 No 7
 (a) "It would be an advantage - but would this experience be more valuable than another specific course?"
 (b) "(No) - perhaps some advantage."
 (c) "Makes them more versatile - otherwise they are too lab oriented."
5. Are there opportunities at your institution for graduate students to obtain field mapping experience beyond normal course work?
 Yes 4
 No 6
 (a) "It is becoming more difficult to provide this experience."
 (b) "By special cooperative arrangement with SCS"
 (c) "Generally no but occasional special projects may provide some opportunity."
 (d) "There are **opportunties** but few have funding attached."
6. Are there opportunities in your region for graduate students to obtain field mapping experience outside the institution.
 Yes 4
 No 7
 If yes, where?
 (a) "Not a real good **mechanism for accomplsihing this** at the graduate level. Occasionally Cornell is able to sponsor a graduate student for a few summer months with one of the field parties - Funds always seem to be limited for this kind of training. It is easier for SCS to provide this kind of training at the undergraduate level through the student trainee program."
 (b) "University of Connecticut (yes)"
 (c) "We had one M.S. student do a special project with SCS (on a non-pay basis)."
 (d) "None outside New York that are available to my students."
 (e) "Private sector - experience may be quite different from a standard class II survey. Wetlands mapping, detailed (highly detailed) for on-site residential and commercial development."
 (f) "(No) not that I'm aware of."
 (g) "Some opportunity exists with the SCS summer trainee program but not on a regular basis - also some opportunity exists with private consultants for summer work."

Considering the following levels of field mapping experience when answering questions 7 through 11.

- (a) None
- (b) Only experience is with course work
- (c) Experience equivalent to one summer (3 months)
- (d) Experience equivalent to two summers (6 months)
- (e) Experience equivalent to 6 months to 1 year
- (f) Experience equivalent of >1 year but not fully trained
- (g) Experience equivalent of a fully trained field soil scientist (GS9)

7. For the past five year period (1979-1984) indicate the levels of field mapping experience for M.S. and Ph.D. graduates where major program emphasis was in soil genesis, soil survey, soil classification, utilization of soil survey information or soil evaluation.

Experience Level on Graduation	M.S.	Ph.D.	Totals
(a)	0	0	0
(b)	22	5	27
(c)	6	1	7
(d)	1	0	1
(e)	3	0	3
(f)	0	1	1
(g)	3	4	7
Totals	35	11	46

8. For Question 7 above, where did these graduates (M.S. and Ph.D.'s) go to work for their first post graduate professional job?

	M.S.	Ph.D.	Level not specified	Totals
(1) College or university	bbg	ggb	3	9
(2) Federal employment	bbbbeeg	g	2	10
(3) State government	b	--	1	2
(4) Local government	bg	—	0	2
(5) Private sector	bbbd	fg	5	11
(6) Continued graduate studies	bbbcc	--	3	9
(7) Unknown	—	—	3	3
(8) Other	--	—	—	--

9. What level of field mapping experience would you consider appropriate for:

M.S. graduates 2(b), 8(c), 2(d)
 Ph.D. graduates 2(c), 7(d), 1(f)
 Comments: _____

- (a) "Obviously, the more the better within limits of completing

programs without undue amounts of time."
(b) "...e = optimum for M.S. and g = optimum for the Ph.D."

10. For faculty members currently at your institution whose major study was in soil genesis, soil survey, etc., what were the levels of field mapping experience upon graduation with the latest degree? (List one level for each individual - no names please)

1=a, 2=b, 1=c, 4=d, 1=e, 3=f, 9=g

11. For faculty members currently at your institution whose major work now is within the field of soil genesis, soil survey, etc., what are the present levels of field mapping experience? (List one level for each individual)

1=a, 2=b, 1=c, 3=d, 1=e, 2=f, 8=g

12. Should some level of field mapping experience be required for an advanced degree in the subject area of soil genesis, soil survey, etc.

M.S. Yes 13
No 2
Ph.D. Yes 13
No

Additional comments in general:

- (a) "Some of these questions were not easy to answer because this university has only two faculty with training in soil survey. One is the extension soil scientist, the other teaches the courses related to soil genesis and survey but does little research in the area. Therefore, we have no graduate research program in soil genesis and/or survey at this time."
- (b) "This is a real problem. As detailed soil **surveys are** completed in the northeast, opportunities even on a volunteer basis for training as part of the National Cooperative Soil Survey are becoming very limited. There are opportunities in Connecticut in the private sector, but this training received may be quite different from that which is typical of National Cooperative Soil Surveys."
- (c) "The mapping experience may be gained while the student is an undergraduate."
- (d) "Many of the above questions are of the 'do you love your mother' type".
- (e) "Mapping experience is an absolute necessity if field consultation is provided within or outside of the job."

COMMITTEE 3

ROLE OF SOIL SERIES IN TAXONOMY

Charges :

1. Evaluate the role of soil series in Soil Taxonomy.
2. Assess the effects of separating **the** series level from Soil Taxonomy on the classification system and its use in soil surveys.

Committee Members:

L. R. Auchmoody, Research Forester, **FS-NE Forest Exp.** Station. PA
R. J. Bartlett, Professor, University of Vermont
W. E. Edmonds, Assistant Professor, **VPI & SU.** VA
D. S. Fanning, (Vice-Chairman), Professor, University of Maryland
D. **G. Grice**, State Soil Scientist, SCS, MA
R. V. **Joslin**, Assistant State Soil Scientist, SCS, **ME**
H. W. Rees, Senior Soil Surveyor, **Agri.** Canada Research Station, NB
J. C. Sencindiver, Associate Professor, West Virginia University
R. A. Shook, Jr., Assistant State Soil Scientist, SCS, CT
H. Smith, (Chairman), Soil Correlator. SCS, NBNTC, PA
D. G. Van Houten, State Soil Scientist, SCS, VT
J. H. Ware. Soil Specialist, SCS, VA
J. W. Warner, Soil Correlator, SCS, NT
W. R. Wright, Associate Professor. University of Rhode Island
D. L. **Yost**, State Soil Scientist, SCS, MD

General:

The preliminary committee work **was** done by correspondence. A questionnaire **was** developed and **sent** to committee members with request for comments on those specific questions and any other pertinent items concerning the charges not covered by the questionnaire. The preliminary report was prepared by the committee chairman. A discussion session was held during the conference at the University of Massachusetts. The preliminary report was adjusted to incorporate the later suggestions made during the conference.

Charge 1. Evaluate the role of soil series in Soil Taxonomy.

Background:

The soils series **was** first introduced in the classification and mapping of **soils** in the United States by the Bureau of Soils in 1903. During this time the series was defined mainly **as** a grouping of certain soil types previously **recognized** and mapped. Each series was to be a class of soils formed in the same kind of parent material. This meant that the series could include the full range of textural classes from sand to clay, and many did. Series were given place names and the individual different types within the series were separated by texture class names. **During** these early days, series such as Miami, Cecil, **Hagerstown**, and Sassafras were very broad, covering large portions of the country. The Miami series, for example, was mapped from North Dakota to New York.

As mapping And the study of **soils progressed in various** parts of the country, **modification** of the original series concept began. The original concept **has** changed **considerably** since these **early days**. However, the primary purpose of the eerier which **is** to relate the **bodies of soil (polypedons) represented on soil maps to taxonomic** classes and to **interpretation** baa been **with us** for A long time. Since the series is the **lowest category** or level in the **hierarchichalsystem** of Soil Taxonomy, the **limits** of diagnostic criteria above soil **series** are Automatically limits beyond which soil series **cannot** range. This, unfortunately creates problems when we try to correlate soils. No matter how hard we may try to define **taxonomic** limits that will fit mappable landscapes, the fit is seldom if ever perfect. The precise limits imposed by Soil Taxonomy frequently force **us** to do one of several thinge: split series, where in fact there is no meaningful use potential; recognize complexes or undifferentiated groups; recognize splinter soils **as** taxadjunct; and treat **soils** as inclusions. These Actions, especially the latter two, create false impressions of low purity of map units when in actuality, these distinctions have little or no effect on the utility of the **soil** map. It is time that we take A hard And thorough look At the role of soil series in Soil Taxonomy. We need to seriously explore the possibility of providing some better "gates" in the fence we have built around the series.

Question: What do you **see as** the role of the series in Soil **Taxonomy?**

Responses:

1. "The series has been A **concept** that allows **us** to classify A portion, or in **some** cases the entire group of soil characteristics within a family."
2. "The soil series is the lowest category or level in the **hiearchical** system of Soil Taxonomy. As such, it carries **all** the differentiating criteria of the higher levels to which it belongs. Series Are differentiated on the basis of detailed features of the pedon. However, guidelines for separating **taxon** at the series level Are loosely defined--left for **judgement--** which may **be** creating **some** problems. The **soil** series is A conceptual class in the same **sense** as are the other categorical levels, i.e., family to order. **As** such, it provides, in one word, A concept that carries with it A wealth of **information** About the **pedons** that belong to it."
3. "To maintain consistency Among soil scientists that make soil surveys and to **allow** for the transfer of information About **soils**. To keep us straight."
4. "Soil **series** are important for communicating information **about** soils and **for** linking **soil interpretations** to the **landscape**. However, in forestry, Soil Taxonomy often differentiates Among series based upon characteristic8 that are sometimes of no significance to forest **management**. In other cases, it does not separate features or distinguish Among **soils that** Are highly important, As it **allows such** wide variation of **soil** properties within A series that sensitive forestry interpretations Are not possible. While I agree with the **use** of soil **series**, I feel that series should be defined with more weight placed on limiting features for **use** And less reliance on minor differences in morphology and chemical features."
5. "I do not see a role for **soil series** in Soil Taxonomy."
6. "No change in classification level."

7. "The series may not have a role in Taxonomy. par series. The series provides a name, a handle, for **the map unit**. The concept and interpretations should reflect the really dominant condition and reaction to use. The name, **concept** and properties **are** easily bandied about by scientists and users alike. **This** is the way it is used now, only we are not honest that it meets Taxonomy requirements."
8. fI believe it is important to remember that the soil series is a classification concept and plays a very important role at the local level. I

11. "Soil series are serving their intended purposes as long as we define landscapes as **map** units and do a good job in defining what is **in** the landscape in terms of inclusions of similar and dissimilar **soils**. The **series** only supplies a reference term for naming map units. The map **unit** description tells what is there and how the soils in a particular landscape unit should be used and managed. Perhaps we need more flexibility in providing interpretations for a map unit or maybe we need to do a better job of training users to better understand how inclusions influence **use** of a given map unit."

Question: Would you like to see the role of the series changed? If so, how?

Responses:

1. "Not changed but modified by the level of use. We may be able to have a taxonomically pure series and a functionally correct reference series that could work at the survey level and still work at a higher level **taxonomically**. A two-tier system."
2. "Soil series should emphasize limitations and proper uses and de-emphasize minor differences in morphology."
3. "I would favor a change in the role of a series if the change would not mess up the classification too **much**. If we allowed a soil series to be widened across classification boundaries, it may be necessary to have 2 to 3 classifications for the series."
4. "No, there is a need to maintain the concept of the soil series as the lowest level of Taxonomy. It has a valid role to play as defined. The problem **is** related to mapping. Taxonomy need not be modified to accommodate this."
5. "It is worth considering. We would have to drop it from Taxonomy."
6. "Yes, I would like to see the role of the soil series changed to reflect ranges in characteristics for delineated soil bodies rather than ranges for a hypothetical **taxon**."
7. "The modal concept of the series should be the point of classification in Taxonomy. The range in characteristics of the series should then be allowed to lap over one or more higher category limits. The series being a conceptual thing cannot possibly fall within the man-made limits of Taxonomy. As it occurs on the landscape, it is going to occupy **a** certain **niche** in the classification system (limits not considered). We need to stop worrying about covering every last observable soil property value for any particular series. If we cover the major portion of the series variation, then the series should be well enough defined. We also have soil property limits that separate series that do not amount to a tinkers damn."
8. "No."
9. "I do not think the role of the series should be changed."

Question: Currently defined and used in NCSS, do you feel **the** series is the best reference to tie interpretations?

Responses:

1. "No. the series is not the best reference for making interpretations **because the inference of** assumed response to use is used to arrive at the series used to name map units at correlation.*"
2. "Interpretations should be tied to the series level. Cur present series definitions restrict interpretations to a small part of the unit, at least theoretically, that meets the series criteria. The question about what to tie interpretations is a long standing dilemma. We want interpretations to reflect the map unit. Inclusions in map units force **us** to interpret on the dominant soil conditions. That is thought to be the series level, but series tied to Taxonomy may not represent **the** dominant conditions."
3. "Yes, unless interpretations can be developed for units."
4. "Yes. "
5. ***Not** sure, advantages and disadvantages. Advantage is that the interpretative standard can be applied within taxonomic limits to a point. Disadvantage is that interpretation of a map unit, a landscape entity, is tied in large part to a **pedon**, a hole. Probably should tie interpretations to the map unit, a collection of pedons."
6. "No, not specifically. Interpretations should be tied to the map unit. Interpretations can only be tied to the series where conditions are relatively uniform and thus correspond to individual series concepts. The series concept is, however, part of the thought process in that it portrays a range of characteristics of the pedons included, and these characteristics are usually the basis for interpretations."
7. "Yes, if you include the latitude of using phases to become the final split ."
8. "Yes, but it could be improved by breaking the series into more uniform landscape units. These would be very similar to the phase."
9. "The series is the best reference for soil interpretations; however, I think we should be allowed to provide interpretations for higher taxonomic categories also. Many interpretations can be precisely given for higher categories as well as at the series level. Isn't Soil Taxonomy supposed to be a system that can be used to supply interpretations? If so, we will use more higher category names where they more accurately reflect the nature of the soils in a given landscape. Perhaps our problems are the result **of always** trying to tie series names to all map units."

Charge 2. Assess the effects of separating the series level from Soil Taxonomy on the classification system and its use in soil surveys.

Background:

During the early sixties when Soil Taxonomy was being developed, the series was defined in the 7th Approximation as "a group of contiguous pedons belonging to a single class of the lowest category." Six categories were proposed in the 7th Approximation--orders, suborders, great groups, subgroups, families, and series. The series has been used in the United States longer

than any of these categories. A6 discussed earlier under Charge 1, the concept of the series has changed over the years. **However**, further changes in the series concept were not proposed in the 7th Approximation. This **is** in **contrast** to change6 made in the other categories. Even though many of these **categories were used** in earlier classification schemes in the United States and **elsewhere, they** were still drastically changed by the 7th Approximation. The soil **series** is the only one of the six **categories** that remained essentially as it was prior to the 7th Approximation. All of the other five categories were changed **so** much that there **was** little or no link between them in the 7th Approximation and how they were used in the earlier classification schemes.

During the formative years of Soil Taxonomy, some investigator8 felt the series should not be a part of the system. Others felt that if it is going to be a part of the system, its concept should be changed from what it **was** in the 1938 system. The primary problem in using the soil series as a category in Soil Taxonomy arises from the fact that soil forms a continuum on the land surface. This continuum changes very gradually over horizontal distances. It **is** time that we openly discuss whether or not we can realistically put strict taxonomic class limits on mappable parts of this continuum. We should evaluate the effects of separating the series level from Soil Taxonomy on the classification system and its use in soil surveys.

Question you support separating the series level from Soil Taxonomy?

Responses:

1. "No." (2)
2. "Yes."
3. "I would support separating series from Soil Taxonomy only if this would allow combining series that differ in taxonomic classification, but which have similar interpretations and **uses.**"
4. "It should be studied and debated."
5. "No. It has a role to play... For completeness sake, Taxonomy requires a category at the level of the series. If series were separated from Soil Taxonomy, **some** equivalent would inevitably be generated to fill the void."
6. "No. Should be part of **hierarchical** system."
7. "No. not with the problem6 I could imagine that may be created."
8. "I would like to **see** the **series** concept remain in Taxonomy **as** a classification unit and to redefine map units if deemed necessary."
9. "At present I do not favor separating series from Soil Taxonomy. I don't **see** how it would work or what would be accomplished by such a change."

Question: What problems, if any, do you foresee if the series is separated from Soil Taxonomy?

Responses :

1. "We will return to the **50's** and early **60's** when **series** were ill defined and/or overlapping. Serious problems will occur in correlation within and between **states**. Differentiation between **series** will be difficult or ~~impossible.~~

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Question: What is your reaction to allowing range* in characteristics for a series to be wider than defined in Soil Taxonomy? How much wider?

Responses:

1. "For taxonomically border line soils, probably should allow for ranges, at least at local level, to transcend taxonomic boundaries. Most series don't fall on borders, but within a taxonomic range. Even so, there could be a functional problem with series that ranges from 18 to 35 percent clay, yet within a taxonomy range. We should use ranges that are reflective of a soil in its natural setting and what we can confidently delineate on maps. What establishes the range for a soil is nature. All our guides, including Taxonomy, help us define and describe the natural availability."
2. "I would like to see the range for series changed to reflect local conditions rather than assumed ranges dictated by a national classification scheme. They could be as wide as necessary."
3. "The allowable variability within a series should be a function of the characteristic. For example. I see little problem in allowing a wide range in those characteristics that do not affect use, such as color. However, I favor a narrow range for features such as drainage, particularly where small variations can have a major impact on interpretations and use."
4. "Great I"
5. "Allowing wider ranges in characteristics would enable a series to include entire land forms or the range in characteristics would enable a series to include entire land forms or the range in characteristics found in the natural setting. I wouldn't favor much greater range than is now allowed. If the family classification didn't have to be adhered to, a natural setting could probably be satisfied without the range being much wider than now allowed. If this method of defining series were used, I could envision some series having much wider ranges in characteristics than other series in a more narrowly defined setting."
6. "This would be a necessity if the series is removed from Taxonomy. I am not sure of all of the ramifications of this. Study is needed."
7. "I would object with vigor. The series ranges should be wide enough to butt up against the series. without crossing lines in Taxonomy."
8. "Soil Taxonomy already allows for the range of soil series to be as wide as that of the family. This represents a fairly wide range."
9. "I do not favor permitting series ranges to be wider than limits as defined in Soil Taxonomy. It sounds as though the intent is to permit the series to cover all or most of the pedons in a map unit. If you do this how do you define the limits that will be permitted before you delineate a different soil? This would tend to get us back to where we are now except that the series would have a much wider range. As presently defined, a number of series seem to be too wide with regard to such features as texture, reaction, density. etc. Many features in the current ranges

result in series that can be interpreted differently for some uses. **For** example some soils have permeability ranges that indicate slight to severe interpretations for sewage disposal."

Question: Would you support two ranges in characteristics for the series?

--A "**narrow**" range or modal concept which would have narrow class limits and be used for classification in Soil Taxonomy.

--A "total" range which would include all or most of the similar **taxa** or soil bodies that are in a delineated map unit. This range would be allowed to straddle or **cross** class limits.

Responses:

1. "Yes, do believe we could develop a two-tier system. The 'series' within the limits of Soil Taxonomy should fall within the series range for the 'total' (functional) soil series. The **taxa** with the total range should **be used** at a level no higher than a county survey. The taxonomically correct soil series should have interpretations that were reflective of the 'total' local functional series. The interpretations would **have** to be essentially the same for both levels of the series."
2. "No. this would cause confusion and chaos in correlation."
3. "I can't envision both. If the series is removed from Taxonomy, there would be a total range. If it stays in Taxonomy, the range would remain narrow."
4. "No. This would most likely result in chaos. The two ranges in characteristics that you suggest are for two separate entities, the series and the map unit. There should **be** a narrowly defined range for the **taxonomic** soil series and a more widely defined map unit that ranges in properties according **to the** established objectives of the survey."
5. "I would favor the use of two ranges, one for the series and one for the map unit."
6. "No, I do not support two ranges. Updating series with one range is sufficient work."
7. "Yes, the modal concept could be just that, a concept. The typifying **pedon** in a manuscript or Established Series Description could the" be a fabricated one not a" actual one--the total range should not have to cover the entire range--most of the range is sufficient."
8. "I do not feel that having two ranges would help. The total or wide range would cover the statements currently given in map unit descriptions to cover inclusions; particularly inclusions of similar soils. I assume that we would not have dissimilar soils included in the wider or 'map unit range'. We need to do a better job of training our field Soil Scientists to adequately document the composition of map units. If this documentation indicates a significant component of dissimilar soils then we need to consider renaming the unit. Perhaps we need more complexes to cover units with two or more dissimilar soils."

Question: If the series were broadened and separated from Soil Taxonomy, what affect. if **any**, would this have **on** our current practice of **publishing** local typifying **pedons** and ranges in characteristics (taxonomic **descriptions**)?

Responses:

1. "Perhaps these differences could be incorporated into the taxonomic unit description. **Any** way it is handled **may** cause more confusion to the layman and another **soil scientist** reading the-report."
2. "This should have no effect on publications."
3. "It would seem to **be** a positive step. The reference pedon and its **func-**tional ranges would cover the dominant situation for a soil as mapped. We should be mindful that the **functional** range of soil should be at least within **the** concept of 'similar' soils. The map unit would still have inclusions of dissimilar soils. Some of our 'older' series descriptions, Charlton for example, had series ranges that covered the 'total' range of the 'functional' Charlton soils."
4. "I would favor only a range **in** characteristics. No typifying pedon would be needed."
5. "The typifying pedon would probably be the same, however, stating the range in characteristics would create a problem. If series ranges were broadened to cover the features in delineated map units, the end result would be series that overlap several families or subgroups, as now defined. Typifying pedons and ranges are useful and should include confidence levels and statements on variation."
6. "No effect."
7. "I assume we would continue to publish typifying pedons but a complete taxonomic description could not be published as there would not be a precise range in characteristics. This would also tend to make the range in characteristics for official descriptions meaningless."

Summary:

The problem in general that has been encountered with the series level in Soil Taxonomy appears to stem from a misunderstanding among investigators as to the relationships of the series to the map unit, taxonomic unit, pedon, and **poly-**pedon. Clear definitions and explanations of how these relate to each other and are to be applied in soil survey do not exist in any one document. Based on **the** responses to **the** committee's charges, it would **appear** that many investigators have assumed that all map units are taxonomic units. Soils, like other naturally occurring ecosystems, are rarely pure taxonomic units. The series was never designed to be synonymous with the taxonomic units and using it to fulfill that objective has led to problems. It is the job of the soil scientist to either map smaller units so they approximate taxonomic units, or to simply describe the map units in terms of the range or abundance of **taxo-****nomi**c units that occur. It would **be** desirable to have all map units correlate with a taxonomic unit. However, the use of multi-taxa units such as complexes and undifferentiated groups do not reduce the value of the maps. Knowing that a map unit is extremely variable in soil properties is just as important as knowing that it is composed of a single taxonomic unit. Section 602.00-5 of

the National Soils Handbook (NSH) notes the amount of similar and dissimilar soils permitted in map unite. The use of "Laboratory Error," "Normal Errors of Observation" and "Allowable Inclusions" in map unite are also discussed in the NSH. When practical application is made of this section of the Handbook, many of the minor problems concerning the series can be resolved easily.

Recommendations:

1. The soil series is important for communicating information about soils and for linking soil interpretations to the landscape. It is a classification concept and plays a very important role at the local level. The role and concept of the series should not be changed.
2. Soil Taxonomy is a Nearchical system and the soil series is the lowest category or level. As such, the series is ~~provided~~

3.

4.

5.

COMMITTEE 4

INTERPRETATIONS OF NE GENERAL SOIL MAP

committee Charge:

1. Evaluate the need for developing and publishing interpretations for the **published** general **soil** map of the **Northeast** States.
2. Develop outline of content and format for possible regional publication.

Chairman - O. W. Rice, Jr., SCS. **NENTC**, PA

Vice Chairman - G. Olson, Cornell University, NT

Committee Members

J. B. Carey, Dept. Natural Res. & Envir., DE

C. F. Eby, SCS, NJ

W. F. Hatfield, SCS, WV

D. E. Hill, New Raven, CT **Exp.** Station

S. Hundley, SCS, MA

G. Martin, SCS, PA

R. L. **McLeese**, SCS, VT

N. A. **McLoda**, SCS, VA

N.K. Peterson, Univ. of NH

E. H. Sautter, **SCS**, CT

R. Shipp, PSU, PA

W. A. **VanEck**, WV Univ., WV

The Committee Recommends:

1. That a regional soil interpretation bulletin be developed along the lines outlined in this report.
2. That the bulletin have a mixture of tabular and narrative information, and that information that can be reduced to a tabular form be presented that way.
3. That the dominant interpretations be presented in the style of those in NY Information Bulletin 119. Interpretations other than **those** in Bulletin 119 **should** be made, but additional interpretations will be more general rather than more specific. Interpretations for soil series will not be made.
4. That the map be digitized for use in geographic information systems and be **made** available to **users** who wished to make their own interpretative **maps**.
5. That the proposed bulletin **consist** of chapters; sections or parts **that** include:
 - A. Soil properties of the **map** units - the single most important part of the proposed bulletin

- B. Principle land uses in the **map** units - see report section "Contents of Publication"
 - C. **Soil interpretations** of map units - see section "Contents of Publication"
 - D. **Rating** guides used in preparing the interpretations
 - E. **Examples of and** guidance to prepare interpretative maps using geographic information systems
6. That information on soil properties, suitability, limitations, soil properties affecting use, etc., be presented as information that applies to a specifically stated proposition - a range of proportions - of map unit to minimize possible misuse of **the** data.
 7. That a bulletin committee be constituted to work on the bulletin.

Committees Findings

A preliminary draft of this report was prepared prior to the conference. It was based on answers to a Questionnaire, a copy of which is included in **this** report. The Committee Findings, given below, summarize the committee's responses to the Questionnaire.

The extended committee meetings at the conference, attended by members of the conference as well as committee members, came to **the same** conclusions as the committee members plus **a** few additional conclusions and these are included in the recommendations.

Evaluation of Need

Eighty-five percent of the committee believes there is a need for published interpretations for the general soil map **of** the Northeast States.

Committee members thought the proposed publication would be useful to a large audience, ranging from **EVERYONE** to:

Traditional SCS users

Resource inventory compilers

Resource planners - county, state, national, state and federal agencies such as EPA, DNR, DOT, consulting firms, etc.

Teachers, for example, geography

The uses were visualized as; **a** tool to guide interested groups to appreciate and plan to conserve agricultural land and natural areas, to guide urban development to suitable areas, to locate general **areas having** large proportions of soil with specific properties, and to inspire users to search for more detailed soils information. **Most committee members** strongly recommended presenting the interpretations in **ways** that **could** encourage misuse. ?

A. Kinds of Interpretations Needed

There was unanimous agreement that the proposed publication should contain interpretations for agriculture and community development. Seventy percent thought it should contain interpretations for sanitary facilities and 60 percent thought it should contain interpretations for woodland.

The kinds of interpretations suggested are as follows; those that will be included in the bulletin will depend on how well they can be developed:

For Agriculture -

Interpretations similar to those in NY Information Bulletin 119

Important Farmland

Potential for waste recycling

Kinds of specific practices needed

Potential benefit from irrigation

Kinds of specific practices needed

Potential benefit from irrigation

Agricultural value groups for **LESA**

Kinds and extent of **crops** grown

Interpretations for probable crop **use** - row crops, fruits, grain crops, pasture

Number and size of aerable tracts per square mile

Physical and chemical characteristics of the soil

For Community Development -

Interpretations similar to those in NY Information Bulletin 119

Soil properties affecting **use**

Recommended **minimum** lot **size** for single-dwellings

Number of suitable **lots** per square mile

Streets and roads

Industrial and **commercial sites**

Considerations for **landscaping**

Key **components such as** septic tank absorption fields, dwellings with basements, local **roads and streets and camp areas as indicator components**

For Sanitary **Facilities -**

Interpretations similar to those in NY Information Bulletin 119 but with **different** ruling criteria

On-rite • **evwa systems**

Pollution **hazard**

Soil **properties** effecting uae

Potential for **waste** recycling

Certain componenta to be wed **as indicators** for **community** development

For Woodland -

Common **trees**

Trees to plant

Productivity

Soil features that affect suitability for **use**

Additional Interpretations -

No one suggested interpretations for other **kinds** of specific **uses**

B. Format for Presenting Interpretations

Sixty percent of responding committee **members** thought the interpretations should be presented mainly in tabular form. Forty-five percent thought that they should be presented in about equal amounts of tabular and narrative form. The most appropriate format **the committee** reviewed is that in NY Information Bulletin 119.

Background for discussion of **Parts C, D, and E.**

The bulletin and map part of the General Soil Hap publication **contains** practically no decriptiona of the physical and chemical properties of the **soils** in the **map units**. There • re no decriptiona of **map** unite ae **such**. Ordinarily, **interpretations** for **map** units are **based** on properties of the **soils** as described And interpretations Are **formulated** by **use** of **an** interpretations guide **constructed** for that purpose. Just what **information** is to be **used** to prepare **interpretations, its source**, and how it **is** to be **used** appeared to be A **question** the **committee** needs to Address.

C. Soils (or units) for Which Interpretations Would be Prepared

Eighty-five percent believed the proposed publication should not contain interpretations At the soil order category. Sixty percent **was** for **interpretations** at the **map** unit **component** level. **such as Hapludalfs** And **Hapludults**, and 30 percent **was** for interpretationa for **the series** that Are **dominant** in the **map** units. Eighty percent of those responding to **this**

percent of those responding, believed that interpretations should be given primarily for the larger proportion of soils in a map unit that have combinations of properties significant to a given use.

As you see, perhaps one of the

1. Make **interpretations** for a **stated** proportion of the map unit. The **user** immediately **knows** that the unit **contains** areas of more than one **quality**.
2. **Make the interpretations** for indicator components of more general **uses**. As an example, **map** units for on-site **sewage system** as an **indicator** of **suitability** for **community** development.
3. Make **interpretations** for **proportions** of map units giving only the **soil** properties that adversely affect the **use**.
4. Do not refer to **soils** by names **similar** to **those** on more detailed **maps**. For example, **interpretations referenced** to **series** names might encourage people to misapply the information.

DRAFT
Example Outline of Narrative for Sections on
Soil Properties, Land Use, and Suitability

Alfisol - (brief description)

A | **Hapludalfs-Hapludults**

Description - (brief description)

composition: **Hapludalfs** 65%
Hapludults 25%
Others 10%

Profile Characteristics: (Texture, depth to bedrock and water table, and drainage)

Surficial Characteristics: (Rock-cover, slope, and flooding)

Soil Temperature: **Mesic**

Dominant Soil Series: Duffield, **Edam**, Prankstovn, **Hagerstown**, and Washington

Distribution: MD, PA, VA, and WV

Land Use

Primary Use: Most of **the area** is used for cultivated crops. Corn and small grain are the principle crops.

Secondary Use: Many areas are used for hay and pasture.

Other User: Small woodlots on farms are scattered throughout the unit. A few **wood** areas are harvested for pulp **wood** or **firewood**. Most cities and **towns** in the unit are small.

Livestock: Mainly dairy and **beef** cattle and some poultry.

Special Crops: **Strawberries**, raspberries, orchards, and a few areas of tobacco.

Agriculture

Prime Farmland Soils: About 1/10 of the area has prime **farm-**land soils.

Suitability For Cropland: About 1/5 well suited on 0-15% slopes. About 2/5 moderately well suited on 15-25% slopes, and 2/3 poorly suited on > 25% slopes.

Limitations: Slope is the main limitation for most uses.

Susceptibility to Erosion: Moderate

Potential Productivity: High for those areas suitable for cropland.

Woodland

Cover Type: Red Oak

Ownership: Mostly privately owned. A few small state and county owned forests.

Limitations: Plant competition when trees are young. Slope and rock fragment are management concerns on 2/5 of the area.

Potential Productivity: High

Urban Development

Dwellings: About 1/2 of the are. has few limitations. A seasonal high water table, flooding, and slope are limitations in about 1/2 the area.

Local Roads: On about 1/2 of the area slope and on less than 2/10 the are. shrink-swell potential are limitations.

Septic Tank Absorption Fields: About 2/5 of the are. is slowly permeable. Less than 1/10 of the are. has few limitations. About 2/5 of the area has seasonal high water table.

Landscaping: (?)

Questionnaire

Please respond to each question as fully as you can. If more room is needed, continue on other side of page.

A. Evaluation of Need

1. Is there a need for publishing interpretations for the general
road map of the Northeast States? Yes No

Comments:

2. To whom would published interpretations be useful?

3. What are examples of specific uses which might be made of the
published interpretations? (These need to be reiterated for each
kind of interpretation.)

4. Should publication contain interpretations for Agriculture?
 Yes No

What are the specific kinds of agricultural interpretations you
would suggest?

What are examples of specific uses of the published interpreta-
tions?

5. Community development? Yes No

List the specific kind of community development interpretations
you would suggest?

Give examples of specific uses of the published interpretations.

6. Sanitary facilities? ___ Yes ___ No

List specific kinds of sanitary facilities interpretations?

Give examples of specific uses of the published interpretations.

7. Woodland? ___ Yes ___ No

List specific kinds of woodland interpretations?

Give examples of specific uses of the published interpretations.

8. Answer the same questions for any others you believe are needed.

B. Format for Presenting

2. List the interpretations (or ● subjects) which should be presented mainly in tabular form.

3. List the interpretations (or subjects) which should be presented mainly in narrative form.

Background for responding to Parts C, D, and E.

The bulletin and map part of the General Soil Map Publication contains practically no descriptions of the physical and chemical properties of the soils in the map units. There are no descriptions of map units as such. Ordinarily, interpretations for map units are based on properties of the soils as described. The interpretations are formulated by use of an interpretations guide. The committee can decide to use the conventional ● approach as outlined ● above or develop an ● alternative approach. Questions in Parts C, D, and E were formulated to evaluate how the committee wants to make the interpretations.

C. The Soils for Which Interpretations Will be Prepared

Should interpretations be prepared:

1. Primarily for the roll orders into which the map units are grouped? ___ Yes ___ No
2. Primarily for the map unit components, ● such as Hapludalfs, Hapludults, etc.? ___ Yes ___ No
3. Primarily for the dominant soil series in the map units? ___ Yes ___ No
4. Primarily for the larger proportions of soils in ● map unit that have combinations of properties very significant to ● given use? ___ Yes ___ No
5. Others?

D. Source of Information on Which the Interpretations Would be Based

- I. Mainly from inferences from the map unit components, (Hapludalfs, Hapludults, etc.) without considering rock fragment cover, family class, slope, etc.;

- II. Mainly from inferences from the dominant soil series in the map unit (without slope, rock fragment cover, extent in map unit);
- III. Estimates of proportions of soils that have sets of soil properties very significant to a given use. We already ^{have} ~~have~~ a preliminary set of estimates for nearly every map unit. See Appendix A for an example outline of the estimates.
1. Which alternative do you prefer? I II III
 None of these
2. If you prefer no alternative not mentioned above, or have suggestions to improve the alternatives mentioned, prepare an example of your choice.

E. Contents of the Publications

1. Indicate which combination of these items--
Soil Map Unit

3. Rating guides used in preparing the interpretations.
___ Yes ___ No

I. Interpretations of the soils. _ Yes _ NO

5. Other (list):

c. Volunteers for Developing an Outline for Various Sections

From the list in Section F or • ddtlonel • ectlou you have suggested, please list the • ectlons for which you would be willing to help develop a fairly detailed outline of contents and format.

I would greatly appreciate you including an outline of the content of any section on which you volunteered to work.

1984 NORTHEAST COOPERATIVE SOIL SURVEY CONFERENCE

1984 NORTHEAST
NATIONAL COOPERATIVE SOIL SURVEY CONFERENCE

MINUTES OF BUSINESS MEETING

JUNE 15, 1984

recorded by Darrell G. Grice

Business meeting called to order at 9:00 a.m. by Fred Gilbert, Conference Chairman. Edward Ciolkosz proposed an amendment to the by-laws of the Northeast NCSS group. The Amendment altered Section B, concerning the conference chairman and vice chairman. The amendment would insert the underlined sentence in the paragraph below:

"Conference Chairman and Vice-chairman

An experiment station representative and a SCS state soil scientist alternate as chairman and vice-chairman. This sequence may be altered by the steering committee for special situations. The vice-chairman named 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:"

The proposal was considered a motion to adopt. The motion was seconded by William Wright. The motion passed by show of hands, but two were opposed.

The conference steering committee reported that plans are to have the 1984 conference in Blacksburg, Virginia. The Steering Committee recommended James Baker as Vice-chairman in charge of local arrangements. The recommendation was considered as a motion. The motion was seconded by Edward Sautter. Vote for passage of the motion was unanimous.

Ted Miller announced the members of the Northeast Soil Taxonomy Committee as follows:

Name	Term*
James Baker	1982-1986
Robert Rourke	1984-1987
Martin Rabenhorst	1984-1988
Fred Gilbert	1982-1985
Gene Grice	1984-1987
Sidney Pilgrim	1984-1988

*term ends on January 1 of the concluding year

The staff, a symbol of the conference chairman, was passed from outgoing chairman Fred Gilbert to new chairman Peter Veneman.

Meeting adjourned at 9:35 a.m.

**BY-LAWS OF 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: Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Virginia, Vermont, West Virginia, and the District of Columbia.

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

Head, Soils Staff, Northeast National Technical Center, Soil Conservation Service.

National Soil Survey Laboratory Liaison to the Northeast.

Cartographic Staff Liaison to the Northeast.

Three representatives from the soils staff of the USDA - Forest Service as follows:

- One from the Eastern Region, National Forest System
- One from the Southern Region, National Forest System
- One from the Northeastern Area, State and Private Forestry

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. Organization and Management

A. 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 chairmen and vice-chairmen. The Steering Committee consists of the following four members:

Head, Soils Staff, NENTC, SCS (chairman)
The conference chairman
The conference vice-chairman
The conference past chairman

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

2. Meetings and Communications

A planning meeting is to be held about 1 year prior to the conference. Additional meetings may be scheduled by the chairman if the need arises.

Most of the committee's 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.

By-laws - 2

The Steering Committee is responsible for the formulation 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 State Directors, (b) The Northeastern State Conservationists, SCS, (c) Director of Soils 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.

4. Chairman's Responsibilities

- a. Call a planning meeting of the steering committee about 1 year in advance of and if possible at the place of the conference to plan the agenda.
- b. Develop with the steering committee the first and final drafts of the conference's committees and their charges.
- c. Send committee assignments to committee members. The committee assignments will be determined by the Steering Committee at the planning meeting. The proposed chairman and vice-chairman of each committee will be contracted personally by the conference chairman or vice-chairman and asked if they will serve prior to final assignments. SCS people will be contacted by a SCS person and experiment station people will be contacted by an experiment station person.
- d.

. Conference Chairman and Vice-chairman

An experiment station representative and a SCS state soil scientists alternate as chairman and vice-chairman. This sequence may be altered by the steering committee for special situations. The vice-chairman named 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. Send out a first announcement of the conference about 3/4 year prior to the conference (see Appendix 1 for an example).
4. Send written invitations to all speakers or panel members. These people will be contacted beforehand by phone or in person by various members of the Steering Committee.
5. Send out written requests to experiment station representatives to find out if they will be presenting a report at the conference.
6. Notify all speakers, panel members, and experiment station representatives in writing that a brief written summary of their presentation will be requested after the conference is over. This material will be included in the conference's proceedings.
7. Preside over the conference.
8. Provide for appropriate publicity for the conference.
9. Preside at the business meeting of the conference.
10. Serve as a member of the editorial board of the Northeast Cooperative Soil Survey Journal.

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. Develop the program agenda 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. Notify all persons attending the meeting of the arrangements for the conference (rooms, etc.). Included in the last mailing will be a copy of the agenda.
5. Compile and distribute the proceedings of the conference.
6. Serve as a member of the editorial board of the Northeast Cooperative Soil Survey Journal.

C. Past Conference Chairman

The past conference chairman's responsibilities are primarily to provide continuity from conference to conference. In particular, his responsibilities include the following:

1. Serve as a member of the Steering Committee.
2. Assist in planning the conference.
3. Serve as the editor of the Northeast Cooperative Soil Survey Journal. This responsibility encompasses gathering information with the other editorial board members, printing the Journal, and distributing it.

D. Administrative Advisors

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

E. Committee Chairman and Vice-chairman

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

IV. 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-chairmen of the conference. The conference vice-chairman is responsible for assembling and distributing the conference proceedings. Suggest distribution is:

One copy to each participant on the mailing list.

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

Ten copies to the Director of Soils, SCS, for distribution to National office staff.

Thirty copies to each SCS National Technical Center Head of Soils Staff for distribution and circulation to both the SCS and cooperators within their region.

Five copies to the S & E Region Forest Service Regional Directors.

Three copies to the National Canadian Soil Survey office.

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 and Regional Soil Survey Conferences

The elected Experiment Station chairman or vice-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 SCA representatives are usually selected by the Director of Soils and SCS, in consultation with the NENTC Director and state conservationists.

One member of the Steering Committee will represent the Northeast region at the Southern, North Central and Western Regional Soil Survey Conference. If none of the members of the Steering Committee can attend a particular conference, a member of the conference will be selected by the Steering Committee for this duty.

VII. Northeast Cooperative Soil Survey Journal

The Northeast Cooperative Soil Survey Conference will publish a journal on soil survey and related topics at least once each year. The journal will be governed by an editorial board made of the Steering Committee for the Northeast conference. The editor of the journal will be the past conference chairman. His responsibility will be to assist in gathering information for the journal, as well as printing and distributing the journal.

VIII. Northeast Soil Taxonomy Committee

Membership of the standing committee is as follows:

Head, Soils Staff, NENTC, 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 Experiment Station conference chairman or vice-chairman is responsible for overseeing the selection of state representatives.

IX. 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
By-Laws Amended June 25, 1982
By-Laws Amended June 15, 1984

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Re: PROCEEDINGS OF THE 1984 CONFERENCE

As most of you know, the proceedings of our conference are assembled and distributed by the vice-chairman. The vice-chairman does not print the proceedings. Thus, we ask you to type, reproduce, and send to Peter Veneman, 1984 vice-chairman your talk, committee report or experiment station report. I should receive the report by June 29, 1984.

In order to get continuity in the proceedings, please follow the instructions given below in preparing your materials.

All Information (Talks, Committee reports and Expt. Station reports)

1. 8-½ x 11" paper.
2. Single space typing.
3. Printed on both sides (front and back).
4. One-inch margins right and left.
5. 200 copies.

Talks (Papers, etc.)

Format as indicated under "All Information" plus at the top of the page:

1. Title of talk.
2. Followed by author and organization of the author (SCS, Washington, DC; Pennsylvania State University, etc.).
3. Followed by body of the talk or paper.

Committee Reports

1. Format as indicated under "All Information" plus at the top of the 1st page:
 - a. Committee number.
 - b. Committee title.
2. Followed by committee members (indicate chairman, vice-chairman and committee charges.
3. Followed by the committee report plus recommendations.
4. Pagination-
Paginate the committee reports with the committee number in the bottom center of the page. For example, 2-1, 2-2, etc.

Experiment Station Reports

1. Format as indicated under "All Information" plus at the top of page one:
 - a. Name of the Agricultural Experiment Station. For example, Massachusetts Agricultural Experiment Station Report.
 - b. Author.
2. Followed by the Report.
3. Pagination:
Paginate the report using the Post Office abbreviation of your state plus the page number (in lower center of page). For example, MD-1, MD-2, etc., MA-1, MA-2, etc.

Peter L. M Veneman
Conference Vice-Chairman

PV/lat

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LIST OF PARTICIPANTS

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NATIONAL COOPERATIVE SOIL SURVEY

Northeast Regional Conference Proceedings

Cornell University, Ithaca, New York
June 20-25, 1982

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PROCEEDINGS OF THE

**Northeast
Cooperative
Soil
Survey**



Conference

CORNELL UNIVERSITY
ITHACA, NEW YORK

JUNE 20 - 25.1982

Proceedings of The 1982 Northeast Cooperative
Soil Survey Conference ^{1/}

Assembled

by

Frederick L. Gilbert ^{2/}

Soil Conservation Service, USDA
James M. **Hanley** Federal Building, **Rm. 771**
100 South Clinton Street
Syracuse, New York 13260

November 1982

^{1/} Conference was held at Cornell University, Ithaca, New York on June 20-
June 25, 1982.

^{2/} State **Soil** Scientist, Soil Conservation Service, USDA

Conference Agenda

General Presentations and Reports

Opening Remarks by Edward **J.** Ciolkosz (conference chairperson)

Soil Surveys of the Past and Future by Paul A. Dodd (New York State Conservationist)

Current Issues by Arthur B. Holland (Director, SCS NENTC)

Technology in Bureaucracy by Ralph **J.** McCracken (Deputy Chief, National Resource Assessments, SCS)

National Cooperative Soil Survey by Richard **W.** Arnold (Director of Soils, SCS National Office)

Regional National Cooperative Survey by **F.** Ted Miller (Head, Soils Staff, SCS **NENTC**)

IRIS Program by George **C.** Bluhm (Director, IRIS, SCS National Office)

National Soil Survey Laboratory by Ronald **D. Yeck** (Liaison to the Northeast, NSSL, Lincoln, NB)

Soil Surveys in Agriculture Value Assessment by Eugene C. Hanchett (Administrator, Soil & Water Resources, NYS Dept. of Ag & Markets)

National Resource Laboratory by Ernest **E.** Hardy (Director, Resource Information Laboratory, Cornell Univ.)

Panel Discussion on Introduction and Presentation of Soil Information:
A New Perspective of Soil Science by Gerald W. Olson (Cornell Univ.)

Education Programs for Agricultural Use of Soil Surveys by R. F. Shipp, **J. H. McGahen,*** and J. E. Baylor* [* not at conference] (Penn. state Univ.)

The Virginia Soils and Land Use Program by Thomas W. Simpson (Virginia Polytechnic Institute and State Univ.)

Maryland's Third Generation Soil Surveys: An Assessment of Soil **Survey** Demands and Production Satisfaction by Fred **P.** Miller (Dept. of Agron., univ. of MD)

Soil Micro Nutrient Laboratory Activity by Joe **Kubota** (Soil Scientist, **U. S.** Plant, Soil and Nutrition Lab, Cornell Univ.)

Report on National Soil Survey Conference by John C. **Sencindiver** (West Virginia Univ.)

Northeast **Soil** Research Committee Report by Robert V. Rourke (univ. of ME)

Panel Discussion on Digitizing Soil Maps: Gale W. **TeSelle**, Chairperson (**Carto. Rem. Sens.**, SCS, Lanham)

Paul **Baxter**, TVA; **Bryon** Edwards, Land Resource Research-Institute (Canada); Robert Lima', Argonne **National** Laboratory; Gary Petersen, **Penn.** state univ.

Experiment Station Reports

Connecticut - David E. Hill
Maine - Robert V. Rourke
Maryland - **Delvin S.** Fanning
Massachusetts - Peter L. M. **Veneman**
New Jersey - Lowell A. Douglas
New York - Ray B. Bryant
Pennsylvania - Robert L. Cunningham
Rhode Island - William **R.** Wright
Vermont - Richard J. Bartlett
Virginia - James C. Baker
West Virginia - John C. **Sencindiver**

Forest Service Report

Walt Russell, Milwaukee, WI.

Conference Committee Reports

Committee 1, Spodosol Classification - Robert **V.** Rourke, Chairperson
Committee 1, Criteria for Land Capability Classification - Frederick
L. Gilbert, Chairperson (1980 Soil Survey Conference)
Committee 2, Post Mapping Role of Soil Scientist - Robert **L.**
Cunningham, Chairperson
Committee 3, Standards and Specifications for Soil Maps - Willis **E.**
Hanna, Chairperson
Committee 4, Improving Descriptions of Map Units - **Karl H.** Langlois,
Jr., Chairperson
Committee 5, General Soils Map and Bulletin of the Northeast - Edward
J. **Ciolkosz**, Chairperson
Committee 8, Northeast Soil Characterization Study - Dick **Cronce**,
Chairperson (1980 Soil Survey conference)

Conference Business Meeting and Summary

Appendix

By-laws of the Northeast Cooperative Soil Survey Conference

List of Attending Participants

AGENDA

NORTHEAST COOPERATIVE SOIL SURVEY CONFERENCE

Bradfield and **Emerson Halls**
Cornell University
Ithaca, New **York**

June 20-25, 1982

June 20, 1982 (Sunday)

4:30-8:00 p.m.	Registration	North Campus Union
5:00-8:00 p.m.	Social Gathering	Dorm Lounge-North Campus

June 21, 1982 (Monday)

	<u>General Sessions</u>	101 Bradfield
8:00-8:15 a.m.	Opening Remarks	Edward J. Ciolkosz Conference Chairperson
8:15-8:30 a.m.	Announcements	Frederick L. Gilbert Conference vice-Chairperson
8:30-9:00 a.m.	Soil Surveys of the Past & Future	Paul A. Dodd State Conservationist
9:00-9:30 a.m.	NYS College of Agriculture & Life Sciences at Cornell University	David L. Call , Dean Cornell University
9:30-10:00 a.m.	Coffee Break	135 Emerson
10:00-10:30 a.m.	Current Issues	Arthur B. Holland, Director Northeast Technical Service Center
10:30-11:00 a.m.	Technology in Bureaucracy	Ralph J. McCracken, Dep. Chief Natural Resource Assessments
11:00-11:30 a.m.	National Cooperative Soil survey	Richard W. Arnold, Director, Soils
11:30-12:45 p.m.	LUNCH	
12:45-1:15 p.m.	Regional National cooperative Survey	F. Ted Miller , Head, Soils Staff , NENTC
1:15-1:45 p.m.	IRIS Program	George C. Bluhm , Director, Integrated Resource Information System

1:45-2:15 p.m.	National Soil Survey Lab	Ronald D. Yeck , Liaison to the Northeast
2:15-2:45 p.m.	Coffee Break	135 Emerson
2:45-5:00 p.m.	<u>Committee Meetings:</u>	
	Committee 1, Spodosol Classification	Robert V. Rourke , Chairperson 240 Emerson
	Committee 2, Post Mapping Role of Soil Scientist	Robert L. Cunningham, Chairperson, 135 Emerson

June 22, 1982 (Tuesday)

	<u>General Sessions</u>	101 Bradfield
8:00-8:30 a.m.	Soil Surveys in Agriculture Value Assessment	Eugene C. Hsnchett, Administrator, Soil & Water Resources, NYS Dept. of Ag & Markets
8:30-9:00 a.m.	Natural Resource Laboratory	Ernest E. Hardy, Director Resource Information Laboratory Cornell University
9:00-9:30 a.m.	Slide Presentation - "Soil Survey"	Richard D. Babcock
9:30-10:00 a.m.	Coffee Break	135 Emerson
10:00-11:30 a.m.	Panel Discussion on Introduction and Presentation of Soil Survey Information	Gerald W. Olson, Chairperson Raymond F. Shlpp Tom Simpson Fred P. Miller
11:30-12:45 p.m.	LUNCH	
12:45-1:15 p.m.	Soil Micro Nutrient Lab Activity	Joe Kubota , Soil Scientist
1:15-2:30 p.m.	<u>Committee Meetings:</u>	
	Committee 3, Standards and Specifications for Soil Maps	Willis E. Hanna , Chairperson 135 Emerson
	Committee 4, Improving Description of Map Units	Karl H. Langlois, Jr., Chairperson, 240 Emerson
2:30-3:00 p.m.	Coffee Break	

3:00-4:00 p.m.

4:00-4:30 p

6:00 until

Robert H. Treman
State Park

June 23, 1982 (Wednesday)

8:00-9:00 a.m.

9:00-9:30 a.m.

9:30-10:00 a.m.

10:00-10:30 a.m.

~~10:30-10:50~~

June 24, 1982 (Thursday)

8:00-9:30 a.m. Experiment Station **Reports** (15 **minutes** each): 101 Bradfield

Pennsylvania
New York
New Jersey
Maine
Connecticut
Connecticut

9:30-10:00 a.m. Coffee Break

10:00-10:45 a.m. Panel - Digitizing
Soil Maps

12:00-1:00 p.m.

LUNCH

1:00-1:45 p.m. Experiment Station Reports

Maryland

Massachusetts
New Hampshire

June 24, 1982 (Thursday)

~~1:45-2:45~~

8:00-9:30 a.m. **Committee** Reports (45 **minutes** each): 101 Bradfield
 committee 2, **Post** Mapping Robert **L.** Cunningham
 Role of Soil Scientists

Committee 3, Standards and Willis **E.** Hanna
Specifications for Soil
 Maps

a.m. Coffee Break

10:00-10:30 a.m. Committee Reports:
 Committee 4, Improving **Karl** H. Langlois, Jr.
 Description of Map Units

10:45-11:30 a.m. Business Meeting: Edward **J.** Ciolkose
 Election of Vice-Chairperson
 Plans for Next Conference
 Proceedings for 1982 Conference
 and Other Items

11:30-12:00 Noon Conference **Summary** F. Ted Miller

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- Current Issues by Arthur B. Holland (Director, SCS NENTC) - 6
- Technology in Bureaucracy by Ralph J. McCracken (Deputy Chief, National Resource Assessments, SCS) - 10
- National Cooperative Soil Survey by Richard W. Arnold (Director of Soils, SCS National Office) - 13
- Regional National Cooperative Survey by F. Ted Miller (Head, Soils Staff, SCS NENTC) - 20
- IRIS Program by George C. Bluhm (Director, IRIS, SCS National Office) - 23
- National Soil Survey Laboratory by Ronald D. Yeck (Liaison to the Northeast, NSSL, Lincoln, NB) - 27
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- Maryland's Third Generation Soil Surveys: An Assessment of Soil Survey Demands and Production Satisfaction by Fred P. Miller (Dept. of Agron., univ. of MD) - 4 - e
- Soil Micro Nutrient Laboratory Activity by Joe Kubota (Soil Scientist, U.S. Plant, Soil and Nutrition Lab, Cornell Univ.) - 66
- Report on National Soil Survey Conference by John G. Sencindiver (west Virginia univ.) - 69
- Northeast Soil Research Committee Report by Robert V. Rourke (Univ. of ME) - 70
- Panel Discussion on Digitizing Soil Maps: Gale W. TeSelle, Chairperson (Carto. Rem. Sens., SCS, Lanham) - 71
- Paul Baxter, TVA
- Bryon Edwards, Land Resource Rereerch Institute (Canada)
- Robert Lima¹, Argonne National Laboratory
- Gary Peterson, The Penn. State Univ.

OPENING REMARKS

Edward J. Ciolkosz
Pennsylvania State University
Conference Chairman

I would like to call to order the 1982 Northeast Cooperative Soil Survey Conference. As most of you know, a conference is not a happening, it takes considerable time and effort on the part of a person or a group of people. For our conference this group is the NECSSC Steering Committee. The 1982 Steering Committee is made up of Ted Miller (Head, Soils Staff, NENTC in Broomall, Pa.), Ed Sautter (SCS State Soil Scientist, Conn.), Fred Gilbert (SCS State Soil Scientist, N.Y.) and Ed Ciolkosz (Penn State University). The Steering Committee provides continuity from conference to conference, and one new member is selected to serve on the committee at each conference.

I believe this arrangement as well as the people involved has triggered a renewed vitality in our conference. I would like to cite two examples of this new vitality. The first is in better communications. We have sent a representative to the Western, Midwestern and Southern Soil Survey Conferences, and the Southern and Midwestern Conferences have reciprocated. We have invited representatives from Canada to attend and participate in our committees and conference, and we have proposed starting a Northeast Soil Survey Newsletter. A second new area of vitality is in projects. We have started a soils map and bulletin project and a comparative lab data project. These two Northeast projects are going well and should provide useful products to us in the near future.

Our conference has a full schedule and it is necessary that our speakers stay on time. Ed Sautter, our past conference chairman, has provided me with a tool to help me keep the speakers and the program on schedule. Ed claims that this tool is very effective in terminating a presentation that has gone on too long.

With these remarks, I would like to welcome you all to what I believe is going to be the best Soil Survey Conference we have ever had in the Northeast region.

SOIL SURVEYS OF THE PAST AND THE **FUTURE**

I would like to take this opportunity to welcome you to New York State. If any of the New York people can be of **assis-**
tance in making your stay here enjoyable, **please** feel free to make your requests known.

Need for Classification

The difference in soils has always been apparent to **land-**
users. Contemporary Soil Scientists did **not invent** soil clas-
sification systems. The early farmers devised methods of
comparing one kind of land with another. They described rocky
soils, **sour** soils (low lime), soils that can't grow alfalfa,
fields that wash, etc. One of the earliest descriptions of
land quality is in the Bible in the parable of the sower.
This description dealt with soil compaction, stoniness, depth
to bedrock, existing land use and vegetation. It looked as
though there was a soil scientist on King James' staff when
this translation was written. In New York there was an early
book by Dr. **Ebenezer** Emmons in 1846 in which a rather accurate
account, for that day, of the soils in New York **is** given.
This **is** a very interesting book and is now a rare collector's
item. There are many fine papers that summarize the history
of soil classification which most of you have read during your
studies in becoming soil scientists. One of the papers that
gives a most concise history of the soil classifications is
the one by Dr. Roy **W. Simonson** in "Science," September 1972.
Another very detailed bibliography is given in the book "Soil
Genesis and Classification" by Buol, Hole and McCracken. One
of the interesting things about this article by Dr. Simonson,
was that soil science began with a classification system some
forty centuries ago in China.

Past Priorities for Soil Surveys Used

Agriculture was the industry that caused the soil survey to
come into existence. The need for understanding the land's
capability in the ever-expanding frontier caused the Federal
government of the United States to become involved in soil
survey as an inventory procedure. The Congress of the United
States was concerned because we understood little of the
developing productivity for specific crops of the expanding
west. crop selection for these areas became very critical
after many, many failures by those that were attempting to
establish themselves west of the Mississippi. We could go on
and on with some of this early history that has been recorded,
but it is well for **us** to remember our route and the reason
that we have a National Cooperative Survey today.

Remarks by **Paul** A. Dodd, State Conservationist, Soil Conserva-
tion Service, Syracuse, New York.

Society's Changing Priorities

We have seen activities happen in our society in the last decade that **we** would not have thought about twenty years ago. There has been **a** large movement to protect prime farmland that you **are** all **aware** of. The need for using **nonprime** farmland for **nonfarming** development, therefore, has become s hot issue in New York State. The soil surveys have been the **basis** for making statements **about** issues pertaining to prime farmland. They will continue to be the basis for making these statements. No one has better information to base prime farmland criteria on than the National Cooperative Survey.

Potential Uses

I am sure that all of you can think shout uses of soil surveys that we have not used to this point. I would like to take this opportunity to solicit some from you and to cause you to think about future uses that have only been dreamed of.

The Future is Now

The hardware for computers is here. Many of the software packages for causing us to manipulate data have been written. We have accurate soils data. Now we need an innovative, aggressive program to join the hardware, software and the basic soils date. This is beginning to happen within various State agencies such as the Adirondack Park Agency. The **APA** has taken existing general soil maps, and have created **unit** cell computer generated maps. This is just the beginning and we anticipate that this **is going to cause us to focus** on this activity a great deal in the next decade.

Summary

The history of the soil survey in the United States **is** relatively short, **less** than one hundred years. It has been guided by people of high integrity who have done a lot of hard work in developing **a** classification system that will allow for technology transfer around the world. The future of the soil survey is dependent upon our commitment to turn out **a** soil survey product that is **accurate** and useful, and is precise as to the use of s specific piece of land.

I wish you the best in your future work and that you have an excellent conference here at Ithaca. If we can he of any assistance during your stay in New York, please do not hesitate to ask for our assistance.

Current Issues

Arthur B. Holland
SCS, Broomall, PA

I appreciate the opportunity to be on the program for the Northeast Cooperative Soil Survey Conference here in Ithaca.

There are several items I would like to discuss briefly with you. They pertain to RCA, targeting, **LESA**, the future of soil scientists in the Northeast, soil survey reports, and the board of directors.

RCA

All of you have heard about RCA and the findings of the RCA inventories that have just been reported. One result of RCA is that the Soil Conservation Service is starting to target its resources to concentrate on critical erosion areas throughout the United States.

Due to the criteria used for determining critical eroding areas, very little of the Northeast **area** is shown as having a major (significant) erosion problem.

However, an item that I think is being overlooked, is soil loss in relation to the **depth** or availability of the soil. For instance, a '**T**' value of 5 tons per acre per year is considered a normal goal to shoot for for most of the soils in the U.S. In the Northeast, however, 75 percent of the soil has a '**T**' value of 3 tons or less per acre per year, and 90 percent of the soils have a '**T**' value of 4 tons per acre per year. This indicates that our soils are much more fragile and that erosion has a greater impact than on some of the deeper **soess** soils in the Midwestern States. **What** this means is that approximately 900 different soils in the Northeast have a '**T**' value of 3 or less and approximately 1,100 soils have a value of 4 or less. As you are aware, there's approximately 1,200 different soils in the Northeast. The measurement that is missing from this information is the number of acres of each of these sites. **At the present** time, we don't have this information. Perhaps, from all of the data that has been gathered, we will soon be able to assemble information on the number of acres for each of the types of soils. This will make the analyses a little more meaningful.

LESA

A new system of evaluating land for development has been prepared by the SCS. It's called "**LESA**" or Land Evaluation and Site Assessment System. The system is broken into two separate parts: The first part evaluates soil conditions as they relate to agriculture, and the second part evaluates site conditions for urban development **vs.** agriculture. The system will establish relative values to determine the quality of land for agricultural uses and then assess sites for their agricultural viability. It is a tool that state and local planners, landowners, and developers, and others can use in decisionmaking. It has a built-in flexibility to accommodate differences among States and areas within States.

The land evaluation part of the system assists local officials in identifying farmland that should be protected consistent with National, State, or local objectives. The key elements of this section are: (1) **land capability** class, (2) productivity, (3) soil potentials, and (4) important farmland rating. The National Cooperative Soil Survey provides much of this data. A computer program applies criteria to data related to a soil series, and the system then identifies and provides information on the various soils. This will aid in making technically defensive decisions on land evaluation.

On the relative quality of the land for agriculture, the site assessment part of this system assists decisionmakers in evaluating factors besides soils that influence land conversion. Some of the factors are: size of the site, shape of the area, availability of alternate sites for development, accessibility to site, road network, utilities, and other locally developed criteria.

The **system can** be used as a tool to implement the National Farmland Protection Policy Act. It can **provide local** sponsors and local government units with a uniform method of evaluating areas. Since the system is consistent within a governmental unit, it should reduce biases and potential lawsuits.

A side benefit of this system is the development of agriculture soil potentials. We are interested in providing **more** information on soil potential, particularly for agricultural uses of soils. This is in line with the Land Evaluation and Site Assessment concept. We have prepared some soil potentials for developing areas for sewage disposal systems, and so forth. But we need to do **more** soil potential ratings based on dominant crops for an area in order to provide information to farmers and local communities on which lands have the best potentials for various crops.

Soil survey status

As you are aware, 70 percent of the Northeast has been mapped, and we are moving right along in completing the mapping and publication of the soil surveys in the Northeast. In fact, mapping is complete in Connecticut, Delaware, Maryland, Rhode Island, and Washington, D.C.; New Jersey and Pennsylvania have more than 97 percent of their areas mapped; and the other States are progressing very well in getting their areas mapped.

We have published 178 soil survey reports for the Northeast, **or** 47 percent of those we anticipate publishing. A" additional 63 areas have been mapped but have not yet been published. So, we've published or mapped approximately 64 percent of the areas slated to be published in the Northeast.

What this indicates, of course, is that mapping in the Northeast will be decreasing in the future and that soil scientists will be needed for purposes other than just mapping. In my opinion, the soil scientist of the future will be a much **more** "sophisticated" scientist than he has been in the past. He will deal not only with soil mapping of specific sites, but will be much more involved with decisionmaking bodies such as local and county governments, **to** help them evaluate soils and site conditions for various uses. He will provide interpretations of available soils information, He will also provide technical guidance for the protection and maintenance of our Nation's soil

resource base. There will be a" increased emphasis on using available soils information and on the soils staff's expertise.

Now, as well as in the future, there should be a distinction between the basic soil service and the project mapping parts of the soil survey program. We envision that in the future each State will have a soils staff that will be able to provide basic soil services. As soon as possible, all States in the Northeast should establish some type of basic soil services as part of their soils program.

This basic service would include all the things a soil scientist is needed for other than project mapping and publishing the soil survey report. In addition,, those States which have not completed their mapping would have a soil survey mapping staff to handle this part of the soil survey program.

The basic soil service activities include interpreting available soils information for soil potential ratings. This is important for soil survey areas and-for special projects. These services also include training in the use of soil surveys and carrying out activities necessary to maintain adequate soils information. Project mapping refers to the acquisition of new soils data, including mapping, soils descriptions, interpretations, map compilation, and the finished publication.

Efforts will be made to sustain and increase SCS resources in those areas where State and local governments and agencies are providing support for soil surveys.

Soil. Survey Reports

At the meeting two years ago, I started my presentation with a plea to consider the possibility of developing two different soil survey reports for the same area--one, a nontechnical report to be used by land users, developers, decisionmakers, and people like me who don't need to know everything; and the other, a technical report to be used by the soil scientists, laboratories, and universities in evaluating various aspects of soils. While this concept has been discussed at some length, it has not yet been accepted.

However, flexibility in content and format of soil survey reports is possible within the present guidelines. In the past the information in the soils reports has been pretty much prewritten and standardized. Now guidelines, handbooks, and bulletins indicate that we should feel free to develop soil survey reports to accommodate the needs of the local users. when a soil survey report is being prepared we need to be aware what the local people want to know about the soils and provide them with information they can use. Of course, some standardization of the text is necessary for continuity and for realizing the benefits of automated procedures. However, this does not prevent us from being innovative and including data applicable to the area for which the report is being published.

Board of Directors

I would like to leave you with a concept that I think would be beneficial to this group. Through experience I have found that when state conservationists and experiment station directors are involved and support an activity more is accomplished than when they are just told what is happening. On that basis, I suggest the development of an advisory committee for the Northeast Cooperative Soil Survey Group. This committee would be made up of selected state conservationists and experiment station directors.

In the Soil Conservation Service we have committees like this for plant materials, training, and other aspects of Service programs. We find that where these committees function the programs benefit because of the support given them from this level of management and administration.

Speaking from the Soil Conservation Service standpoint, I don't think it would be difficult to set up this type of committee with the state conservationists. From the experiment station director's standpoint, I believe it could be accomplished through the Committee of Nine or the Regional Association of Directors, or something similar.

Thank you, again, for the opportunity to meet with you.

TECHNOLOGY IN BUREAUCRACY

Ralph J. McCracken 1/

I'm pleased to respond to the invitation of your Steering Committee to speak on the subject "Technology in Bureaucracy." First I'll offer definitions of the words in this title.

A dictionary definition of technology is "The science or study of the practical or industrial arts," "applied science," "the terms used in a science." Bureaucracy is defined by dictionaries as "The body of career (nonpolitical) employees of Federal and State public agencies, generally the members of bureaus or similar subdivisions of Departments - hence the term **bureaucracy.**"

Among the uses of technology in bureaucracy are these:

1. Provide information not otherwise available for primary end users, including farmers and ranchers, agribusinesses, planners. This information is provided by direct technical assistance, maps and publications, and educational programs.
2. Furnish the data, analyses, and evaluations for policy and executive implementation programs by Federal, State and local governments. The technology is supplied either in raw unprocessed form or summarized and aggregated.
3. Technological information is a major contributor of background information for legislation.
4. Technology is heavily drawn on in preparing regulations.
5. Provides input for analyses, models and technical guides for action programs.
6. Technology is a necessary contributor to inventory, assessment and monitoring activities carried out by government agencies and bureaus.
7. Technology is also an important component of technology transfer and other aid programs for the less developed countries.
8. Technology developed within the bureaucracy is important during national emergencies and for national defense.

The soil survey segment of the bureaucracy displays many examples of uses of technology which we take for granted. Some of these are technologies which were pioneered or very creatively adapted by soil scientists.

1/ Prepared by Ralph J. McCracken, Deputy Chief, Natural Resource Assessments, Soil Conservation Service for presentation during the Northeast Cooperative Soil Survey Conference Cornell University, Ithaca, N.Y., June 21, 1982, at request of the Program Committee.

Consider our common field equipment. The use of airphotos as a base for field mapping was pioneered by soil surveyors, especially Tom Bushnell of Purdue University. The adaptation of the quantitative physical description of colors of materials (developed by the Munsell Foundation) to field description of soils was prepared by much hard study of the physics of color and years of trial by Ed Templin and others of a Soil Survey Work Planning Conference committee.

We have technology guides and handbooks which set the standards and procedures for soil survey around the world: Soil Taxonomy, Soil Survey Manual, and the National Soils Handbook. These are products of the hard work and creativity of our predecessors (Guy Smith and others) - another excellent example of technology in **bureaucracy**.

In the soil cartographic area, we should bear in mind the pioneering work by SCS cartographers and their cooperators in the development and use of Kelsh plotters and of mosaic preparation techniques.

The area of soil survey investigations and research provides us some additional outstanding examples of technology development and application.

Much of the early work on the crystalline structures of clay minerals was conducted for support of the soil survey and better understanding of soils. These activities involved use of X-ray diffraction and differential thermal analyses (such as the work of Sterling Hendricks and Lyle Alexander); soil scientists played key roles in the development and adaption of this technology to soil systems. Now we are seeing the application of scanning electron microscopy to studies of soil minerals, supporting the soil survey.

Among the more recent developments in **bureaucratic** technology are soil data bases (especially the Soils - 5 files), digitization of soil maps, and the use of computer-assisted scheduling of the whole spectrum of soil survey activities (**CASPUSS**).

Considering these technological developments and applications, and the technology now under development but not yet in use (ground penetrating radar, digital remote sensing, and others), should we not agree that soil survey is a relatively high technology field? Let's take pride in the technological level of our work, and be alert to additional technology applications.

Of course, there are many problems in acquiring and applying technology to **pedology**. In our bureaucratic situations, we must be mindful of budgetary and funding concerns and of personnel limitations. Basic research is not yet completed for several promising areas and requires much time. In other instances, technology has been developed but we have not yet made the application to soil survey - either through lack of knowledge of the development or lack of creativity and innovative thinking. This is one of the places where training in our universities is important - including the research activity by soil survey leaders and their graduate students, the development of awareness in the students of the importance of technology and the need to be alert to its potential applications in soil survey. And there's the need for training in the

use of new technology such as use of computers, especially soil map digitization. We need to xx-examine our educational programs to assure that the soil scientists that come after us are prepared for and alert to opportunities for application of the technology of the future.

What are these opportunities and needs for future technological development and application? I see these as examples (not an all-inclusive list):

Ground penetrating radar to improve the accuracy and speed of soil surveys in the field.

Digital remotely sensed soils data with image processing and enhancement, to improve the quality of soil surveys and aid in their interpretation.

Complete digitization of soil maps and thematic, interpretive maps generated and printed by computers; also, the availability of basic soils information on computer terminals operated by farmers and ranchers.

Comprehensive geographic information systems which put together soil survey information, land use, erosion information and other data along with geographic locations to produce packages of natural resource information, available on demand.

But there are several problems for which we need additional information and technology for our soil survey programs of the future.

Crop yield data on key soils and especially on eroded soils in comparison with relatively uneroded soils. We especially need more information on the effects of specific soil properties on crop yields and soil performance.

More basic information on the regeneration rate of soils - to sharpen up our concepts of tolerable soil loss (T values) and the Universal Soil Loss Equation.

We must have more information and technology to clear up problems on the purity and spatial variability of soil mapping units.

I see a bright future of increased recognition and importance of soil survey - if we work together in our bureaucracy to ensure an improved technology base and are alert to potentials for additional applications of technology in soil survey.

1. Consider the soil first. Our world is the **world** of soils. It is sorely misunderstood by others who only see how to use part of our information as a way to achieve some of their **goals** and objectives. There are thousands of users of our information--for a myriad of purposes--but so few realize that we also develop a philosophy of life and of living from our discipline. We have an understanding of the integration of forces of nature, the beauty of the unseen is part of our vision, and beyond the day to day happenings are the recorded history and evaluation of nature and mankind. A story that few attempt to read as we read it. It is no wonder that we consider the soil first!

2. There are many perceptions of soils. In New Zealand, the native **Maori's**, like many other cultural groups, revere the Gods that provide sunlight and rain and the earthy material that mysteriously interacts to provide new forms of life that sustain them.

Imagine a seed that is transformed into something that does not seem possible. What kind of magic abounds beneath the soles of your feet? Surely it is proper that the high priest or chief oversees the ritual of planting and the expectation of harvest. **Many millenia** of changing seasons has not lessened our awe of the earthy material we now call soil.

3. In **Amazonia** there **are** inhabitants whose understanding and management of soils have been passed on for at least 6000 years. For many of them the dawn of their history is lost--but not so their traditions.

In this humid tropical forested area the protein source is fish and a few land animals. They have not had a source of protein such as corn that could be dried and transported long distances and permit them to migrate. Today we may speak of lost civilizations or stagnated cultures. Ah, how we enjoy speaking **in** relative terms. Only where millet, wheat, corn or plentiful **animal** protein sources were produced did we find the spread of cultures throughout history.

We cannot escape from our natural ties to soils, and certainly we should not if we want to comprehend ourselves as human beings.

4. After many hundreds of years mankind started to describe and think of soils as natural, unique entities that could and should be considered. The mysteries beneath the surface could be **diagrammed** to illustrate some of the differences that existed.

Although the significance and meaning of these properties were not always appreciated a new scientific area of interest developed. Who could have imagined that this would captivate the energies and lifetime activities of people. Yet here we are, gathered as disciples of **pedology** to help the world sense its dependence of those phenomena.

5. Now we describe, analyze, and interpret the undescribable. We find variations in what appears to **be uniformity**. The search goes on and on and reaches into the unknown. It is a part of our quest to know why.

Does this resource have a potential beyond the results of its genesis and evolution? Can man live with this resource without destroying the balance of eons?

6. Classification systems that capture our state-of-knowledge have come and gone as the search has continued. To **generalize, our** information and look for relationships we make maps that illustrate what we know. However, the maps also reveal what we don't know thereby leading us on and on.

Soil Taxonomy, possibly the most profound document of concepts in pedology to date. has guided us into some very interesting pathways.

7. Soil Taxonomy provides names and the names are used to identify dominant kinds of components in recognizable landscapes. In this example we see a map of geomorphological units in the upper part at a scale of **1:25,000**. The lower map portrays the dominant soils Identified and named at the subgroup level of Soil Taxonomy.

The correspondence appears to be too good. The correlation is higher than one might expect. Not so! It is exactly right for this level of detail. It verifies what we know and how we make predictions,

Nobody can map Soil Taxonomy. It is unmappable at scales commonly used. We do not map soils--but we do make soil maps!

To the maker of soil maps these statements are self-evident and clearly understood. To most others, it has to be explained. Each of us may explain it **a** little differently but we are trying to tell them that we make delineations of landscapes. Our model of soils suggests the likely conditions that correspond to observable changes of developed soil features.

The evolution of landscapes is also the major evolution of soils and we are soil **geographer/geomorphologists** par excellence. The soil names we associate with these landscapes are the means of applying a taxonomy to the major or dominant kinds of soils in those landscapes.

It is all too common for us to get lost in the semantics of our own language when trying to explain simply the complexities of our soils world.

8. At a somewhat larger scale we can unravel a few more details of geomorphology and the associated dominant **taxonomic** names.

It continues to **amaze** me that there are no soils out-of-place in landscapes once we get the pieces about right. What is wrong is our interpretation of what is there for us to observe. Rose-colored glasses and blinders cause us to focus on only a part of the story that is there.

Research proves again and again that soils are scale dependent. Soils go hand in hand with landscape events that are generally at scales considerably larger than those we use for delineating these beauties of Nature's design. **It** is no wonder that soil variability captures our attention and taxes our methods for presenting information.

9. **In** our attempts to grasp reality we have to have some standards for obtaining facts and describing our observations. We do well with central concepts that are separated far enough for us to **distinquish** but boundaries drive us wild and consume most of our efforts.

We like neat, sharp boundaries and we **abhor** gradational features that force us to arbitrary decisions.

In one sense soils are a continuum but we aren't yet able to effectively utilize the concepts, linguistics, or physical representations of continua. Thus we have classes with defined parameter limits so we can conceptually deal with individuals rather than fuzzy segments of a continuum.

We want to classify soil individuals but we have to work with samples. **Aha!** The pedon is born as a sampling unit--but of what size? It is variable because of certain horizon arrangements and this leads us along a particular pathway.

This slide illustrates the Delmita-Rondado complex. Conceptually there are areas elsewhere of Delmita soils and other areas of **Rondado** soils. Here they are intermingled to form a complex by our definitions. Conceptually they also can be closer or of smaller size **until** we have a **ruptic-lithic** pedon of only one soil.

If the lithic component becomes 40% or 30% of a pedon, how then do we classify the soil? Yes this is an interesting pathway of intellectual pursuit,

10. In a somewhat similar manner we have let series become taxonomic classes in Soil Taxonomy. We say that they consist of polypedons as real landscape counterparts but because they are limited by the limits of a series they seldom can be delineated and completely recognized. These taxonomic limits are seldom the limits of landscapes.

Our attempts to regiment our imperfect knowledge in a systematic fashion has trapped us. We are faced with the dilemma of those who define and map plant communities.

But being clever humans **we** recognize a basic and fundamental property of the universe--probability. The concepts and reality of space and time are probabilistic. The accumulation of criteria from soil orders through soil families are imposed on soil series and how it meshes with what occurs in nature cannot be absolute.

But we have little to fear because all decisions, even the scientific ones, are based on probability **judgements** of the available information. What are the consequences? Soil map units, of course. They represent areas of probabilistic expectation. One of our most interesting challenges is to describe and explain these phenomena to others.

11. We now accept this world. It's not always what we hoped it might be and certainly it would have been nice if it wasn't so complex, so interrelated, so fragile. But our outlook **is** okay--we will continue to go ahead.

12. We work together--we work hard to gather more information that will improve our understanding of relationships. Most of our models are working--we like to refine some of them and train others in their use and application. Our role is to learn and to teach--to receive and to extend. Our first responsibility is scientific integrity of the information we collect.

13. In America we are idealists and dreamers--we can envision a world in harmony with itself. This is in part a consequence of the chances that let **us** be **born** or to grow **up in this country. Our feelings** about beauty are tempered by our own background and environment.

14. We believe that soil inventories are a solid foundation on which to plan development. We see the results of 80 years of soil survey and the ways that information can be used. We are justifiably proud--but are we also aware of our privileged position? And even if we are aware--do we know how to graciously help others in their struggle for an improved standard of living?

15. Some environments have fascinating landscapes--and thoughts of adventure may come to mind as we envision camel caravans carrying us to the exotic oasis in the desert.

16. But other spectres arise--the need for fuel wood to cook the meals we expect--uncooked millet or cassava can be devastating. Yes the search for fuel wood, the search for new areas of potential production and an assured supply could dominate your daily existence if you lived somewhere else.

17. I can almost taste a steak--and I know it's within my power to obtain one--almost at a moments notice. The distribution and marketing systems here give me confidence in the ability to satisfy such a desire.

18. But there are those who spend most of their working hours to have a little water--not fried oysters or a steak or even a pizza--no. just some water to drink, to cook with and maybe bathe a sick grandmother. The Year of the Woman can describe and discuss the plight of women but its difficult to change customs in remote areas of our world.

19. By now you know I'm trying to think of our bigger responsibilities in the world. It's tough sledding but well worth the effort. We make advances slowly and not with a lot of confidence--because we have so much to learn from each other. This is a select group of world leaders that got together to discuss an international reference base for soil classification. At the left only partially visible is Victor **Fridland** of Russia, next is Rene **Tavernier** of Belgium, who has the largest pedological mafia in the world, there is Klaus **Flach**, and Ernest Schlichting of Germany, the past chairmen of Comission V of the **ISSS**, and Dr. **Jamagne**, the head of soil survey in France. They truly represent the pedological Power of the world and they are trying to have a positive influence on our future.

20. **Somedays** it is terrifying to realize that we are only a spot in the universe and that we are just a planet hurtling through space and time. **It** is sobering to see that this is a one and a whole rather than the parts we are in contact with. This reinforces for us that **together** we can influence our short destinies and those yet to come. A National Cooperative Soil Survey must someday become an International Cooperative Soil Survey. Wow! **I** like that--how about you?

21. Recently we walked over some **Quartzipsamments** of Florida. Knowledge gained on **soil** behavior of these soils can be transferred to other ~~Quartzipsamments~~.

35. Red, white, and blue take on many forms. **They** signify different things to people. This is not an American flag. These snow covered red berries outlined against a blue sky remind **me** that I'm privileged to be an American, and it is great to have the opportunity to catch yet another glimpse of the marvelous patterns of nature.

36. And if I think we should consider soil first, let me assure you that in the end as peds come tumbling down over my casket, I will be satisfied to know that I have returned again to the good hands of the earth.

Thank you.

REGIONAL NATIONAL COOPERATIVE
SOIL SURVEY

F. Ted Miller
Head, Soils Staff
Soil **Conservation Service**
Northeast NTC

A number of changes have taken place in the Soil Conservation Service within **our** region since **our last** meeting. Tommie Calhoun and Kermit Larson, who were on our staff at Broomall, are no longer with **us**. Tommie transferred to the State Staff in Florida and Kermit retired. Karl **Langlois** and Loyal Quandt are now in these positions and **are** attending their first Northeast Soil Survey Conference. At the state level, we have two new state soil scientists. Garland **Lipscomb** replaced Art Kuhl in Pennsylvania and Dave Yost replaced Bob Shields in Maryland. The state soil scientist position in Vermont, which was vacated by Bruce Watson's recent retirement, is still vacant, but hopefully it will **be** filled shortly.

I would like to take the next few minutes to briefly review some of our accomplishments, recent activities, and future plans in the Northeast.

Accomplishments

In fiscal year 1981, the Northeast NTC participated in 24 field reviews (Initial, Comprehensive, and Finals). We processed 13 soil survey manuscripts, 10 of which were edited within the NTC. Final correlation reports were prepared for 14 soil survey areas and 14 surveys were published.

As of the beginning of FY '82 (October 1, **1981**), we had mapped 106.245.000 acres, or 70 percent of the 13 states comprising the Northeast region. We had also published 178 of the 374 soil survey **areas** within the region.

According to state APO's, we had 150 field soil scientists on board in FY 1981. In 1980, we had 168 and in 1979 there were 175. Not only did we drop nearly 15 percent of our field soil scientists during this 3-year period, but production (acres mapped) dropped somewhere in the neighborhood of 50 percent. I don't really believe the figures are quite **as** bad as they appear. The field soil scientists include area soil scientists as well **as** party leaders and survey party members. Obviously, we have a number of field soil scientists who have been providing basic soil services for some time. Also, as most of you know, the really big drop in production in 1981 was the result of the emphasis placed on the NRI-82 effort. A number of soil scientists were engaged in the collection of NRI-82 data and were not mapping.

My purpose in discussing this with you is really two-fold. First, I wish to point **out** that although we still have a considerable way to **go in** completing the once-over survey in the Northeast, we have been in a phase down position for the past two years (175 field soil scientists in 1979 and 150 in 1981). Secondly, I truly believe we can do better relative to production. Now that the data collection for NRI-82 is essentially complete, we need to turn our

attention back to the soil survey. With more and more emphasis being placed

changes, or additions to the soil survey are contemplated. We need to know by the comprehensive field review what changes in content and format are being considered.

Program Emphasis in the Northeast

Develop soil potential guidelines for crops and forestry.

Statewide correlations in complete states.

Improve efficiency in project mapping.

Improved packaging and presentation of soils information in targeted areas.

Review and update list of benchmark soils and prepare additional lists of soils important to specified objectives.

Improve soil data base--both laboratory and field data to support classification and soil interpretations.

All of the above items require special emphasis in the coming months. Working together we can accomplish them. In so doing, we will have a more viable soil survey and one that is more responsive to user needs.

EXECUTIVE SUMMARY
IRIS 5 YEAR IMPLEMENTATION
PLAN

INTRODUCTION:

Modern computer experts (Dr. J.S. Birnbaum, Director, HP Research Lab) agree that over the years spectacular advances in hardware have not been matched by advances in programming resulting in a software gap. This gap may be the biggest single problem in scs. Computers and software are needed not for aesthetic reasons but because they are essential to survival in a complex political environment.

WHAT IS IN STORE FOR HARDWARE?

- o Computers will continue to become smaller and cheaper while the amount of information they can store will increase.
- o Computers will operate at increased speeds and require minute amounts of power to supply them
- o Prototype computers can read printed text, hardwriting, and understand spoken words.
- o Key stroking as input to computers will become largely redundant and most input will soon be voice controlled (Sony Corp.).
- o Word processing, editing, and computing will all be accomplished on the same machine.
- o Equipment will not require controlled environments.

Key Points in the IRIS Five Year Implementation Plan

- o The resource data collected by SCS will be integrated within the data base scheme to allow retrieval and analyses on a real time basis.
- o The plan is to acquire dedicated hardware for the National Integrated Resouformation System that can be networked between the National office and Fort Worth. The computer processing will not be site specific but transferred between the networked machinery. Presently that can be accomplished with a UNIX operating system on both machines.
- o All entry and access to IRIS will be transparent to computer programming. It will be menu driven, user friendly, and primarily in the interactive mode.
- o Substantial data will be accessed and brought into IRIS for SCS use from other agencies. This will require considerable software development to provide interface processing. Standard definitions will be required between sharing agencies.

- 0 The enclosed workload analysis shows that to complete the 5 year IRIS plan will require 140 staff years of effort. Some of this effort can be accomplished by innovative IPA's, WAE and contracting efforts.
- 0 IRIS will develop software to overcome the aggregation of data problems that exist today. The SCS is the only agency that has reliable data at the MLRA portion of State. ERS and Census use counties. Other data collection agencies use watershed subareas or floodplains, etc. and this becomes a difficult problem when it is desirable to merge two sets of data for analysis purposes that are reliable at differing boundary levels. A method of analysis must be agreed upon that provides the desired accuracy for National purposes but that does not cost an excessive amount of process time. Canada uses 560 cells to represent cropland for analyses purposes.
- 0 IRIS will be networked with State systems as equipment is acquired at the State level and linkages developed with other State level data sources. Generally data entry will be accomplished at the State level, quality control will be accomplished at the NTC level and data administration at the National level. As network technology is implemented, data and processing capability at any one of the networked location is available to all the rest.
- 0 Future requirements for SCS to monitor and inventory could require considerable field input of new technology is not implemented in SCS. Remote sensing provides a great potential that could be harnessed. IRIS and CARTO can develop the technology with NASA to provide INM with timely image data to monitor change in the landscape. The difficulty to be overcome is the trade off between the least amount of resolution required for the analysis as compared to the large amount of process time and storage costs. Some technological solutions can help this situation. Array processors can speed up process time from 6 to 8 hours to 11 to 20 seconds (ERL lab experiments NASA). Until such technology is available to SCS, image analyses will be limited to State or portion of State size.
- 0 The IRIS data will be implemented into a geographic information system (GIS) technology to provide geo-reference, overlay capability, and graphic map output. This summer three GIS systems will be benchmarked and tested (MOSS, ADAPT, and the Dangermond GIS). This plan requires familiarization of IRIS and CARTO staff with several systems to be able to access and use any of them that will provide practical answers in the most expeditious time. Each system has been developed to fit specific needs of the developer and whatever SCS decides to implement will require further development and modification.

0 The GIS system that SCS implements in the next few years will need to be able to work with line segment (polygons) random point mapping areas and gradient mapping areas. All digitization systems that will provide graphic display for the GIS overlay analyses process are complex. They are an outgrowth of the CAD/CAM (computer aided design/computer aided manufacturing) software development and can be either raster or vector space. SCS has to develop expertise in this environment before we can utilize the technology on a real time basis.

-- Please Note that personnel that work with data, data base management systems, GIS technology, and digitization technology are specialists that require years of experience to become productive. They should not be required to flip-flop into this field and periodically out into other software development. This would be like requiring SCS top drainage design engineers to periodically work on conservation planning.

INTEGRATED RESOURCES INFORMATION SYSTEMS
(IRIS)
BCE Operational Natural Resource Data Base

Data Base	STATUS			Technical Person responsible for maintenance	LOCATION					Compatible with Statistical Program	DATA BASE MANAGER			IRIS Contact	PROCESSING	
	Adequate Data	Needs to be Upgraded	Data Input Needed		WCC	FCC	CSU	U	Of I		ISU	Flat File and Easytrieve	System 2K		"C"	Inter-ctive
67 CNI	X	---	—	KEITH SCHUDE	X				X	X	X		GEORGE C.	X	X	
77 NRI	X	---	—	KEITH SCHUDE	X				X	X	X		GEORGE C.	X	X	
Plant. Materials	X	---	X	WAYNE EVERETT		X					X		JERRY MCH.	X	X	
National List of Plant Names	X	---	X	WAYNE EVERETT	X			X		X	X	X	GEORGE B	X	X	
Soils 5	---	X	X	KEITH YOUNG	X	X		X	X	X	X	X	GORDON D.	X	X	
Suotel	X	---	X	HANES BARTON		X				X	X	X	JIM H.	X	X	
Flood Hazard Analysis	X	---	X	BAP STAFF	X					X	X		GEORGE a.		X	
Woodland	X	---	WA	GARY NORDSTROM		X				X		X	WARREN H.	X	X	
Map Unit Use-SOILS6	X	X	X	BILL REYBOLD	X				X		X		GORDON D.	X	X	
Colorado SRIS		X	X	DAVE ANDERSON			X			X		X	GORDON D.	X	X	

COMMENTS FROM THE NATIONAL SOIL SURVEY LABORATORY

By

R. D. Yeck
Lincoln, Nebraska

Mainly, I will discuss the present status of the soil survey data and data-use objectives for which I think we need to work. Before I get to that, there are a few other items that I want to mention.

First, as Ted Miller mentioned, Dr. **Erling** Gamble, the geomorphologist located at the MNTC, will now be assigned to work, upon request, in the Northeast as well. He is an extremely capable scientist and we can look forward to some nice contributions from him in the Northeast soil survey program.

I also want to mention progress on some research that I *have* mentioned before. Warren Lynn and I are continuing to gather data on the properties of soils containing glauconite and have submitted a paper for the 1982 American Society of Agronomy meetings to propose new criteria for glauconitic families. I am still working with a Spodosol data **set** that includes soils from all parts of the United States, including Alaska. *We* have determined which data are highly correlated and now are working to sort out the logic of those relationships to develop useful, multiple regression relationships.

Over the last 5 years, NSSL has been involved in an increasing number of special studies (Pb-Cd, soil moisture, and some foreign activities) as well as doing more work with the ARS. The funding for the **Pb-Cd** study has been discontinued so sampling has stopped. The data already collected will be analyzed and reports published for each crop sampled, the first report will be on wheat. The NSSL will retain a minimal capacity for Pb-Cd analysis because, although the equipment will remain, there will be no funds for analysts. However, other work is being generated by projects in targeted areas where erosion is a major concern. We will need to gather more data on eroded soils in support of those efforts. Although some of this special work is reimbursable, the NSSL permanent staff has not been increased so some priorities have to be changed. The extent to which priorities will have to shift will depend on our future staffing. A first round proposal was to reduce the NSSL staff by 40 percent by 1985. Negotiations are underway and it probably won't be that drastic, however, **one-**half of the analytical staff scientists can retire in the next 2 years and, by present guidelines, those positions would not all be filled. To compensate for these reductions the choices, depending on the staffing, seem to be:

1. Continue to characterize soils at the present rate but decrease time spent on evaluation of data.
2. Decrease characterization and data evaluation both.

This leads me to a discussion of the present status of data and expectations for the structure and use of that data. By working together, I think we can make more efficient use of all of the data in the Northeast and perhaps neutralize some of the ground that we, and perhaps you, would otherwise lose by reduced budgets and staffing.

We have been fortunate to have been able to collect laboratory data uninterrupted in the soil survey for about 30 years. These data, however, are still in a number of formats, and not yet as useful as we can make them.

At the NSSL, the ADP effort has primarily concentrated on capturing data from analytical instruments, making the necessary calculations, and **producing** a data sheet as a primary **retrieval product**. With that accomplished, we are increasing work to get programs operable to retrieve data combinations from which statements can be made about data relationships. Along with that, we still have some older data that we are adding to the data base. The listing of pedons for which data are computer-stored is available for the recent years (since 1978) and we hope to add the older data within the year. We will need help from each state to update the series names and classifications of those pedons before those data can be the most useful. We plan to have lists of pedons analyzed by NSSL sorted by state and by series available to you by fall. That listing of pedons will help us locate gaps in the data. That is only part of the picture, however, because there is a large body of data from pedons sampled in laboratories in individual states that will not be included. We discussed that at a meeting with our lab staff and the four principal **correlators** in Lincoln recently. To help us avoid duplication regionally, it was recommended that a task force be established to develop a national strategy to coordinate our data gathering **efforts**. From such coordination, we should be able to see where we may need more data in the northeast. We all stand to benefit from having a more complete picture of the data available, regardless of source. **It** would provide more information to bring to bear on decisions for use and management of soils now and provide a planning guide to select soils on which we need additional information. Such an approach is badly needed in our cooperative data efforts.

Now let's talk some about the field data base. Most of you were acquainted with and have worked with the mark-sense description forms. Efforts on that have ceased because of technical equipment problems and because it was too cumbersome to be practical in the field. We, as well as other people, are working on a modified field description form that can be used with the ease of the present SOILS-232 form but formatted so it can more easily be keyed into computer storage. You will have an opportunity to make suggestions about modifications to that form. The advantage would be the option to produce tabular descriptions, portions of which could be sorted for comparisons with other field data or with lab data.

This leads to the comprehensive objective of the ADP efforts with laboratory and field data. With lab and field data both in ADP manageable formats, we can combine both data sets for more complete analysis. This has several benefits, including the ability to make correlation type decisions electronically. We have some real opportunities to enhance the soil survey program through coordination of efforts in gathering and using both lab and field data. Budget restraints promise to reduce our staff and I'm sure we're not alone. From that standpoint, the sooner we can develop a system that will save us time and also help us provide more complete information about our soils, the better.

In **closing**, I would like to suggest the establishment of an NECSSC committee on data coordination. It could serve to establish a method of developing an inventory of all significant soil characterization data (lab data and descriptions) available on soils from the Northeast. Additionally, it could help outline objectives for data use in the next several years.



STATE OF NEW YORK
DEPARTMENT OF AGRICULTURE AND MARKETS
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REMARKS OF EUGENE C. HANCHETT AT THE
NORTHEAST COOPERATIVE SOIL SURVEY
CONFERENCE, ITHACA, NEW YORK
June 22, 1982

I wish to take this opportunity to thank you for inviting me to participate in your Northeast Cooperative Soil Survey Conference. This is the second conference in which I participated, and I know that this one, will be as interesting and informative as the previous one in Pennsylvania. The title of the talk assigned to me was "Soil Surveys in Agricultural Assessment". What I would really like is to take some time to discuss with you the Land Classification System used as a part of the Agricultural Value Assessment Program in New York.

Perhaps, a little background on the Land Classification System and its inception would be in order.

For a number of years farmers, assessors and policy makers have been searching for a better method of taxing agricultural lands. The system previously used in New York was based on sales of agricultural land. The assessed value for tax purposes, within very broad guidelines, was basically up to how the individual assessor viewed the particular parcel of land providing little or no uniformity statewide.

In New York State agriculture is New York's number one industry which may be of a surprise to some of you. It is also the policy of the State to preserve and protect productive farmland established by an amendment of the New York State Constitution in 1969. Assessing agricultural land was further recognized by the passage of the Agricultural Districts Law in 1971 which provides for agricultural value assessment. Since the passage of the law in 1971, a number of farm organizations, interest groups and individuals worked to find methodology which would improve implementation of the agricultural value assessment portion. Subsequently in 1979, the New York State Department of Agriculture and Markets contracted with the Soil Conservation Service to develop a report on a procedure for placing a relative value on agricultural land based upon the National Cooperative Soil Survey.

Objectives were adopted for the proposed improvement of the agricultural value assessment system. Briefly, the system should be as follows:

1. Based on available knowledge and proven research,
2. Understandable to farmers, tax assessors and general public,
3. Standardized so persons could use the Classification System for any given acre of land in New York State,
4. Simple and inexpensive to implement.

The report in keeping with the objectives, was completed in 1980, and found acceptable by the State Legislature. Consequently, the State Legislature amended the Agricultural Districts Law to include a land classification system and capitalization of income method for determining agricultural values per acre.

Using the legislated system, agricultural value assessments are determined according to the value of the **land for agricultural** purposes. When agricultural land has a higher value for development or other purposes, the value in excess of its agricultural value is exempt from real property tax. It is the intent of the law to provide an incentive to farmers to keep their land in agriculture. The **law** further requires that the New York State Department of Agriculture and Markets and the New York State Board of Equalization and Assessment develop, respectively, a land classification system and a capitalization system. So much for general background.

The law specifically states that it's the responsibility of the Commissioner of Agriculture and Markets to develop a land classification system involving the ranking of soils with respect to productivity capability and recognizing the effects of climate. The other part of this package which is the specific responsibility of the New York State Board of Equalization and Assessment and Cornell University, is the development of a capitalization of income method based on the Land Classification System that would provide a complete agricultural value assessment program to be **made** available to farm **owners**.

The theory of the capitalization of income method is that If there's a net return of, for example \$50 for a particular soil group. and this is capitalized by an established interest rate of **.0881**, the soils in that particular soil **group, are worth** \$441.00 for agricultural purposes. The net return to the land is based on a budget which reflects the cost of doing business and the income received for a particular crop. **Crops** were not established by law and selected crops **were used** for the budgeting system. It is not my purpose to dwell on the capitalization of income method but merely to explain that it is a part of the package necessary to establish fair agricultural values.

In passage of the law, the legislature stated that the system would

be implemented in the next taxable year. Needless to say, with the law being passed in Spring 1980 with the requirement that the system be ready to go into effect for the next taxable status year which in most cases begins May 1st unusual effort was needed to put the system in place.

In cooperation with the Agronomy Department at Cornell University and the Soil Conservation Service the mineral soils in the state were divided into ten groups. The organic soils divided were handled by a separate criteria and placed into four groups.

In the report prepared for the Legislature. **the method** of productivity index chosen, was that of total digestive nutrients (TDN's), in tons per acre per year. The next step was to determine the crops for the productivity index. It was decided to use corn silage and hay as corn silage and hay was grown over 70% of the farms in the State. Following this, the rotation had to be established and the most intensive rotation to provide sustained **use** of soils selected was that of 70% corn silage and 30% hay. The other factors involved incorporation of the use of the National Soil Loss formula; therefore to do this prudently yield was determined to be the best then reduced by a harvesting management factor to an average yield. This may sound complicated, but I can assure you that Dr. Shaw Reid **in** the Agronomy Department worked this out and makes it appear very simple once it's in a published form.

The method of ranking a soil mapping unit for a given soil used in a rotation of **C7H3** with 70% corn. and 30% hay times prudent yeild for their respective crop times the **TDN** factor which was **.2** for corn and **.5** for hay. This provided the total TDN tons per acre per year. In this case, It was 3.27. If this particular soil had had the highest TDN value of the soil in the State, then it would have received an index 100. For example, a soil which would yield a TDN **.287** tons per acre would be placed in soil group 2 based on the soil productivity index established for the mineral soil group. Index and Soil Group are shown below:

<u>Soil Productivity Index</u>	<u>Soil Group</u>
90 - 100	1
80 - 89	2
70 - 79	
60 - 69	2
50 - 59	5
40 - 49	6
30 - 39	7
29 or less - Marginal cultivated uses	8
Soils not suitable for pasture or other cultivated uses and not identified above or below	9
Marsh, wetlands and organics not farmed	10

The system is purely voluntary on the part of the landowner, however, should the landowner wish to use it, and it was to his advantage, the law requires the assessor to **use** the system. There has been considerable discussion about whether the assessors might not raise the tax on buildings to offset this tax loss. I don't prefer to become involved in that discussion.

Of course, we weren't perfect the first year in developing **our** system and didn't think we would be. After implementing it we learned that there were some problems with respect to flooding and drainage, for instance, some of the very poorly drained soils had been included with poorly drained. Also, some cases of stoniness soils were not mapped as stoney or not delineated as stoney as they **really were**. So in 1982, we made provisions for allowing this to be changed. There were numerous situations where flooding existed that couldn't readily be identified through the use of soil survey;. A procedure was developed in which a landowner, based on an affidavit showing crop, percentage of crop loss within the last ten years, could have a particular soil placed in a lower soil group. This seemed to have worked very well. In respect to placing soils in a lower group, the affidavits were processed by the Soil and Water Conservation District office or the Agricultural Advisory Districting Committee. Their recommendations were then forwarded to the Department of Agriculture and Markets for appropriate action by the Commissioner. We had approximately 400 requests for reduction or placing a soil in a lower group as a result of flooding this current year.

I forgot to indicate that at the end of the 1981 year there were about 24,300 individual tax parcels in which the soils were requested by landowners. No. all of these did not enter into the agricultural value assessment program. Some of the landowners found they were better off not to. I think this represented a real interest on the part of the landowners to look into the new program and determine its value as it applied to them. I would say that 24,000 parcels processed represented an outstanding job on Soil and Water Conservation Districts' part. One district alone processed over 2500 parcels. The current year, the number of parcels processed **is** reduced significantly - around 6,100 parcels were processed. There has also been about 1400 revisions or requests for revision or change as a result of changes in the soil master list for use in 1982 over the one used **in 1981**.

This, very briefly, **attempts to** cover development of the Land Classification System which, as most of you can guess, was one of intensive work; one which we are continuing to refine. One element which I have not discussed is climate. This has been a very difficult issue because of the difficulty in delineating specific climatic areas based on the lack of good scientific data. However, we feel that at the present time, based on data available, we have adequately incorporated climate into the system because soil productivity is reflective of the climatic region in which the soil has been formed.

We are extremely pleased with how well the system has worked and also with the acceptance by landowners. We held six informational sessions last year to get a feel for how the system should be improved. and to show the system as it is implemented. 0.89 owners.

RESOURCE INFORMATION LABORATORY AT CORNELL UNIVERSITY

By
Ernest E. Hardy, Director, R.I. Lab.
Cornell University, Ithaca, N.Y.

The topic that I am going to be talking about today is the Resource Information Laboratory in New York State as part of the Cooperative Extension Service. I'm not sure there's another one like it anywhere else in the country, so perhaps you who are not from **NYS** will have a different idea of a project and a program that is going on here in our Extension service.

I'm one of the many people who has trouble with memory and I forget such everyday things as my wife's name, which amuses a lot of people. Many times there are real sharp looks of consternation on our friends' faces when I call my wife (her name is Jane) Ruth or Janet, or something like that. I find that many people have trouble with memory, but the most severe case I've heard was related to me by Peter **Noyes**, one of the Cornell football coaches who does a lot of recruiting. Well, he was in Candor about two years ago, and they had a big fellow on the line who weighed close to 300 pounds. He didn't move very much but Pete thought he's **so** dam big that if we can run our plays around him that will give us a plus on offense and so they were looking at him quite seriously. Pete went up and tapped him and said, "**Say**, you're doing quite well. How old are **you**?" The boy paused (to count on his fingers) and said, "**17.**" Pete said, "Well, that's pretty good; you're doing some very good things there. What's your name?" He paused again (lots of hand waving) and said, "Wilbur." Pete was a little perplexed; he thought, boy we'll never make it with this guy at Cornell, so I'll just walk away and forget him. He was walking away from the field and he thought he could understand the part of figuring his age on his fingers, but he couldn't figure out what all the hand shaking was when he asked Wilbur his name. So, he went back and said, "**Say** Wilbur, I know you counted your age up on your fingers, but what was this (waving hands) all

about?" And Wilbur said, "Oh, that's Happy Birthday To You, Happy Birthday To You." So, when it Comes to memory, we all have crutches of one kind or another that we use.

One of the biggest crutches that we use in working with natural **resources** is maps. We just can't remember things. We ride around the countryside and we look at soils; we look at situations; we look at forests. We can't really remember all of the things that we've looked at, so we come up with helpful methods.

Several years ago we did a project in NYS called LUNR (the Land Use and Natural Resource Inventory of NYS) which identifies and maps some 155 different land uses in NYS. And, as an outgrowth of that, we had a great increase of interest in air photos among local government officials, county agents, Extension staff, soil scientists, and others in looking at area measurements and using these maps as memory jogs.

At the time no one had any intention of starting an organization or anything called the Resource Information Laboratory (**RIL**). Over time there were so many calls from Extension staff people and from local government people around the state that it became almost a full time job to answer information requests about the land use patterns within NYS. That job, in part, fell to your's truly, and I did a lot of traveling and talking to get this sort of information started.

Gradually, we started collecting things. And, one thing I had learned in my travels around NYS was that junk dealers never seem to go out of business. Have you ever seen a junk yard that failed? I've never seen one fail and this is a rather good lesson. If you want to stay in business a long time and be successful at something, just start collecting a lot of junk. Somebody's going to want it. So, that's what we did, more or less, We started collecting a lot of junk. This gets to sound like an insult a little later, because one

of the things we collected was soil survey bulletins. We started collecting a lot of things that others didn't want. We started collecting old air photos, old maps, and old projects that people had done, like Dick Arnold's Grape Study. We've got all the soil survey bulletins--the new and the old ones. **We've got** the old maps back to the 1800 series. We can see where the old roads went and where the old houses were. And, sure enough, as time progressed a lot of people wanted to come back and look at the "old junk" that we collected.

One of the things that is really interesting to us is that people will come back to request a project that was done in some department 15, 20, or 25 years ago. They'll come back and ask if there is any chance that anybody has still got those base maps around. If we possibly can, we try to locate the material for the people. Well, one of the greatest examples of that was the REA (Rural Electrification Administration). How many of you here remember that organization? REA in the 1930s went through all of the topographic maps of NYS and identified, in conjunction with what soil information they had, the locations where they felt agriculture could remain strong enough to support the cost of electric lines installed in the area. After the project these maps were pushed aside and were left in an Ag Economics office over in Warren Hall. Just about three years ago the professor in charge was getting a little tired of the mess and clutter the maps created and he actually had all the REA maps in a trash barrel, sitting at the door, ready to be pushed into the hall for the janitor to throw out. And, believe it or not, at that precise time a fellow from down the hall in Rural Sociology came by and asked in a bemused way, "Whatever happened to all the work that was done by the REA in locating rural areas where it would be satisfactory to install electric lines?" The man in charge of the maps said, "Well, it just so happens that

we've got all that stuff right here. If you'd like it, we'd be happy to give it to you." So he presented him with the garbage barrel full of old maps and the fellow went away delighted that he had salvaged the stuff from the REA era.

We work with a large collection of materials. We have a nice facility at the airport with room for about 20 work stations. We base a great deal of our work on three major sources of information. First, we rely very heavily on topographic maps. The second major source is soil bulletins; we think we have more land resource information on one page of a soil bulletin than any other one page you will get your hands on. Third, we use air photos. By using those three basic sources of information, we find that we can generally start to work on most any problem that is brought in to us from anywhere in the state.

The Lab maintains contact with every local government unit in the State of New York which is some 900 towns, about 900 villages, 62 cities, and 62 counties. Within the local government areas there are groups interested in natural resources which some of you may be familiar with. They include Environmental **Management Councils**, Conservation Advisory Commissions, and whatever special groups may be spun off, such as a group working on wetlands mapping, wildlife preservation, or open space **inventory**. And, of course, the Planning Offices across the state rely a great deal upon the kinds of resource information we work with.

In 1977 our laboratory was moved from a rather precarious administrative position to Cooperative Extension Administration. Under Cooperative Extension we were given more permanent status. We have a number of positions on "hard" money. (Those of you who aren't initiated in this business yet will find out sooner or later that "hard" money is important; "soft" money is nice, but it is dangerous.) And, we also have a number of the dangerous positions--the

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soft money kind where we work on special projects.

The Laboratory has a rather simple charge. It is supposed to provide information on natural and other kinds of resources for anyone in the State of New York who wants it. In addition, the Lab can do research anywhere in the State on land use problems. That's a nice charge to have because there's hardly a piece of land that you will look at and can't think of some sort of research to do on it. In addition to that, we can do research anywhere in the United States provided the research has a product that will be useful to us in NYS. That is really a convenient way to get somebody else to pay your research bills. Occasionally we do some rather major projects in other parts of the world.

Perhaps the services of the Laboratory are unique. We run training programs. We can accommodate about 15 people in a training program at one time. If we get into a situation where we have larger groups, there are facilities on campus that we can use. We provide technical services to assist people in actually doing various kinds of resource inventories. We can hire and release personnel as we need them to do this kind of work. We provide space to work. If people are interested in trying out new equipment that we have on hand or working with some of our resources, they are invited to come to the Lab and spend a few days. A team of technicians comes down from SCS in Oneida County on a rather regular basis to use some special equipment to make better use of color infrared photography for soil classification. The public also uses our materials. We have a copy service and we provide copies of information that we have on hand to people who wish to pay the cost of reproduction.

Occasionally some of the projects that we get involved with are a little over our head, but most of them come off successfully. For example, we did

all of the land use information for the Catskill Program which was carried on here about five years ago. We've done a lot of work with the Tug Hill Study Commission which is still a viable organization. On occasion we have gotten together with Fred Gilbert to work on compilation of the NYS Soil survey bulletins. We lost that contract though, to some people down in, where was it--Leavenworth? Yes, the labor cost was a lot cheaper inside those walls than it was inside these ivy-covered walls. So we had to give up on that one.

We've done some extremely detailed projects on such things as wetlands inventories. I think the Riverhead, Long Island Wetland Inventory is probably the best one of its kind that I know of anywhere in the country. I've never seen anything equal to it. We also get into a lot of what you might call rather "hot" situations, and some are literally "hot". For example, at one site in southern New York State, down near the major city, there was a research station working with radio-active plutonium. They had a fire and explosion that left an area that's perhaps rather hot from radio-active plutonium with a half-life of, I keep in mind, 22,000 years. We went to our radiation safety officer here at Cornell, and he said he did not want to see any of our people walking on that property at all. So, we haven't actually been on it. But we have been able to develop a sequence of 15 sets of air photos for that site. So it has been possible to document historical developments on the property, the location of the buildings, the location of the dumps, the size and the growth of the pond that was built there. After the fire we could show the building foundations and so were able to generate a fairly complete history of the activities of this research station.

In another instance there was a village relying upon one small watershed for its source of water and it developed a very high nitrogen content. Well, as the land use patterns of this watershed were studied, it was quite obvious

that a couple of farmers were using the entire watershed for continual corn. And furthermore, they were using a considerable amount of manure on this small watershed. The watershed provided the water resources for just 2 or 3 wells, which are the main source of water for the village. A historical record of what happened in that watershed was developed and it showed that a lot more of the land had been cleared. They had changed the cropping patterns, and sure enough there was an opportunity for a lot more nitrogen to be feeding into this water supply. Well, we learned a very good lesson here.

A previous speaker mentioned the problems you have when you get lawyers involved with things. When you deal with natural resources, the minute you get lawyers involved with the issue on either side and they decide to sue, you've lost your case as far as natural resources are concerned. It doesn't matter which side wins the law suit. Because the lawyers want to settle for immediate financial return only, what happens to the natural resources in the long run is not considered in the settlement. Consequently, on these kinds of issues, if it is possible to keep the lawyers out of the fight, we can probably come up with a solution that will be quite serviceable. In this case it was possible to do that. The farmers are working very nicely with the Extension Service, the SCS, and the local government agencies. They are trying to set up patterns of management that will reduce the nitrogen content. The village is willing to say, "OK, we'll buy bottled water for the infants for a few years to see if we can get the nitrogen level back down to where it belongs." That's a project that has been going on and off for about 18 months now and during that time there have been some good results.

One of the more interesting projects that we did was through some of the western states where we analyzed the amount of pivot irrigation that was introduced during 1972 to 1979. Satellite imagery was used for that project. By

wells and you can actually come up with some good information **on how much** of a pollution problem you have.

Other services provided at the Lab include reproduction of all **LUNR** materials; we are the designated repository for the Agricultural District maps of NYS (for those of you from other states, that's an arrangement in NYS where farmers can declare their land in an agricultural district and have some protection from encroachment on their land resources by being so designated); we have the watershed maps of the State; we keep all old and new soil bulletins on hand; we provide satellite imagery from the **Landsat** series of satellites; we are a sales agency for the topographic maps from the US Department of Interior; and we provide technical services for people who wish to have special projects done in the way of resource inventory information.

I'm quite happy with the fact that the name of the Lab doesn't say land resources or forest resources or anything in particular. It just says Resource Information Laboratory. That ~~means we can~~ include economic, social, cultural, land, natural, and any other kind of resources we need to. As a result, we do get involved with population problems and other kinds of problems as well.

I have a few slides that will give you an idea of the things that go on in the Lab. But this is the background I wanted to present. I invite anyone to visit the Resource Information Laboratory. If there is any way we can be of assistance, we'd be happy to hear from you.

PANEL DISCUSSION ON INTRODUCTION AND PRESENTATION
OF SOIL SURVEY INFORMATION

Gerald W. Olson, Chairman

This slate of speakers had the following presentations:

Introduction - A New perspective of Soil Science. . . . G. W. Olson,
Chairman

Educational Programs to Encourage the Agricultural
Use of Soil Surveys in Pennsylvania R. F. Shipp

The Virginia Soils and Land Use Program: A Unique
Approach to the Use of Soil Surveys T. W. Simpson

Maryland's Third Generation Soil Surveys: An Assess-
ment of Soil Survey Demands and Product Satisfaction. F. P. Miller

Of special significance is the fact that these papers were also
presented the following week at the meetings of the Northeastern
Branch of the American Society of Agronomy. At the Soil Survey Con-
ference soil scientists are largely talking to themselves, but at the
ASA meetings the audiences are much expanded.

A New Perspective of Soil Science. Gerald W. Olson, Cornell University.

A new perspective of soil science is given in the book Soils and the Environment: A Guide to Soil Surveys and their Applications published by Chapman and Hall (London), Methuen (New York), and Dowden and Culver (Stroudsburg, PA) as the first volume (in English and Spanish) of a series on "Environment, Energy and Society." Soils are the most important resources of any society, and must be considered primarily from the geomorphic landscape perspective. When soil profiles (pedons) and soil map units are the entities of focus, then ancillary sub-disciplines of soil science are enhanced through the technology transfer process of correlation and prediction. Widespread detailed soil mapping and greatly accelerated publication of soil survey reports necessitates that ~~the~~ soil survey perspective be adopted in order to facilitate data transfer from one point to other areas from subdisciplines of soil science (physics, chemistry, mineralogy, biology, fertility, genesis, classification, management, and conservation). The soil survey perspective also enables a multitude of correlations and predictions to be made with other disciplines including plant science, economics, engineering, forestry, geology, planning, public health and nutrition, ecology and wildlife management, and many others. This new perspective is rapidly gaining prominence and numerous examples will be given of the enormous potential for improving soil science and land use through data correlations to soil surveys and consequent technology transfers.

Educational Programs for Agricultural Use of Soil Surveys

by

R.F. Shipp, J.H. McGahen and J.E. Baylor

The Pennsylvania State University

Introduction/Background:

The purpose of this paper is to present a discussion of how the soil survey and related soils information is made a part of extension-education programs in the state of Pennsylvania. The paper deals only with agricultural use considerations.

Since 1970, twenty (20) Pennsylvania county soil surveys have been published. Eleven of these were published over a 10 year span for an average of one per year. Then in 1981, 9 were published. These reports were introduced at county meetings for farmers and the general public according to a Memorandum of Understanding which exists between the Soil Conservation and the Cooperative Extension Services in Pennsylvania. These one-time meetings although useful do not serve well as a continuous and meaningful educational program for the use of soil surveys in agriculture. More programs are needed and are used in Pennsylvania to fill this need. The remainder of this paper deals with these programs and zeros in on corn and alfalfa growers programs which not only use soil survey information but also provide data which make the potential yield concepts of soil productivity more meaningful in Pennsylvania.

Discussion:

Soil surveys and related soils information are part of several on-going extension/education programs in Pennsylvania. Some of the more notable examples are as follows:

- Basic Soils Courses
- New Farmer Short Courses
- Soil Fertility Schools
- Agronomy Ag-Service Schools
- Turf Schools and Trade Shows
- Forage, Seed and Fertilizer Workshops
- Crops and Field Days
- In-Service Training
- TVA Demonstration Farms
- Soil Testing Program

These programs and activities reach a wide variety of agriculture related audiences. Included are professionals of all types, dealers, ag-industry people, seed, limestone and fertilizer sales persons, county agents, consultants, the general public and others as well as farmers and producers.

The soil testing program makes daily use of soil survey information and reaches nearly 80,000 people annually. The amounts of fertilizers (plant nutrients) recommended by The Pennsylvania State University soil test program is based in part on the potential yield productivity of soils as well as on chemical analyses of the soils and the nutrient needs of crops to be grown. For example, Pennsylvania soils are all placed by series name into one of 5 productivity groups. These groups reflect the degree to which soil depth and soil drainage characteristics may limit potential crop yield. Productivity group 1 soils are the most potentially productive and group 5 soils have the least potential for crop yield.

Soils are placed into the five groups as shown in the following table.

<u>Drainage</u>	<u>Depth, inches</u>		
	<u>40</u>	<u>20-40</u>	<u>20</u>
Well Drained	1	2	3
Moderately Well Drained	2	3	4
Somewhat Poorly Drained	3	4	5
Poorly and Very Poorly Drained	4	5	5

The soils (name implied) in each group have been assigned an estimated yield potential corresponding to the degree of limitation by these physical factors. These are listed for corn and alfalfa in the following table.

<u>Productivity</u> <u>Group</u>	<u>Corn</u> <u>bu/acre</u>	<u>Alfalfa</u> <u>tons/acre</u>
1	150	6
2	125	5
3	125	4
4	100	NWS
5	100	NWS*

*NWS = not well suited

The soil test user is asked to enter the name of the soil onto the soil test information sheet provided. Thus, the quantities of plant nutrients recommended are based not only on representative soil sample chemical analyses but are based also in part on the yield potential established for the given soil from depth and drainage considerations.

It is recognized that actual yields from given soils on given fields will differ widely from these estimated yield potentials as a result of particular growing seasons, crop varieties, levels of management, incidence of insects and diseases, weed control, herbicide residues, timeliness of planting, harvesting, and many other factors. However, these yield goals were established in 1965 in the soil test program as the most realistic, average yields conceivable for the soils of Pennsylvania assuming reasonably good management.

Actual, measured yields for corn and alfalfa have since been obtained through two on-going extension/education programs administered by J.H. McGahen, Extension Corn Specialist and J.E. Baylor, Extension Forage Specialist. The remainder of this paper deals with a brief discussion of the yield data from these programs and how these average, measured yields from farmers fields compare to the potential yield goals established in 1965.

The Pennsylvania Five Acre Corn Club data summaries provided the following 14 year average yields (1968 through 1981) by soil productivity group.

<u>Productivity Group</u>	<u>Corn Yield bu/acre</u>
1	141
2	139
3	129
4	130

These results have not been statistically analyzed but are based on 2626 individual crop yield measurements. Corn yield potentials for the soil productivity groups as currently implemented and as proposed to be changed and implemented into Penn State's soil test program are shown in the following table.

Corn Yield Potentials

<u>Current</u>		<u>Proposed</u>	
<u>Productivity Group</u>	<u>bu/acre</u>	<u>Productivity Group</u>	<u>bu/acre</u>
1	150	1 and 2	150
2	125		
3	125	3 and 4	125
4	100		
5	100	5	100

The Pennsylvania Alfalfa Growers Program data summaries provided the following 5 year average yields (1977 through 1981) by soil productivity group.

<u>Productivity Group</u>	<u>Alfalfa Yield tons/acre</u>
1	6.0
2	5.6
3	5.2
4	5.2

Again, these results have not been statistically analyzed. Average yields are based on a smaller sampling - 227 individual crop yield measurements. Alfalfa yield potentials for the soil productivity groups as currently implemented and as proposed to be changed and implemented into Penn State's soil test program are shown in the following table.

Alfalfa Yield Potentials

<u>Current</u>		<u>Proposed</u>	
<u>Productivity Group</u>	<u>tons/acre</u>	<u>Productivity Group</u>	<u>tons/acre</u>
1	6	1 and 2	6
2	5		
3	4	3 and 4	5
4	NWS		
5	NWS	5	NWS

These yield data results from both the corn and alfalfa growers programs indicate that the current estimated yield potentials for the soil productivity groups should be adjusted to more accurately reflect the average yields being obtained from farmers fields throughout Pennsylvania.

Summary/Abstract:

Newly published county soil survey reports have historically been presented to farmers, professionals, and the general public at local meetings. These introductory type meetings are often held once in a county. The structure and format of these meetings are usually stipulated in memorandums of understanding between the Soil Conservation Service and Cooperative Extension. Although these meetings to introduce newly published soil surveys are educational and serve a useful immediate purpose, other educational programs are needed to provide for more continuous and meaningful use of soil surveys and soil information by farmers. This paper explores other extension sponsored educational meetings, workshops, seminars plus soil test and corn and alfalfa growers programs used in Pennsylvania which have provided a) a more continuing use of soil survey information by farmers and growers and b) necessary background and up-to-date data for adjusting soil yield potentials by soil type.

The Virginia Soils and Land Use Program

Thomas W. Simpson

Virginia Polytechnic Institute and State University

A detailed (Order 2) soil survey represents the most detailed evaluation of a natural resource conducted on a county wide basis. Approximately ten to twenty man-years are required to prepare a detailed survey for a typical county. During the course of a survey, inputs are made from many people not directly involved in day to day mapping. There are annual field reviews in which representatives from all cooperating agencies review the progress of the survey and assist with mapping and correlation problems. Pedons are described and samples are collected and analyzed to characterize the major soils of the county. Farmers, extension agents, foresters, engineers, planners, and others are involved in the development of yield estimates, use interpretations, and estimates of soil properties. A large team works together to develop and compile the final maps for publication. Assistance is provided at national, state, and local levels in preparing the final narrative report. The survey is completed and the published soil survey is usually released within one to three years after the field party leaves the county. When the report is published, there is usually a presentation ceremony and, in some cases, a one hour to one day training session for interested people.

In most cases, once the field mapping party leaves the county, no one is available to assist the local government in matters requiring soil science expertise. In addition, there is usually little assistance provided in promoting proper use and interpretation of the soil survey. We, the participants in the National Cooperative Soil Survey, then complain about the lack of use of soil science expertise and about the misuse and/or lack of use of soil survey information. Should we expect anything different?

We spend hundreds of thousands of dollars collecting, studying, packaging, and selling the information in a soil survey report but provide little or no assistance in the use of this technical document after publication. We do not provide assistance for matters requiring soil science expertise beyond that available in the soil survey report. We establish a perfect situation for abuse or "no use" of the soil survey information. The fact that there is still considerable use (and overuse) of the information, despite our neglect after publication, is a tribute to tremendous need for soils information and soil science expertise.

What can be done to improve the use of soil survey information and soil science expertise? There are several programs which have this as a goal. I want to discuss the unique efforts that have been made in Virginia for nearly thirty years.

History of the Program

Virginia Polytechnic Institute and State University (VPI&SU) began a cooperative mapping program with federal agencies (now U.S.D.A. Soil Conservation Service) in the 1930's. This continued during the 1940's with semi-detailed maps being made of numerous mountainous and rural counties. In the early 1950's interest began developing to provide more detailed information for urban areas around Washington, D. C. In 1953, an agreement was reached for VPI&SU to prepare a detailed map of Fairfax County oriented to urban land uses. The agreement

included a cost share of \$30,000 from the county. It was also agreed that site specific technical assistance be provided the county as requested during the course of the survey. When mapping was completed in 1955, enough demand for technical assistance had developed that Fairfax County requested that a soil scientist be assigned permanently to the county. The county agreed to contribute funds to VPI&SU to pay the salary. This agreement remained until 1959, when, with a change in personnel, Fairfax County hired the new soil scientist as a county employee. In the mid 1970's Fairfax County hired a second soil scientist and now has 2 soil scientists plus support staff.

Mapping in Price William County, adjacent to Fairfax was completed in 1961. A soil scientist was again left in the county to assist with use of the soils information and provide technical assistance. This individual was to remain a VPI&SU staff member assigned to Prince William County. Two-thirds of the salary would come the county and one third from VPI&SU. This type of agreement has worked well and still exist today. During the 1960's two other urbanizing counties (Loudoun and Chesterfield) entered into agreements similar to the one above. Unfortunately, funding restrictions limited the further development of the program during the 1970's. In 1976 the City of Virginia Beach (a merged city-county unit) hired an interpretative soil scientist. As will be discussed later, future plans should lead to placement of additional soil scientist in post mapping roles.

The unique arrangement between VPI&SU and the counties where our staff are assigned has worked well. This arrangement was established since it was believed to be advantageous for the soil scientist to remain affiliated with VPI&SU. This affiliation assures close contact with and support from other soil scientist. This support has come in the form of technical support, assistance with in-county research, and in service training at the experiment station. Secondly, affiliation with VPI&SU has assured that the responsibilities remain that of a soil scientist. Finally, the affiliation removes the individual from local political pressures and allows him to make objective, scientific judgements.

Almost simultaneous with the development of the county based program was the beginning of the statewide program. In 1956, the position of Extension Specialist, Urban Soils (title changed to Extension Agronomist, Soils and Land Use in 1981) was established in the Agronomy Department at VPI&SU. In 1962, a VPI&SU soil scientist was assigned to Virginia Department of Health to provide technical assistance and training in soil science.

Responsibilities of the County Interpretative Soil Scientists

The county interpretative soils program is a dynamic program. It does not remain the same over time but changes constantly to meet changing needs. The programs also vary from county to county in an effort to meet local needs. The activities of the soil scientists can be separated into the general categories of technical assistance and post mapping soil survey activities.

Initially, the major area of technical assistance was related to soil and site suitability for septic tank drainfield systems. As the counties and the programs have developed, this has needed less attention and the soil scientist has been given many new challenges. In all the counties, the soil scientist is involved in most planning and zoning decisions. The soil scientist, also assists the county in site evaluations for public facilities and water and sanitary

transport and treatment systems. In many cases, the soil scientist, through his understanding of the natural soil system, has saved the county hundreds of thousands of dollars on individual projects. The soil scientist also assists in planning and locating local roads and streets. An area of increasing effort deals with foundation suitability and drainage. As these counties become urbanized, public sewers are more available and development moves onto marginal lands. As a result more effort is needed to avoid extensive foundation and drainage problems. An area of increased activity in recent years involves serving as an expert witness for both civil and criminal cases. The soil scientist has also become closely involved with the preparation of new ordinances relative to soil use. As evidenced from the above discussion the soil scientist is called upon to provide technical assistance for all soil related uses in the county.

Soil survey activities are primarily directed towards educational activities and manipulation of the data to enhance its use. The soil scientist trains county personnel and the general public on the proper use of the soil survey. He also develops detailed map unit interpretations adapted to local regulations and soil conditions. These interpretations are usually more specific and more related to use potential than possible in the format of a published soil survey. The soil scientist office handles distribution of map sheets and interpretative information to the public. The soil scientist also oversees cartographic manipulation of maps for county uses and assist with the development of thematic maps for planning purposes.

More effort is now being directed toward updating and improving the information contained in the published soil survey. Efforts are being made to redefine map unit composition and estimate variability. Since most of these counties were mapped before Soil Taxonomy was adopted, work is also being conducted to recorrelate and reclassify the map units in many of the counties. As part of a continuing characterization program, each county has some lab capability (with additional support at VPI&SU) to obtain additional data on engineering properties of the soils. In most counties, applied research projects are conducted to solve local problems or to provide information relative to statewide concerns. Information obtained in these counties has been input into ongoing soil surveys elsewhere in the state.

Responsibilities of the Extension Agronomist, Soils and Land Use

The Extension Agronomist, Soils and Land Use coordinates the state interpretative program. His technical assistance responsibilities are similar to those of the county soil scientist but are directed to state and regional agencies. He acts in an advisory capacity during the development of state regulations related to Soil uses and serves as a technical arbitrator on appeals of soil related regulatory decisions. Historically, the greatest demand for technical assistance was related to soil suitability for septic tank-drainfield systems. As occurred with the county soil scientists, demand for technical assistance now comes from nearly every state agency involved in soil use decisionmaking. In the past two years, a major effort has been directed towards land application of waste and wastewaters.

The Extension Agronomist, Soils and Land Use also conducts educational programs for agency personnel and the public related to soil use decisions.

He conducts educational programs on the proper use and interpretation of soil survey information. He works with counties who do not have interpretative soil scientist in manipulation of soil survey data and refinement of interpretations. He also acts as an interpretative liaison to ongoing soil surveys. Assistance is given in development and presentation of interpretative information both during the survey and in the published report. In addition, he conducts training sessions for soil scientist on evaluating soil site conditions for specific uses.

Directions for the Future

The Virginia Soils and Land Use Program has saved the people of Virginia millions of dollars in the last thirty years. The success of the program can be seen by the fact that counties who hire county interpretative soil scientist, not only retain their services, but usually expand the program. However, because of funding difficulties, the program has not grown as fast as the counties and state agencies would like. As the soil survey nears completion in Virginia, it is believed that state funds used to support the survey could be wisely used to develop area interpretative soil scientist positions. These soil scientist would have responsibilities in one or more counties depending upon need. The Virginia Soil and Water Conservation Commission, in its six year plan, has expressed interest in seeking funds for such positions. More soil scientist are desperately needed to work with state agencies. State agencies have requested additional assistance and the positions have been given a priority listing by a state personnel task force. However, federal and state budget uncertainties may slow the opening of such positions. The last major new direction for the future is for all interpretative personnel to better document, for soil survey use, the thousands of cases they evaluate each year. This information, if properly related to taxonomic units and/or soil morphologic properties, could be a great asset in refining interpretations for ongoing surveys.

As the soil survey nears completion of the "once over", there is much discussion concerning post mapping roles for soil scientist. We feel that technical expertise is still needed in the county after completion of the survey. The soil survey is a technical document and requires technical interpretation. Secondly, there is a tremendous need for technical assistance beyond that contained in the soil survey. Based on nearly 100 man years of experience, we feel that county or area interpretative soil science positions may offer a tremendously beneficial post mapping role for soil scientist.

Maryland's Third Generation Soil Surveys: An Assessment of Soil Survey Demands and Product Satisfaction ¹

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University of Maryland

Cecil County, Maryland was among the first three counties in the U. S. to have its soils surveyed in 1899. The soil survey was published the following year in 1900. By 1927, the entire State of Maryland had been mapped and published surveys were available for all 23 counties by 1926. As concepts changed and as more data became available, all Maryland counties mapped prior to 1910 were remapped between 1925 and 1930.

Cecil County, Maryland received its second published survey in 1927 and its third published survey in 1973. It was also in 1973 that Maryland held its "last here" ceremony in St. Mary's County, marking the completion of the state's detailed, second order survey begun 35 years earlier. The St. Mary's County survey was published in 1978. The Kent County soil survey, first published as a Physical Land Conditions survey in 1945, was revised and republished in the modern format in 1982, thereby completing Maryland's published detailed soil survey series.

Today's vintage soil surveys are utilized quite differently from their predecessors. The earliest objective of soil surveys was to guide people in selecting soils that were responsive to farm management systems. As USDA developed its conservation programs in the late 1930's and into the 1950's, soil surveys were oriented toward interpretations for technical assistance in soil conservation programs, for planning agricultural programs, and as a basis for credit (Smith, 1968).

As agricultural uses of land intensified and became more complex, land management interpretations became more sophisticated and nonagricultural interpretations increased. The increased nonagricultural interpretations began from early efforts in the 1920's and 1930's where the soil classification system and soil surveys were utilized to guide highway construction and were later applied in defense planning (Kellogg, 1966). As urban and nonagricultural land use intensified after World War II, nonagricultural soil survey interpretations accelerated in the areas of community planning, engineering, transportation, and waste disposal. Continued demands for land use potentials, risk assessment, and modeling studies have ushered in a new era of sophistication for soil scientists, often requiring statistical evaluations of their data and confidence limits of their interpretations.

Table 1 illustrates the changes in soil survey format and interpretation made over the history of the soil survey program in Maryland.

¹ Paper presented before Northeast Cooperative Soil Survey Conference, June 21-25, 1982, Ithaca, New York.

THE DEMAND FOR SOIL SURVEY INFORMATION

As the literature on knowledge transfer and innovation diffusion suggests, a proven technology is not automatically adopted by its potential users. Systematic efforts at dissemination and subsequent assistance are required for its adoption (Cook, 1982). The utilization of soil surveys by both farmers and the general public followed this theorem. The move to educate the public on the potential uses of soil surveys was not unlike the early

These soil survey education programs, especially for planners, sanitarians, and other nonagricultural land use decision-makers, opened the floodgates of demand for soil survey information and interpretation. Yesterday's efforts by soil scientists to arouse the public's interest in soil surveys are today often channeled toward reining in the soil survey user's enthusiasm for using soil surveys beyond their confidence limits.

Soil surveys usually represent the most comprehensive and detailed source of geotechnical information available in a region. Within the last decade, planners, sanitarians, tax assessors, public works personnel and other nonagricultural professionals have usually had exposure to soil surveys either through their college training or in-service and professional training through the Extension Service, S.C.S., and Soil Conservation District program efforts. Today's nonagricultural land use decision-makers have an educational inertia about soil surveys that was unknown just 15 to 20 years ago.

Having completed and published soil surveys for all Maryland counties provides an opportunity to look back and consider where soil scientists fell short and what we must prepare for in looking ahead.

ARE WE COMMUNICATING WITH OUR CLIENTELE?

The increasing availability of published soil surveys along with accelerating demands for interpretive assistance by a variety of clientele require the use of both technical and communication skills by soil scientists. The most competent field soil scientist may be the most incompetent person to articulate the nature of a problem and its solution to a client. Today's soil scientist must be able to speak and write effectively to a broad spectrum of professionals, including the conveying of technical information to the less technically trained.

Too many soil scientists do not communicate well, either in writing or speaking. This has been pointed out as the single greatest weakness in practicing soil scientists (Richards, 1981). Poor communication skill is also the shortcoming most frequently mentioned by employers (Abelson, 1978).

Soil scientists too often commit another communication sin in addressing audiences. They drag their technical jargon into their presentation. One must always assess the interests and orientation of the audience, then take a few moments to review the problem, establish the premise upon which the solution is to be based and make sure everyone is going down the same road together as options are discussed.

Paraphrasing Glenn Frank, Clay Schoenfeld (1968) stated, "The future of America is in the hands of two people -- the investigator and the interpreter. We have a growing supply of investigators. But there is a shortage of readable and responsible interpreters, people who can effectively play mediator between specialist and laymen." This observation must be taken to heart by today's soil scientists and especially the institutions that train them.

PROBLEMS IN THE USE OF SOIL SURVEYS

Confidence Limits

Soil scientists are very much aware of the natural scatter and variability of soil properties with a soil population, whether pedons, series, or mapping units (Wilding and Drees, 1982; Miller et al., 1979). Some properties are more variable than others, thereby requiring the soil scientist to speak less confidently about the quantitative measure of one property vs. another. To speak with the same degree of confidence about all soil properties would require different sample numbers for each property. For example, the coefficient of variability (CV) for pH is commonly in the neighborhood of 10 percent (Wilding and Drees, 1982),

whereas the CV for soil hydraulic conductivity as determined from percolation tests is commonly in the 55 to 80 percent and higher range (Bouma et al., 1972; Derr et al., 1969).

This tremendous variance in the confidence limits of soil properties also translates itself into many of our interpretations, since the criteria for each interpretation is based on these soil properties with variable CV's. Most of our soil survey clientele are unaware of this inequality of confidence limits among soil data and interpretations. And too many soil scientists pay too little attention to it. Table 2 illustrates various soil properties and the approximate number of samples necessary to estimate the population mean within a prescribed confidence interval.

As soil survey users demand some assessment by soil scientists on the confidence of their interpretations, more statistical data will be needed. Furthermore, soil scientists will have to provide at least a subjective idea of the confidence limits of their interpretations.

The class limits established for various properties used in Soil Taxonomy (Soil Survey Staff, 1975) accommodate much of the natural scatter among soil properties. Nevertheless, this scatter will always result in some properties falling outside the class limits used to define the soil unit, thus resulting in taxonomic inclusions within map units. Some properties are more widely scattered and are, therefore, more prone to fall outside the class limits. This situation reduces the confidence limit of interpretations utilizing such a property as an interpretive criterion.

This is a difficult concept for soil survey users to comprehend. Soil scientists must be articulate in relaying this limitation of soil surveys to their clientele. The soil survey is an excellent planning tool. It should not be accorded the status as the only instrument necessary to evaluate a landscape for use options.

Hydrology

The hydrology of a landscape unit often dictates the constraints to specific land uses. Soil surveys are not designed to interpret landscape hydraulic behavior. Soil scientists must, therefore, assess the potential hydraulic behavior of landscapes in making soil interpretations about proposed land uses.

Soil landscapes possess both horizontal and vertical water movement vectors. The saturated hydraulic conductivity data reported in soil surveys deals only with the vertical component of hydraulic flow. Much, if not most, water movement into and across landscapes occurs in the horizontal mode. Such subsurface lateral flow is commonly encountered by soil scientists in pits, roadcuts and other exposures. Soil surveys recognize such hydraulic behavior in soil and map unit descriptions but

Any competent soil scientist evaluating a tract of land for a proposed use where water will impact the use is going to assess the size of the upslope watershed that can potentially feed both surface and subsurface water flow into the area. Soil drainage as expressed by morphology may or may not be diagnostic of the problem. Studies with soil cores and local pedon hydrology do not address the contribution of adjacent pedons to the horizontal component of hydraulic flow. This situation is commonly overlooked by nonsoil scientists who have been briefly "trained" to interpret soil surveys. Clientele often want to know the effect on the water table of draining such sites. The soil scientist, therefore, must either be familiar with water behavior under drainage or be able to tap the appropriate discipline (e.g. engineering, hydrology) for an interpretation.

It is also important to note that much of the water movement in soils, whether from natural or man-generated sources (e.g. septic systems), occurs as unsaturated flow. Therefore, the saturated hydraulic conductivity data reported in soil surveys is often useless as design criteria unless correlations with the unsaturated condition are known.

Hydrology also plays an important role in designing health codes and other standards. For example, the minimum lot size for homes with septic systems is usually determined by the nitrate dilution factor from natural precipitation. In soil conditions that are conducive to waste effluent disposal and attenuation, dilution of nitrate becomes an overriding design criterion. Here again, soil surveys are not designed to assess this limitation, although weather data, water table data and recharge information may be gleaned from some soil surveys to calculate the design limits for domestic on-site waste disposal.

Depth Limitation

Most nonsoil scientist soil survey users do not appreciate the distinction in the definitions of soil as recognized by soil scientists, geologists or civil engineers. An individual with a land use decision may need information or an interpretation of the soil material to a depth of 5 meters. To this individual, academic discipline boundaries and soil taxonomy control sections are irrelevant -- the soil volume to 5 meters is the utilized and needs assessment. Either the individual or an agency representative may interpret the behavior of this volume by extrapolating, either consciously or unconsciously, interpretations from a soil survey. Such extrapolations are clearly unwarranted and exceed the physical and confidence limits of soil surveys. But it is done and will continue to be done by the untrained.

Soil surveys indicate the character and location of pedogenic soil units on the landscape. A soil taxonomy was utilized in identifying these soil units. The thickness of the soil unit is determined by pedogenic processes resulting in soils of differing thickness. But to most users of the land, their interest is determined by the depth to which their proposed use extends. This depth may or may not be confined within the depth range of a soil survey. This is a constant dilemma facing soil scientists. The problem will no doubt increase as

more nonagricultural interpretations are demanded. **Soil scientists** must **rely to the user** the limits of their knowledge base and the depth limitation of the soil survey. We need not apologize for this, but neither should we shrink from clearly advising our clientele of the boundaries of our data base.

This dilemma is illustrated by a land use problem in Maryland where a developer cut into a rolling landscape for a housing subdivision. Some cuts were seven to ten meters deep, exposing several meters of sulfidic materials or "cat clays." Subsequent landscaping damage and concrete deterioration resulted from acid generation by the exposed material. This caused the county authorities to withhold the final permits for the project. Considerable expense was encountered by both the developer and the county in attempting to evaluate the potential severity of the problem and take corrective action to protect potential homebuyers and public utility investments buried in these sulfidic materials. Legal suits may be forthcoming from this problem. The irony, however, is the fact that both the geologist and soil scientist walked out of this county knowing about the problem, but it was not indicated on either the modern soil survey or the geology map. Whose responsibility and jurisdiction is this three to ten meter zone? And does the format (and scale) of our geotechnical data dictate what will and will not be relayed? It would appear that the taxpayers could expect more from their earth scientists.

Technical Versus Political Decisions

Soil scientists become involved in a variety of land use decisions. It is important for the soil scientist to always keep in mind the distinction between scientific knowledge and personal opinions.

For example, a soil scientist can rank the soils of an area for their agricultural productivity using a set of criteria and class limits. Once this ordinal ranking of soil is made, however, it becomes a political or policy decision as to where the line is drawn between the "best" or prime soils and those that are non-prime. To be sure, the soil scientist could draw the line based on his or her judgement and criteria to form a definition of prime land, but this judgmental decision can be debated, whereas the scientific ranking of the soils cannot. Soil scientists are often requested to make both the ranking and to establish the boundary. They can certainly provide both elements of this request (Miller, 1979), but the necessity to maintain the distinction still exists.

The soil scientist must stick with the realm of his or her expertise and not subscribe to a particular use of land, unless requested to do so. The soil scientist is expected to provide expertise on the potentials and limitations of soils for a variety of land uses. But the final land use choice is a policy decision that should be made in the light of soil use potentials and limitations as well as many other factors, including economics, demographics, transportation, utilities etc. Many soil scientists have found themselves in a bind because they tried to play the role of both scientist and policy dictator. Soil scientists must be mindful that while they can play an important role in determining land

uses, they do not have a corner on the market of knowledge necessary for making comprehensive land use decisions.

THE DICHOTOMY OF OUR DISCIPLINE

The ready availability of soil surveys and their promotion to the public through a variety of educational programs pose a dilemma for the professional soil scientist. This dilemma has produced a dichotomy within the discipline that is becoming more troublesome.

On the one hand, soil scientists pride themselves as professionals; promoting certification programs, establishing minimum academic standards and core curricula, joining and supporting professional societies and forming local affiliate associations, subscribing to professional journals, attending professional meetings and presenting professional papers. On the other hand, soil scientists in most states have no authority to approve or "sign off" on soil survey interpretations or land use decisions. Soil scientists are not licensed in most states as are lawyers, engineers, medical doctors and other legally recognized professionals.

Soil scientists, after years of academic training and field experience, commonly turn their product over to the untrained laity and often spend only a few hours with these soil survey users in educating them to make interpretations from soil surveys. The outcome of the interpretation and integrity of the resulting land use decision often transcend the discipline and input of the soil scientist. The soil scientist, therefore, serves only in an advisory capacity in many, if not most, cases.

Where regulatory agencies adopt soil survey criteria as standards for approval or denial of particular land uses, such standards are applied region-wide in a "cook-book" fashion with little or no redress for the uniqueness of each landscape segment. Again, the soil scientist's input is compromised by non-soil scientists dictating policy and leaving no option for site-specific ~~precautions.~~

Since when have real estate professionals set up short courses to teach people to sell their own homes? Do civil engineers provide training for the layman in designing and building dams and load-bearing foundations and other structures? When was the last time you heard of lawyers promoting the teaching of their services to the general public so that you could draft your own will or defend your own liability case? And how often have you seen medical doctors encourage the public to make their own diagnosis and prescribe their own medication?

agencies across the nation are beginning to hire or contract soil scientists either as full time employees to evaluate sites for proposed land uses or to act in the capacity of technical back-up for non-soil scientist personnel. But for most soil scientists in the employ of public agencies, the dilemma of promoting the transferring of technology to the unskilled and reining in the unskilled's enthusiasm for potentially misusing this knowledge remains.

Much of this dilemma of a professional discipline transferring its knowledge to the general public stems from the association of soil science with agriculture. The Hatch Act (1887), which formed the Land Grant Colleges' agricultural research base, and the Smith-Lever Act (1914), which formed the Extension Service, were designed to generate agricultural knowledge and transfer it to the public. Those policies and the institutions (e.g., state and federal experiment stations, Cooperative Extension Service) through which they operate have a long history and broad support. Thus, the historical concept of providing free information from many disciplines to the public has a strong, historical inertia. Most of today's soil scientists are still carried along by this inertia, especially if they are associated with state and federal agencies or Land Grant institutions.

In today's world, soil scientists are coming in contact with a much broader and sophisticated clientele than did their predecessors. Many of the soil scientists' clientele today are unfamiliar with the historic setting of soil science. They are often more familiar and comfortable with contracting for professional services. For soil scientists to promote themselves as professionals in the face of transferring their knowledge base to whomever asks for it at no charge contradicts the premise upon which most soil scientists' clientele view professionalism.

This is not to suggest that soil scientists change their mode of operation but merely a reflection on the historic milieu in which our discipline was incubated. It will be some time before this historic inertia wanes, if it ever will. We already see retired soil scientists hanging out their shingle and continuing to give away their services. Many retired soil scientists merely "want something to do" and are willing to charge enough just to meet expenses, thereby donating their professional expertise to their clients. To build a professional image under such circumstances is about as easy as nailing jello to the wall.

And yet at the very time many soil scientists are struggling for professional identity and the issue of how much of our knowledge base we should transfer to the public, there are calls for scientists to actively advocate their technology and expertise to help alleviate world problems (Cook, 1982). It follows that this call for increased advocacy and the encouragement of scientists to promote their knowledge originates from and is aimed at those disciplines that have traditionally either charged for their services or been comfortably isolated from technology transfer programs and the problems

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Table 1: Chronological comparison of soil surveys for information detail based on text size, map scale, number of

Date	County	Text Pages No.	Text Size (cm ²)	Map Scale	Soil Series No.	Soil Types No.	Data-Interpretive Tables			Data-Interp. Entries No.
							Total No.	Agric No.	Non-Agric No.	
1930	Kent	24	340	1:62500	4	10	4	0	0	22 ^{1/}
1945	Kent	2s	475	1:15840	16	28	15	2	0	90 ^{2/}
1982	Kent	125	600	1:15840	18	31	18	4	9	121
1960	Frederick	144	630	1:20000	59	110	10	1.5	4.5	87
1900	Calvert	23	340	1:62500	6	7	8	0	0	25 ^{1/}
1928	Calvert	22	340	1:62500	5	10	a	0	0	62 ^{1/}
1971	Calvert	76	600	1:15840	17	25	12	1.5	4.5	84

^{1/} Primarily particle size or chemical analyses data

^{2/} Primarily land use data

Table 2. Relative ranking of variability of soil properties that occur in landscape units of a few hectares or less in size. (After Wilding and Preece, 1982).

Variability of Property	Number of Profiles Needed*	Property
Least (CV's < 15%)	> 10	Soil color (hue and value) Soil pH Thickness of A-horizon Total silt content Plasticity limit
Moderate (CV's 15 to 35%)	10 to 25	Total sand content Total clay content Cation exchange capacity Base saturation Soil structure (grade and class) Liquid limit Depth to minimum pH Calcium carbonate equivalent
Most (CV's > 35%)	> 25	B2 horizons and solon thickness Soil color (chroma) Depth to mottling Depth to leaching (carbonates) Exchangeable hydrogen, calcium, magnesium and potassium Fine clay content Organic matter content Plasticity index Soluble salt content Hydraulic conductivity Water content

* Employing 95% confidence interval and a limit of accuracy $\pm 10\%$ of mean.

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Mineral Element Movement
in the Food and Feed Chain of People

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The movement of mineral elements in a food and feed chain can be viewed from different perspectives, depending on one's interests and background. In this report, a biological point of view is taken; namely, how mineral elements affect plants and animals, and consequently people.

The soil on which plants grow is the source of most mineral elements in plants. Plants, in turn, are sources of most mineral elements consumed by man, either directly in the plants he eats or indirectly through animals that eat the plants. The food and feed chain is long and complex. Soils, plants, and animals are important links in this chain because each contributes to buffer man against exposure to excessive levels of mineral elements.

Soils, plants, and animals do not contribute equally to movement of mineral elements under all conditions because different elements behave differently. For example, rice plants grown continuously submerged during growth produce grain with less Cd than plants submerged only during part of their growth. Soil wetness, on the other hand, tends to increase the Mo content in forage plants. All known Mo-toxic areas for cattle are associated with wet soils, but molybdenosis is not coextensive with all wet soil areas. Because ruminants are susceptible to Mo toxicity, they serve to check the transfer of excess Mo to man.

The selective redistribution of elements absorbed by plants from soils into different vegetative and reproductive parts appears to regulate levels of mineral elements that enter the food chain. For example, grain crops like wheat, corn, and soybean appear to selectively exclude Cd and Pb from the grain while transferring Zn. Whether this function is just as effective at high Cd concentrations as it is at low concentrations remains to be established.

Animals effectively buffer man against consumption of excessively high levels of mineral elements, levels that are tolerated by plants. When Se levels in plants are low (0.05 ppm or less) animals are fed supplemental Se or are fed feed grown in Se-adequate areas. Toxic concentrations in feed plants make animals sick so animals are restricted from areas where they are exposed to plants containing toxic Se that cause selenosis.

Studies of mineral elements implicated with nutritional problems in plants and animals suggest that total soil concentrations alone are not equally important in all areas. For example, most soils have percentage amounts of Fe; yet Fe deficiency is a common problem in plants grown on calcareous soils! and Fe deficiency anemia is the most commonly recognized deficiency disease in humans, especially among women of child bearing age. Trace elements like Se, Mo, Cu, Zn and others exert an influence far out of proportion to microgram amounts commonly present in soils. They collectively give rise to a wide range of deficiencies and toxicities in plants and animals.

Soil related nutritional problems in animals are manifested through plant concentrations and reflect the combined impact of soil weathering pattern and soil parent materials. Trace element reserves in soil parent material (capacity factor) interacting with soil weathering (intensity factor) affect concentrations of trace elements in plants. Together they control the available supply to plants of soil trace elements. A summary of how they affect plant concentrations of nutritional importance to animals is outlined in Table 1. Animals suffer from nutritional problems at concentrations levels that have no effect on plant growth, because plants and animals have different requirements and tolerances to a given element.

Interest in Cd in soils, plants, and animals is currently high because Cd toxicity (**itai-itai** disease) can affect people. Currently available information indicates that people possibly have a lower tolerance to Cd than either plants or animals. Considerations important to nutritionists **thus may** be equally important to agricultural scientists, because soil-plant systems contribute to the Cd intake of man.

Table 1. Characteristics of soils and soil parent materials associated with naturally occurring nutritional problem areas for animals in the United States

Trace element	Animal nutritional problem	Significant plant concentration	Characteristics associated with problem areas	
			Soil	Soil parent material
Cobalt	Deficiency	0.04-0.07 ppm or less	Sand texture, acid, poor drainage (Humaquods)	Coastal plain deposit; glacial drift - White Mountain granite
Molybdenum	Toxicity	10-20 ppm or more	Poor drainage, neutral to alkaline reaction	Granitic alluvium, alluvium from shale
Selenium	Toxicity	4-5 ppm or more	Alkaline reaction, calcareous , good drainage	Seleniferous rocks, Cretaceous shales
	Deficiency	0.05 ppm or less	Acid reaction Neutral to alkaline	Mixed, nonseleniferous deposits Volcanic ash
Magnesium	Deficiency	0.15% or less (?)	Mesic soil zone; limited available soil moisture	Mixed, unconsolidated deposits, volcanic ash

National Work Planning Conference Report

John C. Sencindiver
West Virginia University

The 1981 National Technical Work Planning Conference of the National Cooperative Soil Survey was held during the week of April 6-10 in Washington, D.C. The meeting was oriented primarily to users of soil survey information.

The meeting began with reports from the three standing committees: (1) Surface Horizon Characteristics Under Different Conditions, (2) Confidence Limits of Soil Survey Information, and (3) Water Supplying Capacity of Soils for Different Plants. Reports from international committees were also given. These included (1) Soil Moisture Regimes, (2) Low Activity Clay Soils, (3) Andisols, (4) Vertisols and (5) Aridisols. Strategy for updating Soil Taxonomy was discussed, and the Soil Management Support Services Program was reviewed.

The second day began with a round table discussion by international soil scientists. The participating countries included France, Argentina, The Netherlands, Belgium, Syria, Puerto Rico, New Zealand, England, Venezuela and West Germany. These scientists discussed the progress of soil surveys in their countries.

The afternoon of the second day was devoted to the needs and problems of federal users of soil surveys. Non-federal users of soil surveys attended a workshop on the third day.

Regional reports were given and training of soil scientists was discussed on the fourth day. Soil resource information systems were also discussed. Included in the discussions were information needs, soil data bases, digitizing soil maps and interactive computer systems.

Research Committee Report
Robert V. Rourke
University of Maine, Orono, Maine

The Northeast Soil Research Committee met at the Skyline Motor Inn, New York City, January 13 and 14, 1982. All states in the region were represented with the exception of Massachusetts, Rhode Island, and Delaware. Others in attendance were TVA, USDA SCS and USDA CSRS representatives.

Considerable time and effort was spent in developing the subject of sludge disposal through land application. The committee decided to pursue the premise of developing criteria and recommendations for land application of sludges in the Northeast. At this time an initial review of these recommended guidelines has been completed and it is planned to have a public workshop October 20 and 21, 1982 following a final committee meeting September 29, 1982. The final publication will be in January or February, 1983.

Dr. Lowell A. Douglas presented a draft document concerning the Northeastern soil and water research needs. Following a vigorous discussion debate ceased with a request for responses to the draft as distributed.

Reports were received from SCS, USDA concerning soil survey and from USDA ARS presenting research projection emphasis for the next year. Cooperative research with TVA was reported under way at 16 Universities. The nitrogen regional project (NE-39) was being revised in anticipation of renewal in 1983 under the title "Nitrogen transformations and management for crop production and environmental quality". The regional group in soil mineralogy and chemistry (NE-96) anticipates producing two regional publications in 1982 as well as contributing to the sludge disposal by land application publication. State reports were presented by the various states present.

The future of the Northeast Soils Research Committee is in question as a result of changes in the regional representation from department heads to research individuals. The direction formerly exercised by the group is reduced. This problem is not unique to the Northeast and has been noted in other regions having a similar committee.



Line-Segment Digitizing

Advantages

- o Data Output in lines
- o Accuracy of data base
- o User acceptance
- o Flexibility in overlay capability
- o Ease of updating the data base

Disadvantages

- o Cost of data entry
- o Time required for data entry
- o Cost of equipment and maintenance
- o Size required for computer to handle data

Cell Digitizing

Advantages

- o Low Cost of data entry
- o Ease of data entry
- o Ease of computer data processing

Disadvantages

- o Poor appearance of angular boundaries
- o Lack of automated data entry
- o Accuracy of output
- o Difficulty of updating the data base

It is important to note some trends in this listing. Large and more efficient mass data storage devices as well as lower costs and larger computers have developed and are being used. Improvement in automated data entry using the line-segment method have occurred. As a result the cost of line-segment data entry and processing is going down while the cost of manual cell data digit entry is going up. We believe the trend in **selecting a soil map digitizing method** will show in increased use of the line-segment digitizing method in the future.

Organization

Organizationally how is the National Office set-up to provide digitizing assistance?

As a result of the cartographic consolidation the Midwest National Technical Center (**MNTC**) and the West National Technical Center (**WNTC**) automated mapping systems (**AMS**) were transferred to the National Cartographic Center (**NCC**) at the South National Technical Center (**SNTC**) to form the Computer Graphics Branch. The Northeast National Technical Center (**NENTC**) **AMS** operations remained at **Lanham** and was attached to the National Headquarters (**NHQ**) Cartography and Remote Sensing Staff. This staff is called the Digital Cartography Support Staff (**DCSS**). Both **NCC** and **DCSS** have digitizing capabilities primarily dedicated to the soil survey digitizing program.

Our emphasis in the **NCC** computer-graphics branch will be in the operational digitizing capability. The emphasis in the **NHQ-DCSS** staff will be in the development of more advanced digitizing capabilities, procedures for contract digitizing and the development of advanced geographic data processing such as those included in modern geographic information systems.

Program Emphasis

In FY-83 we will be **emphazing** the following aspects of the digitizing and gee-data processing program.

(1) Development of Policy and Data Base Standards. The first and primary task is the development and implementation of digital cartography policy and data base standards. Recently existing policy has been revised and data base standards have been developed in draft form. These standards will be forwarded to you for review. They will also be forwarded to state agencies, other federal agencies and the privator sector for review and comment.

We believe that these draft standards and the procedures we are using for storing and distributing soil geographic data is state-of-art and provides the accuracy and flexibility needed by state agency users as well as other users. Our data storage technique has been developed and is designed to be able to take advantage of small inexpensive micro-graphic systems. We recognize that using this soils geo-data will gain its most extensive use when with these type systems.

(2) Development of a Line-Segment Contract Digitizing Capability. The development of the computer-graphics industry has increased the capability of contractors to perform digitizing operations, and we believe, in accordance with our requirements. The CRS staff has successfully worked with several contractors on pilot projects to provide line-segment digital data.

Draft specifications have been developed and they will be finalized for use in FY-83 contracting. Although we intend to maintain a strong in-house capability, we believe that contracting for this service is the logical way to respond to the increased digitizing workload.

(3) Increased Geographic Data Processing and Display. Once the soil maps, land use maps, or other resource maps have been digitized, it is reasonable to expect fast, economical summary statistics and interpretative map displays. With the small size of our present computers and the increased demand for these products it was apparent that our in-house capability needs improvement. We have budgeted for the replacement of our seven year old mini-computers in both the NCC and the NHQ-CRS operation for larger and more efficient computer processors. With increased in-house data processing and display capability, we can do a better job of encouraging more extensive and inexpensive use of already digitized data and produce a greater number of graphic products without impacting the work schedules of the cartographic technicians preparing maps manually.

(4) Utilization of State Agencies Computer Graphic Systems. Concurrent to increasing our own graphic processing and digitizing capability, we are concentrating on data compatibility to State agencies systems that can also support your graphic analysis, display, and interpretive map

agencies, that you or your staffs are aware of. We intend to forward this map to your offices for updating and the addition of digitizing projects. Your inputs will be used to prepare an updated status map for subsequent reprinting. The map will become a regular status map edition from the Cartography and Remote Sensing Staff, at least on an annual basis.

Another regular occurrence will be CRS informative bulletins about the progress of the status of the digitizing program and development and activities in the field of geographic data processing. A June 1, 1982, information bulletin is being developed now and will be distributed to your offices within the next week or two.

(7) Development and Utilization of Soil and other Resource Geo-Data in a Geographic Information System. A new and emerging technology in the field of computerized information systems is called Geographic Information Systems (**GIS**). A GIS is a computerized method of handling geographic data with associated attribute data so that various geographic data layers can be overlaid, compared and analyzed to produce various types of interpretative map*.

We believe this method of using computerized geographic data is the next logical developmental step for the Cartography and Remote Sensing Staff in their automated mapping operation. This developmental work has become such an important part of their operation that we proposed the Cartography and Remote Sensing Staff name be changed to Cartography and Geographic Information Systems Staff.

A **GIS** would contain several data layers. In the example on display we've shown soils, slope, land cover, erosion, land use, water, drainage, and flooding; however, any number and type resource are possible. The data once digitized is processed by a super mini-computer, a mini-computer or potentially a micro-computer. Output can be directed to line printers for text and tabular information, to plotters for computer drawn maps and graphics. Access and manipulation of the data will be through an interactive graphics terminal. We believe this type of hardware will be necessary at the State Offices for the utilization of geographic data.

The software involved in an SCS GIS needs to include the capability to, support digitizing and interactive editing, process and analyze both **in** polygon and cell format, covert from cell to polygon and polygon to cell, handle a variety of data formats from external systems, transform data from one coordinate system to another, plot maps on a variety of map projections, overlay one data layer over another for analysis and composite mapping, support image processing, and support a variety of output display devices.

The Cartography and Remote Sensing Staff is currently investigating and evaluating this type technology. Benchmark tests and trial use of these systems are planned. So we can help and work with you more effectively, the development of a GIS questionnaire to be forwarded to your offices is planned to help determine your needs in geo-data processing. The

results of this activity will provide SCS the administrative and technical support necessary to purchase needed computer processing capabilities that are compatible with and support geographic information system software.

On an immediate basis the Cartography and Remote Sensing Staff can provide assistance in contracting for special GIS services such as composite mapping. Additionally some GIS software can be made available on a time-sharing basis using graphic terminals available in the State Offices.

In summary, it is important to state that we believe GIS technology is the answer to the efficient utilization and management of geographically referenced resource data. Current GIS systems are complex and require sophisticated approaches but will produce interpretative maps for you and your clientele. There will be **deadends** and pitfalls in our development and eventual implementation, but we believe the rewards will justify the efforts.

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THE CONNECTICUT AGRICULTURAL EXPERIMENT STATION

David E. Hill

Two studies have been initiated relating the movement of pollutants from **waste** disposal sites to ground water. Movement of ammonia, nitrate, and phosphorus from an extensive septic tank leaching field is being monitored at Lake **Waramaug** State Park. In 1981 samples taken at progressive distances from the leaching system from paired wells, 15 and 30 feet deep, have shown that pollutants have not reached the closest well, 10 feet away. **Movement** of 20 different organic chemicals from 8 town and city landfills in Connecticut are also being monitored. Studies are being conducted on the transport and reactions of the organic chemicals with soils.

The distribution of **PCB's** in the **Housatonic** River system has **been** studied and we found that it is controlled by the distribution of **fine-grained** sediment. Dredging of fine-brained sediments in areas of high accumulation has been suggested to **remove** the pollutant sink now that the source of **PCB's** has been eliminated. Land disposal of polluted dredged sediments necessitates studies of the reactions of various **Aroclors** with soils to understand the mechanisms of their reactions. Studies have also been initiated to determine the growth habits of grasses and vegetable crops on PCB-laden sediments dredged from the river.

Investigations are also underway to determine the effect of developing forests on soil and water quality. This study has been established to determine the contribution of changing land use patterns in the Northeast

MAINE AGRICULTURAL EXPERIMENT STATION REPORT

Robert V. Rourke

There are several areas of research being conducted by the faculty at the University of Maine of interest to members of the Northeast Soil Survey Work Planning Conference.

Maryland Agricultural Experiment Station
D. S. Fanning

Maryland Agricultural Experiment Station (MAES) soil survey programs are undergoing some major changes in personnel. Dr. J. E. Foss, who had been MAES soil survey representative since 1966, left in September, 1981 to become chairman of the Department of Soils at North Dakota State University. Now, as of July 1, 1982, Dr. F. P. Miller, extension leader in soil and water resources and teacher of some courses in the soil survey area since 1965 is leaving to become chairman of the Department of Agronomy at the University of Arkansas. As of January, 1983, Dr. Foss's position should be filled by Martin C. Rabenhorst. Martin is presently completing requirements for his Ph. D. degree at TEXAS A & M. He is already well known at Maryland, where he took his B.S. and M. S. degrees before going to Texas in 1979. He did his M.S. thesis (1978) on Maryland soils.

graduate level course on theories of soil genesis at the University in College Park this 1982 fall semester. Additionally, on the USDA-SCS level, State Soil Scientist, District Chief, assigned to the fall of 1982.



other hand it appears that many soil materials have undergone the low pH of sulfuric horizons, (< 3.5) without jarosite formation because Eh conditions were only high enough to oxidize sulfur but not Fe^{+2} . In order for jarosite to be stable, the Eh must be high enough for Fe^{+3} to be stable (as for iron oxides). Thus the sulfuric horizon definition should not require the presence of jarosite for its recognition --- only the low pH (as presently required) and some evidence (e.g., presence of sulfidic materials nearby) that the low pH comes from the generation of sulfuric acid.

I feel that an understanding of acid sulfate weathering phenomena is so important to enable one to understand the properties and genesis of many soils, as well as to facilitate reclamation of lands that are or may be disturbed, that I am teaching the processes by which sulfides accumulate (sulfidization) and oxidize with consequent changes in the soils or soil materials (sulfuricization) in my courses. Printed lecture "notes" about the processes have been prepared and a number of copies

On-going graduate student research Includes:

W. J. McMahon: mapping of soils to a depth of 10 feet employing a combination of auger borings and seismic and resistivity observations. This mapping is being done for two small test areas. So far it does not appear economically feasible for routine soil survey.

John Short: Study of properties and variability of soils in man deposited materials on the Mall in Washington, D. C. One hundred profiles are being examined in considerable detail. John is employed by the National Park Service and they are supporting his work.

James Luzader: Studies of soils of oyster-shell kitchen middens. The middens were deposited by Indians, perhaps beginning as long as 2000 years ago according to limited radiocarbon dates. The midden soils occur on certain bluffs by the Chesapeake Bay and along the Potomac River estuary. Soils beneath the shells appear to be saturated with calcium to depths of several meters.

George

Some Recent Publications

- Carson, C. D., D. S. Fanning, and J. B. Dixon. 1982.** Alfisols and Ultisols with acid sulfate weathering features in Texas. Accepted for publication (see below) edited by J. A. Kittrick, D. S. Fanning, and L. R. Hossner. (in press).
- Darmody, R. G. 1980.** Geomorphic and pedologic relationships of Elloak and associated soils in the Piedmont of Maryland. Ph. D. Dissertation, University of Maryland, College Park.
- Darmody, R. G. and J. E. Foss. 1982.** Soil-landscape relationships in the Piedmont of Maryland. *Soil Sci. Soc. Amer. J.* **46:** 588-592.
- Kittrick, J. A., D. S. Fanning, and L. R. Hossner (editors). 1982.** Acid sulfate weathering. Accepted to be *Soil Sci. Soc. Amer. Spec. Publ. No. 10.* (In press).
- Korcak, R. F., and D. S. Fanning. 1981.** Interaction between high levels of applied heavy metals and indigenous soil manganese. *J. Environ. Qual.* **10:** GY-72.
- Rabenhorst, M. C. and J. E. Foss. 1981.** Soil and geologic mapping over mafic anti ultramafic parent materials in Maryland. *Soil Sci. Soc. Amer. J.* **4:** 1156-1160.
- Rabenhorst, M. C., D. S. Fanning and J. E. Foss. 1980.** Regularly interstratified chlorite/vermiculite in soils over meta-igneous mafic rocks in Maryland. *Clays and Clay Minerals.* **30:** 156-158.
- Rabenhorst, M. C., J. E. Foss and D. S. Fanning. 1962.** Genesis of Maryland soils formed from serpentine. *Soil Sci. Soc. Amer. J.* **46:** 607-616.
- snow, P. A. 1981.** Quantitative determination of total and forms of sulfur in soil and geologic materials employing X-ray spectroscopy. Ph. D. Dissertation, University of Maryland, College Park.
- Wagner, D. P., D. S. Fanning, and J. E. Foss. 1982.** Identification of source materials for acid leachates in the Maryland Coastal Plain. Accepted for publication by Transportation Research Board of National Research Council.
- Wagner, D. P., D. S. Fanning, J. E. Foss, M. S. Patterson, and P. A. Snow. 1982.** Morphological and mineralogical features related to sulfide oxidation under natural and disturbed upland surfaces in Maryland. Accepted for publication (see above) edited by J. A. Kittrick, D. S. Fanning, and L. R. Hossner. (In press!).

Massachusetts Agriculture Experiment Station

P.L.M. Veneman

Characterization studies of Massachusetts soils are progressing. A sizable number of pedons has been sampled in **collaberation** with SCS personnel during the last 4 years and sufficient data is available to permit publication of an Experiment Station bulletin, summarizing the chemical and physical properties of selected Massachusetts soils. Completion of this report is scheduled for the fall of 1982.

To ensure that proper analytical procedures are followed, and that reliable and reproducible data are obtained, our characterization laboratory participated in the on-going Northeast Soil Characterization Study.

Associated with our characterization activities we collected about 40 soil monoliths for use in various soils courses. These soil imprints are especially useful in the soil morphology and classification course where adverse weather conditions often limit the time available for outside activities.

The effect of the presence of a **hardpan** on the soil moisture regime, specifically in relation to soil mottling patterns, was studied in a **Paxton drainage-**topsequence at the University of Massachusetts campus. These dense **hardpans** ~~severely~~ limit vertical drainage of soil water, especially during wet periods such as during late fall or early spring when significant lateral flow over the **hardpan** is evident. Significant mottling with **chromas** < 2 can be observed within 90 cm of the soil surface in soil profiles only **one-third** down the slope. This indicates that during the mapping process the amount of well drained soils may be overstated significantly. Physical characteristics measured in this catena, include soil water potential, **redox** potential and water table fluctuations. Purpose of this study is to link specific mottling patterns to particular moisture regimes. This will facilitate siting of septic tank-soil absorption fields and hazardous waste facilities.

Engineering properties of the **hardpan** are also being determined. Strength of the **hardpan** material is inversely related to moisture content, while the strength characteristics of non-**hardpan** material at the same or higher bulk density, appear unaffected by the amount of water present. Measurements include penetrometer and unconfined compressive strength measurements. The brittle behavior of these **hardpan** infers either the presence of a cementing material or a significant overloading in the past. The latter possibility currently is evaluated by various triaxial shear strength tests.

The effects of mold-board plowing, **discing**, chisel plowing and minimum **tillage** on soil physical soil properties are being assessed in a multi-year silage corn trial. Characteristics evaluated include bulk density, pore size distribution, soil moisture, pore continuity, earth worm activity and permeability. Root distribution, growth characteristics and yield data are being collected as well.

Several studies concerning Spodosol formation in Massachusetts were completed. Observations on forested sites with significant pit and mound microrelief originating from tree throw, revealed that especially precipitation is important in the formation of Spodosols. Soils in areas with frigid temperature regimes and high precipitation generally are subject to podzolization, while the warmer, slightly drier regions mainly are characterized by braunification. The soils in the latter areas used to be classified as Brown Podzolics, but are currently included in the Inceptisol order and the Udipsamments. This change in classification seems justified on the basis of the observed differences in soil formative processes.

Our studies concerning the adaptability of common apple dwarf tree rootstock varieties to Massachusetts soils continued. An experimental planting was initiated in the spring of 1982 at 9 sites throughout the state. Soils at the study locations include the Paxton, Woodbridge, Ridgebury, Wethersfield, Shelburne, Cabot, Charlton and Colrain series. The results of this research eventually will enable extension personnel to recommend planting of specific rootstocks based on the soil type which is prevalent in the orchard.

Effectiveness of curtain drains to control high ground water tables was evaluated in 2 innovative systems in Merrimac soil. Curtain drains appeared successful in lowering seasonally high water tables, thereby improving the performance of the soil absorption field.

New Jersey Agricultural Experiment Station Report

L. A. Douglas

1. Many of the intensively cultivated soils of the Coastal Plain of New Jersey, Delaware and Maryland are prone to erosion by both wind and water. These soils comprise the bulk of the major agricultural soils in New Jersey. A study has been initiated to determine:
 - a. The nature of the soil structure under intensively cultivated conditions
 - b. The comparison of the structure of cultivated soils with "virgin" soils
 - c. Identification of the factors causing the change (degradation) of structure as these soils are brought under cultivation.
2. Professor J. C. F. Tedrow is preparing a book whose tentative title is "The Soils of New Jersey." This book will describe the soils, their pedologic, geologic and geomorphic setting, and the history of soil survey in New Jersey.
3. Many of New Jersey's soils contain "smectites." These soils are in an environment where one would not expect smectites to form—that is, very low pH's. The specific nature of these smectites are being studied. This study has brought to the forefront the problem of identification of smectites in that most of these smectites can be classified either as tetrahedrally substituted smectites or beidellite by some classification systems, while other classification systems will classify these minerals as expanding vermiculites. Consequently, the criteria for identification of smectites is being investigated.
4. Several graduate students have soil genesis studies as their thesis subject matter. Most of these problems deal with either a) time as a soil-forming factor, or b) the effect of geomorphic position on soil genesis.
5. The New Jersey Agricultural Experiment Station has completed the installation of a micromorphology facility, and all of the studies listed above with the exception of the smectite study include micromorphology as one of their experimental tools. Thin sections as large as 5 x 9 cm can be prepared in this facility.

CORNELL UNIVERSITY AGRICULTURAL EXPERIMENT STATION REPORT

RAY B. BRYANT

During the past two years, personnel changes continue to impact our program. Dr. R. W. Arnold took a permanent position as Director of Soil Survey, SCS in Washington, D. C. Ray Bryant, who recently completed a Ph. D. at Purdue University, is the new Soil Survey Project Leader for the Agricultural Experiment Station at Cornell. Melinda Dower has moved on to become a conservationist for SCS in Somerset County, New Jersey. Frankie Ramos is our new soil characterization laboratory technician and handles much of the soil characterization laboratory work. Mr. Kenneth Olson remains as research associate and is working toward obtaining his doctorate degree under the guidance of Dr. Gerald Olson. Ken has done an outstanding job of directing laboratory activities and representing Cornell University in soil survey activities during this period of reorganization.

The New York State Department of Agriculture and Markets has financed the acceleration of the survey of agricultural lands in New York. We are presently in the second year of increased production due to strong state support. With the completion of mapping in Jefferson, Chenango, and Warren Counties, thirty-three counties have been completed, ten counties are in progress, and thirteen counties are remaining. Eighty-five pedons were characterized during the last two years; most were from St. Lawrence and Albany Counties. More have been sampled or are scheduled to be sampled in St. Lawrence, Columbia and Greene Counties. Forty-five monoliths have been taken in the last two years, bringing the total number of monoliths in our collection to eighty-five. In addition, twelve monoliths remain in Albany, Sullivan, and St. Lawrence Counties.

Laboratory activities have been expanded to include routine preparation of thin-sections. The X-ray diffraction unit is presently being upgraded for the purpose of providing mineralogical analyses in the future. An IBM personal computer has been purchased and data for approximately 100 pedons have been stored on computer tape or disk.

Other activities include soil mapping on University owned experimental farms at Willsboro, Aurora, and Harford and detailed characterization of experimental plots at Varna and Aurora. Dr. Bryant traveled in Venezuela for two weeks in March where contacts between Cornell University and soil survey activities under the Ministry of Natural Resources and the University of Venezuela at Maracay were renewed.

Work has been done in the following research and project areas during the past two years:

1. Testing of fragipans to better understand their strength characteristics is completed. Results will be published in Duane Lenhardt's Ph. D. thesis.

NY-1

2. A comprehensive summary of the utilization of soils information in the preferential tax assessment of agricultural land in the United States was prepared to assist the State Board of Equalization and Assessment in formulating policy.
3. The correlation between total potassium analysis and X-ray diffraction methods of determining illitic mineralogy in New York soils was assessed.
4. A pilot project on digitization of soil maps for New York State is in progress.
5. A method of determining agricultural land value utilizing soil properties is being developed.

PUBLICATIONS

- Olson, G. W. 1981. Soils and the environment--a guide to soil surveys and their applications. Chapman and Hall, New York. 178 pp.
- Olson, K. R., and G. W. Olson. 1981. Utilization of soil information in the preferential tax assessment of agricultural land in the United States. Agronomy Mimeo 81-39. 21 pp.
- Olson, K. R., G. W. Olson, and R. B. Bryant. 1981. Clay mineral estimates using X-ray diffraction for twelve fine-textured soil series from Jefferson, Albany, Chautauqua, Essex and Tompkins Counties. Agronomy Mimeo 81-32. 21 pp.
- Olson, K. R., G. W. Olson, and R. B. Bryant. 1981. Total potassium analysis as a supplement to X-ray diffraction for determining illitic mineralogy class.. Agronomy Mimeo 81-33. 16 pp.
- Olson, K. R., G. W. Olson, and S. P. Major. 1982. Soils inventory of the Willsboro Farm in Essex County, New York and implications of soil characteristics for the future. Agronomy Mimeo 82-3. 67 pp.
- Olson, K. R., F. J. Rams, and R. B. Bryant. 1981. Physical, chemical and mineralogical data for 20 soil series from Albany County, New York. Agronomy Mimeo 81-34. 128 pp.

The Pennsylvania State University Agricultural Experiment Station Report -
R. L. Cunningham

The project covering most of the soil survey activities is titled "The Characterization and Interpretation of Pennsylvania Soil Resources for Improved Land Use". The project (2306) was renewed in 1982. Other projects are related and enhance soil survey activities in Pennsylvania, such as OVRT grant to study acid rain effect on soil and several grants to improve remote sensing techniques in soil survey.

Soil Genesis and Morphology. Personnel -

R. L. Cunningham, Project Leader
E. J. Ciolkosz, 1982 Chairman, NESSWP Conference
R. C. Counce, Laboratory Director
G. W. Petersen, Co-Director, ORSER
R. Pennock, Jr., Resident Instructor
R. F. Shipp, Extension Agronomist
C. J. Sacksteder, Computer Programmer/System Analyst
Approximately 20 graduate student assistants.

The 3 program objectives are:

1. to characterize soils
2. to conduct soil genesis research
3. to develop a soil information system

Even though Pennsylvania is 97% field mapped, the characterization program is still active. Sampling is scheduled for the next 3 years and will continue for at least 3 more. There are soils that have not been characterized, and so there are few data available to interpret for use and management, for these soils. Survey areas that need recorrelation and updating will be investigated for soils or mapping units that lack classification or definition. Characterization studies will assist in legend identification and correlation. The present 3-year plan includes such studies.

Soil genesis research is devoted to concepts and relationships that assist in field survey and in interpretations. Thirty three graduate students have earned their degrees with this program since 1970. Presently, 18 have research in progress.

Much effort has been devoted to the development of a soil information system. Much of this effort has been in concert with the remote sensing activity at Penn State. The characterization data formed the early files, the S-5 Interpretations tape from the Iowa Data Processing Center were added, the mapping unit legends of each county with the acreages of each are in file, several areas of soil maps have also been added to the files. Interpretative units are defined and assigned to each mapping unit.

The SCS in Harrisburg have been extremely helpful in assisting and encouraging the efforts in merging all the soil survey data into a system and developing data management techniques.

Since 1980, nineteen (19) papers have been published and are available upon request.

RHODE ISLAND
AGRICULTURAL EXPERIMENT STATION

William R. Wright

This report summarizes the projects completed and the progress on current research activities since the last Northeast Cooperative Soil Survey Conference.

1. Soil Suitability in Selecting Sites for Sewage Sludge Landfills. G. W. Loomis, M.S. Thesis.

Two ~~more~~ landfills

to C/N ratio or any other physical or chemical property evaluated. This study also indicated that repeated drying of the soil did not significantly reduce pH and that a single drying cycle was sufficient in characterizing potential acidity. Comparison of the ditched and unditched marshes did not demonstrate any major differences in the soil characteristics studied or provide evidence of effects of drainage due to mosquito ditching.

4. Factors Influencing the Variability of Field Percolation Rates of Glacial Till Soils. P. J. Morneau, M.S. Thesis.

Twelve sites representing 4 soil series (Charlton, Narragansett, Newport, Paxton) were selected for study. The Charlton and Narragansett soils have developed in friable glacial till; whereas the Newport and Paxton soils are underlain by dense, compact, basal till. The profiles were described and sampled for laboratory analyses. Six percolation tests (3 in B horizon and 3 in C horizon) were performed at each site. The Newport soils exhibited significantly slower perc rates in B horizons than the other soils. The perc rates in C horizons were significantly different for all soil series studied. Multiple regression analyses suggested that percolation rates could be predicted from such soil properties as sand, silt, and clay fractions and soil bulk density.

5. Phosphate Movement in Laboratory Soil Columns and On-Site Sewage Disposal Systems. OVRT Grant, T. Bicki, Research Assistant.

Soil samples were obtained at various depths surrounding 8 cesspools which had been in continuous service for approximately 30 years. Mean concentrations of extractable phosphorus were significantly higher at the base and one meter above the base of the cesspools than levels found one meter below the cesspools or in background soils. Little movement of phosphorus from these systems were noted. Partitioning of the phosphorus into various fractions indicated that approximately 85% of the phosphorus was associated with iron and aluminum. Concentrations of free Fe and Al at the base of the cesspools were double those found in background soils suggesting that the addition of these components from cesspools would increase the P-adsorption capacity of the soils. Studies are currently being conducted to evaluate the effects of various septic system rejuvenators (H_2SO_4 , H_2O_2 , petroleum distillates, enzymes) on the movement of phosphorus.

6. Land Application of Landfill Leachate OERI Grant, A. Brown
Research Assistant.

Leachate obtained from a sewage sludge landfill is currently being applied weekly at various rates to plots of established perennial ryegrass. Movement of nutrients and heavy metals through the soils is being monitored from suction lysimeters. In addition, nutrient and heavy metal uptake by the ryegrass will be evaluated.

7. Soil Characterization and Soil Variability Studies; P.S.
Schauer, Research Associate.

Approximately five soil profiles are processed through the characterization laboratory each year. In addition, studies are currently underway to evaluate variability of soil properties within series as well as within mapping units.

VERMONT AGRICULTURAL EXPERIMENT STATION REPORT

Richmond J. Bartlett

Our soil science effort is spread a little thin at times since there are only two of us engaged in soils teaching and research. Fred Magdoff has worked on several soil fertility projects: manure runoff, septic tank effluent disposal, and mound system: He is presently working on a soil test for nitrogen. Amounts of nitrate in the surface horizon in mid-June appear to be promising in forecasting yields of corn. He is also working on nitrogen fixation at interfaces.

Bartlett is still trying to get people to study soil instead of "lab dirt" - this being the dried, sieved, and stored reagent grade soil. Discovery of oxidation of chromium in soils by manganese oxides has lead to interesting work involving manganese redox reactions in soils. For example, we have demonstrated that manganese can oxidize nitrites to nitrates in soils, a process which may explain lack of accumulation of nitrites in soils unfavorable for oxidation by autotrophic nitrobacter.

Work continues on the new Vermont soil test involving measurement of Al. We are the only state lab doing this.

Determination of Reactive Al by extracting a soil sample with pH 4.8 NH_4OAc (1.25 N acetate) characterizes for northern acid soils the quantity of soil acidity that must be neutralized to meet lime need and also lower the P adsorbing capacity. Extracted Al is used in conjunction with pH in 10 mM CaCl_2 to calculate the lime requirement directly. First, the amount of P fertilizer needed is approximated, based on the P intensity (Available P) determined in the same NH_4OAc extract. Then the recommended amount is increased by a P-fixation factor obtained from the Reactive Al measured, and decreased by a Reserve P factor derived from fluoride extractable P.

Unlike a buffer lime requirement method, which predicts lime needed to reach a target pH, the Reactive Al test estimates the quantity of acidity that must be neutralized to prevent fixation of P fertilizer by soil Al and to release P from Al-bound sources. Attaining a particular target pH is not the primary goal. The Reserve P test measures the amount of unavailable Al phosphates that becomes partially available when lime needs are met.

Here is my soil chemistry lecture for the day. Cation exchange capacity is made up of cations that are exchangeable in soils. This includes basic cations and aluminum as well, if it is exchangeable by a neutral salt, such as KCl. There is no exchangeable aluminum in soils if the pH is above about 5.0 or 5.5. Cation exchange capacity as measured by ammonium acetate at pH 7.0 includes the above described exchange sites and also titratable acidity. This would be aluminum reactive with lime if you lime a soil to pH 7.0. However, to calculate percent base saturation based on CEC at pH 7.0 is not correct. The percent base saturation must be based on exchangeable bases or acid. Any soil that has a pH greater than 5.0 must by definition be 100% base saturated. If we want to predict susceptibility to acidification of a soil (e.g., acid precipitation effects), we need to know quantity of bases in the soil, not CEC at pH 7.0. If resistance to damage by acid rain were related to CEC at pH 7.0, our Cryorthods should be the most resistant in the Northeast because they have a very high titratable or pH dependent acidity. Actually, I am sure that such soils are among our most susceptible soils.

Virginia Agricultural Experiment Station Report

James C. Baker

The Virginia Experiment Station Report will center around the soil survey program in Virginia and Virginia Tech's role in that survey.

The Virginia soil survey is a cooperative effort involving principally the Virginia Soil and Water Conservation Commission (VaSWCC), the Soil Conservation Service (SCS), the U. S. Forest Service (USFS), and Virginia Polytechnic Institute and State University (Virginia Tech).

A master plan to complete the soil survey of Virginia by 1990 was approved by the General Assembly in 1972. The plan calls for increased state funding to accelerate the survey by passing such funds through the VaSWCC to cooperating agencies (Va. Tech, SCS, and USFS) for use in mapping and characterizing the soils of Virginia. Anticipated funding for reaching the goal has not kept pace with the plan or the effects of inflation. Consequently, there is little possibility of completing the survey by 1990.

The state consists of 95 counties, 3 cities (formerly counties), and 37 additional independent cities. The total land area in the state is 25,458,200 acres of which 23,166,200 are non-Federal lands and 2,292,000 acres are Federal lands. To date, modern soil surveys have been completed in 47 counties and cities comprising 10,900,000 acres or about 43% of the state. An additional 10% of the state has been surveyed in either non-progressive survey areas or progressive survey that are incomplete.

At the average rate of 880,000 acres per year, the remaining 12 million acres are expected to be completed by 1996. This appears to be a realistic goal and is consistent with the present national goal for completion of the soil survey for the entire nation.

The major responsibilities of each organization as outlined in the Master Plan of 1972 are as follows:

VaSWCC: Overall coordination of the Virginia Soil Survey, administration of funds appropriated by the General Assembly and set priorities for surveys in Virginia.

USFS: The Jefferson and George Washington National Forests are cooperating with Va. Tech and SCS in planning for mapping of Federal land in ongoing surveys and by providing funds for mapping lands under their responsibility.

scs: Field mapping, correlation leadership, interpretation, cartographic assistance, and publication of soil survey reports. The SCS currently has 21 field soil scientist (including one technician) assigned full or part-time to progressive soil surveys.

Va. Tech: Field mapping, laboratory characterization for all surveys, education, research and interpretation, and publication of interim and special reports.

Virginia Tech's Role in the Soil Survey

Field Operation

Virginia Tech currently employs 20 soil scientists divided among 9 counties with progressive soil surveys. Those counties are Wythe, Greene, King William, New Kent, Greensville, Washington, Appomattox, Northampton, and Accomack. Three of those soil scientist are assigned to SCS field parties in Shenandoah, Powhatan, and Bedford Counties. Virginia Tech has in addition three interpretative specialists to work primarily with urban soils problems in Chesterfield, Loudoun, and Prince William Counties. One soil scientist is assigned to the State Health Department to help train sanitarians in soils work.

A CMS terminal has been installed at Blacksburg to store and recall data and to use as a word processor in manuscript preparation.

Laboratory Characterization Program

Virginia Tech provides laboratory support for all soil surveys in Virginia. This accounts for approximately 150 pedons per year plus other samples from special research and correlation studies. Physical characterization includes particle size analysis, bulk density, moisture retention curves, and selected engineering tests such as Atterberg limits and potential volume change. Standard chemical characterizations are run routinely as well as petrographic and clay analyses on selected samples.

Teaching and Extension Activities on Campus

The following courses are offered at some time over a two year period at Virginia Tech:

3000 level Soil Morphology and Cartography	3 credits
4000 level Soil Genesis and Taxonomy	3 credits
5000 level Advanced Soil Genesis and Morphology	4 credits
3000 level Soil Interpretations	3 credits
5000 level Advanced Soil Interpretations	4 credits
5000 level Soil Geomorphology	4 credits
2000 level Soil Evaluation	1 credit

In addition to the above formal classroom courses (1) a two week summer course to train sanitarians, etc. on urban soil problems is offered as is (2) a 1-1/2 day short course on Conservation Inventory Resources.

Virginia Tech administers a soil science scholarship program, funded by the State through the Virginia Soil and Water Conservation Commission. This scholarship program provides funds for 12 quarters of assistance for up to 12 students at a time such that they may be educated and field trained as soil scientists. This program has graduated 38 soil scientists from Virginia Tech over the past 11 years. Currently there are nine students on the scholarship program

Current Research Projects Relating to Soil Survey, Soil Genesis, and Land Use

I. Soil Mapping and Variability Projects

1. Methodology for Updating Pretaxonomy Soil Surveys (Cowherd, Baker, and Edmonds)
2. Adequacy of Soil Taxonomy for Soil Survey Purposes
 - (a) Variability of soils in landscapes
 - (b) Map unit descriptions
 - (c) Chemistry-Mineralogy-Physical Data (Edmonds and Baker)
3. Taxonomic Variability of the Chester Soils - Loudoun County, Virginia (Weber, Ams, and Zelazny)
4. Elioak-Tatum-Landscape Variability (Wilson and Edmonds)
5. Distribution of Soil Mineralogy Classes on Soils of the Eastern Shore of Virginia (Edmonds, Harris, et. al)

II. Soil Genesis Studies

1. Aspect as it Relates to Soil Morphology, Soil Temperature, Soil Moisture and Chemistry in Wythe County, Virginia (Blackburn and Edmonds)
2. Acid Sulfate Weathering - Its Effect on Soil Formation in Virginia (Edmonds, Zelazny, Baker)
3. Nason-Tatum Studies on Soils from Sericite Schists with High Aluminum (Wilson and Zelazny)
4. B Horizon Development in Beach Deposits (Baker and Hatch)
5. Characterization of Soils with Vermiculite Mineralogy (Weber and Zelazny)
6. Myersville Soil Study (Weber and Zelazny)
7. Mineralogy Quantification - Mica Mineralogy Classes in Soils (Harris, Zelazny, and Parker)
8. Alfisol-Ultisol Landscapes in the Southern Piedmont of Virginia (Baker, Edmonds, etc.)
9. Origin and Properties of Coarse Grained Kaolinite in Piedmont Soils and Saprolites (Harris, Zelazny, Baker)

III. Soil Reclamation and Urban Interpretations

1. Suitability of Surface Mined Areas for Residential Development (Bell and Ams)
2. Cost Benefit Ratios of Controlled Placement of Mine Spoil (Zipper and Ams)

3. **Land Application of Waste Water and Sludge - Nitrogen Balances and Relation to Taxonomic Units (Simpson)**
 4. **Water Table and Temperature Studies on Spotsylvania and**
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West Virginia Agricultural and Forestry
Experiment Station Report

John C. Sencindiver

The major efforts in soil research are in mined-land reclamation and disposal of fly ash. Most of my time for the past year has been devoted to two committees established by the Director of the Department of Natural Resources (DNR). These committees are the Acid Mine Drainage Task Force and the Acid Mine Drainage Technical Advisory Committee.

The Task Force members are primarily surface coal mine operators, consultants and DNR reclamation inspectors. The purpose of this group is to keep industry up-to-date on new technology relating to overburden handling, acid-mine' drainage abatement and reclamation.

The Technical Advisory Committee has 12 members: two geologists, a hydrologist, a chemist, a soil scientist (Sencindiver), two biologists (DNR Reclamation Division), two representatives of the coal industry (an engineer and an agronomist), the Chief of the DNA Reclamation Division and the Director of DNR. This-committee has two major functions: (1) review of surface mine permit applications for mine sites in potentially acid producing areas and (2) cooperative research aimed at solving the acid mine drainage problem in West Virginia. My portion of the research includes evaluating the effects of new surface mining and reclamation techniques on soil properties and plant growth, and the evaluation of alternative topsoil materials.

Other studies in which members of the soils group at WVU have been involved include:

1. Abandoned mine land reclamation.
2. Nutritive value of forages growing on mine lands.
3. Studies of mycorrhizal fungi in minesoils.
4. Utilization of fly ash for crop growth.
5. Utilization of fly ash and rock phosphate mixtures for reclamation of abandoned mine lands.
6. Absorption of heavy metals by soils.
7. Physical properties of minesoils.
8. Effects of mulches and organic amendments on minesoil properties.
9. Relationship of perc tests to soil morphology.
10. Characterization and classification of some soils of Togo, Africa.

Papers and Theses

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3. Frost, J.D. 1981. Variability of Kittanning Coal Overburden at a Surface Mine in Upshur County, West Virginia. M.S. Thesis. West Virginia University.
4. Grube, W.E., Jr., R.M. Smith and J. T. Ammons. 1982. Mineralogical Alterations that Affect Pedogenesis in Minesoils from Bituminous Coal Overburdens. In: Acid Sulfate Weathering. Chapter 12. pp. 209-223. SSSA Spec. Pub. No. 10. Madison, Wis.
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Forest Service Report

Wisconsin - Walt Russell - 101

Forest Service Remarks

By Walt Russell, Regional Soil Scientist, USDA-Forest Service, Milwaukee, WI.

I represent Region 9 (Eastern Region) of the National Forest System. There are six National Forests in the NE NCSS Region. However, **only four of them** are in the Eastern NFS Region. They are the Monongahela in West Virginia, the Allegheny in Pennsylvania, the **Green Mountain in** Vermont, and the White Mountain in New Hampshire and Maine. We are also responsible for managing the Hector Land Use area in New York State, just a few miles west of Ithaca. The Hector unit is administered by the Green Mountain National Forest.

The other two National Forests in the NE NCSS Region are in the State of Virginia, and are in Region 8 (Southern Region) of the National Forest System (NFS). **Ken** Bracy is here from the George Washington National Forest in Virginia.

From our Eastern Region headquarters in Milwaukee, we also coordinate management of eleven other National Forests in the Midwestern states of Ohio, Indiana, Illinois, Missouri, Minnesota, Wisconsin, and Michigan.

There is a heavy emphasis today on an interdisciplinary approach to **National** Forest land and resource planning and management. Consequently, almost all **NFS** technical staffs include one or more soil scientists, along with specialists in assorted other disciplines.

The role of the soil scientist in National Forest management **can be summed up** as follows:

- to work with the Forest resource managers to learn what soils information is needed, and to present it to them in the ways that best meet their needs.

If our approach in terms of format, or whatever, sometimes seems a little far out in terms of traditional ways of doing things, please realize that we are simply striving to make our product as useful and valuable to our users as we possibly can. We get a lot of user feedback, and this is reflected in our map unit design, interpretations, etc. I am pleased to note in the NCSS generally, a growing emphasis on satisfying user needs. Several of the talks yesterday were indicative of that. We will not survive long if we do not understand, and satisfy our users' needs.

Now a few words about the organization of the Forest Service. We are organized into three broad but specific areas of responsibility. They are National Forest Systems Management, State and Private Forestry, **and** Forest Experiment Stations (or Forest Service Research).

So far I have talked about only the National Forest System (NFS), the branch I am affiliated with. Our mission is to **manage** the National Forests. State and Private Forestry (S&PF) provides **technical** advice and assistance to State Government Forestry organizations, and through them, to private landowners. Forest Service Research, of course, is involved in scientific research in Forestry and related areas.

I am pleased to tell you that a soil scientist position has recently been added to the State and Private Forestry, Northeast Area staff in Broomall. The incumbent in that position is Paul Johnson. He is here, and I will now turn it over to Paul to tell you about the soils program in S&PF.

Conference Committee Reports

Committee 1, Spodosol Classification - Robert V. Rourke, Chairperson - 103

Committee ²2, Criteria for Land Capability Classification - Frederick L. Gilbert, chairperson (1980 Soil Survey Conference) - 107

Committee ³3, Post Mapping Role of Soil Scientist - Robert L. Cunningham, Chairperson - 110

Committee ⁴4, Standards and Specifications for Soil Maps - Willis E. Hanna, Chairperson - 112

Committee ⁵5, Improving Descriptions of Map Units - Karl H. Langlois, Jr., Chairperson - 132

Committee ⁶6, General Soils Map and Bulletin of the Northeast - Edward J. Ciolkosz, Chairperson - 173

Committee ⁷7, Northeast Soil Characterization Study - Dick Cronce, Chairperson (1980 Soil Survey Conference) - 174

COMMITTEE 1

SPODOSOL CLASSIFICATION

Committee Members

Chairman: R. V. Rourke

Vice Chairman: R. D. Yeck

Committee Members:

R. S. Bartlett
R. Bryant
D. G. Grice
R. V. Joslin
J. A. McKeague
S. A. L. Pilgrim
H. Smith
P. L. Veneman
J. H. Ware
J. W. Warner
B. G. Watson
D. L. Yost

Charges:

1. Review the development of classification of soils marginal to Spodosols or Inceptisols.
2. Evaluate chemical criteria for defining spodic horizons.
3. Evaluate morphological criteria of Spodosols with emphasis on criteria **at** the subgroup level.

Charge 1

Background:

The classification of soils considered marginal to Spodosols and Inceptisols has been a continuing problem in the Northeast. The problem seems **to** be greatest in those states that have large areas of land that have "ever been cleared and farmed. In these areas many of the soils that show weak evidence of the **podzolization** process have tempted soil scientists to try to place them in Spodosols or great groups that intergrade toward Spodosols. I" states where most of the land was cleared and farmed until the late **1800's**, Bh, **Bhs**, or Bs horizons of less developed **podzols** have **been mixed** into the **Ap** and their presence is **not** tempting the soil scientists to push these soils into the **Spodosol** order. During the past 12 years, several multi-state field studies have **been** organized in the Northeast to study Spodosols and soils with spodic-like characteristics. In 1970, a trip was organized to study Inceptisols and Spodosols of the Connecticut River Valley in Connecticut, Massachusetts, New

Hampshire and Vermont. A tri-state field study of Spodosols in Massachusetts, New York and Vermont was completed in 1973. As a result of these field studies, all Orthods in mesic temperature regimes in New England and New York were reclassified as Ochrcpts or Orthents.

Recommendations:

1. This committee should be continued at the next meeting.
2. A review of existing data and **pedon** descriptions for frigid soils that are marginal to either Ochrepts or Spodosols be conducted and changes to accommodate these soils in the **Entic** subgroup of Spodosols be proposed. The review should also include soils in **mesic** areas marginal to frigid areas. The review should lead to new criteria for the **Entic** subgroup of Spodosols.
3. Spodic intergrades to other orders in frigid regions in the Northeast should not be considered at this time.

Charge 2

Background:

Spodic horizons may be recognized morphologically or chemically. Morphologic criteria include: ortsteins; pellets of silt size or larger of isotropic amorphous mixtures of organic matter, iron, and aluminum; or cracked coatings of the isotropic material on sand grains or minerals. A spodic horizon has its reddest hue **at** its top and the color becomes yellower as depth increases. Cracked coatings or pellets of silt size or larger are difficult to observe in the field. Many spodic horizons lack an ortstein. Frequently it is necessary to rely upon laboratory analyses to separate spodic from **cambic** horizons. The chemical data currently in use are: pyrophosphate Fe + Al/clay ≥ 0.2 ; pyrophosphate Fe + **Al/dithionite** citrate Fe + Al > 0.5 ; CEC @ pH 8.2 - $\frac{1}{2}$ clay **x** thickness in cm of spodic ≥ 65 . A spodic horizon must satisfy all three chemical requirements.

Recommendations:

1. Taxonomy changes "Summary of the limits of a spodic horizon" pg. 32.

A. In the first paragraph delete:

"If the soil temperature regime is frigid or warmer, **some** part of the spodic horizon must meet one or more of the following requirements below a depth of 12.5 cm or below any Ap horizon that is present. If the soil temperature regime is cryic or pergelic, there is no requirement for depth."

and replace it with the following:

Spodic criteria may be met at any depth **in the** soil.

B. Following **item 2 add:**

or, those **horizons meeting** spodic criteria as determined by the KOH spodic test kit are spodic; or,

C. Change item 3b as follows:

When volcanic ash is present the sum of pyrophosphate extractable iron plus aluminum is half or more the sum of dithionite - citrate extractable iron plus aluminum (percentage of pyrophosphate - extractable Fe + Al \geq percentage of dithionite - citrate Fe + Al \geq 0.5).

D. Delete item **3c.**

2. The committee should be continued at the next meeting.
3. The concept of total carbon (ignition) of 0.5% with a minimum Fe p + Al p of **0.6%**, or 0.4% for sands, in spodic horizons should be tested.
4. The utilization of **placic** horizons as spodic criteria should be reviewed by ICOMOD.
5. The lower limit of Fe p + Al p/clay \geq 0.2 be evaluated in terms of reducing the ratio to \geq 0.1.
6. Evaluate the usefulness of cracked coatings and silt size pellets as criteria for spodic horizon identification.
7. Evaluate the use of **smeariness** as a criteria for field identification of spodic horizons.

Charge 3

Background:

Entic subgroups have been little used because of the switch of most **mesic** soils into Inceptisols from Spodosols and the high organic carbon contents of spodic horizons in soils remaining in Spodosols. Aquic subgroups have been difficult to correlate from state to state because of varying interpretations of the depth of spodic horizons and the tendency to continue to try to relate drainage class and soil taxonomy. **Humic** subgroups have been used at higher elevations for **soils** that appeared to be **Humods** but failed to meet Fe:C ratios.

Recommendations:

1. The committee should be continued at the next meeting.
2. The presence of spodic horizons above 12.5 cm but not **below** should be evaluated as criteria to separate Entic and Typic subgroups.

3. The definition of Humods should be altered to read: Humods to have an organic carbon content of the Bh \geq 5%; Fe:C of \leq 0.4; and a Bh \geq 10 cm thick in 90% of the pedon. This definition should be tested.
4. Humic subgroups should be altered to read: have an organic carbon content \geq 5%; value of 2 or 3 and a chroma \leq 2; 7.5 to 10 cm thick or occurs in $<$ 90% of the Bh in the pedon. This definition should be tested.
5. The definition of Aquic subgroups be changed as follows: Spodosols having distinct or prominent drainage mottles at depths shallower than 60 cm This definition should be tested.
6. Thixotropic particle size classes be redefined in relationship to Spodosols that the mineral particle size class may be used for spodic horizons in cryic temperature regimes when high organic contents are not a factor.

REPORT OF COMMITTEE ² - 1980 SOIL SURVEY WORK PLANNING
CONFERENCE

Criteria for Land Capability Classification

Chairperson - Frederick L. Gilbert.

INTRODUCTION

The grouping of soils into land capability classification units, subclasses and classes, is one of the most used and popular soil survey interpretations that has been made. The definition of the categories in the land capability classification system are given in the Agriculture Handbook 210 which was issued in September 1961. The criteria for the various categories is stated in that publication in a qualitative manner. The application of the criteria to specific soils phases has been fairly good over the years, but because the criteria is qualitative, there are some correlation problems of correlating land capability classification subclasses from state to state. It is because of this lack of a definitive classification system, that the committee undertook to develop the flow chart that is enclosed with this paper.

Committee Charge

The committee charge for the 1980 conference was to develop guidelines for quantifying the criteria used for capability subclasses and to test this criteria on selective soils in the Northeast on the basis of MLRA's. These two charges were carried out in 1979 and 1981. • 1.3 and to test step 2op guat senj 1.critchargeto develop

Follow-up on the 1980 Recommendations

In 1981, the revised flow chart was sent to all state soil scientists in the Northeast, and to Oliver Rice, who has the responsibility for interpretations for the Northeast SCS Region. Also, this revised guideline was sent to all members of Committee I for their comments. At that time, the recipients of the revised flow chart were asked to rate some benchmark soils, or representative soils in their states using the flow chart and to also rate the same soils using a table that had been developed at the South Regional Soil Survey Work Planning Conference, and see how they compared to the current placement that was on the SCS-5's. I received comments from a number of state soil scientists. Generally, all the comments were favorable towards using the flow chart as a guideline. There were, however, numerous variances with the current rating on the SCS-5, which was to be expected, and **which was** the reason for developing the guideline to begin with.

Recommendations

It is herein recommended to the conference that the flow chart be adopted for use in the Northeast, and that a copy be forwarded to the National Office of the Soil Conservation Service for their consideration. It is also recommended that the National Office of the Soil Conservation Service, in cooperation with all agencies in the National Cooperative Soil Survey, consider a revision or an extension of this flow chart as a definitive scheme for placing soil mapping units into land capability classification subclasses throughout the United States.

Enclosure

1980-1-2

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A PROPOSED GUIDE FOR PLACING A SOIL OR A MAP UNIT INTO A LAND CAPABILITY SUBCLASS (LCS). (NOTE: SEVERELY ERODED SOILS ARE AT LEAST ONE CAPABILITY CLASS LOWER.)

CHYTIC OR PERGELLIC TEMPERATURE REGIMES

<u>Stony or Bouldery</u>	<u>LCS</u>
<u>Class 1 & 2</u>	
0-25% slopes	VIc
>25% slopes	VIIe
<u>Class 3-6</u>	
All slopes	VIIIs

FRIGID, MESIC, OR THERMIC TEMPERATURE REGIMES

CLASS 3-6 STONY/BOULDERY OR >1% ROCK OUTCROP

	<u>LCS BY % Slope</u>		
	<u>0-3</u>	<u>3-25</u>	<u>>25</u>
<u>STONY/BOULDERY</u>			
Class 3 OR 1-50% ROCK OUTCROP	Vs	VIc	VIIc
CLASS 4-6 OR 50-90% ROCK OUTCROP	VIIc	VIIc	VIIc
>90% ROCK OUTCROP	VIIIs	VIIIs	VIIIs

**CLASS 1 & 2 STONY/BOULDERY
1% or LESS ROCK OUTCROP**

LESS THAN 10 INCHES TO BEDROCK
VIIc

MORE THAN 10 INCHES TO BEDROCK

FLOODS LESS THAN FREQUENTLY DURING THE GROWING SEASON

FLOODS FREQUENTLY DURING THE GROWING SEASON
Vw

AQUIC MOISTURE REGIME WITH SLOPES GREATER THAN 8% OR UDIC MOISTURE REGIME

AQUIC MOISTURE REGIME WITH SLOPES LESS THAN 8%

DRAINAGE	LCS		
CLASS	DRAINED	DRAINABLE	UNDRAINABLE
SWP	IIIw	IIIw	IIIw
P&VP	IIIw	IVw	Vw

Moderately Well Drained

SLOPE (%)		R. INCHES		LCS	
COASTAL	PLAIN	OTHER	<.32	>.32	
0-2	0-3	0-3	IIIw	IIIw	
2-5	3-8	3-8	IIw	IIe	
5-10	8-15	8-15	*	IIIe	
10-15	15-25	15-25	*	IVe	
15-25	25-35	25-35	*	VIe	
25+	35+	35+	*	VIIe	

*Go to next table

Well Drained to Excessively Drained

<0.1 PERCENT ROCK OUTCROP

SLOPE (%)		AVAILABLE WATER CAPACITY (inches/40-inch depth)						LCS
COASTAL	PLAIN	OTHER	>3.5	3.5	2.5	1.5	1.0	<0.5
0-2	0-3	0-3	I ^a	IIc	IIIc	IVc	VIIc	VIIIc
2-5	3-8	3-8	IIc	IIc	IIIc	IVc	VIIc	VIIIc
5-10	8-15	8-15	IIIc	IIIc	IVc	VIc	VIIc	VIIIc
10-15	15-25	15-25	IVc	IVc	VIc	VIIc	VIIc	VIIIc
15-25	25-35	25-35	VIc	VIc	VIIc	VIIc	VIIc	VIIIc
25+	35+	35+	VIIc	VIIc	VIIc	VIIc	VIIc	VIIIc

*SOILS 20-40 INCHES TO BEDROCK ARE IIc

0.1-1 PERCENT ROCK OUTCROP

SLOPE (%)		LCS
COASTAL	OTHER	
0-2	0-3	IIc
2-5	3-8	IIc
5-10	8-15	IIIc
10-15	15-25	IVc
15-25	25-35	VIc
25+	35+	VIIc

Committee ³ 2 - Post Mapping Role of Soil Scientists

List of committee members:

Robert L. Cunningham 311 Tyson, University Park, PA 16802, Chairman

Edward H. Sautter, SCS, Mansfield Prof. Park, Storrs, CT. 06268, Vice Chairman

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Willem A. Van Eck, 1076 Agricultural Sciences Bldg., West Virginia University, Morgantown, WV 26506

William R. Wright, Dept. of Plant & Soil Science, University of Rhode Island, Kingston, RI 02881

Charge: Develop a strategy for a soil information delivery system

The charge was "A strategy for a soil information system using computer techniques".

Digitizing soil maps: Presently considerable soil information is managed by computer, but not soil maps. The maps must be encoded to utilize the computer capabilities of searching, display, map making, interpreting, etc. Considerable discussion pointed out the need for further study of map digitizing techniques and led to Recommendation 2 of this report. Also, emphasized strongly, was the necessity of soil scientists to participate in both the encoding of map delineations and the final display or delivery of soil information. Soil scientists need not be computer programmers but soil scientists must be aware of the capabilities of this new tool to deliver and display information.

Soil data bases: The Committee discussed several components of soil data bases; such as descriptions, characterization data, interpretations, national resource inventory, on-site investigation reports, and geo-information systems. Some of these components are computer compatible, others are not. The responsibility for the creation and maintenance of soil data bases should be identified for the states and region. Discussion in the 1981 National Soil Survey Work Planning Conference and the recognition of a Basic Soil Services within the SCS are indicators that changes to accommodate new technology are being implemented. Communication of activities and plans are needed throughout the Northeast U.S. as evidenced by the questions regarding digitizing, computers, and map display. The discussions led to Recommendation 3.

Recommendations:

1. Terminate Committee on Post-Mapping Role of Soil Scientists.
2. The TSC appoint a soil data base management task force for the Northeast.
3. A committee on computers in soil survey be appointed for the 1984 Regional Meeting.

COMMITTEE
EVALUATING SOIL MAP QUALITY

Committee Members:

W. E. Hanna, scs, NY (Chairman)	R. L. Googins, SCS, V A
w. J. Edmonds, VPI&SU (Vice-Chairman)	T. A. Johnson, SCS, NTC
D. F. Amos, VPI&SU, VA	K. R. Olson, Cornell Univ., NY
D. A. Darling, SCS, NTC	O. W. Rice, Jr., SCS, NTC
C. F. Eby, SCS, NJ	J. C. Sencindiver, Univ. of WV
W. J. Ellyson, SCS, WV	R. A. Shook, SCS, CT
J. A. Ferwerda, SCS, ME	

Background :

High quality soil surveys have been a basic objective of the soil survey program since its beginning in 1899. Since that time, we have developed many procedures, including some standards and specifications for making high quality surveys. We have not, however, developed any systematic procedure for measuring the quality of the soil survey itself. With more and more use being made of soil surveys involving legal requirements (zoning ordinances, sanitation laws, land use, etc.), it is imperative that we develop standards for measuring quality and thus the credibility of our soil maps.

Committee Charges:

1. Determine what the necessary characteristics and attributes are of a high quality order 2 survey.
2. Determine how we measure and how we express the degree with which soil surveys conform to those attributes and characteristics.

COMMITTEE REPORT

General

Before presenting the Committee report' and recommendations, a few general comments are in order. Committee opinion has been somewhat divergent as to the kind of standard **and procedure to apply to judge soil map quality.** Some have indicated that adequate standards (NSH and Soil Survey Manual) already exist and that a new quantitative standard would add little and not necessarily be desirable. In order to clarify opinion concerning a quantitative standard, a questionnaire was sent to Committee Members and additional Soil Scientists (see Appendix 1). From the questionnaire and other Committee Members' comments the following are some points of general agreement:

- A quantitative standard for assessing soil map quality is desirable (better than 2 to 1 margin in favor **as per questionnaire**).
- **Any system or** method that assesses map quality should have a strong interpretative bias -- "utilitarian" **correctness** of the map to meet the survey objectives.
- The method or standard be flexible enough to account for the objective and intensity of the survey and complexity of the landscape.
- Individual States should develop both policy and procedure for assessing map quality with regional or Nation81 coordination or approval; or the National office develop policy and procedure but allow States considerable flexibility in interpreting the standard and applying the procedure.
- The accuracy of soil maps should be judged by Soil **Scientist** (only **Soil** Scientists were polled).
- Time is an obvious constraint in evaluating soil maps; thus, an evaluation **system** that can be satisfactorily applied in about a half-day to 1 day to **assess** an average-size map sheet (a portion of) would be desirable.
- Some consensus that a simple error rate scheme may be more efficient than a detailed statistical approach for evaluating mapping.

Charges

Most of the Committee's attention has been directed toward Charge 2 -- developing a method for assessing **map** quality rather than determining the actual standard that should be reached as implied in Charge 1. The charges indicate we are assessing soil survey quality; however, the primary intent of the Committee appears to be the development of methods for evaluating soil map quality as stated in the Committee title.

Charge 1

"Determine attributes of a high quality order 2 survey."

John Ferwerda, Maine, has provided an outline of the requirements of a high quality survey. This outline, modified slightly **as per** Committee Members' comments, is as follows:

"A high quality soil survey meets the needs for **which** it is made, and has the following attributes:"

- (1) Soil maps are accurate, legible and of correct scale for the complexity of the soil landscape and objective of the survey.
- (2) The map base is of high quality, and cultural features and other **nonsoil** information is clear and accurate.
- (3) Map units are properly described and designed to fit natural landscape features, are **consistently** delineated and meet the needs of the survey.
- (4) Map units are correctly interpreted and these interpretations fulfill the objectives of the survey.
- (5) **Classification and** correlation of the soils conform to National Cooperative Soil Survey standards.
- (6) Data, both laboratory and field, is sufficient to support classification and interpretation accuracy.
- (7) The soil survey manuscript (publication) **is** clear, concise and easily understood by users.

Recommendations - Charge 1

That we accept the above proposed standards as partial fulfillment of Charge 1. When a quantitative method(s) **is** established for assessing map quality, that Charge 1 be made more specific in relation to that standard. The quantified value at which we can say a soil map or soil survey is of high quality and meets the narrative standards.

Charge 2

"Determine how to measure and express the degree with which soil surveys conform to the attributes and characteristics of a high quality survey."

As indicated previously, the Committee's efforts have dealt mostly with this charge, more specifically with the aspect of soil map quality. The procedure to evaluate map quality appears to fall into 3 areas: (1) accuracy of map unit identification and map unit boundary placement (Appendix 2), (2) cartographic accuracy (Appendix 3), and (3) base map accuracy (Appendix 4).

Four quantitative methods have been identified for assessing map quality.

- (1) Maine's proposed method

- (2) New York's proposed method - Provides for an evaluation of map sheets based on the magnitude of error (class difference for soil features at variance from the norm) and number of errors (number of **minimum-size** delineations in error). See Appendix 2b for details of this method.
- (3) Cornell's International Soil Surveys Evaluation Committee's method - Utilizes a stratified random sampling technique that evaluates the purity (similar soils) of the mapping and the number of strongly **contrasting** soils (**binominal** test).
- (4) Virginia's method - Nested analysis.

Recommendations - Charge 2

1. That West Virginia, New York, Maine, New Jersey, Connecticut, and Pennsylvania field test above proposed quantitative methods for feasibility of application. The kind of survey and survey areas tested will be determined by the state representatives. Proposed assignments, with **tentative** acceptance from states, are as follows:

West Virginia - (active survey - will assess two methods in the same survey area).

New York - (active survey - 3 methods).

Maine - (active survey - 3 methods).

New Jersey - (older published survey - 2 methods).

Connecticut - (older published survey - 2 methods).

Pennsylvania - (older published survey - 2 methods).

The Committee Chairman will provide each state with the methods to be tested. Test results, including advantages-disadvantages, effectiveness, time requirements, will be reported to the Committee 3 Chairman six **months** prior to the next Work Planning **Conference** (Summer-1984) for summation.

2. Other states within the region are **encouraged** to further develop, define, and quantify any methods they may be using for evaluating soil survey quality. **These methods, with an accompanying evaluation, be provided to Committee 3.**
3. **That Charge 1 be made more specific in relation to any quantitative method that is found acceptable for application.**
4. **That Committee 3 be continued and be assigned the charge of evaluating the above test results. The Committee vice-chairman be asked to serve as Committee chairman for the next Northeast Cooperative Soil Survey Conference.**

QUESTIONNAIRE - RESPONSE SUMMARY

The following is a summary of the responses to the questionnaire concerning soil map quality. Numbers at the left indicate those having a similar response. (Response rate -- 20 out of 41.)

1. Some Soil Scientists have indicated that a set of quantitative standard that judges a soil map on a "acceptable-unacceptable basis is undesirable. Do you agree or disagree with this?--Additional comments.

Response
No.

- 14 - Disagree, a quantitative standard is desirable.
- 6 - Agree that a set quantitative standard is undesirable.

Additional Comments

- 3 - Quantitative standard must be tailored to the objectives of the survey, quality will vary with complexity of the landscape and detail required.
- 3 - Inflexible standard would be undesirable.
- 3 - Cannot be a strict quantitative standard, must involve a qualitative aspect because mapping is not completely supported by statistical sound scientific data. Art vs. Science.
- 1 - Quantitative standard is absolute must; we must believe in scientific method with a systematic quantitative approach or soil survey will remain mediocre and eventually decline.
- 1 - Should be a quality range, not just an acceptable-unacceptable answer.
- 1 - Quantitative standard not as important as better training of soil scientists which will lead to better quality maps.

2. a. What is the basis for user confidence in soil maps at the present time?

- 5 - On faith, uninformed accept soil survey at face value, many believe what is published by Government or Universities.

APPENDIX 1

- 4 - On past experience in **use** of soils information or from knowledge or other satisfied **users**.
 - 2 - Professional users (such as Engineers) regard soil survey as a guide, nonprofessionals regard as **absolute**.
 - 2 - Users do not read map unit descriptions close enough, thus do not understand inclusions and expect higher purity in map units than **is** realistic.
 - 2 - Accurate line placement and legibility make visual impact on user, line placement is key to user's confidence.
- b. Would a user's confidence be greater if it is known that soil maps **are** judged **against** a quantitative standard?

- 9 - **Yes**.
- 9 - **No**, user confidence not greatly affected by knowing soil map quality is judged against a quantitative standard.

Additional Comments

- 4 - Most people probably assume there is quality control (and there is) or a standard.
 - 2 - User only wants to know there is quality control, not the method.
 - 1 - Explanation of quantitative standard in soil survey text would be difficult for most user's understanding.
 - 1 - Statement should be added to soil survey text explaining method of quality control.
3. If a soil map is judged and stated to have a certain degree or level of "Correctness" in relation to a set standard of "complete" correctness (70, 80, 90% correct, etc.) -- will the **user** be left wondering if he is dealing with the *correct" or "incorrect" part?
- 9 - Yes, user **may** wonder if he is dealing with the incorrect part if related to "complete" correctness. Some indicate such a quantitative appraisal should an in-house standard.

APPENDIX 1

- 6 - No, doubt that user will be greatly bothered by an expression of the degree of "correctness," it is better that he be made aware of the limitations of soil maps.
- 4 - It is important to have good map unit descriptions which clearly describe the similar and dissimilar soil components (inclusions).
- 1 - Grading surveys should have the effect of moving surveys to a higher level.
- 1 - Correctness poor choice of words -- probabilities is better.

4. At the present time, are we doing an acceptable job of adequately documenting and stating the accuracy of soil maps in relation to Nation81 standards?

- 11 - No, we are not doing an adequate job of documenting the accuracy of soil maps.
- 4 - Doing an acceptable job, but room for improvement.
- 2 - Yes, we are doing an acceptable job of documentation.
- 2 - Not doing an acceptable job of gathering data or documenting the composition of map units.
- 1 - Varies from state to state.
- 1 - Should not worry so much about stating accuracy, but how to improve accuracy.

5. Who should judge the accuracy of soil, maps?

- 7 - Soil Scientists (all levels who have responsibility and field experience).
- 4 - State Soil Scientist or Experiment Station Leader and Party Leader.
- 3 - Party Members -- Party Leader -- State Soil Scientist.
- 3 - Soil Scientists first and users second.
- 2 - User.

APPENDIX 1

- 1 - Soil scientists for technical accuracy, and users such as District Conservationist, and Planners for interpretive aspects.

6. Could a standard that sets a minimum level for accuracy have a negative effect on map accuracy?

(1) PROCEDURE FOR EVALUATING THE ACCURACY OF MAP UNIT IDENTIFICATION AND BOUNDARY PLACEMENT

This aspect of map evaluation is the most important and also the most difficult to judge and quantify.

Two methods, Maine's (Appendix 2a) and New York's (Appendix 2b), are presented for assessing the adequacy of map unit identification and line placement. Both methods rely on procedures commonly used at present to evaluate mapping, including:

In-office; stereoscope review and check against topo maps and available geology maps (will assist in determining errors in line placement, slope designation and identification of parent material).

In-field; 2 or 3 random transects, and road traverses and accompanying stops. The transects will also allow evaluation of map unit design in relation to natural landscape components. **Characteristics** of the map units observed in the field are evaluated against the map unit description (the map unit description is the basis for judging the adequacy of map unit identification).

MAINE'S METHOD:

APPENDIX 2a

This method is proposed by John **Ferwerda** and provides a simple error rate per square inch area of the field sheet. Ten items are **evaluated** and weighted for the seriousness of the error. This method combines both the evaluation for cartographic quality and map unit identification-line placement accuracy. Also evaluated is the adequacy of the map unit descriptions. A 10 to 20 percent area of the map sheet is randomly selected for inspection. The following table shows the items inspected and weight given to each item. The error score is totaled and compared to a previously established tolerable error limit.

—
y

- 3. Detail on map not adequate
- 4.
- 5.
- 6.
- 7.
- 8.

NEW YORK'S METHOD(S) (1a and 1b): This method is explained fully on pages 3-12. There are 2 versions of this method, 1a and 1b.

General -

- A randomly selected square mile area of a field sheet is evaluated for the number and magnitude of errors.
- Soil features rated most important for most interpretations provide the basis for evaluation. They include -- depth to bedrock or impervious layer, natural drainage class (moisture regime), flooding, family textural class, slope, stoniness or rockiness, and surface texture.
- Magnitude of error -- expressed as the class difference for soil features (above) that are **at** variance from what is **al-**lowed in the map unit (variances from the norm). Consideration is given to similar soils as allowed in map unit design (Chapter 5 - New Soil Survey Manual).
- Number of errors - expressed **as** the number of minimum-size delineations in error. This could be expressed as acres or hectares, but any area in error smaller than the **minimum-**size delineation is an inclusion; thus not judged as a "error."
- For Method **1a**, the number of class variances outside the norm **in** relation to the number of deviations (number of minimum-size delineations in error) provides a " **acceptable-**unacceptable answer to map quality. See conceptual model and table in Appendix on pages 3-13 and 3-14.
- Method **1b** utilizes the same approach as 1a but assigns penalty points to the degree of error (number of class variances) and number of errors. The penalty points are totaled for the square mile area -- a certain maximum level of penalty points serve to judge the mapping unacceptable, or the **number** of points can be used to give a " expression of the degree of accuracy to the map.
- Additional comments: At a scale of **1:15,840**, a square mile area could potentially have about 320 minimum-size delineations; obviously no map would attain this number (nor would we want it **to**) -- it is not intended that each potential minimum-size delineation be examined in the field but rather that the present methods previously outlined be followed. We are judging the mapping "**as** we would have mapped it" -- do map unit boundaries follow natural **landform** breaks, etc.? In-office stereoscopic may lead us **to** transect areas

where the mapping appears questionable (thus not a randomly selected transect) or where landforms provide a more varied array of soils. The square mile area is evaluated in a reasonable time period.

Advantages of New York Method (1a and 1b)

- Could be used by evaluators not familiar with the area.
- Identifies those soil features that are important to the functional quality of a soil map.
- Can be objectively applied.

Disadvantages of New York Method (1a and 1b)

- May be too time consuming to apply in the field.
- Obtaining a statistically reliable sample for evaluating the potential number of **minimum-size** delineations in a square mile area **may** not be feasible.
- Method is somewhat inflexible as presented.

Method 1a and 1b

Specifics - New York Method

The Standard for Soil Map Adequacy

The soil mapping activity carried out by soil scientists within the framework of the National Cooperative Soil Survey (**NCSS**) is in reality the art of-

Making consistent decisions about the acceptability of soil maps must be based upon a predetermined decision about allowable differences. There are two deviations from the norm for soil maps that must be evaluated to determine if mapping is acceptable. First, the number of classes of soil features that an area in question is in variance from the norm. As an example, consider an area mapped as a B slope phase (3 to 8 percent) and it is slightly in an

A slope phase say 2 percent. An evaluator would not determine the map unacceptable based upon this slight variance. If, on the other hand, the slope of the area in question is dominantly 20 percent, the evaluator will determine this deviation to be unacceptable.

The second deviation that must be evaluated concerns the number of errors. If the investigator of the 'mapping discover's only one place with dominantly two percent slopes, (of a B phase map unit), the evaluator would determine the map to be acceptable. On the other hand, if the evaluator found that 25 places on the map had the slope phase slightly out of the range, he would determine the maps as unacceptable. The relationship of the number of deviations to the degree of the deviations is shown as a conceptual model in Figure 1.

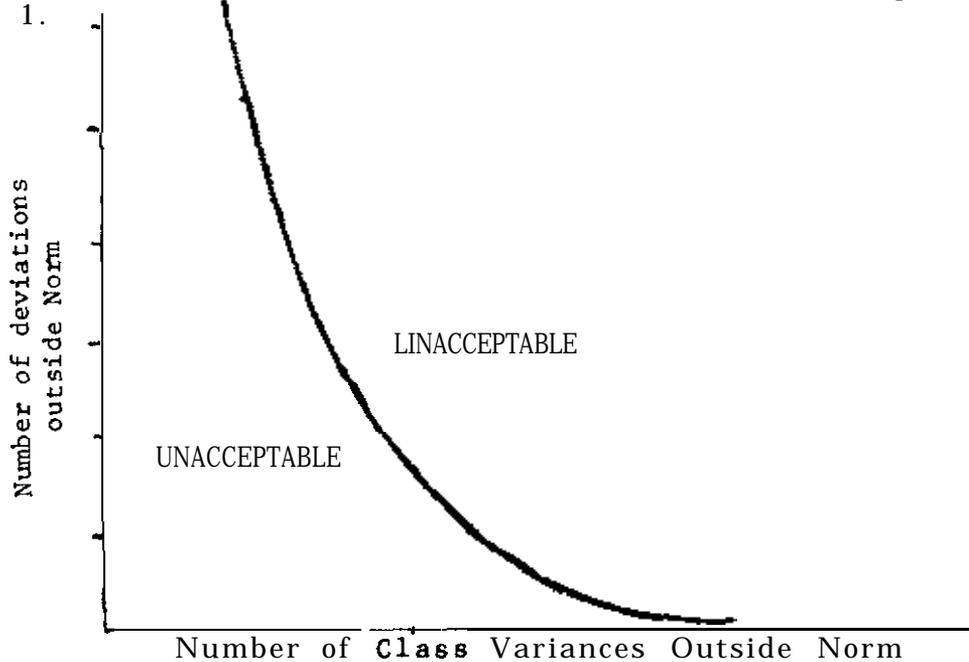


Figure 1. Relationship of classes of deviations outside the norm to number of classes outside the norm.

In order for the units along the axis in' Figure 1 to have meaning, the units in the following table will be used to guide mapping acceptability:

TABLE
NUMBER OF CLASS VARIANCES AND SIZE OF VARIANCES ALLOWABLE
FOR CERTAIN SOIL FEATURE CLASSES

<u>Soil Feature Class</u>	<u>No of Class Variances</u>	<u>Method la</u> Number of Equivalent Minimum-Size Delinea- tions Per Square Mile Having Indicated Variance to be Unacceptable	<u>Method lb</u> Penalty Points per Min-Size Delineation in Error
Depth to bedrock or impervious layer	1	5	1
	2	2	2
	3	1	5
Natural Drainage Class	1	5	1
	2	2	2
	3	1	5
Flood hazard	1	2	10
Family textural class	1	8	1
	2	2	2
	3	1	8
Slope	1	8	1
	2	3	3
	3	1	8
Stoniness, boulderiness , rockiness	1	10	1
	2	2	2
	3	1	5
Surface texture	2	10	1
	3	5	2
			Total points in sq. mile evaluated

125

Application

The standards set forth in this document will be used in determining map acceptability. Presume that in checking a map, the evaluator picks at random the northeast quarter of a randomly-selected field sheet. In that quarter of the map is a 40-acre delineation of **Mardin** silt loam, 3 to 8 percent slopes. After examining the area it is apparent that the area is dominantly **Volusia** silt loam, 3 to 8 percent slopes. The minimum-size delineation for this msp (scale 1:15,840) is about 2 acres. This means that there are about $40 \div 2 = 20$ minimum-size areas that should have been mapped one drainage class better. This is not an allowable variance according to the Table, thus the map is unacceptable.

In another place the evaluator picks at random, a square mile test area of mapping in a mountainous area where the minimum-size delineation is stated to be 20 acres. In this area, the evaluator judges that there is a 10-acre area that could be delineated as a soil on the legend that is two classes of bedrock in variance with the norm (i.e., **Hollis** vs. **Charlton**) in one part of the square mile test area*. The evaluator finds a 40-acre area in the other part of the square mile where the slope is one slope class less steep than the stated slope class. In the first instance, the variance is smaller than the minimum-size delineation and is not considered a variance. In the second place, the area represents two **minimum-size** delineations and is within the **acceptable** range of the **scheme** in the Table. The map is acceptable.

Guidelines for making a **judgement** about **map** acceptability are difficult to provide because there are many soil features that make up the soil that is mapped which **causes** many possibilities for a variance to occur. The **scheme** offered in this Appendix should be considered a guide to judging map acceptability and used in that way.

(2) PROCEDURE FOR EVALUATING THE CARTOGRAPHIC QUALITY OF SOIL MAPS.

Two methods are presented that give a simple estimated error measure of the cartographic quality and the accuracy of non-soil information on field sheets. Both methods utilize a random sample (about 15 to 20 percent) for in-office inspection of completeness, **neatness**, conformity of cultural features, **joining**, etc. In some instances, the items inspected are viewed against topo maps or with a stereoscope to determine accuracy. The estimated error value compared to the error rate for maps that have been judged cartographically acceptable provides a guide for **accepting** or rejecting the cartographic aspects of a map.

METHOD 1 is essentially the method in Section 603.2(b). Part II, NSH for random sampling of finished map sheets to determine the estimated error rate. The number of errors recorded for each item evaluated, divided by the number of soil lines crossed by diagonal lines from the sample cell corners provides the estimated error value. (See Section 603.2(b), NSH, for complete explanations.) The evaluation record form and grid to locate random cells for finished map sheets will require modification for field sheet evaluation. The items reviewed and method are (with example numbers) as follows:

<u>Item Evaluated</u>	<u>No. of soil areas with errors (example numbers)</u>
a) Missing or illegible symbol, symbol not conforming to ID Legend, cultural and special symbols not conforming to Form 37A.	1
b) Two different symbols in same delineation.	0
c) Mismatched boundaries or symbols between sheets.	1
d) Unclosed soil boundaries, common boundaries.	0
e) Incorrect labeling of cultural features, inaccurate location of cultural features, omission of cultural features and other features that should be shown. (Check made against topo map, roadmap and/or with stereoscope.) (Each inaccuracy counts as one error.)	1

APPENDIX 3

<u>Item Evaluated</u>	<u>NO. of soil areas with errors (example numbers)</u>
f) Number of soil lines crossed by NW-SE diagonal.	55
g) Number of soil lines crossed by NE-SW diagonal.	45
Est. error rate = $\frac{(a)+(b)+(c)+(d)+(e)}{(f) + (g)}$	$= \frac{3}{100} = 0.03$

For map finishing, an estimated error rate less than or equal to 0.02 is generally **recognized as** being in the acceptable range. Thus, if the same acceptability level were used for field sheets, the 0.03 error rate in the example would give a marginal rating to the sheet.

METHOD 2 is based on a suggestion from a couple of Committee Members that a simple error percentage be assigned to cartographic items similar to those that Maine has outlined for inspection during field reviews. Again, a 15 to 20 percent random sample is selected for inspection. In many instances the total number of observations can be estimated. The review items evaluated (with example numbers) are on the following page:

APPENDIX 3

<u>METHOD 2:</u>	<u>Item</u>	<u>Total No. of Observations in Sample Area</u>	<u>Number of Errors</u>	<u>Percent Error</u>
	1. Map unit boundaries closed, map units identified, common boundaries.	60	2	= 3.3
	2. Map unit identified, different map unit symbols in the same delineation	60	2	. 3.3
	3. Symbols conform to current ID Legend	60	1	= 1.6
	4. Nap unit delineations neat and clear symbols legible.	60	3	= 5.0
	5. Soil boundaries joined with adjacent field sheets.	20	2	= 10.0
	6. Cultural features and symbols shown conform to SCS-37A.	20	0	= 0
	7. Correct location and proper labeling of town and other boundaries, roads, other cultural features. (Check against topo maps and roadmaps.) (No of features in sample check.)	10	1	= 10.0
	8. Accurate location and labeling of streams and rivers. (Check against topo map and with stereoscope.)	10	0	= 0
	9. Omission of cultural features and streams that should be shown. (Check against topo map and with stereoscope.) (No. missing.)	15	1	= 7.0
	10. Scale of map, north arrow, acreage reported, mappers' name or initials, other survey information that is required are those shown. Total check	8	0	= 0

$$\text{AVERAGE ERROR RATE FOR FIELD SHEET} = \frac{\text{Total Error \%}}{\text{Total No. of Items Inspected}} = \frac{40.2}{10} = 4.0\%$$

The above percentage figure has little meaning unless related to the value for an acceptable level.

APPENDIX 3

Advantages - Method 1 is quick; **works** well on compiled atlas sheets; easier to use by **nonsoil scientists**.

- Method 2 accounts for joining; acreage reported, etc., as well as cartographic items in Method 1; adapted to field sheets.

COMMITTEE 

IMPROVING DESCRIPTIONS OF MAP UNITS

Committee charges:

Charge 1. Develop an **outline** of minimum items to be discussed in the map unit description; the order in which they should be discussed; and optional items to include.

Charge 2. Develop examples of map unit descriptions illustrating the outline developed in Charge 1.

Charge 3. Evaluate statements about behavioral data, particularly relative to urban interpretations and develop examples that will improve those statements (i.e. ways to overcome limitations).

Charge 4. Recommend implementation or actions to be taken on committee report.

Committee Members:

Karl H. **Langlois** Jr. (Chairman)
James C. Baker (Vice-Chairman)
Paul A. Beers
Dale F. Childs
Kenneth **J. LaFlamme**
James A. Giuliano
Garland H. **Lipscomb**

Harvey D. **Luce**
Henry R. Mount
Amos L. **Oleson**
James C. Patterson
Nobel K. Peterson
Dean D. Rector
Walter E. Russell

Background

The map unit description is that part of the soil survey where the soil scientist can fully explain what he knows about soils. He can discuss their setting, important properties, and how they respond to certain uses and management practices. Information presented by the map unit description must be informative, practical, accurate, and applicable to the survey area. All too often, map unit descriptions do not include as much information as they could. Many map unit descriptions lack adequate explanation of how the soils occur on the landscape; do not fully list or explain soil limitations; and often do not discuss management practices that can overcome limitations.

Guidelines which include content and examples of map unit descriptions are needed for authors of soil surveys. Also needed are guidelines which list management practices that can be used to overcome soil limitations, especially limitations for certain urban uses.

Committee members were initially contacted to review the Committee's charges and were requested to submit ideas and information relating to the charges. Examples for charges 1, 2, and 3 were developed and sent with a corresponding worksheet to committee members. Committee members responses were reviewed and incorporated into the examples.

Charge 1. Develop an outline of **minimum** items to be discussed in the map unit description; the order in which they should be discussed; and optional items to include.

OUTLINE FOR WRITING MAP UNIT DESCRIPTIONS
FOR
SOIL SURVEY MANUSCRIPTS AND DESCRIPTIVE LEGENDS

- I. Map symbol and name of map unit.
- II. Description of Soil Features and Setting:
 - A. Major features
 1. Depth
 2. Slope name
 3. Drainage class
 - B. Special surface features
 1. Stones, boulders
 2. Rock outcrops
 3. Coarse fragments
 4. Gullies
 5. Dissecting of drains
 6. seeps
 7. Flooding, **ponding**
 8. Severe erosion or inclusions of severely eroded areas
 9. Other significant surface features
 - C. Shape of individual areas
 - D. Size of individual areas
 - E. Setting
 1. **Slope**
 - a. configuration
 - b. length
 - c. pattern
 - d. evenness
 - e. aspect
 2. Description on the landscape
 - a. Appearance and position on the landscape
 - b. Relationship of soils to each other in a complex or association
 - F. Percent of slope (if not part of correlated name)

- G. Statement explaining why the unit is a complex or undifferentiated group
 - H. The percent of each named soil in a unit that is a complex, association, or undifferentiated group
- III. Description of profile
- A. Color, mottles, and texture for ---
 - 1. Surface layer
 - 2. Subsurface **layer**
 - 3. Subsoil
 - 4. Substratum
 - B. Depth to bedrock (if **described** in typical **pedon**)
 - C. Similar inclusions
- IV. **Inclusions (constrasting)**
- A. Series name (only if on the legend) or description
 - B. **Size**
 - C. Percent (give for each inclusion, if different)
 - D. Location of each in the landscape
 - E. Describe and locate small included areas that are only in certain parts of the survey **area**.
- V. Soil properties:
- A. Permeability
 - B. Available water capacity
 - C. Organic matter content (optional)
 - D. Natural fertility - also unusual plant nutrient deficiencies or poor response to soil **admendments**. (optional)
 - E. **Soil reaction** (optional)
 - F. Surface runoff (**optional**)
 - G. Erosion hazard
 - H. Tilth and workability (optional)
 - I. Depth to bedrock or other significant layer such as dense basal **till**
 - J. Water table if significant, or wetness

- K. Depth of root zone (optional)
 - L. Potential frost action
 - M. Shrink-swell potential
 - N. other significant **soil** property
- VI. Use of the soil
- A. Current use
 - B. Potential use for a crop requiring certain physical characteristics (such as cranberries)
- VII. Use for cultivated crops
- a. Suitability
 - B. Hazards
 - 1. Erosion
 - 2. Soil blowing
 - 3. Flooding
 - C. Limitations
 - 1. Rock fragments
 - 2. Wetness
 - 3. Slope
 - 4. Droughtiness
 - 5. Root zone
 - 6. Surface crusting
 - 7. Reaction
 - 8. Fertility
 - 9. Others
 - D. Other management concerns
 - E. Practices to reduce hazards and overcome limitations
 - F. Important limiting and non-limiting inclusions
- VIII. use for pasture
- A. **Suitability**
 - B. Hazards (see **VII.B.**)
 - C. Limitations (see **VII.C.**)

- D. Other management concerns
 - 1. overgrazing
 - 2. compaction
 - 3. **Hoofs** cutting sod
 - 4. Others
- E. practices to reduce hazards and overcome limitations
- F. Important limiting and non-limiting inclusions
- IX. Use for woodland
 - A. Suitability (optional)
 - B. Productivity
 - C. Limitations (from Table **F**)
 - D. Other management **concerns**
 - E. Methods of overcoming limitations
 - F. Important **limiting** and non-limiting inclusion⁸
 - G. Dominant plant communities
- X. Other uses (optional)
 - A. Recreation
 - B. Wildlife
 - C. Others**

For one or more of the above items give:

 - 1. Suitability
 - 2. Limitations (from Table)
 - 3. Other management concerns
 - 4. Methods of overcoming limitations
 - 5. Important limiting and non-limiting inclusions
- XI. Urban uses
 - A. Dwellings
 - B. Septic tank absorption fields
 - C. Local roads and streets
 - D. Shallow excavation

E. Lawns, landscaping and golf fairways

F. Others

For one or more of the above items give:

1. The type of limitation (from table - such as flooding, depth to rock, etc.),
2. The corrective measure (drainage, landshaping, etc.), and
3. The important limiting and non-limiting inclusions

XII. Soil groups

A. Capability class and subclass

B. Woodland ordination symbol

C. Others

Note: Items I through VI are required in map unit descriptions but subheadings are optional. Items VII through XII are optional. Parts of these items should only be used when the factor is important to the map unit and the survey area. For instance, rock outcrops (II.B.2.) should only be discussed if there actually are rock outcrops in the unit.

Charge 2. Develop examples of map unit descriptions illustrating the outline developed in Charge 1.

Examples of Map Unit Descriptions

Consociation
Complex
Undifferentiated Group
Association

The attached map unit **descriptions** are examples of the format and content to be used when writing descriptions of a **consociation**, complex, undifferentiated group, or association. These descriptions should be used in conjunction with the "Outline for Writing Map Unit Descriptions" and "Urban Uses of Map Units."

The examples of the **consociation** and complex include the use of tabular format for the profile **description** and the soil properties. The examples for an undifferentiated group and association show the use of paragraph format throughout the map unit descriptions. The use of tabular format is optional, but if it is used for a survey area, It must be used for all map unit descriptions.

Map Unit Description Example 1

Consociation

Ap Alpha silt loam. This soil is very deep, nearly **level**, and moderately well drained. It is on the tops of broad ridges and small hills and is at the base of long, gentle slopes. The areas **are** long and **narrow**, oval, or irregularly shaped. They range from 10 to 40 acres. Slopes typically **are** smooth and range from 0 to 2 percent.

The typical sequence, depth, and composition of the layers of this soil are as **follows**:

Surface layer:

Surface to 3 inches, grayish brown silt loam

Subsurface layer:

3 to 14 inches, light yellowish brown silt loam

Subsoil:

14 to 25 inches, light yellowish brown sandy loam with brown mottles

25 to 38 inches, yellowish brown, very firm sandy loam with brown and gray mottles

38 to 51 inches, strong brown sandy loam with red mottles

Substratum:

51 to 70 inches or more, strong brown sandy clay loam with red and gray mottles

In some map units a layer of sandy **clay** loam is above the very firm part of the subsoil.

Included with this soil in mapping are small areas of well drained Beta and Delta soils, and poorly drained **Tau** soils. The Beta and Delta soils are on small convex areas in various parts of the unit and make up about 10 percent of the unit. The **Tau** soils are in **swales** and shallow drainageways and comprise about 5 percent of the unit. In some areas this soil does not have a very firm part in the subsoil.

Soil properties!

Permeability: Moderately rapid in the surface layer and upper part of the subsoil, slow in the very firm part of the subsoil, and moderate in the lower part of the subsoil and in the substratum.

Available **water** capacity: Moderate

Organic matter content: **Low**

Natural **fertility**: Low

Soil reaction: Extremely acid through strongly acid throughout, but varies in the surface layer because of local liming practices.

Surface runoff: Slow

Erosion hazard: Slight

Water Table: A seasonal high water table is perched above the very firm part of the subsoil in winter and early spring.

Root Zone: Typically extends to a depth of about **25** inches.

Shrink-swell potential: **Low**

Most areas of this soil are in woodland. Other areas are used for cultivated crops and pasture.

This soil is moderately **well** suited to cultivated **crops**. The **seasonal** high water table and the very firm part of the subsoil are the main **limitations** for crops. **This soil is** easily tilled when moist, but the seasonal high water table sometimes delays planting and harvesting. A drainage system will help to reduce this delay, especially a subsurface drainage system installed above the very firm part of the subsoil. This requires special design in areas where the upper part of the subsoil is **very** firm. The surface layer of the soil in cultivated areas often has a thin crust after heavy rains. This crust reduces the rate of water infiltration and increases runoff. Plant roots are restricted by the very firm part of the subsoil and do not receive sufficient water during dry periods. Some areas do not have a very firm subsoil and plant roots in those areas extend to a depth of 60 Inches or more. Using cover crops, including grasses and legumes in the cropping system, and using a conservation **tillage** system that leaves some or all of the crop residue on the surface are practices that help to reduce crusting, maintain or **increase** the organic matter content of the surface layer, and improve infiltration.

This soil is well suited to hay and pasture. The very **firm** part of the subsoil and the seasonal high water table restrict the root growth of some legumes. Grazing when the soil is too wet will compact the surface layer. Overgrazing reduces the quantity and quality of the forage. Deferred and rotational grazing, the application of lime and fertilizer, harvesting at the proper stage of plant growth, and weed and brush control are practices that help to increase the quantity and quality of feed and forage.

The potential productivity for trees on this soil is moderately high. Plant competition, the seasonal high water table, and restricted rooting depth are the major limitations. Seeds and seedlings survive **and** grow well if competing vegetation is controlled. The soil is soft when wet, restricting the **use** of heavy equipment to dry periods. Rooting depth is restricted by the very firm part **of** the subsoil, and some trees are uprooted during windy periods. Keeping thinning to 8 minimum helps reduce **uprooting**.

The **seasonal high water table is** the **main limitation of** these soils as a site for dwellings with basements. Installing **foundation** drains and sealing foundations will help to prevent wet basements. The included areas of Beta and Delta soils have few limitations for dwellings.

Low strength and the seasonal high water table are the main limitations of this soil as a site for local roads and streets. This soil is soft when wet, causing the pavement to crack under heavy traffic. **providing coarser grained subgrade** or base material helps to prevent damaged pavement caused by the low strength and the seasonal high water table. Installing drainage will help to prevent damage caused by the seasonal high water table.

The seasonal high water table and the slow permeability in **the** very firm layer of the subsoil limit the **soil** as a site for septic tank absorption fields. Special designs, such as enlarging the absorption field and using a wide, deep trench below the **distribution** lines, will help overcome the

effects of the water table and the permeability. Included areas of Delta soils have a very firm, slowly permeable layer in the subsoil which limits the soil as a site for septic tank absorption fields, and Beta soils have few limitations for this use.

The capability subclass is IIw.

Map Unit **Description** Example 2

Complex

MvC Monadnock-Lyman stony fine sandy loam, 8 to 15 percent slopes. This unit consists of strongly sloping soils on the tops and sides of hills and ridges. The Monadnock soils are generally at a slightly lower position on the landscape than the Lyman soils. Slopes **are** generally smooth, but a few areas are dissected by many small drainageways. Stones that are 5 to 40 feet apart are on the surface. The areas of **the** unit range from 10 to 100 acres. They consist of about 45 percent very deep, well drained Monadnock soils; 25 percent shallow, somewhat excessively drained Lyman soils; and 30 percent other soils. The Nonadnock and Lyman soils are so Intermingled that it was not practical to map them separately.

Typically, the Nonadnock soils are covered by a thin layer of partially decomposed and decomposed **leaves**, needles, and twigs. Under that layer, the typical sequence, depth, and composition of the layers of this **soil** are as follows:

Subsurface layer:

Mineral surface to 2 inches, gray fine sandy loam

Subsoil:

2 to 3 inches, dusky red fine sandy loam

3 to 13 inches, yellowish red and yellowish brown fine sandy loam

13 to 31 inches, light olive **brown** and olive **fine** sandy loam

Substratumr

31 to 36 Inches, olive gravelly fine sandy loam

36 to 60 inches or more,

areas of moderately well drained Sunapee soils and poorly drained Lyme soils in depressions and drainageways, and a few areas with no stones on the surface.

Soil properties:

Permeability: Monadnock soils--moderate in the surface layer and subsoil and moderately rapid in the substratum. Lyman soils--moderately rapid throughout.

Available water capacity: Moderate in the Monadnock soils and low in the Lyman soils,

Soil Reaction: Extremely acid to moderately acid

Depth to bedrock: **More** than 60 inches in **the** Monadnock soils and 8 to 20 inches in the Lyman soils.

Root zone: Same as depth to bedrock

Potential frost action: Low in the Monadnock soils and moderate in the Lyman soils.

Most areas of this unit are in woodland. A few areas are used for hay and pasture, and a few are used for community development.

The soils in **this** unit are poorly suited to cultivated crops. The main limitation is the stones on the surface. If these soils are cleared of stones, they are suited to cultivated crops. The main limitations for cleared areas are slope, an erosion hazard, and the low available **water** capacity and shallow rooting depth of the Lyman soils. In some areas bedrock

is close enough to the surface to interfere with **tillage**. Excessive erosion of the Lyman soils in this unit will expose bedrock. Most crops on the **Lyman** soils will show stress during dry periods. Slope is the main limitation for irrigation. using cover crops and grasses and legumes in the cropping system and using a conservation **tillage** system that leaves some or all of the crop residue on the surface are practices that help to control erosion and maintain the organic matter content of the surface layer. Contour **tillage**, grassed waterways, and diversions further help to control erosion. The included areas of Sunapee and Lyme soils have a seasonal high water table that sometimes delays planting and harvesting.

These soils are poorly suited to hay and pasture because of stones on the surface. The stones limit the use of equipment for pasture renovation, but use of a no-till system is practical for establishing or re-establishing hay or pasture. If cleared of stones, the soils are suited to hay and pasture, but the shallow depth to bedrock in the Lyman soils restricts the root growth of most grasses and legumes. Grazing when the soil is too wet will compact the surface layer. Overgrazing reduces the quantity and quality of the forage. Deferred **grazing** and using a planned grazing system are practices that help to increase the production of feed and forage and control erosion.

The potential productivity for trees on these soils **is** moderate, especially for shallow rooted trees. **Monadnock** soils have few limitations for trees. The main limitations for trees on the Lyman soils are the depth to bedrock and a high rate of seedling mortality. Bedrock restricts rooting

depth, causing the uprooting of some trees during windy periods. Keeping thinning to a minimum helps reduce uprooting. The rate of seedling mortality can be reduced by planting seedlings in **early** spring, allowing them to obtain sufficient moisture from spring rains.

Slope is the main limitation of the soils in this unit as a site for dwellings. The shallow depth to bedrock limits the Lyman soils as a site for dwellings, especially those with basements, and is difficult to overcome. The Monadnock soils in this unit are deeper to bedrock, making them better

Slope is the main limitation of the soils in this unit as a site for local roads and streets. The depth to bedrock is an additional limitation of the Lyman soils for roads and streets, and **low** strength is a further limitation of the Monadnock soils. Bedrock will generally be encountered during grading and land shaping. Building the roads and streets on the contour helps to overcome **the** slope. Providing coarser **grained**

Slope, along with the shallow depth to bedrock of the Lyman soils, limits this unit as a site for septic tank absorption fields. In some areas, the impermeability of the bedrock causes effluent from the septic system to seep to the surface on a lower part of the slope, either in areas of this unit or another unit.

The capability subclass is **VI_s**.

Map Unit Description Example 3

Undifferentiated Group

13B Groseclose and Poplimento silt loams, 2 to 7 percent slopes. **This** unit consists of very deep, gently **sloping**, well drained soils on broad ridgetops and on side slopes. Slopes are generally smooth and convex with few drainageways on side slopes. The **areas** are irregularly shaped or are long and narrow and range from 3 to **70** acres. Some areas consist mostly of Groseclose soils, some mostly of Poplimento soils, and some of both. **The Groseclose and Poplimento** soils were mapped together because they have no major differences in use and management. The total acreage of the unit **is** about 50 percent Groseclose soils, 35 percent Poplimento soils, and 15 percent other soils.

Typically, the surface layer of the Groseclose soils is dark yellowish brown silt loam about 8 inches thick. The subsoil is 54 inches thick and is generally yellowish brown mottled with brown and red. In sequence from the top it is silty clay, clay, and silty clay loam. The substratum is brownish yellow silty clay loam 5 inches thick. Bedrock is at a depth of 67 inches.

Typically, the surface layer of the Poplimento soils is dark yellowish brown silt loam about 7 inches thick. The subsoil is 37 inches thick. In sequence from the top it **is** strong brown silt loam, yellowish brown clay, strong brown clay, and reddish yellow clay. The substratum is a mottled

layer of reddish yellow, strong brown, and brownish yellow silty clay loam to a depth of 60 Inches or more. Many areas have been limed and the reaction of the surface layer and subsoil in these areas is slightly acid or neutral.

Included with this unit in mapping are small areas of moderately deep, well drained Garbo, **Wurno**, and Faywood soils and very deep, moderately well drained **Slabtown** soils, all of which make up about 15 percent of the unit. The **Carbo**, **Wurno**, and Faywood soils are on small convex areas throughout the unit. The **Slabtown** soils are in saddles and in the heads of drainageways. Rock outcrops comprise about 5 percent of some units.

Permeability is slow in the Groseclose soils and moderately **slow** in the Poplimento soils. Available water capacity is moderate in both soils. Surface runoff is medium. The surface layer is friable and easily tilled throughout a wide range of moisture content. Groseclose soils are low in natural fertility and Poplimento soils are medium. Organic matter content of the surface layer of both soils is moderately low. Reaction of the surface layer and subsoil is strongly acid or very strongly acid in the Groseclose soils and ranges from moderately acid to very strongly acid in the Poplimento soils. The soils have a moderate potential frost action and have a high shrink-swell potential in the subsoil. The rooting depth is at least 40 inches. The depth to bedrock is at least 50 inches.

Most areas of these soils are used for cultivated crops, A few areas are used for pasture, and a few areas are in woodland.

These soils are well suited to cultivated crops. Erosion is a hazard. The surface layer of these soils in cultivated areas often has a thin crust after heavy rains. This crust reduces the rate of water infiltration and increases runoff. The main management practices are using cover crops, grasses and legumes in the cropping system, crop residue use, and using a conservation **tillage** system that leaves **some** or all of the crop residue on the surface. All these practices help to reduce crusting, runoff, and erosion and help to increase **the** organic matter content of the surface layer. Terraces and contour **tillage** further help to reduce runoff and erosion.

These soils are well suited to hay and pasture. Grazing when the soil is too wet causes compaction of the surface layer and puddling on the surface. Overgrazing reduces the quantity and quality of forage produced and increases runoff and erosion. Deferred grazing and using a planned grazing system are practices that help to increase the production of feed and forage and reduce runoff and erosion.

The potential productivity for trees on these soils is high. These soils have few limitations that affect woodland management. The use of equipment, especially on trails, **will** generally disturb the surface layer and expose the subsoil, which is sticky and slippery when wet.

The high shrink-swell potential is the main limitation of the soils in this unit as a site for dwellings. Reinforcing footings and foundations and backfilling with sandy material help to prevent the structural damage caused

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by shrinking and swelling. The depth to bedrock in the included areas of Carbo, Wurno, and **Faywood** soils and a seasonal high water table in the **Slabtown** soils limits the unit as a site for dwellings, especially **those** with basements.

Low strength and a high shrink-swell potential are the main limitations of the soils in this unit **as** a site for local roads and streets. Providing a coarser **grained subgrade** or base material helps to prevent damaged pavement caused by the low strength and shrinking and swelling of the soil. In some map units a few areas of bedrock will **be** encountered during grading and land shaping.

The slow or moderately slow permeability limits these soils **as** a site for septic tank absorption fields. Increasing the area of the absorption field, digging deeper trenches under the distribution tile, and placing absorption fields on the contour will generally help to increase lateral and downward flow. In some map units a few areas of bedrock are close to the surface and will interfere with the installation of septic tank absorption fields and with the movement of effluent in the soil.

Capability subclass is **Iie.**

Map Unit Description Example 4

Association

Pmc **Peru-Marlow** association, **very** stony, 3 to 15 percent slopes. This unit consists of very deep, gently sloping and moderately sloping soils on the sides and tops of hills and mountains. The Peru soils are typically on the lower parts of slopes or in slightly **concave** areas. The **Marlow** soils **are** typically on the upper parts of slopes or in convex areas. Stones and boulders approximately 5 to 20 feet apart are prominent on the landscape. The areas of this "it **are** irregularly shaped and range from 30 to 300 **acres**. This unit consists of about 60 percent moderately well drained Peru soils, 20 percent well drained **Marlow** soils, and 20 percent other soils.

Typically, the surface layer of the **Peru** soils is very dark grayish brown fine sandy loam about 2 inches thick. The subsoil is mottled, yellowish brow" fine sandy loam, about 26 inches thick. The substratum is firm, mottled, dark yellowish brow" fine sandy loam to a depth of 60 inches or **more**.

Typically, the surface layer of the **Marlow** soils is black loam about 3 inches thick. The subsoil is dark reddish brow" and dark brow" fine sandy loam, about 26 inches thick. The substratum **is** very firm and brittle, dark grayish brow" fine sandy loam to a depth of 60 inches or more.

Included **with** this unit in mapping are poorly drained and very poorly drained soils, **some** of which are nearly level and some of which are

depressional, and in the center of some depressional areas are soils that are mostly organic material. These areas make up about 10 percent of the unit and are up to 20 acres each. About 10 percent of the unit consists of small areas of rock outcrop, areas on the sides of hills that are 1 to 60 inches deep to bedrock, and well drained Berkshire soils on hills and knolls. Some units have a higher percentage of **Marlow soils** than Peru soils.

The permeability **in** these Peru and **Marlow** soils **is** moderate above the substratum and slow or moderately slow In the substratum. The available water capacity of both soils is moderate. A seasonal high water table is perched above the **substratum** of these soils for brief periods during winter and spring and after prolonged rains. The seasonal high water table is generally in the Peru soils for a longer period than in the **Marlow** soils. The root zone extends to the substratum. Reaction of the soils ranges from extremely acid to moderately acid.

Most areas of these soils are in woodland. Some areas are used for pasture, and a few areas are cultivated.

The soils in this unit **are** poorly suited to cultivated crops, hay, and pasture. The main limitation is the stones on the surface. Areas of these soils that are cleared of stones are suited to hay and pasture. However, the soils in this unit are at a high elevation, which makes the growing **season** too short for most of the cultivated crops commonly grow" in the valleys. In some areas bedrock is close enough to the surface to interfere with **tillage**. Grazing when the soil is too wet till compact the surface layer. Overgrazing reduces the quantity and quality of forage produced, Deferred grazing and

using a planned grazing system are practices that help to increase the production of feed and forage and control erosion.

The potential productivity for trees on this unit is moderately high. These soils have few limitations that affect the management of woodland, but the rate of tree growth on these soils is generally slower on units at higher elevations than on those at a **lower** elevation. The included areas of poorly drained and very poorly drained soils are generally soft when wet, limiting the use of heavy **equipment**.

The climax vegetation on areas of this map unit is composed of sugar maple, beech, and hemlock. Some units have pure or mixed stands of red pine or Eastern white pine. In mixed stands of pine, the associated species generally consists of a **combination** of sugar maple, birches, basswood, red spruce, white spruce, or balsam fir. In areas that are not disturbed, the climax vegetation of sugar maple, beech, and hemlock will succeed the pine. In many areas the understory vegetation consists of viburnum, ladyslipper, or false **Solomons** seal.

These soils have few limitations if used as a site for paths and trails. Slope and the stones on the surface limit **the** use of the soils as a site for camp and picnic areas. Removing the stones and shaping the land will help overcome those limitations. Designing camp and picnic areas to conform to the natural **slope** and setting will help to keep land shaping to a minimum. The seasonal high water table of the **Peru** soils is an additional limitation for camp and picnic areas. Establishing diversions and drains that intercept

water from higher areas will help to overcome the limitation caused by the water table.

Slopes in the moderately sloping areas and the seasonal high water table perched above the substratum are the **main** limitations of **the soils** in this unit as a site for dwellings. Excavation for foundations is often difficult, especially when the soil is dry, because of the very firm substratum. Sealing foundations, installing foundation drains, and using diversions to intercept water from higher areas will help to prevent wet basements. Land shaping and grading will help to overcome the slope, although in some areas bedrock will be encountered. Erosion is a hazard in areas cleared for construction, but designing dwellings to conform to the natural slope and setting will help keep land shaping, and thus erosion, to a minimum. **Revegetating** during or soon after **construction** is completed will help to further reduce erosion. Included **areas** of Berkshire soils have few limitations for dwellings other than a slope limitation on moderately sloping **areas.**

Potential frost action is the main limitation of the soils in this unit as a site for local roads and streets. The soils are further limited for those uses by the seasonal high water table and the slope on moderately sloping areas. Providing drainage and replacing the upper layer of the soil with a more suitable base material help to prevent the damage caused by frost action. Building roads and **streets** on the contour will help overcome the slope **limitation.**

The seasonal high water table and the slow or moderately slow permeability of the substratum limit these soils as a site for septic tank absorption fields. Diversions and drains to intercept water from higher areas will help overcome the wetness limitation. Increasing the area of the absorption field and placing absorption fields on the contour will generally help to increase lateral and downward flow. **In some** areas, the impermeability of the bedrock or the slow or moderately slow permeability of the substratum **causes** effluent from the septic system to seep to the surface on the lower part of the slope, either in areas of this unit or another unit. Included areas of Berkshire soils have few limitations for septic tank absorption fields other than a slope limitation on moderately sloping areas.

A seasonal high water table limits the use of the included areas of poorly drained and very poorly drained soils as a site for dwellings, local roads and streets, and septic tank absorption fields.

The capability subclass is **VIIIs**.

As part of Charge 2, the Committee introduced the use of tabular format in map unit descriptions. The following examples A through E, are map units that include tabular format for the description of the profile and the soil properties. These examples were printed so that committee members could review map units that had several different types and styles of tabular format.

A

MvC--Monadnock-Lyman stony fine sandy loam, 8 to 15 percent slopes. This unit consists of strongly sloping soils on the tops and sides of hills and ridges. The Monadnock soils are generally at a slightly lower position than the Lyman soils. Slopes are generally smooth, but a few areas are dissected by many small drainageways. Stones that are 5 to 40 feet apart are on the surface. The areas of the unit range from 10 to 100 acres. They consist of about 45 percent very deep, well drained Monadnock soils; 25 percent shallow, somewhat excessively drained Lyman soils; and 30 percent other soils. The Monadnock and Lyman soils are so intermingled that it was not practical to map them separately.

Typically, the Monadnock soils are covered by a thin layer of partially decomposed and decomposed leaves, needles and twigs. Under this layer, the typical sequence, depth, and composition of the layers of this soil are as follows:

Surface layer:

Mineral surface to 2 inches, gray fine sandy loam

Subsoil:

2 to 3 inches, dusky red fine sandy loam
3 to 13 inches, yellowish red and yellowish brown fine sandy loam
13 to 31 inches, light olive brown and olive fine sandy loam

Substratum:

31 to 36 inches, olive gravelly fine sandy loam
36 to 60 inches or more, olive gravelly loamy sand

Many areas of this soil in the southeastern part of the town of Unity are loamy fine sand in the lower part of the subsoil and in the substratum.

Typically, the Lyman soils are covered by a thin layer of partially decomposed and decomposed leaves, needles, and twigs. Under this layer, the typical sequence, depth, and composition of the layers of this soil are as follows:

Surface layer:

Mine & surface to 1 inch, very dark brown fine sandy loam

Subsurface layer:

1 to 2 inches, brown fine sandy loam

Subsoil:

2 to 8 inches, dark reddish brown and reddish brown fine sandy loam
8 to 15 inches, dark yellowish brown fine sandy loam

Bedrock:

15 inches

Included with this unit in mapping are soils that have bedrock between the surface and a depth of 8 inches and a few areas of rock outcrop. These areas make up about 10 percent of the unit. About 20 percent of the unit consists of soils that are 20 to 60 inches deep to bedrock, well drained Marlow soils and somewhat excessively drained Herman soils on convex areas, moderately well drained Sunaoee soils and poorly drained Lyme soils in depressions and drainageways, and a few areas with no stones on the surface.

Important soil properties:

Permeability: Monadnock soil: -moderate in the surface layer and subsoil and moderately rapid in the substratum. Lyman soils-moderately rapid throughout.

Available water capacity: Moderate in the Monadnock soils and low in the Lyman soils.

Soil Reaction: Extremely acid to medium acid

Depth to bedrock: More than 60 inches in the Monadnock soils and 8 to 20 inches in the Lyman soils.

Root zone: Same as depth to bedrock

Potential frost action: Low in the Monadnock soils and moderate in the Lyman soils.

Most areas of this unit are in woodland. A few areas are used for hay and pasture, and a few are used for industrial development.

The soils in this unit are poorly suited to cultivated crops. The main limitation is stones on the surface. If this soil is cleared of stones, it is suited to cultivated crops. The main limitations for cleared areas are slope, an erosion hazard, and the low available water capacity and shallow rooting depth of the Lyman soils. In some areas bedrock is close enough to the surface to interfere with tillage. Excessive erosion of the Lyman soils in this

unit will expose bedrock. Most crops on the Lyman soils will show stress during dry periods. Slope is the main limitation for irrigation. Using cover crops and grasses and legumes in the cropping system and using a conservation tillage system that includes no-tillage, strip tillage, and stubble mulching are practices that help to control erosion and maintain the organic matter content of the surface layer. Contour tillage, grassed waterways, and diversions further help to control erosion. Individual areas of Sunapee and Lyme soils have a seasonal high water table that sometimes delays planting and harvesting.

These soils are poorly suited to hay and pasture because of stones on the surface. If cleared of stones, the soils are suited to hay and pasture, but the shallow depth to bedrock in the Lyman soils restricts the root growth of most grasses and legumes. Overgrazing and grazing when the soil is too wet will compact the surface layer. Overgrazing also prevents new growth of grasses and legumes. Deferred grazing, rotational grazing, and using proper stocking rates help to increase the carrying capacity of pastures and control erosion.

The potential productivity for trees on this unit is moderate. Monadnock soils have few limitations for trees. The main limitations for trees on the Lyman soils are the depth to bedrock and a high rate of seedling mortality. Bedrock restricts rooting, causing an uprooting of some trees during windy periods. Planting trees that have a shallow root system and keeping thinning to a minimum help to prevent uprooting. The rate of seedling mortality can be reduced by planting seedlings in early spring, allowing them to obtain sufficient moisture from spring rain?

Slope is the main limitation of the soils in this unit as a site for dwellings. The shallow depth to bedrock limits the Lyman soils as a site for dwellings, especially with basements, and is difficult to overcome. The Monadnock soils in this unit are deeper to bedrock, making them better suited to dwellings with basements than are the Lyman soils. Land shaping and grading will help to overcome the slope, although in most areas bedrock will be encountered. Designing dwellings that conform to the natural slope and setting will help keep land shaping to a minimum.

Slope is the main limitation of the soils in this unit as a site for local roads and streets. The depth to bedrock is an additional limitation of the Lyman soils for roads and streets, and low strength is a further limitation of the Monadnock soils. Bedrock will generally be encountered during grading and land shaping. Building the roads and streets on the contour helps to overcome the slope. Providing coarser grained subgrade or base material helps to prevent the damage caused by low strength.

Slope, along with the shallow depth to bedrock of the Lyman soils, limits this unit as a site for septic tank absorption fields. In some areas, the impermeability of the bedrock causes effluent from the septic system to

seep to the surface on a lower part of the slopes, either in areas of this unit or another unit.

The capability subclass is VIs.

B **Ap—Alpha silt loam.** This soil is very deep, nearly level, and moderately well drained. It is on the tops of broad ridges and small hilts and is at the base of long, gentle slopes. Areas are long and narrow, oval, or irregularly shaped. They range from 10 to 40 acres. Slopes typically are smooth and range from 0 to 2 percent.

The typical sequence, depth, and composition of the layers of this soil are as follows:

Surface layer:

*Surface to 3 inches, grayish brown silt loam

Subsurface layer:

*3 to 14 inches, light yellowish brown silt loam

Subsoil:

- 14 to 25 inches, tight yellowish brown sandy loam with brown mottles
- 25 to 38 inches, yellowish brown very firm sandy loam with brown and gray mottles
- 38 to 51 inches, strong brown sandy loam with red mottles.

Substratum:

*51 to 70 inches or more, strong brown sandy clay' loam with red and gray mottles

In some map units a layer of sandy clay loam is above the very firm part of the subsoil, and some others do not have a very firm part in the subsoil.

Included with this soil in mapping are small areas of Beta, Delta, and Tau soils. The well drained Beta and Delta soils are on small convex areas in various parts of the unit and make up about 10 percent of the unit. The poorly drained Tau soils are in swales and shallow drainageways and comprise about 5 percent of the unit.

Important soil properties:

Permeability. Moderately rapid in the surface layer and upper part of the subsoil, slow in the very firm part of the subsoil, and moderate in the lower part of the subsoil and in the substratum.

Available water capacity: Moderate

Organic matter content: Low

Natural fertility: Low

Soil reaction: Extremely acid through strongly acid in unlimed areas, but varies in the surface layer because of local liming practices.

Surface runoff: Slow

Erosion hazard: Slight

Tilth:

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Water Table: A seasonal high water table is perched above the very firm part of the subsoil in winter and early spring.

Root zone: Typically extends to a depth of about 25 inches, but in some areas it is deeper where the very firm part of the subsoil is intermittent.

Shrink-swell potential: Low

Most areas of this soil are in woodland. Other areas are used for cultivated crops and pasture.

This soil is moderately well suited to cultivated crops. The seasonal high water table and the very firm part of the subsoil are the main limitations for crops. The seasonal high water table sometimes delays planting and harvesting. A drainage system will help to reduce this limitation, especially a subsurface drainage system installed above the very firm part of the subsoil. This requires special design in areas where the upper part of the subsoil is very firm. The surface layer of the soil in cultivated areas often has a thin crust after heavy rains. This crust reduces the rate of water infiltration and increases runoff. Plant roots are restricted by the very firm part of the subsoil and do not receive sufficient water during dry periods. Using cover crops and grasses and legumes in the cropping system, incorporating crop residue into the surface layer, and using a conservation tillage system that includes no-tillage or stubble mulching are practices that help to reduce crusting and increase the organic matter content of the surface layer.

This soil is well suited to hay and pasture. The very firm part of the subsoil and the seasonal high water table restrict the root growth of some legumes. Overgrazing and grazing when the soil is too wet will compact the surface layer. Overgrazing also prevents new growth of grasses and legumes. Deferred grazing, rotational grazing, and using proper stocking rates help to increase the carrying capacity of pastures.

The potential productivity for trees on this soil is moderately high. Plant competition, the seasonal high water table, and restricted rooting depth are the major limitations. Seeds and seedlings survive and grow well if competing vegetation is controlled. The soil is soft when wet, restricting the use of heavy equipment to dry periods. Rooting depth is restricted by the very firm part of the subsoil, and some trees are uprooted during windy periods. Planting trees that have a shallow root system and keeping thinning to a minimum help to prevent uprooting.

The seasonal high water table is the main limitation of these soils as a site for dwellings with basements. Installing foundation drains and sealing foundations will help to prevent wet basements. Included areas of Beta and Delta soils have few limitations for dwellings.

Low strength and the seasonal high water table are the main limitations of this soil as a site for local roads and streets. This soil is soft when wet, causing the pavement to crack under heavy traffic. Providing coarser

grained subgrade or base material helps to prevent damage caused by the low strength and the seasonal high water table. Installing drainage will help to prevent damage caused by the seasonal high water table.

The seasonal high water table and the slow permeability in the very firm layer of the subsoil limit the soil as a site for septic tank absorption fields and sometimes make use of an alternative site necessary. Included areas of Delta soils have a very firm slowly permeable layer in the subsoil which limit the soil as a site for septic tank absorption fields and Beta soils have few limitations for this use.

The capability subclass is *llw*.

© **MvC**—Monadnock-Lyman stony, fine sandy loam. **8** to 15 percent slopes. This unit consists of strongly sloping soils on the tops and sides of hills and ridges. The Monadnock soils are generally at a slightly lower position than the Lyman soils. Slopes are generally smooth, but a few areas are dissected by many small drainageways. Stones that are 5 to 40 feet apart are on the surface. The areas of the unit range from 10 to 100 acres. They consist of about 45 percent very deep, well drained Monadnock soils; 25 percent shallow, somewhat excessively drained Lyman soils; and 30 percent other soils. The Monadnock and Lyman soils are so intermingled that it was not practical to map them separately.

Typically, the Monadnock soils are covered by a thin layer of partially decomposed and decomposed leaves, needles and twigs. Under this layer, the typical sequence, depth, and composition of the layers of this soil are as follows:

Surface layer:

-Mineral surface to 2 inches, gray fine sandy loam

Subsoil:

-2 to 3 inches, dusky red fine sandy loam

—3 to 13 inches, yellowish red and yellowish brown fine sandy loam

-13 to 31 inches, light olive brown and olive fine sandy loam

Substratum:

—31 to 36 inches, olive gravelly fine sandy loam

-36 to 60 inches or more, olive gravelly loamy sand

Many areas of this soil in the southeastern part of the town of Unity are loamy fine sand in the lower part of the subsoil and in the substratum.

Typically, the Lyman soils are covered by a thin layer of partially decomposed and decomposed leaves, needles, and twigs. Under this layer, the typical sequence, depth, and composition of the layers of this soil are as follows:

Surface layer:

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-Mineral surface to 1 inch, very dark brown line sandy loam

Subsurface layer:

-1 to 2 inches, brown fine sandy loam

Subsoil:

-2 to 8 inches, dark reddish brown and reddish brown fine sandy loam

—8 to 15 inches, dark yellowish brown fine sandy loam

Bedrock:

-15 inches

Included with this unit in mapping are soils that have bedrock between the surface and a depth of 8 inches and a few areas of rock outcrop. These areas make up about 10 percent of the unit. About 20 percent of the unit consists of soils that are 20 to 60 inches deep to bedrock, well drained Marlow soils and somewhat excessively drained Herman soils on convex areas, moderately well drained Sunapee soils and poorly drained Lyme soils in depressions and drainageways, and a few areas with no stones on the surface.

Important soil properties:

Permeability: Monadnock soils—moderate in the surface layer and subsoil and moderately rapid in the substratum. Lyman soils—moderately rapid throughout.

Available water capacity: Moderate in the Monadnock soils and low in the Lyman soils.

Soil Reaction: Extremely acid to medium acid

Depth to bedrock: More than 60 inches in the Monadnock soils and 6 to 20 inches in the Lyman soils.

Root zone: Same as depth to bedrock

Potential frost action: Low in the Monadnock soils and moderate in the Lyman soils.

Most areas of this unit are in woodland. A few areas are used for hay and pasture, and a few are used for industrial development.

The soils in this unit are poorly suited to cultivated crops. The main limitation is stones on the surface. If this soil is cleared of stones, it is suited to cultivated crops. The main limitations for cleared areas are slope, an erosion hazard, and the low available water capacity and shallow rooting depth of the Lyman soils. In some areas bedrock is close enough to the surface to interfere with tillage. Excessive erosion of the Lyman soils in this unit will expose bedrock. Most crops on the Lyman soils will show stress during dry periods. Slope is the main limitation for irrigation. Using cover crops and grasses and legumes in the cropping system and using a conservation tillage system that includes no-tillage, strip tillage, and stubble mulching are practices that help to

control erosion and maintain the organic matter content of the surface layer. Contour tillage, grassed waterways, and diversions further help to control erosion. Individual areas of Sunapee and Lyme soils have a seasonal high water table that sometimes delays planting and harvesting.

These soils are poorly suited to hay and pasture because of stones on the surface. If cleared of stones, the soils are suited to hay and pasture, but the shallow depth to bedrock in the Lyman soils restricts the root growth of most grasses and legumes. Overgrazing and grazing when the soil is too wet will compact the surface layer. Overgrazing also prevents new growth of grasses and legumes. Deferred grazing, rotational grazing, and using proper stocking rates help to increase the carrying capacity of pastures and control erosion.

The potential productivity for trees on this unit is moderate. Monadnock soils have few limitations for trees. The main limitations for trees on the Lyman soils are the depth to bedrock and a high rate of seedling mortality. Bedrock restricts rooting, causing an uprooting of some trees during windy periods. Planting trees that have a shallow root system and keeping thinning to a minimum help to prevent uprooting. The rate of seedling mortality can be reduced by planting seedlings in early spring, allowing them to obtain sufficient moisture from spring rains.

Slope is the main limitation of the soils in this unit as a site for dwellings. The shallow depth to bedrock limits the Lyman soils as a site for dwellings, especially with basements, and is difficult to overcome. The Monadnock soils in this unit are deeper to bedrock, making them better suited to dwellings with basements than are the Lyman soils. Land shaping and grading will help to overcome the slope, although in most areas bedrock will be encountered. Designing dwellings that conform to the natural slope and setting will help keep land shaping to a minimum.

Slope is the main limitation of the soils in this unit as a site for local roads and streets. The depth to bedrock is an additional limitation of the Lyman soils for roads and streets, and low strength is a further limitation of the Monadnock soils. Bedrock will generally be encountered during grading and land shaping. Building the roads and streets on the contour helps to overcome the slope. Providing coarser grained subgrade or base material helps to prevent the damage caused by low strength.

Slope, along with the shallow depth to bedrock of the Lyman soils, limits this unit as a site for septic tank absorption fields. In some areas, the impermeability of the bedrock causes effluent from the septic system to seep to the surface on a lower part of the slopes, either in areas of this unit or another unit.

The capability subclass is Vls.

(D) Ap—Alpha silt loam. This soil is very deep, nearly level, and moderately well drained. It is on the tops of

broad ridges and small hills and is at the base of long, gentle slopes. Areas are long and narrow, oval, or irregularly shaped. They range from 10 to 40 acres. Slopes typically are smooth and range from 0 to 2 percent.

The typical sequence, depth, and composition of the layers of this soil are as follows:

Surface layer:

Surface to 3 inches, grayish brown silt loam

Subsurface layer:

3 to 14 inches, light yellowish brown silt loam

Subsoil:

14 to 25 inches, light yellowish brown sandy loam with brown mottles

25 to 38 inches, yellowish brown very firm sandy loam with brown and gray mottles

38 to 51 inches, strong brown sandy loam with red mottles.

Substratum:

51 to 70 inches or more, strong brown sandy clay loam with red and gray mottles

In some map units a layer of sandy clay loam is above the very firm part of the subsoil, and some others do not have a very firm part in the subsoil.

Included with this soil in mapping are small areas of Beta, Delta, and Tau soils. The well drained Beta and Delta soils are on small convex areas in various parts of the unit and make up about 10 percent of the unit. The poorly drained Tau soils are in swales and shallow drainageways and comprise about 5 percent of the unit.

Important soil properties:

Permeability. *Moderately rapid in the surface layer and upper part of the subsoil, slow in the very firm part of the subsoil, and moderate in the lower part of the subsoil and in the substratum.*

Available water capacity: *Moderate*

Organic matter content: *Low*

Natural fertility: *Low*

Soil reaction: *Extreme/y acid through strongly acid in unlimed areas. but varies in the surface layer because of local liming practices.*

Surface runoff: *Slow*

Erosion hazard: *Slight*

Tilth: *The soil is easily tilled under a variety of moisture conditions.*

Water Table: *A seasonal high water table is perched above the very firm part of the subsoil in winter and early spring.*

Root zone: *Typically extends to a depth of about 25 inches, but in some areas it is deeper where the very firm part of the subsoil is intermittent.*

Shrink-swell potential: *Low*

Most areas of this soil are in woodland. Other areas are used for cultivated crops and pasture.

This soil is moderately well suited to cultivated crops. The seasonal high water table and the very firm part of the subsoil are the main limitations for crops. The seasonal high water table sometimes delays planting and harvesting. A drainage system will help to reduce this limitation, especially a subsurface drainage system installed above the very firm part of the subsoil. This requires special design in areas where the upper part of the subsoil is very firm.. The surface layer of the soil in cultivated areas often has a thin crust after heavy rains. This crust reduces the rate of water infiltration and increases runoff. Plant roots are restricted by the very firm part of the subsoil and do not receive sufficient water during dry periods. Using cover crops and grasses and legumes in the cropping system, incorporating crop residue into the surface layer, and using a conservation tillage system that includes no-tillage or stubble mulching are practices that help to reduce crusting and increase the organic matter content of the surface layer.

This soil is well suited to hay and pasture. The very firm part of the subsoil and the seasonal high water table restrict the root growth of some legumes. Overgrazing and grazing when the soil is too wet will compact the surface layer. Overgrazing also prevents new growth of grasses and legumes. Deferred grazing, rotational grazing, and using proper stocking rates help to increase the carrying capacity of pastures.

The potential productivity for trees on this soil is moderately high. Plant competition, the seasonal high water table, and restricted rooting depth are the major limitations. Seeds and seedlings survive and grow well if competing vegetation is controlled. The soil is soft when wet, restricting the use of heavy equipment to dry periods. Rooting depth is restricted by the very firm part of the subsoil, and some trees are uprooted during windy periods. Planting trees that have a shallow root system and keeping thinning to a minimum help to prevent uprooting.

The seasonal high water table is the main limitation of these soils as a site for dwellings with basements. Installing foundation drains and sealing foundations will help to prevent wet basements. Included areas of Beta and Delta soils have few limitations for dwellings.

Low strength and the seasonal high water table are the main limitations of this soil as a site for local roads and streets. This soil is soft when wet, causing the pavement to crack under heavy traffic. Providing coarser grained subgrade or base material helps to prevent damage caused by the low strength and the seasonal high water table. Installing drainage will help to prevent damage caused by the seasonal high water table.

The seasonal high water table and the slow permeability in the very firm layer of the subsoil limit the soil as a site for septic tank absorption fields and sometimes make use of an alternative site necessary.

Included areas of Delta soils **have a very firm slowly** permeable layer in the subsoil which limit the soil as a site for septic tank absorption fields and Beta soils have few limitations for this use.

The capability subclass is llw.

E

MvC-Monadnock-Lyman stony **fine sandy loam, 8 to 15 percent slopes.** This unit consists of strongly sloping soils on the tops and sides of hills and ridges, The Monadnock soils are generally at a slightly lower position than the Lyman soils. Slopes are generally smooth, but a few areas are dissected by many small drainageways. Stones that are 5 to 40 feet apart are on **the** surface. The areas of the unit range from **10** to 100 acres. They consist of about 45 percent very deep, well drained Monadnock soils: 25 percent shallow, somewhat excessively drained Lyman soils: and 30 percent other soils. The Monadnock and Lyman soils are so intermingled that it was not practical to map them separately.

Typically, the Monadnock soils are covered by a thin layer of partially decomposed and decomposed leaves, needles and twigs. Under this layer, the typical sequence, depth, and composition of the layers of this soil are as follows:

Surface layer:

*Mineral surface to 2 inches, gray fine sandy loam

Subsoil:

- 2 to 3 inches, dusky red fine sandy loam
- 3 to 13 inches, yellowish red and yellowish brown fir? sandy loam
- 13
- S

Charge 3. Evaluate statements about behavioral data, particularly relative to urban **interpretations** and develop examples that will improve those statements (i.e. ways to overcome limitations).

Urban Uses of Map Units

The last paragraph(s) of the map unit is for the discussion of urban uses. The party leader should pick those items for which most users would need information. Generally items to **be** discussed are:

1. Dwellings (with or without basements)
2. Shallow Excavations
3. Lawns, Landscaping and Golf Fairways
4. Local Roads and Streets
5. Septic Tank Absorption Fields

Some surveys may discuss all of these items, some may discuss one or two items, and in some there may be a need to **discuss** other items.

For each item discussed in the map unit, it **is** important to state what the limitations are, methods of correcting those limitations, and the importance of limiting and non-limiting inclusions. Limitations stated in the map unit should be the **same** as those listed in the table for the item being discussed.

The intent of presenting corrective methods is to suggest ways of overcoming limitations and not **to** prevent design criteria. For instance. If an area is wet, it should be suggested that drainage will help overcome the wetness limitation. Details as to the type of drainage, such as tile, or the size and amount of tile, should **be** avoided. These types of details should be left to planners and **engineers** on a site by site basis.

Local Roads and Streets

<u>Restrictive Feature</u>	<u>*Method of Overcoming Limitation</u>
Depth to rock	<ol style="list-style-type: none"> 1. Plan grades and locations to avoid removal of rock. 2. Rip the rock (when soft). 3. Blast the rock (when hard).
Low Strength	<ol style="list-style-type: none"> 1. Provide suitable subgrade or base material. 2. Provide special construction for adequate support.
Ponding	<ol style="list-style-type: none"> 1. Select better suited soils.
wetness	<ol style="list-style-type: none"> 1. Construct on raised fill material. 2. Install drainage system.
Slope	<ol style="list-style-type: none"> 1. Construct on the contour. 2. Landshaping and grading. 3. Adapt design to slope.
Floods	<ol style="list-style-type: none"> 1. Construct on raised fill material..
Frost action	<ol style="list-style-type: none"> 1. Provide coarser grained subgrade or base material to frost depth.
Shrink swell	<ol style="list-style-type: none"> 1. Provide coarser grained subgrade or base material.
Large stones	<ol style="list-style-type: none"> 1. Remove stones.

*Methods discussed in map **unit** descriptions should be those approved by local and state codes,

Dwellings with Basements

<u>Restrictive Feature</u>	<u>*Method of overcoming Limitation</u>
Flooding	1. Select better suited soils.
Ponding	1. Select better suited soils.
Wetness (Severe limitation)	1. Select better suited soils.
Wetness (Moderate limitation)	1. Drains by footings. 2. Adequately seal foundation. 3. shape land so surface water moves away from dwelling and runoff is diverted from dwelling. 4. Place in high area of map unit. 5. Place in non-limiting inclusion.
Depth to rock	1. Check for deep areas of unit (inclusions). 2. Build above rock and landscape with additional fill. 3. Select better suited soil.
Slope	1. Design to conform with natural slope. 2. Shape the land.
Shrink-Swell	1. Extra reinforcement in footings and foundation. 2. Backfill with sandy material.
Low Strength	1. Select better suited soils.
Large Stones	1. State that excavation, and disposition of stones, and boulders may be difficult.

*Methods discussed in map unit descriptions should be those approved by local and state codes.

Dwellings Without Basements

<u>Restrictive Feature</u>	<u>*Method of Overcoming Limitation</u>
Flooding	1. Select better suited soils.
Ponding	1. Select better suited soils.
wetness (Severe limitation)	1. Select better suited soils. 2. Drains by footings. 3. Shape land so surface water moves away from dwelling and runoff is diverted from dwelling. 4. Place in high area of map unit. 5. Place in non-limiting inclusion.
Wetness (Moderate limitation)	1. Tile drains by footings. 2. Shape land so surface water moves away from dwelling and runoff is diverted from dwelling. 3. Place in high area of map unit. 4. Place in non-limiting inclusion
Shrink-Swell	1. Extra reinforcement in footings. 2. Backfill with sandy material,
Low Strength	1. Select better suited soils.
Slope	1. Design to conform with natural slope. 2. Shape the land.
Depth to rock	1. Check for deep areas in unit (inclusions). 2. Build above rock and landscape with additional fill. 3. Select better suited soil.
Large stones	1. State that excavation, and disposition of the atones, and boulders may be difficult.

*Methods discussed in map unit descriptions should be those approved by local and state codes.

Septic Tank Absorption Fields

<u>Restrictive Feature</u>	<u>*Method of Overcoming Limitation</u>
Flooding	1. Select better suited soil.
Depth to Rock	1. Check for deep areas (inclusions).
Ponding	2. Select better suited soil.
Wetness (Severe limitation)	1. Select better suited soil.
	2. Drainage system around filter field.
	3. Install diversions to intercept water from higher areas.
	4. Place in high area of map unit.
	5. Place in non-limiting inclusion.
	6. Specially designed or other alternate system.
Wetness (Moderate limitation)	1. Drainage system around filter field.
	2. Install diversions to intercept water from higher areas.
	3. Place in high area of map unit.
	4. Place in non-limiting inclusion.
	5. Specially designed or other alternate system.
Percs slowly (Moderate limitation)	1. Enlarge absorption field.
	2. Wide, deep trench below distribution lines.
(Severe limitation)	1. Select better suited soil.
	2. Specially designed or other alternate system.

Poor Filter

1. Indicate possible **contamination** of ground water,
2. Select better suited soil.

Slope

1. Land shaping.
2. Install lines across the slope. (contour)
3. Install on inclusion of lower percent slope.

Large stones

1. Backfill with material that contain fewer stones.

* **Methods** discussed in map unit descriptions should be those approved by local and state health codes.

Charge 4. Recommend implementation or action to be taken on committee report.

1. The Committee recommends that Committee 4, Improving Descriptions of Map Units be terminated.
2. The Committee recommends that the material developed by the Committee for Changes 1, 2, and 3 be approved by the conference. It also recommends that if the material is approved by the conference, the chairman of **Committee 4** request that the **Head, Soils Staff**, distribute the following to all Northeast state soil scientists:
 - A. Outline for Writing Map Unit Descriptions for Soil Survey **Manuscripts** and Descriptive Legends developed for Charge 1.
 - B. Examples of Map Unit Descriptions developed for Charge 2.
 - C. Urban Uses of Map Units developed for Charge 3.

The chairman will also request that the Head, Soils Staff encourage state soil scientists to distribute the material to all authors for use when developing map unit descriptions for soil survey manuscripts and descriptive legends.

3. The Committee recommends that the Chairman of Committee 4 request the Head, Soils Staff, to pursue the use of tabular format in map unit descriptions. The Committee suggests that map unit descriptions with tabular format be published in 1 or 2 soil surveys on a trial basis and that the Head, Soils Staff, then determine whether this format should be continued.

(These recommendations were approved at the Conference)

General Soils Map and Bulletin of the Northeast

Committee Membership

General Editor - Ed Ciolkosz

(A) Bulletin Chairman - Bob Cunningham

- Chapter 1 Physiography - John Sencindiver and Ed Ciolkosz
- Chapter 2 Soil Classification - F. Ted Miller and Loyal Quandt
- Chapter 3 Entisols - Bill Wright, Lew Douglas, and John Ferwerda
- Chapter 4 Inceptisols - Bob Cunningham and Bruce Watson
- Chapter 5 Spodosols - Ron Yeck, Bob Rourke, and Sid Pilgrim
- Chapter 6 Alfisols - Art Kuhl and Fred Gilbert
- Chapter 7 Ultisols - Jim Baker and Del Fanning
- Chapter 8 Histosols - Dave Hill and Peter Veneman
- Chapter 9 Mollisols - Bill Hatfield and Gary Petersen
- Chapter 10 Soil Interpretations - Oliver Rice, Jerry Olson, and Vin Van Eck

(B) Map Chairman - Horace Smith

Committee members - Fred Miller, Bob Rourke, Ed Sautter, Gene Grice, and Tom Simpson

Charges

1. To draft and publish a soils map of the Northeast.
2. To draft and publish a bulletin on the soils of the Northeast.

Report

1. Map Committee (Horace Smith, Chairman)
 - a) The Northeast General Soil Map will be published at a scale of 1:2,500,000. This map will consist of about 120 map units which will be at the great group level, representing six soil orders. There will be six colors on the published map--one for each soil order represented. Soil temperature will be superimposed on the map by cross-hatching.

The first draft of the map, which did not include Virginia, was prepared by the Map Committee Chairman and circulated to the full committee for review and comments in March, 1981. In January, 1982, the Steering Committee determined that Virginia should be added to the Northeast Map, even though it is also a part of the South's map. Suggestions on the first draft from the committee were incorporated into a second draft in April, 1982, by the Committee Chairman and sent to the full committee for review and comments. This draft was also sent to the Northeast State Soil Scientists for review.

All comments and suggestions from reviewers will be incorporated into a final draft by the committee by January, 1983.

2. Bulletin Committee (Bob Cunningham, Chairman)
 - a) Seven of the 10 chapters planned are drafted to enable editing and possible revision of the manuscripts. The soil interpretation chapter has been outlined but not completed. The Soil Classification and Mollisols chapters have not been received. When all chapters have been received, an edit to standardize the format is planned. Some return to authors will probably be necessary. Publication is planned by 1984.

NORTHEAST SOIL CHARACTERIZATION STUDY

Richard Cronce - Director, Soil Characterization Laboratory
The Pennsylvania State University

Soils data generated by soil characterization labs are used extensively by a wide range of users for various purposes. Soil Conservation Service personnel use soil characterization data for establishing the ranges in characteristics of soil series, for correlating soils within and between soil survey areas, and for making interpretations for use and management of soils. University personnel involved in soils research review soils data from soil characterization labs in planning and evaluating their research. The soils information which is generated by these agencies based on these data is ultimately used by public and private concerns for a variety of purposes.

The uses of soil characterization lab data often require that soils data from more than one soil characterization lab be grouped together. It is then important to estimate the proportion of the total variability in the data that can be attributed to the analytical variability within and between labs. Within lab variability shows the range in analytical results obtained if several identical samples are analyzed by one laboratory. Between lab variability shows the range in analytical results obtained if several identical samples are analyzed by several different laboratories.

Several studies have been conducted to estimate the amount and causes of this laboratory variability. An interlab study of the variability in CEC and particle size data has shown that wide variations in these results can be expected and that these differences may be largely ascribed to differences in methods and the execution of the procedure (van Reeuwijk and Sombroek, 1981). Rust and Fenton (1981) conducted a study of the laboratory variability for various particle size and soil chemical parameters. These investigators found highly significant differences between laboratories for about half of the particle size parameters but no significant differences for the determination of very coarse sand, fine sand and clay percentages. Rust and Fenton (1981) also found significant differences between labs in the determination of Mg, K, H, CEC, organic carbon and pH in water and in CaCl_2 . They found no significant differences between labs in the determination of Ca, Na, base saturation, available P and calcium carbonate equivalent. Again, the variability in these results is attributed primarily to differences in methodology. A separate study of the variability in particle size data from soil characterization labs again shows considerable variability in this data (Jones *et al.*, 1979). These differences, once more, are attributed largely to sampling technique and analytical method.

In addition, several investigators (Cronce, 1980; Rust and Fenton, 1981; van Reeuwijk and Sombroek, 1981) have indicated that the amount of variability in soil laboratory data may also be associated with the nature of the sample itself. Soil characteristics such as the percent organic matter, the amount of clay, and the presence or absence of free carbonates and cementing agents can have a pronounced effect on the amount of variability in the data resulting from different analytical techniques. The effect of free carbonates on the determination of CEC by different methods, or differences in the effectiveness of various soil dispersion techniques due to differences in organic matter content or various cementing agents are common examples of how the sample characteristics can affect the results of an analysis.

General soil characteristics and analytical methodologies vary between geographical areas. Therefore, the resultant variability in the soil laboratory data will also vary somewhat according to the samples employed in the study and the particular analytical methods used. Care should be taken in assigning the resultant variability from one study to labs or soils not included in that study.

Despite this problem, this information increases the confidence in the knowledge of the true variability in the data due to the soils. This study was generated to examine the analytical variability in soils data being generated by soil characterization labs in the northeast and more specifically:

1. To determine the factors which affect soil characterization data.
2. To estimate the variability in soils data within and between labs.
3. To consider the practical significance of the variability in the lab data to the use of this data.

Methods and Materials

Over a 4 year period of time 14 soil samples representing 9 soil series (Table 1) were mixed, split, and sent to 7 soil characterization laboratories (Table 2). The samples included were of soils of major extent which varied in their physical and chemical properties.

The characterization labs were requested to perform their own standard characterization analysis, in duplicate, on as many of the samples as possible. The resulting data were then compiled and an analysis of variance was performed using the statistical model:

$$Y = \text{Lab} + \text{Rep(Lab)} + \text{Soil} + \text{lab} \times \text{Soil} + E$$

The General Linear Models (GLM) procedure in the SAS statistical package was used for the statistical analysis (Goodnight, 1979).

Table 1. Soil samples analyzed and their taxonomic classification.

Series	Horizon	Classification
Groveton	AR	coarse-loamy, mixed, frigid Typic Haplorthod
Groveton	B2ir	
Hagerstown	Ap	fine, mixed, mesic, Typic Hapludalf
Hagerstown	B2	
Gilpin	Ap	fine-loamy, mixed, mesic, Typic Hapludult
Gilpin	B2	
Honeoye	B2	fine-loamy, mixed, mesic. Glossoboric Hapludalf
Vergennes	Ap	very fine, illitic, mesic, Glossaquic Hapludalf
Vergennes	B2	
Sassafras	B2	fine-loamy, siliceous, mesic Typic Hapludult
Guernsey	B23t	fine, mixed, mesic, Aquic Hapludalf
Guernsey	Clg	
Unknown	B2	fine, montmorillonitic, thermic Typic Haplaquilt
Tioga	IIIB2	fine-loamy, mixed, mesic Typic Hapludalf

Table 2. Soil characterization labs involved in the study.

University of Rhode Island
SCS National Soil Survey Laboratory
University of Maine
University of Massachusetts
The Pennsylvania State University
Cornell University
Land Resource Research Institute, Ontario

Results and Discussion

Analysis of Variance

In order to determine where the variability in the soils data is coming from, an analysis of variance was carried out. Values of F are calculated to determine the level of significance (the source of variability) and, in general, the larger the F value, the greater will be the significance of that factor. Tables 3, 4, and 5 show the F values and statistical levels of significance of the experimental factors for each of the soil parameters determined. The data show that there were highly significant differences (0.01 level) between labs in the determinations of sand, silt, clay, 15 atmosphere moisture, Na, K, H, CEC, and pH and H₂O and in 0.01 M CaCl₂. There were significant differences (0.05 level) between labs in the determinations of organic carbon, Ca and Mg. There was no significant difference between labs in the determination of the percent base saturation. There were highly significant differences (0.01 level) between the replications within labs for only the percent base saturation and the pH in 0.01 M CaCl₂. There were no significant differences between replications within labs for any of the other parameters determined. There were highly significant differences between soils for all parameters determined and this was expected. There was also a significant lab x soil interaction for all parameters determined.

The reported values and the general non-significance of the replication within a lab (Rep(Lab)) factor indicates that the replication of an analysis within a soil characterization lab contributes the least amount of variability to the data. Because of the relatively close grouping of the data within any one lab, the individual groupings in the data from several labs can be distinguished from each other. This causes the data from the labs to be statistically different when compared to each other.

Some differences in the data due to labs is expected due to minor differences in methodology and other common sources of analytical variability such as varying lab technique. The data from the labs included in the analysis of variance was inspected to determine if the significant differences between labs might be caused by one or two labs being drastically off. The data (Tables 6, 7, and 8) show that except for lab number 6 being somewhat high in the determination of Ca, Mg, and K, and lab number 2 being low in the determination of percent base saturation, the differences in the data are spread over all of the labs. A review of the analytical methods employed by these two labs, as well as the other labs in the study, does not point out major consistent differences in results even when different or modifications in methods were used. In general, the laboratories included in this study are consistent in their analytical

Table 3. F values and the statistical levels of significance of the experimental factors for sand, silt, clay, organic carbon, and 15 abm moisture.

Factor	Sand		Silt		Clay		Organic Carbon		15 abm. Moisture	
	F	Sig	F	Sig	F	Sig	F	Sig	F	Sig
Lab	9.77	**	9.55	**	10.92	**	3.27	*	13.28	**
Rep(Lab)	1.00	NS	1.50	NS	2.07	NS	0.84	NS	0.59	NS
Soil	9921.77	**	2945.21	**	4390.86	**	4640.22	**	889.95	**
Lab x Soil	12.79	**	12.06	**	9.78	**	19.02	**	7.28	**

* = Significant at 0.05 level.
 ** = Significant at 0.01 level.
 NS = Not significant.

Table 4. F values and statistical levels of significance of the experimental factors for Ca, Mg, Na, K, and H.

Factor	Ca		Mg		Na		K		H	
	F	Sig	F	Sig	F	Sig	F	Sig	F	Sig
Lab	5.01	*	3.08	*	7.98	**	18.36	**	13.64	**
Rep(Lab)	2.39	NS	0.26	NS	1.18	NS	1.33	NS	0.77	NS
Soil	2845.24	**	2564.69	**	132.14	**	198.03	**	1275.22	**
Lab x Soil	26.12	**	50.66	**	14.35	**	20.44	**	4.22	**

* = Significant at 0.05 level.
 ** = Significant at 0.01 level.
 NS = Not significant.

Table 5. F values and the statistical levels of significance of the experimental factors for CEC, %B.S., and soil pH in H₂O and 0.01M CaCl₂.

Factor	CEC		%B.S.		H ₂ O		0.01M CaCl ₂	
	F	Sig	F	Sig	F	Sig	F	Sig
Lab	4.75	**	2.33	NS	12.29	**	8.60	**
Rep(Lab)	1.41	NS	6.09	**	2.22	NS	8.57	**
Soil	1037.79	**	1976.62	**	2158.48	**	2655.98	**
Lab x Soil	61.62	**	136.03	**	15.68	**	16.21	**

* = Significant at .05 level.
 ** = Significant at .01 level.
 NS = Not significant.

methods. The differences in the data are therefore attributed to differences in general laboratory conditions such as water quality, condition and type of equipment, laboratory reagents, and other factors. The differences in the training and expertise of the many individual analysts involved in this study is probably also a factor.

The analysis of the data and the large F values for the soil factor shows that although there are statistically significant differences between labs, this amount of variability is practically insignificant when compared to the natural variability in the soils included in this study. The fact that statistically significant differences between labs exist must be interpreted in perspective with the particular reason for the analysis. The range in values that exists due to the variability in the lab analysis must be compared to the desired level of difference to be determined in the soil samples to be analyzed.

Levels of Variability

This brings us to the second, and perhaps more useful part of this study, which was to estimate the amount of variability within and between laboratories.

Tables 6, 7, and 8 show the means for each parameter, for each lab, when all of the data from all samples analyzed by that lab are averaged. This data can be used to compare the average results of the analysis from the individual labs. However, this can be done directly only when the data from the same number of analysis on the same number of soil samples is included in the mean. The presence of a Duncan's test behind the values indicates that this is the case and it also shows whether or not the average differences between the labs in question is statistically significant. For example, the sand data (Table 6) show that, on the average, samples analyzed by laboratory one will come out 1.6 percent lower in sand than if the same samples were analyzed by laboratory two (19.1 vs. 20.7). The different letters following the data (c and b) show this difference in results to be statistically significant. Again, whether or not a consistent difference of 1.6 percent is of practical significance depends on the use being made of the data.

Tables 6, 7, and 8 also show the average values for one standard deviation from the mean within each individual lab (+ values following the individual lab means) and over all labs (+ values following the grand means at the bottom of the tables). These values indicate the estimated within lab and between lab variability in the soils data from the characterization labs. Again, using the sand data (Table 6) as an example, this data can be used as follows. If the sand content of several identical samples is determined by lab one, 67 percent of the individual analysis will fall within ± 0.6 percent of the mean for that particular sample as determined by lab one. This, by definition is one standard deviation from the mean. If the same set of identical samples is analyzed by lab two, in general the mean will be 1.6 percent higher than that obtained by lab one, and will have a standard deviation from the mean of ± 0.5 percent as determined by lab two. If a set of the same identical samples is analyzed by all of the labs in this study, the mean of the results from all of the labs will be 1.5 percent higher than the mean from lab one, 0.1 percent lower than the mean from lab two, and will have a standard deviation from the mean of ± 1.9 percent for that set of analysis. On the other hand, when considering the results of an individual sand determination from an individual lab, you can be 67 percent sure that the value is within one standard deviation from the true mean of that sample as determined by that lab. This true mean

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would have to be determined by several analyses of the sample. If lab two reports a sand content of 30 percent, it may be assumed that the true mean of that sample, upon repeated analysis, will be ± 0.5 percent, or between 29.5 and 30.5 percent.

Tables 9, 10, and 11 show the results of the analysis of the samples included in this study. This data show the mean and standard deviation from the mean for each parameter for each soil sample when all of the analyses from all of the labs are considered. The data show that the variation in the analytical results was not the same for each sample. For example, the results of the sand analysis of the Groveton Ap sample had a standard deviation of ± 4.1 percent. The results of this analysis for the Vergennes Ap sample was only ± 0.7 percent. The variability in the characterization data as reported in Tables 6, 7, and 8 are averages of the variability over all soil types. In an attempt to be more specific in the estimates of variability, linear regression was used to test the relationship of the amount of variability in results to the level of the parameter. In other words, is there a consistent and predictable trend in the amount of laboratory variability as you change the level of the parameter over different soil samples. These relationships were tested over all labs but they could also be tested for each individual lab as well.

Tables 12 and 13 show the linear regression equations calculated to estimate the standard deviation from the mean for the various parameters determined. The tables also show the r^2 values and level of significance for the equation. The r^2 values and levels of significance indicate how well the equation predicts the amount of lab variability you can expect based on the level of the parameter. Of the parameters investigated, there are statistically significant relationships and reasonable r^2 ($> .65$) between the level of the parameter and the amount of lab variability for the determination of clay, H, Ca, and Mg. The data indicate that for these parameters it is possible to make more specific estimates of the expected between lab variability if you consider the level of the parameter. Using the linear regression equation for clay percentage (Table 12) as an example, this procedure goes as follows. If a mean clay content of 16 percent, based on several analyses by the different labs in this study, is being considered, it is possible to calculate that the value actually may range by ± 1.28 by substituting 16 for (% clay) in the following equation:

$$\text{std. dev.} = 0.50 t (0.049)(\% \text{ clay})$$

In contrast, by using the same procedure, it is possible to estimate that the range in a clay mean of 60 percent will be ± 3.4 percent. By using this procedure it is possible to be more specific in an estimate of the variability than by simply saying that any clay mean determined by the labs in the northeast will vary by ± 2.48 percent (Table 6). For the parameters showing low r^2 values ($< .65$) there was no predictable and consistent relationship between the level of the parameter and the amount of between lab variability. Therefore, for these parameters, the use of this procedure to make more specific estimates of variability than shown on Tables 6, 7, and 8 is invalid.

Significance of Lab Variability

The results of the variability in lab data as determined in this study can be used in several ways. The individual labs involved in the study now have reliable estimates of the variance within their own lab. This is particularly

Table 9. Sand, silt, clay, organic carbon and 15 atm. moisture data for individual soils over all laboratories.

Soil	Percent				
	Sand	Silt	Clay	org. carbon	15 Atm. mist
Groveton Ap	17.2 ± 4.1				
Groveton B21r	25.1 ± 4.2				
Hagerstown Ap	13.3 ± 1.2				
Hagerstown B2	13.6 ± 1.6				
Gilpin Aq	19.0 ± 1.2				
Gilpin B2	15.7 ± 1.6				
Honeoye 8 2	52.7 ± 2.7				
Vergenner Aq	9.8 ± 0.7				
Vergennes B2	3.9 ± 1.1				
Sassafras					

Table 11. SEC. % Base Saturation, and pH in H₂O, In KCL and in 0.01 M CaCl₂ data for individual soils over all laboratories.

Soil	CEC (meq/100 gm)	% Base saturation	pH		
			H ₂ O	1N KCL	0.01 M CaCl ₂
Groveton Ap	29.7 ± 2.3	45.0 ± a.5	6.00 ± 0.21	5.14 ± 0.17	5.64 ± 0.11
Groveton B2lr	18.4 ± 0.9	28.7 ± 7.3	6.07 ± 0.38	4.96 ± 0.21	5.63 ± 0.46
Hagerstown Ap	16.0 ± 1.1	35.9 ± 6.2	5.46 ± 0.19	4.52 ± 0.08	5.07 ± 0.19
Hagerstown B2	17.0 ± 0.7	29.9 ± 5.2	4.75 ± 0.19	3.58 ± 0.08	4.20 ± 0.19
Gilpin Ap	15.0 ± 1.6	56.8 ± 6.9	6.11 ± 0.27	5.16 ± 0.09	5.78 ± 0.24
Gilpin B2	13.0 ± 1.2	61.6 ± 7.5	5.96 ± 0.28	4.77 ± 0.16	5.61 ± 0.26
Honeoye B2	13.3 ± 4.4	93.4 ± 2.8	7.33 ± 0.50	6.32 ± 0.54	7.00 ± 0.37
Vergennes Ap	24.1 ± 3.4	62.0 ± 7.4	5.75 ± 0.31	4.80 ± 0.06	5.46 ± 0.25
Vergennes B2	29.7 ± 4.9	77.5 ± 6.7	6.45 ± 0.34	5.01 ± 0.19	6.15 ± 0.26
Sassafras B2	6.9 ± 0.8	30.1 ± 9.8	5.02 ± 0.20	3.97 ± 0.15	4.53 ± 0.22
Guernsey B23t	27.5 ± 9.8	88.2 ± 3.7	7.33 ± 0.14	6.43 ± 0.16	7.09 ± 0.15
Guernsey Clg	38.5 ± 7.6	19.2 ± 40.5	7.96 ± 0.13	6.88 ± 0.11	7.56 ± 0.16
Unnamed B2	29.8 ± 1.5	3.0 ± 0.6	4.23 ± 0.16	3.00 ± 0.07	3.56 ± 0.19
Tioga 111 B2	a.1 ± 0.7	69.8 ± 6.1	6.42 ± 0.13	5.26 ± 0.08	5.88 ± 0.19

Table 12. Linear regression equations calculated to estimate the standard deviation from the mean for the percent sand, silt and clay, the pH in H₂O, 1 N KCl and 0.01 M CaCl₂, the meq/100 g of extractable H, and the % base saturation.

Parameter	Linear Regression Equation	r ²	Level of sig.
sand (%)	std. dev. =	co. 15	
silt (%)	std. dev. =	co. 15	
clay (%)	std. dev. = 0.50 + (0.049)(% clay)	0.66	0.01
pH (H ₂ O)	std. dev. =	co. 15	
pH (1 ii KCl)	std. dev. = -0.09 + (0.050)(pH)	0.19	0.12
pH (0.01 M CaCl ₂)	std. dev. =	co. 15	
Extr. H (meq/100 g)	std. dev. = 0.50 + (0.049)(extr. H)	0.65	0.01
base Saturation (%)	std. dev. =	<0.15	

Table 13. Linear regression equations calculated to estimate the standard deviation from the mean for the meq/100 g of Ca, Mg, Na, K and CEC and 15 bar moisture (%).

Parameter	Linear Regression Equation	r ²	Level of Sig.
Ca (meq/100 g)	std. dev. = 0.41 + (0.181)(Ca meq/100 g)	0.82	0.01
Mg (meq/100 g)	std. dev. = -0.07 + (0.271)(Mg meq/100 g)	0.88	0.01
Na (meq/100 g)	std. dev. = 0.014 + (0.558)(Na meq/100 g)	0.56	0.01
K (meq/100 g)	std. dev. = 0.02 + (0.32)(K meq/100 g)	0.47	0.01
CEC (meq/100 g)	std. dev. = -0.98 + (0.191)(CEC meq/100 g)	0.40	0.02
Mbisture (%)	std. dev. =	co. 15	

useful when the reliability of the lab data is questioned. Several of the labs have also developed, or further substantiated, the expected range in results for their own internal lab standards. This is of utmost importance in maintaining quality control within the lab. Knowing this variability, persons considering data from a particular lab have a basis for determining whether differences in characteristics are really substantial or if these differences may simply be due to lab variability. For example, when considering data from lab two, it is questionable to determine that a soil is a taxadjunct if the results of the analysis of one sample is outside the range in base saturation by less than 2.4 percent. Additional analysis of that sample, or additional field sampling of that soil is probably justified if this level of precision is needed.

Another use of the data from this study is when the data from several labs is combined. Computerized data bases and the merging of these data bases from various labs is becoming more common. For example, several laboratories in different states may have data on one soil type such as the Hagerstown soil. When correlating this series across state lines or when determining the regional range in characteristics of this series, the data from several labs is used. The variability in the characteristics of this soil as determined by the different labs can be considered with respect to the analytical variability expected between those labs.

Present soil series and soil taxonomic criteria have established rigid boundaries with respect to physical and chemical characteristics. The various percent base saturation breaks between alfisols and ultisols, dystrochrepts and eutrochrepts, and ultic Hapludalfs and typic Hapludalfs are rigidly defined. This study shows that when placing a soil into one or the other of these categories, if the data upon which the decision is based is close to the defined break, then the probability that the correct decision is made should be determined with respect to the expected laboratory variability. This study, and others (McKeague *et al.*, 1978; Jones *et al.*, 1979; Rust and Fenton, 1981; van Reeuwijk and Sombroek, 1981), provide reasonable estimates which can aide in making these decisions.

Acknowledgments

The writers would like to thank the many people involved in this study and, in particular, the analysts who handled the additional workloads involved in the analysis of these samples.

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Conference Business Meeting and S-ry

Business meeting conducted by Edward J. Ciolkosz, recorded by Frederick
L. Gilbert

Conference summary by F. Ted Miller - 187

BUSINESS MEETING

1982 NORTHEAST COOPERATIVE SOIL SURVEY CONFERENCE

Business meeting **was** called to order at 10:00 a.m. on June 25, 1982, by Chairperson Edward J. Ciolkosz.

The first item of business that **was** placed before the group **was** the question, "Should the **Northeast** Cooperative Soil Survey Conference continue publishing the Northeast Cooperative Soil Survey?" The motion **was** made **by** Garland **Lipscomb**, that the conference continue to publish the journal. The **motion** was seconded by Ronald **Yeck**. The following discussion ensued:

Bill Wright: Suggested that various soil survey organizations in the states contribute to the journal minutes of their meetings, proceedings, papers, etc.

Robert Rourke: Bob questioned Ed Ciolkosz about the cost of the journal, to which Ed Ciolkosz replied, "that the total cost for the last issued was about \$35.00, and that the payment should come from registration revenues from the soil survey conference."

Del Fanning: Raised the question about who it goes to. Ed **Ciolkosz** said that the conference members and friends of the conference would receive copies.

Ronald **Yeck**: Suggested **that** it come out about every six months. Ed Ciolkosz replied that there should be some latitude in this **mat-ter**, and that it should come out when there is enough news to justify having **a** journal and possibly, when there is some "hot **item**" of business **that** needs to be given publicity for the group.

Ed Sautter: Who will serve on the editorial board? Ed Ciolkosz: "It is the Steering Committee that will be the editorial board and the past chairperson will be the editor."

After this discussion ended, the motion **was** voted on and **was unan-**imously affirmed.

The next item of business **was** the amendment of the by-laws. Ed Ciolkosz passed out copies of the amendment of the by-laws, which are attached to the minutes of this business meeting. He gave an overview of the changes and he explained the duties of the Steering Committee, and **now**, a part of the by-laws.

Walt Russell: Suggested that the state and private forest organizations be listed separately. After some discussion, it was decided that this would be done.

Del Fanning: Suggested that Jim Patterson of the National Park Service be added. This **was** agreed to.

After discussion ended, the chairperson called for a show of hands of those that were in favor of adopting the by-laws, this vote was unanimous for approving the by-laws.

Next item of business concerned the location of the next meeting and the name of the new vice-chairperson of the Steering Committee.

The Steering Committee recommended that the University of **Massachusetts**, Amherst, Massachusetts, be the next meeting place, about the middle of June 1984. It **was** recommended by the Steering Committee that Peter L. M. **Veneman** will be the next vice-chairperson of the Steering Committee.

The next item of business concerned a suggestion that was made by Art Holland, Director of the Northeast National Technical Center, that an advisory board be developed to advise the conference on policy issues, and his suggestion, that it be made up of state conservationists and directors of experiment stations (one or two of each).

Bob Rourke: Expressed a general negative sentiment to this suggestion.

Del Fanning: Was generally in favor of the suggestion.

Dave Lietzke: As a representative of the Southern Region, Dr. Lietzke pointed out that the southern states had this kind of an arrangement, in that an experiment station leader attended and participated in the work planning conference, and that it worked out very well in the southern region.

Ed Ciolkosz: Suggested that the Steering Committee explore the possibility, and report to the conference in 1984. This suggestion **was** affirmed by a show of hands of the conference participants at the meeting.

Chairperson Ciolkosz announced that on July 19-20, that the Steering Committee for the National Soil Survey Conference will be meeting in Chicago.

Ronald Yeck: They need to get their proceedings out earlier so that they will be useful for us in our regional meetings.

Oliver Rice: The regional material should be passed on to the National steering committee.

Richard Arnold: At the last meeting of the National Soil Survey Conference, the emphasis was on policy issues and this did not seem to work out well. We need to get in our suggestions about both policy and technical issues to the National Conference **as soon as** possible.

F. Ted Miller: Provided a summary of the conference. He passed out copies of the National Soil Survey Conference hy-lows. He announced that David Yost, State Soil Scientist from Maryland, will replace Bruce Watson, retired State Soil Scientist from Vermont, on the Soil Taxonomy Committee, and that the **tenure** of the other members of the Soil Taxonomy Committee will be extended one year.

The business meeting and the conference adjourned at **11:30** a.m.

Frederick L. Gilbert
State Soil Scientist
Recorder

REGIONAL NATIONAL COOPERATIVE
SOIL SURVEY

CONFERENCE SUMMARY

F. Ted Miller
Head, Soils staff
Soil Conservation Service
Northeast NTC

We have had a full, busy and productive week. I cannot add much to what has already been said other than to say I believe our conferences get better each year. This has been a" outstanding one. It is through conferences such as this that **new** ideas are exchanged, new procedures and techniques proposed, and old ones evaluated. This sharing of ideas and experiences improve our personal contributions to the soil survey program.

I wish to personally thank each of you, committee chairman, members and participants, for the efforts you have made to make this a successful conference. I also wish to thank our gracious hosts here at Cornell, for making this a very enjoyable experience, as well. The excellent **accomo-**dations and the outstanding tour attest to their personal efforts and commitments in making this a successful conference.

I do not intend to summarize **all** of the topics and discussions that took place here this week. The committee chairman have already done this. I do, however, wish to leave you with a couple of thoughts. First, I ask that each of you brief your supervisor on the major topics discussed here at the conference. They must be continually informed on the needs of soil survey. Secondly, I ask that each of you provide meaningful feedback to the steering committee on kinds of committees and charges needed for our next conference. Recommendations and proposals are needed from you, the participants, to insure that future conferences **continue** to be as successful as this one. Keep in mind, too, that recommendations coming out of conferences such as ours, provide the basis for new or revised National Soil Survey policy and procedure.

In closing, let me say that I believe the future offers some interesting challenges for us in soil survey. There continue to remain many opportunities for improvement in soil taxonomy, interpretations and training. The fact that we are moving more and more from producing (project mapping) soil surveys to using (basic soil services) soil surveys **will** require additional effort from each of **us**. We must make a special effort to keep abreast of all pertinent new technology to help us solve problems in soil survey. **Working** together we will succeed.

Again, thanks to each of you and have a safe and pleasant trip home.

Appendix

By-laws of the Northeast Soil Survey Conference

List of Attending Participants

Appendix 1

BY-LAWS OF 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 I" 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: Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Virginia, Vermont, West Virginia, and the District of Columbia.

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

Head, Soils **Staff**, Northeast National Technical Center, Soil Conservation Service.

National Soil Survey Laboratory Liaison to the Northeast.

Cartographic Staff Liaison to the Northeast.

Three representatives from the soils staff of the USDA - Forest service **as** follows:

- One from the Eastern Region, National Forest System
- One from the Southern Region, National Forest **System**
- One **from** the Northeastern Area, State and Private Forestry

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 **con-**ference. 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. Organization and Management

A. 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, Soils Staff, NENTC, SCS (chairman)
The conference chairman
The conference vice-chairman
The conference past chairman

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

2. Meetings and Communications

A planning meeting is to be held about 1 year **prior** to the conference. Additional meetings may be scheduled by the chairman if the need arises.

Most of the committee's **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 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) Director of Soils 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)

B. Conference Chairman and Vice-chairman

An experiment station representative and a SCS state soil scientist alternate as chairman and vice-chairman. The vice-chairman named 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. Send out a first announcement of the conference about 3/4 year prior to the conference (see Appendix 1 for an example).
4. Send written invitations to all speakers or panel members. These people will be contacted beforehand by phone or in person by various members of the Steering Committee.
5. Send out written requests to experiment station representatives to find out if they will be presenting a report at the conference.
6. Notify all speakers, panel members, and experiment station representatives in writing that a brief written summary of their presentation will be requested after the conference is over. This material will be included in the conference's proceedings.
7. Preside over the conference.
8. Provide for appropriate publicity for the conference.
9. Preside at the business meeting of the conference.
10. Serve as a member of the editorial board of the Northeast cooperative Soil survey Journal.

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. Develop the program agenda of the conference.
4. Make necessary arrangement⁸ for lodging accommodations for conference members, for food functions, for meeting rooms, including committee rooms, and for local transport on official functions. Notify all persons attending the meeting of the arrangements for the conference (rooms, etc.). Included in the last mailing will be a copy of the agenda.
5. Compile and distribute the proceedings of the conference.
6. Serve as a member of the editorial board of the Northeast Cooperative Soil Survey Journal.

c. Past Conference Chairman

The past conference chairman's responsibilities are primarily to provide continuity from conference to conference. In particular, his responsibilities include the following:

1. Serve as a member of the Steering Committee.
2. Assist in planning the conference.
3. Serve as the editor of the Northeast Cooperative Soil Survey Journal. This responsibility encompasses gathering information with the other editorial board members, printing the Journal, and distributing it.

D. Administrative Advisors

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

E. Committee Chairman and Vice-chairman

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

IV. 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,

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 Director of Soils and SCS, in consultation with the NENTC Director and state conservationists.

One member of the steering Committee will represent the Northeast region at the Southern, North Central and Western Regional Soil Survey Conferences. If **none** of the members of the Steering Committee can attend a particular conference, a member of the conference will be selected by the Steering Committee for this duty.

VII. Northeast Cooperative Soil Survey Journal

The Northeast Cooperative Soil Survey Conference will publish a journal on soil survey and related topics at least once each year. The journal will be governed by a" editorial board made of the Steering Committee for the Northeast **conference**. The editor of the journal will be the past conference chairman. His responsibility will be to assist in gathering information for the journal, as well as printing and distributing the journal.

VIII. Northeast Soil Taxonomy Committee

Membership of the standing committee is as follows:

Head, Soils Staff, NENTC, 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 Experiment station conference chairman or vice-chairman is **reponsible** for overseeing the selection of state representatives.

IX. 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
By-Laws Amended June 25, 1982

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APPENDIX 1

Example of Conference 1st Announcement Letter

To: **Participants** and guests of the 1982 Northeast Cooperative Soil Survey Conference

From: NECSSC Steering Committee (Ted Miller, Fred Gilbert, Ed **Sautter** and Ed **Ciolkosz**)

Date: August 1, 1981

Subj: First announcement of the 1982 NE Cooperative Soil Survey Conference

The conference will be held June **20-25**, 1982, on the Cornell University Campus in Ithaca, New York. Accommodations will be in the dormitories, and the meetings will be held in Bradfield and Emerson Halls.

The program will be similar to past conferences, in that committee meetings will be a major focal point of the conference. Following is a very brief summary of the conference agenda:

Speakers: Paul Dodd, NY State Conservationist; David Call, Dean, Cornell University; Art Holland, Director NENTC; Ralph McCracken, SCS National office; Dick Arnold, SCS National office; George Bluhm, IRIS Staff; Joe Kubota, Soil Micro. Nutr. Lab; Eugene Hanchett, NY Dept. Agr. & Markets; Ernest Hardy, Cornell Natural Res. Lab, and others.

Committees: Spodosol Classification; Post Mapping Role of Soil Scientists; Standards and Specifications for Soil Maps; Improving Descriptions of Mapping Units; also the following committees will be giving reports-- Northeast Soil Map and Bulletin Project, Northeast Soil Characterization Study, and Criteria for Land Capability Classification.

Panel Discussions: Introduction and Presentation of Soil Survey Information; Digitizing Soil Maps.

Experiment Stations will be giving research reports and other activities will include a Wednesday afternoon field trip to view soils and landscapes in Finger Lakes area, and a Tuesday night picnic.

Complete registration information will be sent out next spring by conference vice-chairman Fred Gilbert. Also, shortly before the conference, a finalized agenda will be sent to participants.

We believe the 1982 Conference will be one of the best we have had in the Northeast and hope you can join us in Ithaca next June.

Committee Reports

1. Format as indicated under "All Information" plus at the top of the 1st page:

8. Committee number.
- b. committee **title**.

2. Followed by committee members (indicate chairman, and vice-chairman and committee charges).

3. Followed by the committee report plus recommendations.

4. Pagination:

Paginate the committee reports with the committee number in the bottom center of the page. For example, 2-1, 2-2, etc.

Experiment Station Reports

1. Format as indicated under "All Information plus at the top of page 1:

- a. Name of the Agricultural Experiment Station. For **example**, Maryland Agricultural Experiment station Report.
- b. Author.

2. Followed by the report.

3. Pagination:

Paginate the report **using** the post Office **abbreviation** of your **state** plus the page number (in lower center of **page**). For example, MD-1, MD-2, etc., MA-1, MA-2, etc.

Frederick L. Gilbert
Conference Vice-Chairman

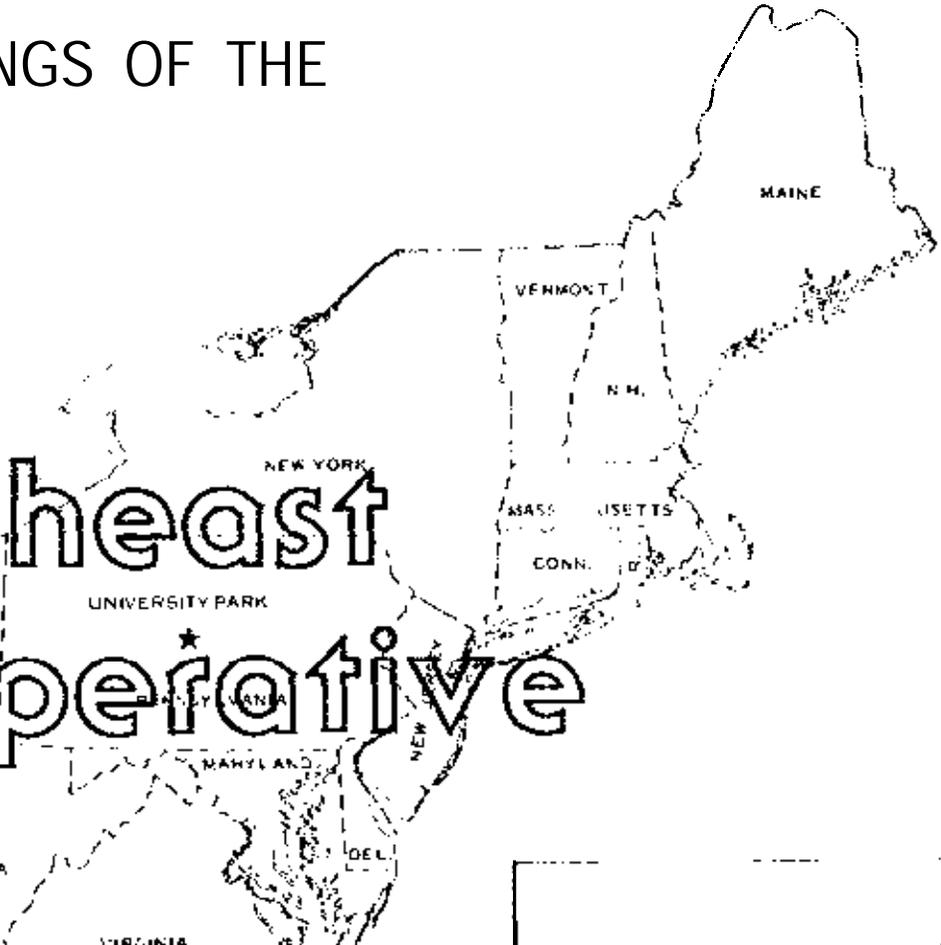
NATIONAL COOPERATIVE SOIL SURVEY

Northeast Regional Conference Proceedings

University Park, Pennsylvania
June 23-27,1980

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PROCEEDINGS OF THE



**Northeast
Cooperative
Soil
Survey**

Conference

University Park, Pennsylvania
June 23-27, 1980

**Proceedings of The 1980 Northeast Cooperative
Soil Survey Conference^{1/}**

Assembled

by

Edward J. Ciolkosz^{2/}

Agronomy Series Number 65

Agronomy Department, The Pennsylvania State University

University Park, Pennsylvania 16802

November 1980

^{1/}Conference was held at University Park, Pennsylvania on June 23-
June 27, 1980.

^{2/}Professor of Soil Genesis and Morphology, Agronomy Department, Pennsylv-
ania State University.

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- Soil Survey of the Northeast by F. Ted Miller (Head, Soils Staff, SCS NETSC)
- National Resource Inventory by Jerry Lee (Director of Inventory and Monitoring, SCS National Office)
- National Cooperative Soil Survey by Klaus Flach (Deputy Chief of Natural Resource Assessments, SCS National Office)
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By-laws of the Northeast Cooperative Soil Survey Conference

List of Attending Participants

NORTHEAST COOPERATIVE SOIL SURVEY CONFERENCE

Keller Conference Center

**Penn State University
University Park, Pennsylvania**

June 23 - June 27, 1980

AGENDA

Sunday, June 22, 1980

**5:30 - 8:00 p. m Registration and Social Gathering - Assembly Room
Nittany Lion Inn**

Monday, June 23, 1980

8:00 - 12:00 a. m

8:10 - 8:15 a. m

8:15 - 8:30 a. m

8:30 - 9:00 a. m

9:00 - 9:30 a. m

9:30 - 9:50 a. m

9:50 - 10:20 a. m

10:20

**Committee 3 (Room 402) Post Mapping Role of Soil Scientists -
Art Kuhl, Chairman**

2:45 - 3:15 p. m **Coffee Break** **Ground Floor Conf. Center**

3:15 - 5:00 p. m **Committees 1, 2 and 3 continue their meetings**

Tuesday, June 24, 1980

8:00 - 9:45 a. m Committee Meetings

**Committee 4 (Room 403) Soil Survey Interpretations Made at
Categories above the Series Level - Oliver Rice, Chairman**

**Committee 5 (Room 405) Evaluating the Adequacy of Older
Published Soil Surveys - Bob Cunningham, Chairman**

**Committee 6 (Room 402) Soil Water Terminology and Hydrologic
Modeling - Tom Calhoun, Chairman**

9:45 - 10:15 a. m **Coffee Break**

10:15 - 12:00 a. m **Committees 4, 5 and 6 continue their meetings**

12:00 - 1:00 p. m **Lunch**

1:00 - 1:20 p. m **The Use of Soils by the Pennsylv- Leonard Tritt (Section Chief
ania Department of Environ- of the Toxic and Hazardous
mental Resources (PennDER) Materials Section of PennDER)**

1:20 - 1:35 p. m **Spodosol Studies of the Ron Yeck (Soil Scientist,
Northeast National Soil Survey Lab)**

1:35 - 2:00 p. m **Status Report on the Northeast Tom Calhoun (Soil Scientist
Fragipan Study SCS-NETSC)**

2:00 - 2:45 p. m **Experiment Station Reports (15 minutes each)**

**Connecticut Dave Hill
Connecticut Harvey Luce
Maine Bob Rourke**

2:45 - 3:15 p. m **Coffee Break**

3:15 - 5:00 p. m **Committee Meetings**

**Committee 1 (Room 405) Criteria for Land Capability
Classification - Fred Gilbert**

**Committee 2 (Room 403) Soil Wetness Classes and Soil-Water
States - Bob Rourke**

**Committee 3 (Room 402) Post Mapping Role of Soil Scientists -
Art Kuhl**

Wednesday, June 25, 1980

8:00 - 8:45 a. m Experiment Station Reports (Room 402-403; 15 minutes each)

**Maryland John Foss
Massachusetts Peter Veneman
New Hampshire Nobel Peterson**

8:45 - 9:15 a. m **Report on the 1979 National Co- Peter Veneman
operative Soil Survey Conference**

9:15 - 9:45 a. m **Report on the 1980 Northeast Peter Veneman
Soil Research Meeting**

9:45 - 10:15 a. m **Coffee Break**

10:15 - 12:00 a. m **Committee Meetings**

Committee 4 (Room 403) Soil Survey Interpretations Made at
 Categories above the Series Level - Oliver Rice
 Committee 5 (Room 405) Evaluating the Adequacy of Older
 Published Soil Surveys - Bob Cunningham
 Committee 6 (Room 402) Soil Water Terminology and Hydrologic
 Modeling - Tom Calhoun

1:00 - 5:30 p.m. Tour - Soils and Geology of Nittany Valley
 Ed Ciolkosz and Gary Petersen

Thursday, June 26, 1980

8:00 - 9:45 a.m. Experiment Station Reports (Room 402-403; 15 minutes each)

New Jersey	Lowell Douglas
New York	Ken Olson
Pennsylvania	Bob Cunningham
Rhode Island	Bill Wright
Virginia	James Baker
Vermont	Rich Bartlett
West Virginia	John Sencindiver

9:45 - 10:15 a.m. Coffee Break

10:15 - 12:00 a.m. Committee Reports (Room 402-403; about 45 minutes each)

Committee 1 Criteria for Land Capability Classification -
 Fred Gilbert
 Committee 2 Soil Wetness Classes and Soil Water States -
 Bob Rourke

12:00 - 1:00 a.m. Lunch

1:00 - 2:45 p.m. Committee Reports (continued)

Committee 3 Post Mapping Role of Soil Scientists -
 Art Kuhl

2:45 - 3:15 p.m. Coffee Break

3:15 - 5:00 p.m. Committee Reports (continued)

Committee 4 Soil Survey Interpretations Made at Categories
 above the Series Level - Oliver Rice
 Committee 5 Evaluating the Adequacy of Older Published
 Soil Surveys - Bob Cunningham

Friday, June 27, 1980

8:00 - 9:45 a.m. Committee Reports (continued)

Committee 6 Soil Water Terminology and Hydrologic
 Modeling - Tom Calhoun
 Committee 7 General Soils Map and Bulletin of the North-
 east - Ed Ciolkosz
 Committee 8 Northeast Soil Characterization Study -
 Ed Ciolkosz

9:45 - 10:15 a.m. Coffee Break

10:15 - 11:45 a.m. Business Meeting Ed Sautter

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 Other Items

11:45 - 12:00 a.m. Conference Summary F. Ted Miller (Head Soils
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OPENING REMARKS

Edward H. Sautter, Chairman

Soil Conservation Service, Storrs, Connecticut

It's a pleasure for me to welcome all the participants to this year's conference. Furthermore, as your Chairman, I declare the 1980 Northeast Cooperative Soil Survey Conference officially in session. The Steering Committee has developed a good program. The program is designed to address some of the major items of importance to the Northeast, now and in the future. The six technical committees will deal with these items during this week's meetings. The conference should prove interesting, informative, and professionally beneficial to each of us, and most of all, the results will strengthen the soil survey program in the Northeast.

I must take this opportunity to make a personal reference to the fact that I was first introduced to the Cooperative Soil Survey in the Northeastern part of the United States, here in Pennsylvania, some 16 years ago. The experiences here were very rewarding and helpful to me in my work and career.

Our bi-annual conferences have become an important event in the Cooperative Soil Survey Program. I will take a moment to repeat the purpose of these conferences, as Dr. Arnold did in 1978.

"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 the committees and the 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."

The activities related to the soil survey are changing in some states as surveys are completed. In the Northeast, we have completed soil surveys in Delaware, Maryland, Puerto Rico, Rhode Island, and Connecticut, as well as Washington, DC. Other states, such as New Jersey and Pennsylvania, are nearing completion.

This fact presents some challenges: First, more emphasis will be on the use of the information. Soil scientists will be called upon to make more on-site investigations, and we need to format the information to enhance intelligent decisions. The second challenge is the need to explain soil surveys to the public so they can be understood. What is a soil survey? How can it be used? What are the limitations? These questions and many others must be answered so that a survey does not lose credibility or gather dust. Third, what kind of post mapping staff will be needed and what backgrounds will these people need to have to carry out these challenges. This conference should help find answers to these questions.

Finally, I think it's important to remind ourselves that we are involved in a rather unique program in the National Cooperative Soil Survey. It is one of the few programs that is made up of several state and federal agencies with a common objective.

This cooperation adds support to the quality, use and credibility of soils information. I am sure that this same cooperative spirit will help us this week as we approach the agenda items.

With these comments, I sincerely want to thank each of you who have a part in this conference and I also sincerely hope that you'll find this a worthwhile week.

Thank you.

SOIL SURVEY FOR THE FUTURE

Soil survey in the northeast is rapidly approaching a crossroads. Many states have completed field mapping, others have quite a long way to go. Seventy percent of the northeast is soil surveyed but the Caribbean area, Connecticut, Delaware, Maryland and Rhode Island are completed. New Jersey should be finished with their field mapping in the near future. We, in Pennsylvania, are 95 percent complete and plan on finishing the field mapping in 1985.

We, in Pennsylvania, have been asking ourselves some serious questions about the mission of the National Cooperative Soil Survey (NCSS) in Pennsylvania once field mapping is completed and the soil surveys have been published. In the past, I think we in SCS--and perhaps some of our other cooperators as well--have equated the NCSS with soils mapping. I think we, and when I say we I mean both soil scientists and line officers like myself at local, State and national levels, have sold soil survey on completing the soils mapping. We talk about completing the mapping in the county, State or whole United States for that matter as being complete in 1975, 1985, 1995, etc., as if completing the mapping is some kind of end in itself.

This kind of mentality can lead us into a trap. We have fallen into this trap in soil survey many times in the past and will probably be trapped by it in the future. As an example, what do we do when the soils mapping in a county or soil survey area is complete? We write a manuscript, publish a soil survey and move the soil scientist elsewhere. The soil survey publication has become an end in itself.

Ask yourself how much soil scientist time is allocated to areas with completed soil surveys. Both you and I know that many counties throughout the United States with published soil surveys have not had a soil scientist in the area for years.

Our thinking seems to be that the soil survey does not require any soil scientist expertise to use and make further soils interpretations. In a way, this is similar to an engineer designing a bridge and **then leaving** the building of the bridge to a carpenter or **stonemason** without ever checking to see what has been done with his plans. Certainly, we do not need as many soil scientist around to interpret soil surveys as when we were soils mapping, but we do need some of them.

Let us ask ourselves what the soil scientist should do. Let us also **ask** ourselves if this soil survey meets the needs of the principal users of soils resource data in the **1980's**.

I feel that the answer to the second question is in the negative. Soil surveys are technical documents filled with technical jargon. Most soil surveys have been assembled in such a way that the user must start by

Remarks by Graham T. Kunkittrick, State Conservationist, Soil **Conservation** Service, Harrisburg, Pennsylvania, at the Northeast Cooperative Soil Survey Conference, June 23-27, 1980, at University Park, Pennsylvania.

locating oneself **on** a map and then go to a guide to mapping units table or to the table of contents to locate the place in the report where **soils** information is located about a specific map unit. He then can branch out in several directions. He can read the Section on map unit descriptions or perhaps **the** section on the **taxonomic** unit that represents the series in **the** soil survey area. Most likely the user will go directly to one of a dozen or so tables in the text that interprets the map unit located on the soil map for particular uses.

This type of exercise to obtain technical information is perfectly acceptable in a technical document. The question I want to propose is this: Is this the best way to present soil survey information to the general public in the **1980's**? After all, the taxpayers who support the program **are** paying the taxes with the understanding that the soil survey is a very **useable** document that can be interpreted for many different kinds of uses. Are we presenting soils interpretations in the most **useable** format to benefit the greatest number of users?

These are the kinds of questions we in Pennsylvania have been asking ourselves. We do not pretend to have all the answers, but we have a pretty good idea of the direction in which we think we should go to present soils resource data and other resource data as well. We feel that soils information must, as much as possible, be automated and the soil surveys digitized. We also feel that other resource information such as geology, hydrology, land use information, etc., should be computerized to produce a **resource** management information system for Pennsylvania. The base of the REMAPS (Resource **Management** Information System) is, of course, soils information.

The Pennsylvania State University has worked with SCS hand in hand in our quest to computerize soils data. Each map unit for each soil **survey** in Pennsylvania is now in the computer at Penn State University. Other pertinent **data**, such as acreage of each map unit and capability subclasses, is also in the computer for each map unit. Pennsylvania has 3,100 different mapping units and close to 7,000 total mapping units. Computerized data such as this gives us a powerful tool to analyze the soil survey in Pennsylvania. As a" example, we can analyze which map units have the most acreage. We can study the relationships between the dominant slopes groups in the Allegheny Plateau region **vs** the rigid valley province.

These are interesting uses of the computerized data. The user and taxpayer, however, do not reap any immediate benefits. Of greater importance to the user is the relationship of soil map units and soil interpretations. A year and a half ago we stored all the soils interpretations records (**SCS-SOILS-5's**) that are used in Pennsylvania in the computer at Penn State University. Several weeks ago we updated **these** records with the latest information in Ames to keep the records current. We have used the information in several ways.
units in individual soil surveys
pretations for specific

Next we will digitize all our **soil** survey maps in Pennsylvania. **Our ultimate goal in computerizing** soils data is to make it possible for **users** in both the public and private sector **to** obtain soils interpretation data via computer by simply locating the site on the soils map by coordinates and **asking** the computer for specific interpretations. The next step is to digitize other resource data, such **as** geology, hydrology, land use, etc., to produce a true REMAPS.

Not only would soils and other resource data be made more readily available to those with access to computer terminals, but it would also be much easier to keep the data current. As **new** techniques are developed, the data can be quickly updated.

I spent most of my allotted time answering my second question, which is, does **a** present conventional soil survey publication meet the needs of the users in the **80's**, without addressing the first question, which is, what should the future soil scientist do? Perhaps the second answer partly answers the first question.

Certainly, the soil scientist in the future should provide **onsite** assistance to **users** who need special attention in interpreting soil surveys.

Certainly, we must provide some mechanism to keep older soil surveys up **to date**. The present method of completing **a** soil survey, **not** really examining it closely for 30 years or more and then remapping, is a costly luxury we cannot afford in the future.

We **must** also provide the needed soil scientist assistance to carry out inventory and monitoring, **RAMP**, Rural Clean Water Program (**RCWP**), **RCA** and other programs within each state. We must provide enough **soil** scientist expertise to keep **our** soil series descriptions and soil interpretations records current,

Last, and certainly to me not the least **important** task of the soil survey of the future, should be to provide users with new and better ways of utilizing the soil survey data to keep the National Cooperative Soil Survey current with the needs of users in the 80's.

Sudan - evaluation of soil survey laboratory procedures

Other technical assistance activities include review of project proposals for AID/Washington and preparation of special reports. One report will describe the past, present and future, international activities of SCS.

Continued improvement of food _____

OBSERVATIONS FROM THE TSC

Arthur B. Holland
Associate Director
NETSC, Broomall, PA

It is interesting to note that at the conference two years ago my subject was "Remarks" and this year it is titled "Observations." I'm not sure whether this is progress or not; however, it does give me *an* open license for selecting my topics.

There are four subjects that I wish to cover today. The first is a status report on the Northeast Cooperative Soil Survey Program; then I want to outline the remaining workload for completing the soil survey in the Northeast; third, I have some comments to make about CASPUSS (Computer Aided Scheduling of Published *Soil* Survey System); and, last, I'll briefly describe a soil scientist training position at the TSC.

But, before I get into these topics, I would like to make a proposal to the conference for your consideration.

There is concern regarding the information in the soil survey report by the various people who write and use it. The soil scientist is concerned that much of the technical information and data is not being fully developed, which limits its use as a technical document. However, *on* the other side, *the* non-soil scientist is concerned that the document is too technical, with too much *support* information which he believes is not necessary.

Both of these viewpoints are valid in my estimation. I therefore suggest that consideration be given to developing a soil survey publication both in a popular edition and a scientific (technical) edition. The popular edition would include the information that a non-soil scientist is looking for such as how to use the various soils and where they are located. The scientific edition could include all the data, soils terminology and scientific background for those who are interested in delving into the more intricate part of soil surveys. Klaus Flach has mentioned that he has seen examples of this in foreign countries. The popular edition is the main publication, with the scientific data appended.

It might be desirable for this conference to examine this proposal and possibly establish a committee that could look into this and report at a future conference.

Now, to move on to my announced four topics the first of which is -

Status report for the Northeast Soil Survey Program

Sixty-five percent of the Northeast area has been mapped. As of October 1979 this includes 101,300,000 acres. There have been 167 soil survey reports published in the Northeast. The mapping is complete in five states - Connecticut, Delaware, Maryland, Rhode Island, the Caribbean Area, and the District of Columbia. New Jersey will complete their mapping this calendar year. At the next Northeast Cooperative Soil Survey Conference, two years from now, six states could have all of their soil survey reports published if they hustle. These six states are:

<u>State</u>	<u>Last SS Report to be Published</u>
Delaware	Completed 1974
Rhode Island	February 1981
Caribbean Area	July 1981
Maryland	July 1981
New Jersey	August 1982
Connecticut	January 1983

At the present time, there are approximately 155 soil scientists in the Northeast States. The SCS budget for the soil survey program in FY '80 for the Northeast States was \$3.9 million. This was a drop of \$7 million from FY '79 when it was \$4.6 million. If \$3.9 million is divided by \$30,000, the approximate cost of a soil scientist staff year, it equals about 129 staff years. It is apparent that approximately 26 staff years (155 less 129) of soil scientist time is being used for other than the soil survey program. This is not necessarily a negative concern; it shows that we are using soil scientists for jobs other than mapping and publishing soil surveys. There is a tremendous need for their talents and services in other areas.

Let's move on to the -

Soil survey workload for the Northeast -

As of last October, there were 50,700,000 acres to be mapped and 214 soil survey areas on which reports are to be published. If we use an average annual mapping rate of 20,000 acres per staff year, it would require 2,500 staff years to complete the mapping (20,000 acres per staff year may be high or low, depending upon the soil scientist's experience and other activities or jobs he has to perform). There are approximately 3,200 staff years available for mapping between now and the end of the century; therefore, if the mapping is to be completed in the Northeast by the end of this century (1999), approximately 17 soil scientists and \$500,000 per fiscal year to pay their salary are needed. Of course, another way the mapping could be completed is to increase the production rate above a mapping rate of 20,000 acres per year.

It is my prediction, based on an analysis I have made, that five states in the Northeast will still be mapping soils in the year 2000, unless production is increased. Three states should finish before the end of the century - Pennsylvania, Massachusetts and New Hampshire. Pennsylvania and Massachusetts should complete their mapping within the next 10 years. New Hampshire should complete sometime in the late 1990's. This, of course, is all based on the present level of funding and manpower.

My third topic has to do with CASPUSS -

As you are aware, this is a computerized method of keeping the scheduling of all the soil survey activities current. It has two objectives: one is to maintain a short-term schedule, and the other is to put into perspective the long-term scheduling. The CASPUSS is a complete listing of all the soil survey areas that are to be mapped and published. It provides the dates when each step in putting a soil survey report together is scheduled. From this standpoint, it is a long-term planning document; however, since it is updated every two months, it is also a very useful management tool for short-term planning and scheduling of both manpower and funds.

CASPUSS is being used by management to allocate funds to the states and to set up staffing plans in the TSC and National Office to handle the anticipated workload. In addition to the normal printout of CASPUSS, which is set up in three separate categories (Operations, Cartographic, and Manuscripts), the TSC is getting an additional printout of the different jobs that are scheduled to come to the TSC for input. The past fiscal year we received information for the current fiscal year and the next three fiscal years. We get dates for ordering new base imagery, initial field reviews, comprehensive field reviews, final field reviews, final correlation conference, correlation documents signed, map compilation to TSC, initial manuscript review by state and TSC, and manuscript editing dates. In updating the CASPUSS from the TSC, we will not schedule more work than our staff can handle - based on the estimated time we anticipate each of these tasks to take and the number of people we have on our staff. This will probably mean that some jobs that have been scheduled in the past for the TSC will be delayed because of our limited manpower.

It is disturbing to note that a high percentage of the dates listed on CASPUSS are not being met for some reason or other. The schedules the TSC has been planning on have not been realistic in the past, but we hope this will improve in the future. An example is that 33 soil survey reports were scheduled to be published in FY'81. The average for the Northeast for the past five years has been eight or nine, so you can see it is quite unrealistic to expect the Northeast to publish 33 soil survey reports in FY'81. We have published only six to date, and it is expected that only three or four more will be published this fiscal year.

Other observations are being made by management - there are 21 manuscripts ready for publication sitting on the shelf at Lanham. They are waiting for the atlas sheets to be prepared. One of these manuscripts has been waiting on the shelf for accompanying since March of 1977.

CASPUSS also shows us how long it takes **to** complete each step in the soil survey publication process. It takes, for instance, on the average 24 months following the completion of field mapping before the correlation document is signed. It also shows that following completion of field mapping, it takes 26 months before the editing is complete and 58 months before the page proof is prepared for the manuscripts. The average time it takes after the mapping is completed before the manuscripts and atlas sheets are sent to GPO is 65 months and another six months for GPO to print and distribute the report. We hope that the average times for these various steps can be shortened.

We realize it takes considerable manpower to keep CASPUSS current; however, with the amount of time and effort put into it, it should be a useful management tool. Our track record to date, however, has not been very good. In checking the June CASPUSS with the August 1979 CASPUSS, I found that there were 64 dates on CASPUSS delayed, 69 that had been completed on schedule, and 17 that had been completed ahead of schedule. This means that approximately 40 percent of our work is delayed even with an update every two months.

SOIL SURVEY PROGRAM
OF THE NORTHEAST

F. Ted Miller
Head, Soils Staff
SCS, Northeast TSC

First, let me say that I am very happy to be here and am looking forward to working with each of you. From Ed's introduction it would appear that my background and experiences are quite broad. I'd like to clarify that just a bit. Although I have worked in the SCS's other three TSC areas, the West, Midwest, and South, I never really resided anywhere else but in the old Great Plains region, which at one time extended from Texas to North Dakota, and included eastern Wyoming and eastern Montana. So I guess, at times, you will have to listen to some of my plains biases, but I'm sure we all recognize the fact that there are few of us who are completely free of bias. Most of the things we do are influenced, at least to some degree, by our backgrounds, both in education and experience. I don't believe our biases are all bad. **Actually**, some of the best soil survey programs I have seen have been in states where there is a good mix of varied backgrounds among the soils staff. This provides a much broader base for ideas and results in a higher quality product. We must, however, never let our biases keep us from having an open mind and from hearing the other side. Anyway, at times you may think my plains bias is too much, but I just ask that you keep an open mind, as I promise I will to you.

As you might expect, there's not a great deal I can say at the moment about the Soil Survey program in the Northeast since I've only been here some four weeks now. There are, however, several items I want to discuss very briefly which I would appreciate your giving some thought to.

First, I would like us to be thinking seriously of what we are going to do in the States where mapping is complete - Rhode Island, Connecticut, Maryland, Delaware, Caribbean Area; and where mapping is fast approaching completion - New Jersey and Pennsylvania. I'm happy to see we have several committees that will be addressing this subject in our deliberations this week - Committee 3 on "Post Mapping Role of Soil Scientists" and Committee 5 "Evaluating the Adequacy of Older Published Soil Surveys." Most certainly the job does not end with the completion of the mapping. It really means a re-direction of our programs. In completed States, we must now turn our full attention to using the surveys. How can we make them more useful? - digitizing and interpretive maps?; special publications? How about onsite work? What plans do we have for evaluating and maintaining the adequacy of published soil surveys? Most certainly published soil surveys become outdated and must be periodically evaluated to determine if they meet current needs. This does not mean, I don't believe, that every survey needs re-correlating, remapping, or even new base maps, except in areas of great change in land use. Too often people look at the interpretations and erroneously conclude that since they are out-of-date, the entire survey needs remapping. Current names really aren't that important if you have the proper interpretive values to tag on the map unit. How about staffing? What kind of staff will be need? In addition to the items I have already mentioned, I believe you should give some thought to additional kinds of publications - publications that would enhance the use of our surveys. Cooperative, statewide publications that would compliment

and tie together our individual NCSS publications. Maybe several types of publications, technical ones, as well as popular types, that are aimed essentially at planners and other disciplines who use our surveys. At any rate, I believe we here in the Northeast are in a unique position to help set the direction (nationally) of the soils program. Let's give it some serious thought.

Now, a few brief comments to those states where there is considerable mapping yet to be done. I am sure that you have previously heard the remarks I am about to make, probably many, many times. Eut I am going to make them again. Not so much because I think you've forgotten them, but just to assure you that I too feel quite strongly about them.

First, let's talk about mapping intensity. I think we all agree that the scale and detail of a soil survey and the interpretations must meet the needs of the user. Too little detail can severely limit its usefulness - too much detail can cause extra difficulty in separating the needed level of information. The soil map must be matched to the predicted use. These users do not always require the same mapping intensity. Where they are less intense, map units can be designed that will save time and money but still meet the needs of the user. I'm, of course, not yet that familiar with the Northeast but I should think there are areas yet to be mapped that do not require high intensity mapping. We're not putting all of our soils in the Northeast under houses, shopping centers, black top, etc., are we? At least I ask that if you have areas where land use is relatively broad, that you think seriously about the kind of map we are making. I just don't believe that with the kinds of manpower and money restraints we have that we can afford to make maps any more detailed than the use requires.

The second item I want to mention deals with responsibility. Who is responsible for the scientific accuracy, completeness and consistency of the soil survey? I know that you all know the answer. I also know what our National Soils Handbook says. Although it says the State Conservationist is responsible, the real "bottom line" is that you folks sitting here in this room are really the ones responsible. The State Conservationist, accepts or rejects, based on your recommendations. Our role in the TSC is to assist you as much as possible, but I ask that you keep foremost in mind that you are the ones responsible for the quality of the mapping, field classification and correlation; soil interpretations, and the soil survey manuscript, both text and Atlas sheets. Ultimate approval of the correlation and of the manuscript, both text and maps for publication, rests with the TSC. We, of course, review for scientific accuracy, consistency, and completeness. HOW the survey gets that way is essentially the States responsibility.

Again. I appreciate the opportunity of being here and I am looking forward to working with you in the future. I am sure this will be a very meaningful conference and ask only that each of us give our best effort in our discussions this week. Thank you.

National Resources Inventory

by
Jerry S. Lee ^{1/}

SCS has been a leading collector, user, and supplier of natural resource data since the agency was founded, more than 40 years ago. This paper discusses some of the important inventories made by SCS.

Snow Survey and Water Forecasting

Since 1935, a network of more than 1,600 snow courses has been located in the western mountains and systematically measured on a monthly or more frequent basis. These data are used to develop water supply forecasts. Although forecasts were initially developed for determining availability of water for irrigated agriculture, they are now used for a variety of purposes including reservoir operation, determination of municipal water supply, hydropower generation, and recreation development.

In response to the expressed needs of users for obtaining more frequent measurements of snow and related data, SCS began in 1975 to implement a plan to install 475 interrogable automated sites. After a period of correlation, these sites will replace at least that number of manually measured sites. Installation of the automated system called SNOTEL (for snow telemetry), was completed on October 1, 1980. Most of the sites are expected to be operational for the 1980-1981 snow season. At present, the remote data sets collect snow water equivalent, accumulated precipitation, maximum and minimum air temperature, and battery voltage. An additional 12 parameters can be collected at each site without significant modification of the equipment. Communication from the remote data sites to the metric station (probe location) is achieved by reflecting radio signals from shortlived meteorite trails. This communication system has proven highly reliable.

Wind erosion conditions are monitored primarily in the 10 Great Plains States at least three times per year. **More** frequent observations are made during droughts and severe wind erosion events.

Reports of flooding, drought, and other natural disasters are monitoring activities of SCS.

Conservation Needs Inventory

The 1958 Conservation Needs Inventory (**CNI**), was our first nationwide survey of soils, land use, conservation problems, and conservation treatment needed to solve erosion and other soil problems. For the 1958 CNI, SCS with assistance of some State agricultural experiment stations collected basic data on soils and land use for statistically selected sample areas in each county. Sample plot data were expanded to represent the entire county.

^{1/} Director, Inventory and Monitoring, Soil Conservation Service, Washington D.C.

The purpose of the 1958 CNI was to provide the U.S Department of Agriculture and other land-use planning and conservation agencies with reasonable estimates of the carrying capacity of various lands and conservable stock production capacity.

Among the new data to be collected for the 1982 NRI are windbreaks, critically eroding areas, irrigation, cropping history, land cover, wetland, riparian vegetation, wildlife habitat, additional information on soils, and supplemental vegetation data on pastureland, rangeland, and forest land. Each of the sample points will be identified in a way that will allow access to the computerized soil information file. This access will allow detailed analyses of soil suitabilities and limitations, and potentials for a wide variety of land uses.

Inventory techniques for the 1982 effort will consist primarily of field observations within the primary sample unit that **will** be recorded on an aerial photograph base map. From this base we will develop a monitoring methodology consistent with current technology. This will include use of photointerpretation techniques, satellite data collection systems, in-place sensors, and mechanized scanning to the extent feasible.

Monitoring Needs for the 1962 NRI

In planning for future monitoring efforts, **SCS** must examine the spectrum of our monitoring objectives? Perhaps you can help us with application of remote sensing technology in the following areas of resource monitoring:

1. Water quality:

- a. Location of areas of high pollution, including data on sediment and water temperature.
- b. Effectiveness of sediment control practices.
- c. Location of areas of eutrophication and high nutrient loads.

Air quality:

2. Wind erosion on the farms by remote automatic sensors.

- a. Airborne dust in cities.

3. Soil quality

- a. Sheet and rill erosion.
- b. Areas of waterlogging.
- c. Areas of saline seeps.
- d. Soil moisture on benchmark **cropland** soils.

4. Vegetation quality.

- a. Progression of stress on selected plants due to drought, insects, and disease.

- b. Condition of range and pasture vegetation; for example, invasion of undesirable shrubs.
- c. Burned areas of forest and rangelands.
- d. Changes in land use and cover.

The greatest value of these monitoring activities will be their integration with other data for prediction of phenomena. For example, integrating climatic data with soil moisture data for benchmark **cropland** soils would enable predictions of the probability and severity of drought, wind erosion, or flooding.

The 1982 NRI will be the most comprehensive natural resource inventory ever undertaken by SCS. We have hopes that it will fill our present data voids. However, we need to constantly be on the lookout for new data voids and more reliable and cost effective ways to gather data.

NATIONAL COOPERATIVE SOIL SURVEY ^{1/}

SCS Reorganization

SCS will be organized with six deputy chiefs for: Administration, State and Local Operations, Natural Resource Projects, Technical Development and Application, Natural Resource Assessments, and Planning and Evaluation. Each deputy chief will have an associate deputy chief.

The Deputy Chief for Natural Resource Assessments will be responsible for: Soil Staff, Inventory and Monitoring, Intergrated Information Systems, Cartographic and Remote Sensing.

The Soil Staff will be organized under a Head, Soil Staff, with the following staffs, each with a staff leader:

<u>STAFF</u>	<u>PRIMARY RESPONSIBILITY</u>
NCSS Program	Budget and Evaluation, Development and Management
Soil Classification	Maintenance of Soil Taxonomy and Soil Survey Manual, Application of Climatology to Soil Classification, Taxonomic Systems Development (ADP)
Soil Survey Research Coordination	Research Application and Coordination, NSSL
Soil Technology	Technical Application and Coordination Within SCS and USDA, Technical Application and Coordination other Agencies and Public, Interpretive Criteria Development and Evaluation
Soil Survey and Correlation	Technical Evaluation Mapping, Classification, Correlation, and Manuscripts; Procedure Development; Scheduling Coordination; Small Scale Maps; International Soils Program

Soil Surveys

The soil survey publication program is in a period of overcoming delays in publishing soil surveys resulting from decentralization and reorganization of cartographic activities.

^{1/} Presented by **K. Flach**, Associate Deputy Chief, Natural Resource Assessments, Soil Conservation Service, Washington, D.C.

The soil survey program should have about 200 soil surveys in the review, edit, and publication process at any one time. This is based on an average of 100 survey areas correlated per year and the policy that surveys will be published within 2 years of final correlation. At the start of FY-79 there were 398 surveys in the review, edit, and publication process, 198 more than normal. At the end of FY-79 this figure had decreased by 49,149 surveys over the 200 considered normal. This number should continue to decline. Major reasons for publication delay are:

Compilation and finishing - 41 percent,

Final map negative preparation at the WTSC - 17 percent,

Base imagery - 13 percent.

Better management by State staffs is shortening the time interval between mapping completion and final correlation, and between final correlation and the date the manuscript and compiled and finished maps are sent to the TSC. With continued good management by State staffs, these intervals can be further reduced.

Imagery has been ordered for all progressive SCS soil surveys and for all surveys scheduled to be initiated in the next 3 years.

During the first quarter of FY-80, 56 soil surveys were sent for printing and binding--more than in any other quarter.

Of the 98 surveys edited in FY-79, about one-third were edited at the TSC's.

Of the 3,090 soil survey areas comprising the U.S., 1,245 are published; 410 have mapping complete, waiting publication; 511 have mapping in progress; and 924 have incomplete mapping and publication plans.

Recent Accomplishments

Four pilot projects have been completed using soil potential to inform users of methods to minimize effects of soil limitations.

Soil survey operations has developed a computerized soil operations data (SOD) file that provides information on soil survey finances, personnel, goals, and accomplishments by agency, State, TSC, and Nation. Computerization allows quick analysis of the data for program evaluation.

A map that will aid soil classification is available from soil survey's Soil Classification and Mapping Branch showing soil moisture regimes for the U.S. Data from 5,000 climate stations were used to compute the regimes which are plotted in 1/2-degree quadrangles on a 1:7,500,000 national map.

A multicolor map showing major land resource areas of the United States has been updated and recently printed. An accompanying text is being edited for publication.

Soil survey has established a computerized national mapping unit use file that is generating inquiries for use from SCS and outside sources.

SCS has initiated a program with USGS to obtain aerial photography of the entire U.S. every 5 years. One-fifth of the country is to be flown each year, which hopefully will prevent the chronic delays in publishing soil surveys because of lack of a map base.

SCS soil scientists are participating in agriculture production potential studies of less developed countries in cooperation with the Economic Statistics and Cooperatives Service and the Agency for International Development.

A chapter of the revised Soil Survey Manual has been made official and is being issued as an appendix of the National Soils Handbook, with more chapters to follow.

Current Activities

Soil survey is developing a program to determine the probability of deficient moisture in the rooting zone of crop plants to aid in making soil interpretations for conservation practices such as waste water disposal on land.

Soil survey has committed a soil scientist at the national level to assist in a comprehensive study of the quihyle shrub, a possible alternative to energy intensive synthetic rubber.

Soil survey will prepare "growing period zone maps" of the U.S. to specifications of the UN's Food and Agriculture Organization. The maps will aid the transfer of technology from the U.S.'s areas of **rainfed** agriculture to similar areas in less developed countries.

Soil survey's mapping unit use file can be interfaced with the soil interpretation record to provide acreage of soils with specific interpretations for areas with final correlations.

Soil moisture is being measured in widely spaced U.S. locations to improve methods of estimating crop yields and drought evaluation.

Background levels of cadmium and lead are being determined in human diet crops and their associated soils.

The Agency for International Development is making funds available to SCS for an International Soil Management Support Services Program headed by a Director in **SCS's** soil survey to provide assistance to other countries at their request. SCS will provide soil **classification** and

soil management assistance

- Implementing the International Soils Program.
- Improving the use of soil laboratory data.
- Expanding the use of remote sensing for making soil surveys.
- Increasing public awareness of the soil survey program and technical help available.
- Preparing plans for completing the once-over soil mapping of the U.S.
- Improving soil survey coordination with the Forest Service and Bureau of Land Management.

COMPUTER GENERATED SOIL MAPS

Gary W Petersen

**Agronomy Department
The Pennsylvania State University**

The Role of Landsat Data Products in Soil Surveys. Image enhancements and spectral thematic maps were developed for an area of arid and semiarid rangeland in east-central Utah using Landsat digital data. Both enhanced images and thematic maps proved useful for manual interpretation of soil unit boundaries. Ancillary cartographic information and soil boundaries were digitized, spatially registered, and merged with the

Resource Management Programing System

R. L. Cunningham
The Pennsylvania State University

Modern soil survey reports have been published, in publication stage, or near publication stage for most Pennsylvania counties. Also, there are many characterization data collected since 1957 that are valuable to land users. These sources of soil resource information are often lacking in format, specificity, or organization to provide efficient answers to soil questions. Through the cooperation of SCS and Conservation Districts, the Department of Agronomy is developing a soil information system for Pennsylvania.

A state mapping unit legend has been compiled from county legends listing the symbol, acres, and capability class of every mapping unit. This file provides many types of state summary data, i.e.: acres of Class I land; acres of extremely stony mapping units; acres of strip mined land. Data are identified by county so that similar summaries for a county, groups of counties, or regions can also be developed.

In addition to the acreage file, Penn State requested and received from the state SCS a tape of the interpretations file from the Iowa State University data processing center for the soils of the state. This file is used to add classification, estimated properties, or interpretations to the state mapping unit legend, for example, all mapping units with the potential of producing greater than 100 bushels of corn per acre can be identified and listed, the acres totaled, and the classification of each indicated.

The third file in storage contains the characterization data. These data can be matched, merged, sorted, edited, listed, and printed in combination with the other two files of soil information. Many of these data can form the input to other programs or models that require soils information.

One additional set of soils data needs to be compiled. Although research at Penn State has shown the delineations of soils on atlas sheets of a soil survey can be digitized, the task of electronically storing these maps is formidable. However the identity of the spatial extent and location of a soil with unique qualities was the original reason for mapping soils. The potential of adding the mapping unit boundaries to the other soils information would take advantage of today's development in data processing, communication, and information delivery.

Soil information is basic to land use and management. The soil information system when fully developed can assist in managing Pennsylvania's soil resources.

THE USE OF SOILS BY THE PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES

by

Leonard Tritt

Division of Hazardous Waste Management
Pennsylvania Department of Environmental Resources
Harrisburg, Pennsylvania

Within the Pennsylvania Department of Environmental Resources (DER) soils data and mapping is frequently needed and used. Some of these uses will be discussed here.

The Bureau of Soil and Water Conservation uses soil survey data in evaluating erosion and sedimentation plans to determine their adequacy, to ascertain and evaluate problem areas concerning storm water management, and in providing general information in reply to soils-related inquiries. The Watershed Branch of the Bureau utilizes soil survey data in review and preparation of watershed plans.

The Bureau of State Parks has utilized soil survey data in the planning and development of state parks. Soils data can be useful in designing a park and is important in developing parks, especially as related to locating buildings and siting sanitary facilities. Soils maps have also been used in planning upgraded facilities and improvements.

In the Bureau of Surface Mine Reclamation soil survey data is currently used in identifying soils on land for which applications for surface mining permits have been submitted. They are used to determine whether prime farmland (as listed by SCS) would be destroyed by the proposed surface mining activity (quarry, gravel pit, strip mine, etc.). If so, greater precautions in back-filling are required.

The Bureau of Water Quality Management utilizes soil survey data in several ways. This bureau conducts the spray irrigation and on-lot sewage disposal programs (among others). Soils are obviously an important aspect of spray irrigation of liquid wastes, and applicants are required to submit soil survey data supplemented by on-site soils evaluation. Soil survey data is also required on applications for permits for on-lot sewage disposal systems. These permits are issued by semi-professional to professional sewage enforcement officers employed by municipalities, but certified by the Department. Soil survey data is also used in sewerage planning to evaluate soil suitability for on-lot systems as related to other alternatives.

Soil survey data is also used in the landfill, sewage sludge, and solid waste management planning programs of the Bureau of Solid Waste Management. The soils information is required on forms submitted with permit applications and supplemented by on-site soils evaluations. In planning, the soil surveys are used in screening for potential solid waste disposal sites.

Because we use soil surveys so frequently and in so many ways, we'd like to offer some ways to maintain and improve usefulness of future surveys. Some recommendations are:

- a. Do not discontinue mapping erosion classes. This is especially important with severely eroded areas. Severe erosion may render a moderately deep soil shallow, or a deep one moderately deep. It is also important to know about because the severely eroded soil will likely have lower productivity and could alter runoff potential.
- b. Do not use broad slope ranges excessively. The 0-3, 3-8, 8-15, etc. percent slope ranges are quite useful. But, for example, an 8-25% range is of limited value in making sound evaluations, because slopes range from moderate to steep. Use of broad slope ranges in soils mapping is not so much a disadvantage in some predominantly mountainous countries, but is in countries where
- c. Please watch the correlations; please do not correlate dissimilar soils or correlate simply to reduce the size of the legend. Excessive correlations reduce the accuracy and thus the usefulness of the mapping. Data presented is thus much less reliable from all aspects.
- d. Minimize inclusions and undifferentiated mapping units. Again, overuse of these limit the accuracy, and thus the utility and reliability of the mapping. When these must be used, it would be beneficial to list what inclusions are likely to be, and approximately what the distribution percentages of the series in undifferentiated mapping units are (e.g., 60% Series A, 40% Series B). This information would be included in the narrative section of the soil survey report.
- e. When establishing or finalizing legends, don't be too conservative. If a series, variant, or peculiar taxadjunct occurs in 200 acres or more, map it. While some of the major interpretations of these "oddball" or inextensive soils may be similar to more extensive soils in the survey area, the soils themselves will not be alike. The purpose of the soil survey is to map soils, not interpretations. Don't delete cantena members.
- f. Map soils in close accord with the geology where possible. For many uses there is a close relationship between the soil and parent material. Where soils are defined, correlated, or mapped in accord with parent materials, more information can be gleaned from the survey. Obviously, this cannot always be done, e.g., highly interbedded terrane, complex glacial terrane, etc. But where possible, it would be beneficial.

- g. For best utility, the scale of mapping should not be more than 1 inch = 1320 feet or 1:15840. Smaller scale mapping is harder to read, see, and measure from. Further, much of the landscape detail which can be seen or interpreted from the imagery or photography will be lost or at least more difficult to comprehend.
- h. To further improve the soil survey do not delete surface feature details. Features such as sinkholes, outcrops, springs, wet spots, and important drainage courses not discernable by mappable soil patterns should appear on soils maps. Cultural features such as schools or churches are often omitted but are aids in using the survey. Often,
- i. For completeness and accuracy, it would be advisable when writing some of the interpretations to contact appropriate state agencies to ascertain regulations in that state applicable to items included in the interpretations. For example, in Pennsylvania while SCS might rate a moderately well drained soil "severe" for on-lot sewage disposal, there are legal alternative-design on-lot sewage systems which could deem the same moderately well drained soil "slight" or "moderate". And under certain circumstances a landfill could be permitted on off-drainage soils. Otherwise, it should be stated that the SCS ratings are for conventional designs of the respective facilities.

Probably agricultural and environmental-related (including planners) users of soil survey information account for a vast majority of employment of soil survey data. And in some environmental areas the importance of good, thorough soils information is increasing. For example, funding monies for sewerage are decreasing, and emphasis is being placed on land disposal methods. The usefulness of soils maps at small scale, with limited surface feature details shown, and with numerous inclusions and correlations resulting in common occurrences of soils unlike those implied by the mapping unit, yield a survey that is easily misconstrued and truly less effective and valuable.

It is often stated that soil surveys must be made simple so the average homeowner, farmer, or developer is capable of using it. But, the average person is not a great user of the survey, and further, the current general mapping is less likely to tell him what he needs to know anyhow. Also, it must be recognized that planners usually include soil survey maps in land use, sewerage, and solid waste management plans. And typically the mapping is purported to show what soils are actually present. Subsequently, these plans are approved based on false or misleading data. This problem is enhanced when soils maps are made with numerous inclusions and correlations. It is important to know that variability exists and what variability exists. Soil use interpretations may or may not be truly the same.

It is readily acknowledged that the soil survey is not to be, and cannot be, superior to on-site soils evaluations. But there are many times a soil survey could suffice if it were not so general as they have been made recently. The more is known about a site or tract the better regardless of the proposed use. At least in Pennsylvania, competent consulting soil scientists are uncommon, so it is difficult many times to accurately obtain detailed soils evaluations and/or mapping. This places further burden on SCS to provide more detailed soils mapping. It is a certainty that the most frequent users of soils maps will put detailed maps to full use.

What is being promoted here is not something new. It is our observation that the accuracy, thoroughness, and quality of usefulness of soil surveys finalized, underway, or published in the last six to eight years or so is inferior to most of those performed and released earlier. Most of that earlier work has been adequate, in our experience, although some are superior to others.

Cutting production costs and speeding the rate of publication are two reasons cited for current soil survey practices. But reducing quality of the soil survey is certainly not wise. Even though a quality survey will take longer, it is worth it; until publication, interim survey reports or copies from map sheets can be used to disseminate available information. But cutting costs by reducing soil survey quality is inadvisable. Remember the old saying: "You get what you pay for."

Spodosol Studies in the Northeast
Ronald D. Yeck, SCS, Lincoln, Nebraska

For the past 5 years, we have emphasized sampling of Spodosols and closely related soils in the Northeast States where such soils are extensive. The purpose was to develop a broader data base which could be used to evaluate our present chemical criteria for spodic horizons.

The laboratory analyses primarily intended to identify spodic horizons by present chemical criteria were made on almost all horizons so the distribution of iron, aluminum, and organic carbon could be evaluated for the entire pedon. Additionally, other characterization analyses were made on all pedons. The data from the pedons sampled are stored together as a data set in a computer along with similar data from other parts of the United States (including Alaska). We plan to summarize the data and look at the **data** interrelationships with help from the computer. Plans are to publish the data and discussion of the data based on the computer summary. The publication will be part of the Soil Survey Investigations Report (**SSIR**) series.

Dr. George Holmgren, a soil chemist at the National Soil Survey Laboratory, has developed a spodic horizon field kit. It measures **humic** color of horizons in liter-color units per gram using a modification from a water purity test. Percent aluminum extracted by KOH at **pH 10** is also measured. Dr. **Holmgren's** early data indicate that horizons with either 10 or more **1-cu/g** or 0.75 percent or more Al are spodic horizons. The kits are being field tested during the 1980 field season in Maine, New Hampshire, Vermont, New York, Florida, Michigan, and Alaska. Each of these states will submit an evaluation of the kit at the end of the field season.

Using the data summarized from the last 5 year's sampling and the data from the field kit, we plan to propose modifications for criteria defining spodic horizons.

I am aware of a number of concerns about present criteria, but we need as much input as possible from scientists who are working with Spodosols. If you have thoughts about improving the spodic horizon criteria, I would be happy to hear from you. We need as much input as possible prior to proposing criteria changes.

RECOMMENDED RECLASSIFICATION OF DESIGNATION
 OF
 NORTHEAST REGION SOILS NOW CLASSIFIED AS HEAVY FRAGIPANS
 By
 Thomas E. Colbourn
 Soil Conservation Service
 Northeast Technical Service Center, Brookhill, PA

INTRODUCTION

A variety of soil horizons and layers have been identified as fragipans in the glaciated area of New England and Northeastern New York. Some of these are pedogenic horizons. Others are inherited

(which exhibits some properties of a fragipan) has been affected by the soil forming processes. This has caused inconsistent identification of pedogenic fragipans, essentially unaltered dense basal till, and dense basal till which has been subjected to pedogenesis. Inconsistent identification causes problems in the classification and correlation of the soils involved.

The following table, compiled from information provided by the respective state soil scientists in 1975, demonstrates the scope of this problem in the Northeast.

	Total Acres	Acreage of Fragipan Soils		Percentage of State
		True Fragipan	Inherited Fragipan	
Connecticut	3,132,160	0	940,000	30
Delaware	1,265,883	9,551	0	0.8
Maine	19,848,000	0	9,400,000	49
Maryland	6,319,000	390,949	0	6.3
Massachusetts	5,033,000	0	1,006,600	20
New Hampshire	5,769,000	47,250	897,750	16
New Jersey	4,810,000	335,000	0	7
New York	30,670,000	8,635,000	1,500,000	3 3
Pennsylvania	28,797,500	8,545,141	0	30
Puerto Rico	2,274,094	0	0	0
Rhode Island	677,120	0	215,030	33
Vermont	5,937,293	1,270,251	190,000	2 5
Virginia	25,458,000	1,000,000	0	4
West Virginia	15,402,000	020,000	0	5.3
TOTAL	155,393,050	21,061,142	14,159,350	22.7

This table was generated from information provided by the respective state soil scientists.

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The table shows Connecticut, Maine, Massachusetts, and Rhode Island have only non-genetic (pedogenic) fragipans. The majority of the fragipans in New Hampshire are non-genetic, and significant acreages of fragipans in New York and Vermont are non-genetic.

distinctions between soils with and without true fragipans if their genesis and morphology is to be understood.

The Northeast Fragipan Study, initiated in November 1977, was designed to allow observation of the range of soils in the New England states being mapped as having fragipans. These observations were intended to aid in answering the following questions:

1. Are pedogenic features superimposed on compacted material (i.e., evidence of degradation rather than formation), or is compacted material the result of pedogenic fragipan formation?
2. If both are common, where does each occur? What is its importance? How can it be identified and delineated?
3. Can we identify any of the formation processes? If so, are they the same everywhere?
4. How can we improve our predictions of fragipan conditions? How can we measure the effects of fragipans on soil use? Does mode of formation affect behavior in ways now undetected? Test-look at pore continuity, hydraulic conductivity, lateral continuity of fragipans, landscape position, moisture regime, etc.). What taxonomic alternatives can be devised to make classes more useful?

DISCUSSION

As a result of the study, the soils in the Northeast classified as having fragipans can be divided into three groups.

1. Soils with true genetic fragipans.
2. Soils forming in essentially unaltered dense basal till.

3. Soils forming in dense basal till that has been affected by soil forming processes.

Group 1

Based on the number and aerial extent of pedons examined, soils with true genetic fragipans were the least extensive. They were found only on the Tug Hill Plateau area of New York and in Vermont. The New York soils had the best expressed fragipans seen on the study. They had moderate to strong medium blocky secondary structure, and coarse prismatic primary structure. The prism faces were well defined. In most of these soils the material along the prism faces was as hard and brittle as the matrix. Ped faces had continuous clay films; and the peds were firm and brittle. The soil colors in the fragipan related well to the materials above the fragipan. They did not relate as well to the materials below the fragipan. In one profile, staining marking wetting fronts moving into the fragipan was readily apparent. These fragipans also had definite lower boundaries. In most cases the lower boundary was gradual and wavy, but the distinction between fragipan and C material was obvious.

Most important, however, the occurrence of these fragipans was predictable based on landscape position and could be traced across the landscape. The pans occur on the broad areas of stable upland landscapes. The pans are absent on steep sloping areas and in areas

where streams have encroached on the stable upland landscape. In Vermont the pans occurred on gently sloping colluvial toe slopes.

The Tug Hill Plateau has an interesting glacial history. Some interpreters of history believe the glaciation of Wisconsin Age did not override this area, but divided into flows around the area. Others believe that ice did override the plateau during the Early Wisconsin Age but that this did not occur during Middle and Late Wisconsin Age. Both theories, however, indicate the surficial tills covering most of New York and New England were formed before Late Wisconsin time. This I believe is why those soils have well developed pedogenic fragipans. It is also interesting to note the temperature regime for this area. It is being called frigid although some of the data shows it to be mesic. For the most part, well developed genetic fragipans tend to occur in mesic or warmer soils.

Group 2

These soils were the most extensively observed during the study. They have been classified as having a fragipan but this "pan" is not a genetic horizon. It is essentially unaltered dense basal till. This material has commonly been designated as a Ck horizon.

One outstanding feature of the dense till is its structure. It is commonly described as platy, however, it is not platy according to the usual definition of the term. The plates are tapered laterally to form lens shaped pods. These pods overlap like scales. This con-

figuration provides a great deal of resistance to penetration vertically. The penetration resistance is less laterally. These flat elongated lenses are typical features of basal tills where vertical compression and lateral shear stress was exerted by the glacier.

Attention should also be given to the orientation of these lenses. At first glance, they may appear to be parallel to the soil surface (which is evidence of soil structure), however on closer investigation the plates can commonly be found at angles of 30 to 45 degrees to the soil surface. This dip commonly varies laterally in accordance to variations in the till deposition. Commonly widely spaced, weak "prisms" also occur. These "prisms" have the typical bleached faces. Where these "prism" faces can be observed with depth, it is evident that many are stress or dessication fractures. The fractures are widest at the top and narrow with depth. In some deep exposures, fractures extended to 20 feet. The fractures provide essentially the only channels for water to move vertically. The "bleached" ped faces adjacent to the fractures are in fact gleyed faces. This gleyed material is normally more friable than the dense till matrix. At the top of the fractures, where they are widest, it is common to find interfingering of B horizon materials into the dense till, further accentuating the "prismatic" structure.

Another important characteristic of the dense till is its inconsistency. In some deposits, uniform materials 30 or more feet thick are found. In such deposits the lenticular structure may continue throughout the 30 or more feet. The density of the material throughout is about 1.8 g/cc. In other deposits, friable lenses of sand, loamy sand, loam, silt loam and gravelly analogues may occur randomly scattered throughout the dense till. In still other deposits, the tills are stratified. A layer of dense till may be underlain by a more

friable till layer, this layer in turn may be underlain by a dense till.

These are important characteristics when making interpretations for land use recommendations. One may expect water to move through these more friable lenses or layers fairly rapidly. Likewise, if one of these lenses or friable layers outcrops, water may be released from it causing a seep. These are common problems encountered when making interpretations for "fragipan" soils of New England and New York.

These dense till "pans" are not predictable by landscape position. They are however somewhat predictable by landform. For example, on a drumoidal landscape the tops, upper slopes and north end of the drumlin are normally underlain by dense till. The lower slopes and south end of the drumlin are commonly covered by a more friable till. There is strong stratigraphic evidence that much of the tills making up the drumlin core is older than the more friable till which commonly occurs on lower drumlin slopes and on the south ends of drumlins. At any rate, the dense till can be traced on almost all slope positions of the drumlin. Dense tills also occur along the sides and bottoms of glacial valleys. They are not found in colluvial or alluvial positions unless colluvial or alluvial sediments are superimposed on top of the dense till. So in the glacial landscape the dense tills may occur in many different slope positions. They do not occur only in stable, undissected, normally gently sloping to nearly level positions typical of pedogenic fragipans. In all areas studied, the dense till could be traced up hills, into depressions, and across dissected areas. In road cuts the depth to these "pans" was seen to vary according to landscape position. At the bottom of hills the "pan" was

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In these discussions, emphasis has been placed on the parent material, not the soil. This is proper since the soils are rather insignificant. The average depth to the basal till is 19 inches. The extremes are 9 inches and 37 inches. These soils are young having developed in dense till of late Wisconsin Age. There has not been sufficient time for deep weathering of the dense basal till. At the soil-till interface it is common to see evidence of weathering. In some profiles the upper few inches of till has been disrupted by frost heaving. A few pieces of very weathered gravel-size resistant till are commonly found incorporated in the B horizons of these soils.

Coatings of silt and sometimes clay (observed through a hand lens) frequently occur on the dense till fragments. These coatings can be found at almost any depth in the till. Some were observed on till fragments taken from a depth of 30 feet. Such evidence indicates these clay or silt coats are not pedogenic but are a characteristic of the till. It is very doubtful the pedogenic process has extended to 30 feet in these young soils when it has hardly reached these depths in the old soils of the warm humid Southeastern United States.

Group 3

The soils of this group have developed in the same types of materials as the soils of Group 2. However, they differ in that there has been some illuviation into the dense basal till. More commonly, however, the upper foot or so of the dense till is mottled from water which

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has been perched above the dense material. Because of this mottling, the layer is considered a castic horizon. In this situation the dense and brittle properties are inherited from the dense basal till parent material; however, due to the alteration by illuviation or intense mottling, the layer must be designated a B horizon. With present conventions this layer then becomes a Bx horizon even though the dense and brittle properties of the "pan" are not pedogenic.

These soils are, in a sense, landscape dependent. That is, the presence of mottling or slight illuviation can be predicted, the presence of the dense basal till, however, is still independent of landscape position. Where the dense till is fairly level and undissected, this evidence of pedogenesis will occur; in other words, it is most common where the soil is very poorly, poorly, somewhat poorly, and occasionally moderately well drained.

It should be stressed that these pans have characteristics of the dense tills. They continue with depth, they commonly have lenticular structure, they may contain lenses of more friable materials, and they may be stratified. These soils are found intermingled with the soils described in Group 2.

Summary:

Distinguishing between a soil with a genetic fragipan and a soil developing on essentially unaltered dense basal till is not too difficult when good examples of the two have been observed. Distinguishing between a soil with a genetic fragipan and a soil developing on mottled or slightly illuviated dense basal till is more complex. This complexity:

conventions used in (designating horizo

conditions of

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the till has an influence on crop yields. It is, therefore, inappropriate to terminate the control sections at the contact with the dense till;

(3) Recognizing dense tills in Soil Taxonomy at the Great Group Level.

It is written in Chapter 5 of Soil Taxonomy that at the Family level, soils are grouped according to similar physical and chemical properties that affect response to management and manipulation for use. This includes thickness of soil penetrable by roots, properties important to the movement and retention of water, and to aeration. These statements on the intent of the Family grouping seems to summarize the significant properties of the dense tills. The dense tills are not pedogenic features so classification above the Family level would be inconsistent with the intent of Soil Taxonomy; and (4) designating the essentially unaltered dense till as a C horizon without any subscript and adequately describes the material. The primary objection to this is that these tills are very significant to users of soil information in the Northeast and some mechanism is needed to emphasize their presence in the soil profile. Several states are, however, recognizing dense till in this manner. In particular, calcareous tills are handled this way.

PROPOSAL

The key to the problem in identifying these "pans" is in the term "genetic." A fragipan is defined as a genetic soil horizon. This is a proper definition as these situations do occur. Dense basal till, however, is not a product of pedogenesis, although it has the features of firmness and brittleness and a few other associated features in common with fragipans.

The symbol used to indicate the fragipan when symbolizing soil horizons is the lower case "x."

From the revised Chapter 4 of the Soil Survey Manual, the fragipan character "x" is defined as: "This symbol is used to indicate genetically developed firmness, brittleness, or high bulk density. These features are characteristic of fragipans, but some horizons designated "x" lack other features characteristic of fragipans." This character is defined similarly in Appendix I of Soil Taxonomy.

This definition should be revised as follows: "This symbol is used to indicate the properties of firmness, brittleness or high bulk density. These features are characteristic of fragipans and dense basal tills."

This revision will allow these important characteristics to be noted in the horizon designation without regard to the origin of the properties. It also removes the classification bias of the "x" character and makes it more consistent with the other characters used. It has been argued that these subscripts are supposed to imply that a pedogenic process has taken place. This is not consistently true. The subscripts f, g, p, and r are not the result of pedogenesis. The symbol cn can be used to indicate the presence of concretions but the source does not have to be the soil in which they are found. The symbols h, ir, and t are illuvial accumulations which definitely imply a pedogenic process. They are not, however, necessarily diagnostic horizons from Soil Taxonomy. An h, ir, or, t could be used on a strata which is a result of sedimentation instead of pedogenesis. It can be seen then that there really is no consistency in the implications of the subscripts. They are used to designate a describable feature of the soil profile. They should not be used to imply anything.

The fragipan character, "x" is now used to describe the firmness, brittleness, high density and characteristic clay distribution of fragipans, but



If your response is positive, the subject will be as proposed. A negative response will result in the essentially unaltered dense till being designated as C material with no descriptive subscript. Values judgements will still need to be made on the dense till which has been affected by pedogenic processes. The "x" subscript is a viable alternative for these horizons under either of the alternative solutions. Whether or not to use the "x" for these situations is a judgement that must be made in the field by those describing the soils.

It will not, however, dictate the placement of the soil in Soil Taxonomy. The "x" subscript can be used to indicate the brittleness, firmness, denseness, or characteristic clay distribution of a fragipan without all these characteristics being well enough expressed for the horizon to qualify as a fragipan. In such situations the soil would not be placed into a fragi great group. Such determinations cannot be made by observing only the horizon in question. The whole soil, the parent material, and the distribution on the landscape must be considered.

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STATES RESPONSIBLE	PRESENT CLASSIFICATION	PROPOSED CLASSIFICATION
1. ALABAMA	coarse-silty, mixed, mesic Typic Fragiochrepts	No change
2. ALASKA	coarse-loamy, mixed, mesic Typic Fragiochrepts	No change
3. ARIZONA	coarse-loamy, mixed, frigid Typic Fragiochrepts	coarse-loamy, over sandy or sandy-skeletal, mixed, frigid Typic Haploorthods
4. ARKANSAS	coarse-loamy, mixed, mesic Typic Fragiochrepts	coarse-loamy, mixed, mesic Typic Dystrochrepts
5. CALIFORNIA	sandy, mixed, mesic Typic Fragiochrepts	sandy over loamy, mixed, mesic Aquic Dystrochrepts
6. COLORADO	coarse-loamy, mixed, mesic Typic Fragiochrepts	No change
7. CONNECTICUT	coarse-loamy, mixed, frigid Aquic Fragiochrepts	coarse-loamy, mixed, nonacid, frigid Aquic Haploorthods
8. DELAWARE	coarse-loamy, mixed, mesic Typic Fragiochrepts	No change
9. FLORIDA	coarse-loamy, mixed, mesic Typic Fragiochrepts	coarse-loamy, mixed, mesic Typic Dystrochrepts
10. GEORGIA	sandy, mixed, mesic Aquic Fragiochrepts	sandy, mixed, acid, mesic Typic Haploorthods
11. ILLINOIS	coarse-loamy, mixed, frigid Entic Fragiochrepts	coarse-loamy, mixed, frigid Entic Haploorthods
12. INDIANA	coarse-loamy, mixed, frigid Typic Fragiochrepts	coarse-loamy, mixed, nonacid, frigid Typic Haploorthods
13. IOWA	coarse-loamy, mixed, frigid Typic Fragiochrepts	coarse-loamy, mixed, frigid Typic Haploorthods
14. KANSAS	fine-loamy, mixed, frigid Typic Fragiochrepts	No change
15. KENTUCKY	coarse-silty, mixed, mesic Typic Fragiochrepts	No change
16. LOUISIANA	fine-loamy, mixed, mesic Typic Fragiochrepts	No change
17. MARYLAND	coarse-loamy, mixed, frigid Aquic Fragiochrepts	coarse-loamy, mixed, frigid Aquic Haploorthods

PRESENT CLASSIFICATION

PROPOSED CLASSIFICATION

SERIES	STATE	PRESENT CLASSIFICATION	PROPOSED CLASSIFICATION
19. CACON	CA	fine-loamy, mixed, frigid Aeric Fragloaquepts	fine-loamy, mixed, nonacid, frigid Aeric Haploaquepts
19. CACON	NY	coarse-silty, mixed, mesic Aeric Fragloaquepts	No change
20. CANTON	NV	coarse-loamy, mixed, frigid Typic Fragloaquepts	coarse-loamy, mixed, acid, frigid Typic Haploaquepts
21. CANTON	NY	coarse-loamy, mixed, frigid Aquic Fragloaquepts	coarse-loamy, mixed, frigid Aquic Haploaquepts
22. CANTON	NY	sandy, mixed, mesic Typic Fragloaquepts	sandy, mixed, mesic Typic Dystroaquepts
23. CANTON	CA	coarse-loamy, mixed, frigid Aquic Fragloaquepts	coarse-loamy, mixed, frigid Aquic Haploaquepts
24. CANTON	NY	coarse-loamy, mixed, mesic Typic Fragloaquepts	No change
25. CANTON	CA	coarse-loamy, mixed, mesic Typic Fragloaquepts	No change
26. CANTON	CA	coarse-loamy, mixed, mesic Typic Fragloaquepts	coarse-loamy, mixed, mesic Aquic Dystroaquepts
27. CANTON	CA	coarse-loamy, mixed, mesic Typic Fragloaquepts	coarse-loamy, mixed, acid, mesic Humic Haploaquepts
28. CANTON	NY	fine-loamy, mixed, frigid Typic Fragloaquepts	fine-loamy, mixed, nonacid, frigid Humic Haploaquepts
29. CANTON	NY	coarse-loamy, mixed, mesic Typic Fragloaquepts	No change
30. CANTON	NY	fine-loamy, mixed, mesic Typic Fragloaquepts	No change
31. CANTON	CA	coarse-loamy, mixed, frigid Typic Fragloaquepts	coarse-loamy, mixed, frigid, Typic Haploaquepts
32. CANTON	CA	coarse-loamy, mixed, mesic Aeric Fragloaquepts	coarse-loamy, mixed, acid, mesic Aeric Haploaquepts
33. CANTON	CA	coarse-loamy, mixed, frigid Entic Fragloaquepts	coarse-loamy over sandy or sandy-skeletal, mixed, frigid Typic Haploaquepts
34. CANTON	CA	coarse-loamy, mixed, frigid Aeric Fragloaquepts	coarse-loamy, mixed, nonacid, frigid Aeric Haploaquepts
35. CANTON	NY	coarse-loamy, mixed, mesic Typic Fragloaquepts	coarse-loamy, mixed, mesic Typic Dystroaquepts
36. CANTON	PA	coarse-loamy, mixed, mesic Aeric Fragloaquepts	No change

STATE	PRESENT CLASSIFICATION	PROPOSED CLASSIFICATION
37. MONTANA	coarse-loamy, mixed, mesic Aquic Fragiochrepts	No change
38. MONTANET	coarse-loamy, mixed, mesic Typic Fragiochrepts	coarse-loamy, mixed, mesic Typic Dystrochrepts
39. NEBRASKA	coarse-loamy, mixed, mesic Typic Fragiochrepts	coarse-loamy, mixed, mesic Typic Dystrochrepts
40. NEBRASKA	sandy, mixed, mesic Typic Fragiochrepts	sandy, mixed, acid, mesic Typic Haplochrepts
41. NEBRASKA	fine-loamy, mixed, mesic Typic Fragiochrepts	No change
42. NEBRASKA	coarse-loamy, mixed, mesic Typic Fragiochrepts	coarse-loamy, mixed, mesic Typic Dystrochrepts
43. NEBRASKA	coarse-loamy, mixed, frigid Humic Fragiochrepts	coarse-loamy, mixed, nonacid, frigid Histic Humiq-
44. NEBRASKA	fine-loamy, mixed, frigid Typic Fragiochrepts	11 fine-loamy, mixed frigid Typic Dystrochrepts
45. NEBRASKA	coarse-loamy, mixed, frigid Aquic Fragiochrepts	coarse-loamy, mixed, frigid Aquic Haplochrepts
46. NEBRASKA	coarse-loamy, mixed, frigid Typic Fragiochrepts	coarse-loamy, mixed, frigid Typic Haplochrepts
47. NEBRASKA	coarse-loamy, mixed, mesic Typic Fragiochrepts	coarse-loamy, mixed, mesic Aquic Dystrochrepts
48. NEBRASKA	coarse-loamy, mixed, frigid Typic Fragiochrepts	coarse-loamy, mixed, frigid Typic Haplochrepts
49. NEBRASKA	sandy, mixed, mesic Typic Fragiochrepts	very coarse loamy, mixed, mesic Typic Dystrochrepts Typic Dystrochrepts
50. NEBRASKA	coarse-loamy, mixed, frigid Typic Fragiochrepts	coarse-loamy, mixed, frigid Typic Haplochrepts
51. NEBRASKA	coarse-loamy, mixed, mesic Typic Fragiochrepts	coarse-loamy, mixed, mesic Aquic Dystrochrepts
52. NEBRASKA	coarse-loamy, mixed, mesic Aeric Fragiochrepts	No change

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PROPOSED CLASSIFICATION

STATUS	PRESENT CLASSIFICATION	PROPOSED CLASSIFICATION
51. BINGEMBY	coarse-loamy, mixed, mesic Aric Fraglaquepts	coarse-loamy, mixed, nonacid, mesic Aric Haplaquepts
54. SCILANTE	coarse-loamy, mixed, mesic Typic Fraglaquepts	coarse-loamy over sandy or sandy-skeletal, mixed, mesic Typic Dystrochrepts
55. SCRIFA	coarse-loamy, mixed, mesic Aric Fraglaquepts	No change
55. SUELBORNE	coarse-loamy, mixed, frigid Typic Fraglaquepts	coarse-loamy, mixed, frigid Typic Dystrochrepts
57. SKERRY	coarse-loamy, mixed, frigid Aquic Fraglaquepts	coarse-loamy, mixed, frigid Aquic Haplaquepts
58. SOBUS	coarse-loamy, mixed, mesic Typic Fraglaquepts	No change
59. STASSING	coarse-loamy, mixed, mesic Aric Fraglaquepts	coarse-loamy, mixed, acid, mesic Aric Haplaquepts
60. STONS	coarse-loamy, mixed, frigid Entic Fraglaquepts	coarse-loamy, mixed, frigid Entic Haplaquepts
61. SUTJONHO	coarse-loamy, mixed, mesic Typic Fraglaquepts	No change
62. VOTUSIA	fine-loamy, mixed, mesic Aric Fraglaquepts	No change
63. WALLENGER	coarse-silty, mixed, mesic Aric Fraglaquepts	No change
64. WISSONO	coarse-loamy, mixed, mesic Typic Fraglaquepts	No change
65. WESTWAY	coarse-loamy, mixed, frigid Typic Fraglaquepts	coarse-loamy, mixed, frigid Entic Haplaquepts
66. WILSONGRIE	coarse-loamy, mixed, mesic Typic Fraglaquepts	coarse-loamy, mixed, mesic Typic Dystrochrepts
67. WILSON	coarse-loamy, mixed, mesic Humic Fraglaquepts	coarse-loamy, mixed, nonacid, mesic Humic Haplaquepts
68. WILSONMAN	coarse-loamy, mixed, mesic Aquic Fraglaquepts	coarse-loamy, mixed, mesic Aquic Dystrochrepts

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STATE RESPONSIBLE

PROPOSED CLASSIFICATION

SERIES	STATE RESPONSIBLE	PRESENT CLASSIFICATION	PROPOSED CLASSIFICATION
59. WILMINGTON	NY	coarse-silty, mixed, mesic Typic Fraglochrpts	No change
70. WOODBRIDGE	CT	coarse-loamy, mixed, mesic Typic Fraglochrpts	coarse-loamy, mixed, mesic Typic Dystrchrpts
71. WORTH	NY	coarse-loamy, mixed, frigid Typic Fraglochrpts	coarse-loamy, mixed, frigid Typic Maplochrpts
72. WOODBORO	PA	coarse-loamy, mixed, mesic Typic Fraglochrpts	No change

NOTES

During this study many soil features were seen that were being mis-identified as fragipans. Some of these were strong argillic horizons, old buried soils, strongly weathered saprolites, abrupt textural changes, and strata of fine textured materials such as clay. None of these qualify as a fragipan nor should they be designated with an "x." Some of these will perch water, and some are quite hard especially when dry. Careful observations of soil profiles must be made before they can be categorized properly. This cannot always be adequately done with an auger.

Becket Series: The range of characteristics given for this series may include some pedons which will classify as coarse-loamy, mixed frigid Typic Haplorthods. Under this proposal there will be 6 series with this classification into which these pedons could fit. Also, some pedons may classify as sandy, mixed, frigid Typic Haplorthods. A new series would have to be proposed for these soils.

Birchwood Series: The range of characteristics given for this series may include some pedons which will classify as sandy, mixed, mesic Aquic Gytrochrepts. A new series may be needed if these soils are mapped.

Breckton Series: The range of characteristics given for this soil may include some pedons that classify as sandy, mixed, acid, mesic Humic Hapludquepts. A new series may be needed if these soils are mapped.

Manfield Series: The range of characteristics given for this soil may include some pedons that classify as coarse-loamy, mixed, non-acid, mesic Humic Hapludquepts, coarse-loamy, mixed, acid, mesic Typic Hapludquepts, and coarse-loamy, mixed, nonacid, mesic Typic Humaquepts. New series will be needed for these soils if mapped.

Menlo Series: The range of characteristics for this soil may include some pedons that classify as coarse-loamy, mixed, acid, mesic Aeric Haplaquepts. A new series will be needed for these soils if mapped.

Monarda Series: The range of characteristics given for this soil may include some pedons that classify as coarse-loamy, mixed, acid, frigid Aeric Haplaquepts. A new series will be needed for these soils if mapped.

Montauk Series: The range of characteristics given for this soil may include some pedons that classify as coarse-loamy over sandy or sandy-skeletal, mixed, mesic Typic Dystrachrepts. These soils will probably fit the proposed classification for Scituate series, however, if these pedons are well drained a new series will be needed if these soils are mapped.

Nantucket Series: The range of characteristics given for this soil may include some pedons that classify as coarse-loamy, mixed, mesic Typic Dystrachrepts. These soils will probably fit the proposed classifications of Newport, Broadbrook or one of the other 5 series which will classify this way.

Norwell Series: The range of characteristics given for this soil may include some pedons that classify as sandy, mixed, nonacid, mesic Typic Haplaquepts, sandy, mixed, acid, mesic Humic Haplaquepts, and sandy, mixed, nonacid, mesic Humic Haplaquepts. New series will be needed for these soils if mapped.

Peabody Series: The range of characteristics given for this soil may include some pedons that classify as coarse-loamy, mixed, nonacid, frigid Typic Haplaquepts. A new series will be needed for these soils if mapped.

Peperun Series: The range of characteristics given for this soil may include some pedons that classify as fine-loamy, mixed, frigid Typic Entrochrepts. A new series will be needed for these soils if mapped.

Pocomoock Series: The range of characteristics given for this soil may include some pedons that classify as sandy, mixed, mesic Typic Dystrachrepts. These soils will probably fit the proposed classification of Essex series.

Ridgeway Series: The range of characteristics given for this soil

if mapped.

Shelburne Series: The range of characteristics given for this soil may include some pedons that classify as coarse-loamy, mixed, frigid Typic Entrochrepts. A new series will be needed for these soils if mapped.

Stissing Series: The range of characteristics given for this soil may include some pedons that classify as coarse-loamy, mixed, nonacid, mesic Aeric Haplaquepts. A new series will be needed for these soils if mapped.

Whitman Series: The range of characteristics given for this soil may

mapped.

The range of characteristics of these series will need revision to exclude those soils that do not meet the proposed classifications.

Northeast Soils Research Committee (NEC-28) Report

Peter **L.M.** Veneman
University of Massachusetts-Amherst

The 1980 Northeast Soils Research Committee Meeting was held on January 9th and 10th in New York City. Dr. C.R. Frink, the administrative advisor to this committee, expressed faith in the future of agricultural research and predicted that more federal funds might become available, especially in the form of competitive grants. Dr. E.V. Miller from the SEA, expressed similar feelings, and also predicted that the Hatch allocations would be the same or somewhat higher than last year's appropriation. This still amounts to a decrease in real dollars, given the present rate of inflation.

John Rourke reported about progress in the SCS programs in the Northeastern region. The mapping program in several states approaches completion, but it will probably take until the **1990's** for all soil reports in the region to be published. He also discussed a proposal for a regional project in Soils and Land Use. No action was taken on **this** subject because it only involved a statement of objectives and not a true research proposal. Paul Giordano from the T.V.A. discussed some of the current **research projects** in which that organization is currently involved. His main interest was with fly ash research and other powerplant related problems. Dr. Frink presented the progress report from the soil nitrogen committee (**NE-39**), which had met at the same location **just prior** to the NEC-28 meeting.

State reports on soils related research and research needs as well as the progress report from the "**heavy metal**" committee (**NE-96**) were presented during the following day. It was decided to recommend the continuation of the NE-96 project with some minor changes in the study objectives.

The next meeting will be held on January 14, and 15. 1981 either in New York City or another location to be decided by the chairman of the committee.

National Work Planning Conference Report

Peter L.M. Veneman
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The 1979 National Technical Work Planning Conference of the National Cooperative Soil Survey was held on January 29 to February 2 in San Antonio, Texas. **Over** 60 scientists representing a variety of academic, state, and federal agencies participated.

Six committees had been formed prior to the meetings. A substantial part of the committee work was already done by mail, and the discussion papers on a formal draft were distributed at the beginning of the **conference**. The reports were discussed by each committee in two 3 hour meetings, and all remarks and recommendations were then incorporated into a final committee report.

During several general sessions **the** current status of the Soil Survey was discussed by a number of SCS administrators. Representatives of other federal agencies and other Soil Survey information users reported on their needs as far as soils information is concerned.

Participants from foreign **countries** (Canada, Syria, England, the Netherlands, and France) commented on the progress of their soil surveys and often stressed the importance of Soil Taxonomy, especially in tropical countries where less detailed surveys are often desirable.

The final committee reports were discussed during the last two days of the conference. Three committees (Surface Horizon Characteristics under Different **conditions**, Water Supplying Capacity of Soils for Different Plants, and Confidence Limits for Soil Survey Information) needed additional time for further assessment of the issues and development of recommendations. The suggestions of the other committees (Long Range Objectives of the National Cooperative Soil Survey, Use of Family Class in Design of Map Units, and Review and Test Soil Water Section of the Revised Soil Survey Manual) will be used for policy guidance and/or incorporation into the National Soils Handbook or Soil Survey Manual.

CONNECTICUT AGRICULTURAL EXPERIMENT STATION REPORT

David E. Hill

In our study of septic tank longevity in the Town of Glastonbury, Connecticut, an additional 5-years data was added to the 1973 inventory. From an 18-year record we now estimate that the linear projection of the half-life (50% cumulative failure of the septic system population) of all systems is 36.3 years an increase of about 9 years from 1973. The increase is due to the elimination of a segment of the 1973 population of systems in homes connected to sewers. These systems were failing at a higher rate than the total population. Also 425 new systems were added whose early failure rate was extremely low. Early failures have been virtually eliminated because the town requires spring percolation testing and observation holes detecting perched water. If septic systems are segregated according to soil type, half-lives range from 27 years in loose glacial till to 53 years in compact glacial till. Shorter half-lives in loose glacial till are attributed with smearing of infiltration surfaces with silt and clay during construction of the system. Increasing the size of the system by a factor of 1.2 in loose tills with fast percolation rates should overcome the problem.

Soil interpretations for waste disposal (CAES Bull. 776) have been developed for septic wastes, sanitary landfill and land application of sewage treatment plant effluent. Each mapping unit has been rated for both limitations and potentials. Best management practices are enumerated for each soil type and use.

A long-term study of phosphorus movement in a 6 x 10-foot isolated soil block has been completed in an area with a seasonal water table perched over bedrock at 30" depth. The system is normally aerobic from May to October and anaerobic during November-April. Anaerobiosis can also be induced by flooding the moat surrounding the cell and adding sugar as a carbon source in the treatment water. The system was dosed with waste water containing 12 ppm P, 2 or 3 times each week, for 2.5 years except when the soil was frozen. Analysis of P concentrations collected from sampling ports at 18" and 30" showed that heterogenous soil conditions created by worm holes, old root channels and structural units of soil may produce breakthrough to ground water before all sorption sites are fully saturated with P. Renovation of waste water over long periods of time reduces the sorption capacity for P but that resting of the soil under aerobic conditions increases the potential for additional P sorption. Regeneration of sorption sites were diminished during resting periods when anaerobic conditions occurred. The onset of anaerobiosis in a system that contains abundant sorbed P creates a rapid lowering of P sorption capacity. We conclude that anaerobic conditions may enhance mobility of P and its discharge to ground water in soils that have sorbed abundant P through continual waste water applications.

Mapping of Connecticut soils by the Cooperative Soil Survey was completed in 1979. Since it is difficult to observe the statewide distribution of soils from county reports, a General Soil Map was prepared that identifies 31 map units. We have recently completed a report that describes the composition of the map units, lists the important physical and chemical characteristics and identifies the limitations of the soils for many uses including cropland,

Storrs Agricultural Experiment Station Report
Harvey D. Luoe

A soil-parent material study is being conducted involving **selected** soil series formed over glacial till in the highlands of Connecticut. It is hypothesized that the **solums** of a number of soils previously thought to have formed entirely in glacial till are actually formed entirely or partially in aeolian material. Efforts are being made to resolve this question using the scanning **electron** microscope and **mineralogical** identification. Geologists have identified two tills of different ages in southern New England, one of **Woodfordian** age and an earlier till possibly of the **Altonian** age. Both a friable ablation component and a compact basal component of the younger till have been recognized while only a compact basal component has been recognized in the case of the older till. The younger till tends to be distinctly coarser than the older till. Both the basal and the ablation component of the younger till are usually a **sand** or loamy sand in texture while the older basal till is typically a fine sandy **loam** but may vary from a **sandy** loam to a loam or silt loam. Field studies indicate that certain soil series are presently being mapped more or less exclusively on either the younger **ablation** till, the younger basal till or the older basal till while other series are mapped across two or more of these till "**types**". The Canton soil appears to be formed in an aeolian capping over the younger ablation till. Soils of the Montauk series are formed in an aeolian capping over the younger basal till. Soils of the **Paxton** series appear to us to be, in some oases, formed in an aeolian capping over the lower basal till while in other oases it is formed entirely in the lower basal till. The **Woodbridge** and **Ridgebury** series are presently being mapped over both the older and the younger basal tills. The **pedons** of Woodbridge and Ridgebury that we have observed occurring on the younger till are **taxadjuncts**.

Measurements with a pocket penetrometer gave equally high values for both the younger and the older basal till. However, measurement of hydraulic conductivity gave values that were higher and more variable for the younger till. Bulk density values were high (1.6 - 1.9 **g/cc**) in both tills. Additional studies are being made of the chemical and mineralogical properties of these soils (and tills).

A study is being conducted involving the **comparison** of water quality in **two** different watersheds in eastern Connecticut. **One** watershed is forest while the other is in **corn** and **hay**. This latter watershed is receiving high levels of nutrients via cow manure and commercial fertilizers. Both watersheds **occur** on drumlins and are underlain by compact basal till that occurs at two to three feet below the surface. The soils on both watersheds **compose** a **toposequence** of soils. The soils on the farmed watershed include the well drained **Paxton**, the moderately well drained **Woodbridge**, the poorly drained **Ridgebury** and the very poorly drained Whitman. The soils of the forested watershed differ from the farmed watershed in that the **Paxton** soil is absent and is "replaced" by the Montauk soil. A series of open wells and **suction lysimeter** have been installed within each watershed. Soil water and groundwater are being **analyzed** for $\text{NO}_3\text{-N}$, $\text{NO}_2\text{-N}$, $\text{NH}_4\text{-N}$, Cl, P, Ca, **Mg**, Na, and K.

MAINE AGRICULTURAL EXPERIMENT STATION REPORT

Robert V. Rourke

Activities of the various **members** of the research staff that are of **interest** to individuals concerned with soil survey in the Northeast are in the areas of soil characterization, soil fertilization and soil series interpretation.

Soil characterization activities during 1978 and 1979 include field sampling and laboratory analysis of the Au Gras, **Becket**, **Coffeelos**, **Colton**, **Monson** and **Skerry** soil series. A study of organic carbon levels in flood plain soils of Western Maine was initiated in the fall of 1979.

A **lime** requirement test has been developed to predict lime needs to reach a soil **pH** of 6.0 or 6.5 based upon the source of acidity in Maine soils. Slow releases **sources** of N were compared to area in establishing and maintaining sod along roadsides and in **gravel** pits. A micronutrient fertilization study of apples on a **Marlow** soil was completed and showed that **Zn**, **Cu**, **Mn**, and **Mo** remained near the soil surface and were recycled in the turf but **B** was found to increase: in the leaf tissue and in the soil solution of the root zone.

Work has been started to evaluate soil suitability for land use planning as it relates to domestic waste disposal in residential and forested areas.

Extensive research is continuing into the relationships of various soils and their properties to tree **growth**. Research areas include site index and other tree growth **measures** as related to soil properties; the effect of **pH** and soil acidity on tree **growth**; relationship of the organic pad to soil and stand properties; and the relationship of soil properties to **budworm** damage of spruce and fir.

The impact of acid rain upon spruce seedlings and the **interaction** of soil series is **being studied**.

The studies present the areas of intensive soils work of Maine and reflect the input of several principle investigators, cooperators and graduate students at the **Orono** campus.

Maryland Agricultural Experiment Station Report:

Cooperative Soil Survey Program
J. E. Foss, D. S. Fanning, F. P. Miller
Department of Agronomy
University of Maryland
June 23, 1950

The following projects and publications have been completed since the last combined meeting of cooperators:

A. T h e s i s

1. Study of the Soils Derived from Serpentine and Associated Rocks in Maryland: M. C. Rabenhorst, M. S. Thesis, 1973.
2. Erosion and Sedimentation on a Small Maryland Watershed: L. M. Roberts, M. S. Thesis, 1979.
3. Mapping, Classification, and Characterization of Highly Han-Influenced Soils in the District of Columbia: C. E. Stein, M.

6. Miller, F. P. 1976. Soil survey under pressure: The Maryland experience. J. Soil and Water Cons. 33(3): 104-11.
7. Miller, F. P. 1976. Soil characteristics and ability to renovate effluent. Proceedings of Symposium on Land Treatment of Waste Effluents, April 25-26, 1978. Univ. of Maryland, p. 24-33
8. Rabenhorst, M. C. and J. E. Foss. 1977. Chemical and

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Massachusetts Agriculture Experiment Station Report

Peter L.M. Veneman

Soil survey related research projects at the University of Massachusetts-Amherst include:

- Heavy metals. Dr. John Baker (soil chemistry) is researching the contamination of urban and natural soils with heavy metals, particularly lead. The solubility of lead under various environmental conditions is studied and the total amount of heavy metals in selected psdons of **major Massachusetts** soils is determined. Spodosols generally contain low amounts of heavy metals, while soils from the urbanized regions show sometimes high levels of Pb, Hi and Cd.
- Hydrologic modeling, Dr. Hillel (soil physics) is involved in efforts to mathematically describe the **hydrolic**

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CORNELL UNIVERSITY AGRICULTURAL EXPERIMENT STATION REPORT

Kenneth R. Olson

A number of personnel changes have occurred during the past two years and they have had corresponding impacts on our total program. Dr. R.W. Arnold has been on a leave of absence for one year and has been working as Director of the Soil Survey Classification and Correlation Division, SCS in Washington, D.C. Keith Wheeler has moved on to become a soil mapper for SCS in St. Lawrence County, New York. Keith has been replaced by Melinda Dower and she currently handles much of the soil characterization laboratory work. Don Rappalie, a field soil scientist, recently retired. Despite personnel changes, the Soil Characterization Laboratory has continued to develop and has enjoyed the strong support both from the Experiment Station and from the Agronomy faculty.

The analysis for 600 soil samples (95 pedons) from ten counties was completed during the past two years. This data is being provided by the Characterization Laboratory to soil survey party leaders to aid them in classifying and interpreting their soil series. The analysis commonly includes particle bulk density, available moisture, COLE, pH, percent organic matter, available nutrients, CEC, sum of bases, base saturation and extractable Al and Fe. The laboratory is developing the thin section capability to assist routinely in identifying both argillic horizons and spodic horizons.

The laboratory collected and prepared 41 new soil monoliths for use in exhibits, training sessions and as teaching aids. The monoliths are available for soil survey party leader use.

CUAES personnel co-sponsored a two-week basic soils training course at Marcy, New York for first and second-year soil scientists from the Northeast.

A bill to accelerate both soil mapping and soil characterization work has been introduced in the New York State Assembly. We believe there is now a good chance of passage since soil survey data is being used to assist in determining agricultural value.

Work has been done in the following project areas during the past two years :

1. Testing of samples of fragipans to understand better their strength characteristics under different conditions is nearly complete. We hope to find relationships with properties which are easier and quicker to measure. By leaching confined samples with extractants for silica, iron and other binding agents, we hope to obtain clues about the environments in which fragipan horizons have developed.
2. Soil productivity indexes based on TDN's were jointly prepared with SCS for each county in New York having a completed soil survey.
3. To assist the State Board of Equalization and Assessment, a farm sale analysis based on soil survey information was made. TDN estimates for soil map units in the Ithaca area were exponentially related to assigned appraisal values ($r^2 = .90$). Regressions of TDN values for soil maps of operating farms with tentative 1978 tax assessments were highly predictive ($r^2 > .90$). The method is being further evaluated by E & A.
4. An additional study of three soil mapping units and their ability to handle septic tank effluent is being conducted to show the value of using defined soil map units.

5. A visual classification key of the percent of the maximum potential cartographic area error of delineations on a soil map was developed. By classifying delineations according to this system, the relationships between delineation complexity and size, and the internal variability resulting from both cartographic and classification errors can be analyzed.
6. A study is being conducted of how the modification of effective moisture by the slope properties of gradient, length and landscape position influences the field observable morphological and physical properties of the soil. After analyzing combinations and intensities of the soil-water processes on individual slope components we hope to be able to connect these segments and accurately interpret the soil landscape system.

Pennsylvania Experiment Station Report

R. L. Cunningham

The Soil Characterization Laboratory has been moved into 312 Armsby, benches have been renovated, and the equipment upgraded with a new fume hood, water still, and atomic absorption instrument. Funds were made available from The College of Agriculture. Mr. Dick Counce has done an outstanding job in directing the lab activities and supervising student, graduate student, and work study employees. Lancaster and Lycoming County data were verified and distributed. About 125 soil samples have been analyzed in the RAMP activities. The laboratory is participating in a sample and methods standardization study conducted by about 15 different laboratories in the Federal and State agencies. Graduate students are using the laboratory for routine soil analysis. Samples were collected in Adams and Bedford Counties in June.

The following are graduate students in soil genesis and morphology studies, their research topic, and their major advisor:

David Ball	Natural resource inventory	Cunningham
Brian Carter	Soil development with time	Ciolkosz
Doug Henry	Data processing of soil survey data	Cunningham
Mike Hoover	Parent material as a soil forming factor	Ciolkosz
John Hudak	Soil erosion impact on corn yields	Pennock
Mark Inhoff	Application of Landsat data to soil mapping	Petersen
Terry Keene	Hydraulic conductivity of soil horizons	Cunningham
Dale Krach	Suitable materials for sand mounds	Petersen
Elissa Levine	Genesis of Fragipans	Ciolkosz
Dean Mimms	Landsat imagery application to soil	Petersen
John Shaffer	Corn productivity potential of soil	Pennock
Steve Sykes	Computer generated interpretative soil maps	Petersen
Bill Naltman	Genesis of glacial till soils	Cunningham

All of the graduate students contribute to teaching as well as research-work responsibilities,

The National Soil Judging Competition was hosted April 16, 17, and 18 by Penn State. The Northeast Branch of the American Society of Agronomy will be at Penn State on June 29-July 2, 1980. The soil genesis faculty and graduate students have or will assist with the soil programs associated with these meetings.

A member of the Soil Genesis group has and will participate in the field reviews of the active soil surveys in the state.

Progress in soil resource data storage is near the stage of a bulletin Publication. Acreage data are being updated and the most recently revised interpretation data tape has been received. The state SCS office has cooperated fully in obtaining program and data tapes. Three map sheets of Huntingdon County Soil Survey have been encoded and interpretative maps can be displayed on a color monitor. The Chickies Creek watershed data tape has also been received and interpretative maps have been generated from the ORSER system similar to those circulated recently by SCS. A new CRT terminal has been ordered to assist in handling data storage and retrieval.

The Soil Characterization storage building will be used for alternate storage of soil survey reports.

Three graduate students, David Ball, Elfssa Levine and Bill Waltman, are gaining field experience in soil science through a cooperative arrangement with SCS. David is stationed in Dauphin County, Elfssa in Clearfield County, and Bill in Butler County.

A new memorandum of understanding has been signed for the State soil survey among the DER, SCS, Dept. of Ag., and PSU.

Publications

- Baker, D. E., K. K. S. Pflay, A. W. Rose, and E. J. Cfolkosz. 1978. Development of an Approach for Monitoring the Plant Availability of Transuranics in the Nevada Test Site Soils. In Selected Environmental Plutonium Research Reports of the NAEG. Nevada Applied Ecology Group. U.S. Dept. of Energy, Las Vegas, Nevada. 157-176.
- Carter, B. J. 1979. Soil Genesis and Classification Studies in Pennsylvania M.S. Thesis. Pennsylvania State University. 136 p.
- Cfolkosz, E. J., R. L. Cunningham and G. W. Petersen. 1980. Soil Associations of Pennsylvania. Pennsylvania State University Agronomy Series No. 62..
- Cfolkosz, E. J., L. T. Kardos, and W. F. Beers. 1979. The Effect of Acid Mine Drainage Water on Two Pennsylvania Soils. Soil Sci. 127. 102-107.
- Cfolkosz, E. J., R. R. Parizek, G. W. Petersen, R. L. Cunningham, T. W. Gardner, J. W. Hatch and R. D. Shipman. 1980. Soils and Geology of Nittany Valley. Pennsylvania State University Agronomy Series No. 64.
- Cfolkosz, E. J., G. W. Petersen and R. L. Cunningham 1979. Landslide-prone Soils of Southwestern Pennsylvania. Soil Sci, 128:348-352.
- Cfolkosz, E. J., G. W. Petersen, R. L. Cunningham, and R. P. Matelski. 1979. Soils Developed in Colluvium

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RHODE ISLAND
AGRICULTURAL EXPERIMENT STATION REPORT

William R. Wright

This report summarizes the projects completed and the progress on current research activities since the last Northeast Cooperative Soil Survey Conference.

1. Sewage Sludge and Heavy Metal Availability to Vegetable Crops

A two year field study on the effect of a single application of municipal sewage sludge on the heavy metal concentrations of carrots, radishes, tomatoes, and lettuce was completed in 1978. Lettuce tissue accumulated the highest concentrations of Zn, Cu, and Cd, while carrots accumulated the most. Heavy metal concentrations in plant tissue were greater during the second year which correlated with increased DTPA extractable soil metals.

2. Movement of Nutrients and Heavy Metals from a Sewage Sludge Landfill. C. E.

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tory were selected for study. One of these marshes has never been disturbed, whereas the other marsh contains a network of mosquito ditches **which** were constructed **in the** mid-1940's. In addition to mapping vegetation and depth profiles of the marsh, various physical and chemical properties will be measured to determine the effect of this alteration on organic matter decomposition and release of various elements.

6. Translocation of Zinc Through Soil Profiles

Research plots which received industrial wastes in 1974 are currently being evaluated for translocation of **Zn** during this 6-year period. Both silt loam and loamy sand soils are included in this study.

7. Lead Accumulation From Burning Waste Oil

A network of 40 sampling sites surrounding the University of R. I. boiler plant, which burns waste oil, are being evaluated for atmospheric additions of lead. Initial data suggest greater lead levels near the smoke stack and in an easterly direction up to a distance of 3 miles.

3. Characterization

Characterization analyses of 3 profiles of each of the soils of the Eewport Catena are completed. Similar analyses of the soils of the **Paxton** Catena will be completed in 1980.

Publications

Wright, W. R. 1978. Laboratory and field mineralization of nitrogen from fermentation residues. Jour. Environ. Qual. **7:343-346.**

Wright, W. R. and E. H. Sautter. 1979. Soils of Rhode Island Landscapes. R. I. Agr. Exp. Sta. Bul. 429.

Wright, W. R. 1979. A state soil for Rhode Island? In Touch, March/April. R. I. Coop. Ext. Service, Univ. of R. I.

Schauer, P. S., W. R. Wright, and J. Pelchat. 1980. **Sludge-**borne heavy metal availability and uptake by vegetable crops under field conditions. Jour. of Environ. Qual. **9:69-73.**

Galgowski, C. G. and W. R. Wright. 1980. A variable-depth groundwater sampler. Soil Sci. Soc. Amer. J. (Sept-Oct. Issue).

Virginia Agricultural Experiment Station Report

James C. Baker

The Virginia soil survey is a cooperative effort involving principally the Virginia Soil and Water Conservation Commission (VaSWCC), the United States Forest Service (USFS), the Soil Conservation Service (SCS), and Virginia Polytechnic Institute and State University (Virginia Tech).

Major responsibilities of each organization as outlined in the Master Plan to accelerate the soil survey and adopted by the Virginia General Assembly in 1972 are as follows:

VaSWCC - overall coordination of Virginia soil survey, administration of funds appropriated by the General Assembly and set priorities for surveys in Virginia.

USFS - field mapping and interpretations of National Forest lands in Virginia.

SCS - field mapping, correlation leadership, interpretation, cartographic assistance, and publication of soil survey reports.

Va. Tech - field mapping, laboratory characterization for all surveys, education, research and interpretation, publication of interim and special reports.

Of the approximately 25 million acres in Virginia, 12 million acres have soil surveys acceptable by modern standards (48% complete). At the average rate of 750,000 acres/year (1979 average), the remaining 13 million acres are expected to be completed by 1996.

Virginia Tech's Role in the Soil Survey

Field Operation. Virginia Tech currently employs 21 soil scientists, divided among 8 counties with progressive soil surveys. Three Virginia Tech soil scientists are assigned to SCS field parties and one soil scientist is assigned to the correlation of Prince William County. Virginia Tech employs three interpretative specialists to work primarily with urban soils problems in Chesterfield, Loudoun, and Prince William Counties. One soil scientist is assigned to the State Health Department to help train sanitarians in soils work.

Recently a CMS terminal has been installed at Blacksburg to store and recall data and to use as a word processor in manuscript preparation.

Laboratory Characterization Program

Virginia Tech provides laboratory support for all soil surveys in Virginia. This accounts for approximately 150 pedons per year plus other samples from special research and correlation studies. Physical characterization

includes particle size analysis, bulk density, moisture retention curves, and selected engineering tests such as Atterberg limits and potential volume charge. Standard chemical characterizations are run routinely as well as petrographic and clay analyses on selected samples.

Teaching and Extension Activities on Campus

The following courses are offered at some time over a two year period at Virginia Tech:

3000 level	Soil Survey	3 credits
4000 level	Soil Taxonomy	3 credits
5000 level	Advanced Soil Genesis and Morphology	4 credits
3000 level	Soil Interpretations	3 credits
5000 level	Advanced Soil Interpretations	4 credits
5000 level	Soil Geomorphology	4 credits
2000 level	Soil Evaluation	1 credit

In addition to the above formal classroom courses (1) a two week summer course to train sanitarians, etc. on urban soils problems is offered as is (2) a 1-1/2 day short course on Conservation Inventory Resources.

Virginia Tech administrators a soil science scholarship program, funded by the State through the Virginia Soil and Water Conservation Commission. This scholarship program provides funds for 12 quarters of assistance for up to 12 students at a time such that they may be educated and field trained as soil scientists. This program has graduated 32 soil scientist from Virginia Tech over the past 9 years. Currently there are eight students on the scholarship program

Publications (1978-1980)

- (1) Soil Survey Chesterfield County, Virginia, 1978, Hodges, R. L., et. al.
- (2) Soil Survey Hanover County, Virginia, 1980, Hodges, R. L., et. al.
- (3) Soil Survey Gloucester County, Virginia, 1980, Newhouse, M E., et. al.
- (4) Soil Survey of Prince William Forest Park, 1978, Elder, J. E., et. al.
- (5) Zelazny, L. W, D. A. Lietzke, and H. L. Barwood. 1980. "Septic Tank Drainfield Failures Resulting from Mineralogical Changes", Bulletin 124, Virginia Water Resources Research Center.
- (6) Harris, W G., S. S. Iyengar, L. W Zelazny, J. C. Parker, D. A. Lietzke, and W J. Edmonds. 1980. "Mineralogy of a Chronosequence Formed in New River Alluvium", J. Soil Science 44:862-868.
- (7) Kitchel, W. F., S. K. Thomas, and C. D. Peacock, Jr. 1980. "The Effects of Drainage on a Pocosin in Isle of Wight County, Virginia", Va. J. Science, Vol. 30, No. 2.
- (8) Reneau, R. B., Jr., W. F. Kitchel, and C. D. Peacock, Jr. 1979. "Effect of Septic Tank Effluent on Base Status of Two Tile-Drained Soils", Soil Science, Vol. 127, No. 2:117-126.
- (9) Blackburn, A. C., C. D. Peacock, Jr., J. L. Richardson. 1979. "Comparison of Pipette and Hydrometer Mechanical Analysis of Selected Virginia Soils", Va. J. Science, Vol. 29, No. 2:37
- (10) Peacock, C. D., Jr., A. C. Blackburn, J. L. Richardson. 1979. "Changes in Mechanical Analysis Results on Soil Subjected to Prolonged Soaking in Calgon Solution", Va. J. Science, Vol 29, No. 2:45.

Theses on Soil Genesis, Classification, and Utilization (1978-1980)

"Septic Field Effluent Induced Soil Mineralogical Changes". 1980. Barwood, Henry Lewis.

"Characterization, Classification, and Genesis of Cullen Soils from the Virginia Piedmont". 1979. Wysocki, Douglas A.

"Physical, Chemical, and Mineralogical Properties of Mine Spoil Derived from the Wise Formation, Buchanan County, Virginia". 1979. Howard, Jeffrey Lynn.

"Soil Genesis on Relatively Young Surface Mined Lands in Southern West Virginia". 1979. Sweeny, Larry Ross

"Erosion, Runoff, and Associated Physical Properties of a Davidson Soil Modified with Selected Amendments". 1978. Warden, Randall L.

"A Soil Information Algorithm for the Appalachian Ridge and Valley Province of Virginia". 1978. Hamm, Catherine P.

Current Research Projects

- (1) Statistical Variability of Soils in Virginia
 - (a) Composition of mapping units
 - (b) Variability of mineralogy families within mapping units
 - (c) Evaluation of pretaxonomy mapping
- (2) Landscape evaluation for slope classes using computer techniques.
- (3) Studies involving fluvial cappings in Piedmont and upper Coastal Plain soils.
- (4) Studies relating Rhododulfts to carbonate weathering and New River gravels in southeastern Wythe County, Virginia.
- (5) Vegetative factors that have effected soil genesis in southwestern Virginia.
- (6) Mineralogy studies of high aluminum soils developed from sericite schists (Nason and Tatum).
- (7) Studies utilizing remote sensing techniques to asses conditions and soil environments related to peanut blight.
- (8) Soil development from mine spoil materials.
- (9) Studies of marsh soils in Virginia's Tidewater region.
- (10) Characterization of soils with vermiculite mineralogy.
- (11) Myersville soil study.

VERMONT AGRICULTURAL EXPERIMENT STATION

Richmond J. Bartlett

With a total of 1.3 professional man years devoted to soil research, emphasis has been on mound **systems** of **disposal** of septic tank effluent, problems with storage of manure, soil fertility benefits of manure, **N** problems and benefits of **sewage** sludge, **management** of soil **N**, survey of background **levels** of heavy metals in **Vermont** soils, behavior of heavy metals in soils of the Northeast with emphasis on Cr, and study of Al in relation to soil tests to predict fertility needs. Soil tests have been modified so that extractable Al predicts lime requirement and modifies the P soil **recommendation**. **Fundamental** research is being conducted on the formation of soil manganese oxides and their roles as scavengers for heavy metals and as regulators in nitrogen **trans* formations** and other oxidation-reduction reactions in soils.

Soil research needs relate to characterization as soils relate to greater self-sufficiency in agricultural products, disposal of wood ashes, acid rain effects, sanitary land fills, other waste disposal, and preservation of agricultural land.

West Virginia Agricultural and Forestry
Experiment Station Report

by

John C. Sencindiver

A significant item of interest, particularly to soil scientists at WVU, is that the name of the Division of Plant Sciences has been changed to the Division of Plant and Soil Sciences.

Some progress has been made toward developing a soil characterization laboratory. Everyone appears to agree that a laboratory should be established but budgetary and personnel constraints have slowed progress toward the final objective. However, the experiment station has run a few pipette textural analyses for SCS field soil scientists;

The Soil Conservation Service, in 1978, began a three year soil sampling plan. Ten soil series will be sampled in each MLHA in which they occur in the state. Soil properties, vegetation, climatic factors and parent materials will be compared. In December 1979, SCS published a general soils map of the state.

In 1979 the EPA established a National Clearinghouse on Small Wastewater Flows at WVU. The clearinghouse has five staff positions: 2 sanitary engineers, 2 bacteriologists and 1 soil scientist (Dr. Willem van Eck). Each staff member has or will have a student assistant.

The purpose of the clearinghouse is to compile information on domestic wastewater treatment systems, on-site sewage disposal soil problems etc., and to disseminate information and reports. The clearinghouse will essentially be maintaining a data bank. Dr. van Eck intends to store SCS Form 5 information related to septic tank absorption fields and sewage lagoons.

Most of the research of the soils group at WVU involves minesoils, coal overburdens and surface mine reclamation. The following studies have been completed since the 1978 conference, and reports will soon be available.

1. Soil Water Relations and Root Development on Characterized Classes of Minesoils (R.M. Smith).
2. Determining and Interpreting Minesoil Property Variations Within Mappable Classes (R. M. Smith).
3. Defining and Diagnosing Orphan Lands for Reclamation and Land Use Potential (R. M. Smith).
4. Defining, Classifying and Utilizing Minesoils and Topsoils (R. M. Smith).

The following studies have been initiated since 1978:

1. Disposal of Fly Ash- (Keefer and Singh).
2. Land Use Decisions Based on Open-Ended Minesoil Taxonomy (Sencindiver).
3. Preventing Pollution by Overburden Analysis and Controlled Placement (Sencindiver).

4. Computer Pool of Overburden Properties (Sencindiver).
5. Abandoned Mine Land Reclamation (Sencindiver).
6. Use of Waste Products in Surface Mine Reclamation (Keefer and Singh).
7. Minesoil Properties for High Priority Uses (Jencks and Sencindiver).

Papers, Reports, Publications and Theses
written since 1978 meeting.

Ammons, John T. 1979. Minesoil Properties, Root Growth and Land Use Implications. Ph.D. Dissertation. wvu.

Ammons, J. T., C. H. Delp, K. O. Schmude, J. C. Sencindiver and R. M. Smith. 1980. Defining, Classifying and Utilizing Minesoils and Topsoils. Final Report. Grant Number 684-15-12. Submitted to USDA-SEA-CR.

Ammons, John T. and Eric F. Perry. 1979. The Relationship of Overburden Analysis to Minesoil Properties in Post Mining Land Use. In: Surface Coal Mining and Reclamation. McGraw-Hill, Inc. New York, NY.

Ammons, J. T., E. F. Perry and R. M. Smith. 1979. Soil Water Relations and Root Development on Characterized Classes of Minesoils. Final Report. Grant No. 684-15-16. Submitted to USDA-SEA-CR.

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Conference Committee Reports

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- Committee 3, Post Mapping Role of Soil Scientists - Art Kuhl, Chairman - 93
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REPORT OF COMMITTEE 1

Criteria for Land Capability Classification

Committee Members

Chairman - Frederick L. Gilbert, SCS, Syracuse, NY
Vice Chairman - Dr. Raymond F.

Report of Committee 1 (Contd.)

Questions and comments about the chart mailed on March 18, 1980:

1. Ellyson, Shipp, Pennock

Rock fragments refers to stoniness? (Should be changed to stony or **bouldery** since rock fragments includes all pieces over 2 mm in size.)

2. Ellyson

Where do soils fit that have about 50 percent or more coarse fragments in the surface layer, i.e., very **cherty**? Does the "K" factor cover these? (The "K" factor should cause these soils to be included in a "S" subgroup.)

3. Ellyson

It would seem that occasional flooding could also fall in the "w" group depending on the time of flooding. (The committee should consider this point.)

4. Shipp, Pennock, Oleson

Should we allow dual subclass, i.e.: **IVew?** (The committee should consider.)

5. Shipp, Pennock

Questioned soils less than 40 inches to bedrock getting an "s" limitation.

6. Shipp, Pennock

Questioned "moderately well drained" being a "w" limitation.

7. Oleson

11. The subclass criteria must provide for the clear identification of those soils with an erosion hazard or limitation."

8. Oleson

All soils in a **Udic** Moisture Regime, not subject to frequent flooding, on a slope of 3 percent or less would have a subclass of **w** or **s**. It is my opinion that we have soils fitting these characteristics that have an erosion limitation that is equal to or greater than a wetness or soil limitation. Caribou gravelly loam might be one example. Also, I have no feeling for using a "K" factor of 0.17 to differentiate between **e** and **s** for these soils on slopes greater than 3 percent. This would need testing in the field.

Report of Committee 1 (Contd.)

9. Oleson

All soils in an Aquic Moisture Regime on slopes of 8 percent or less would have a w subclass. I don't have a specific example but again, these soils on slopes of about 3-8 percent or less could have an erosion hazard and the flow chart does not provide a means to recognize this problem.

10. Oleson

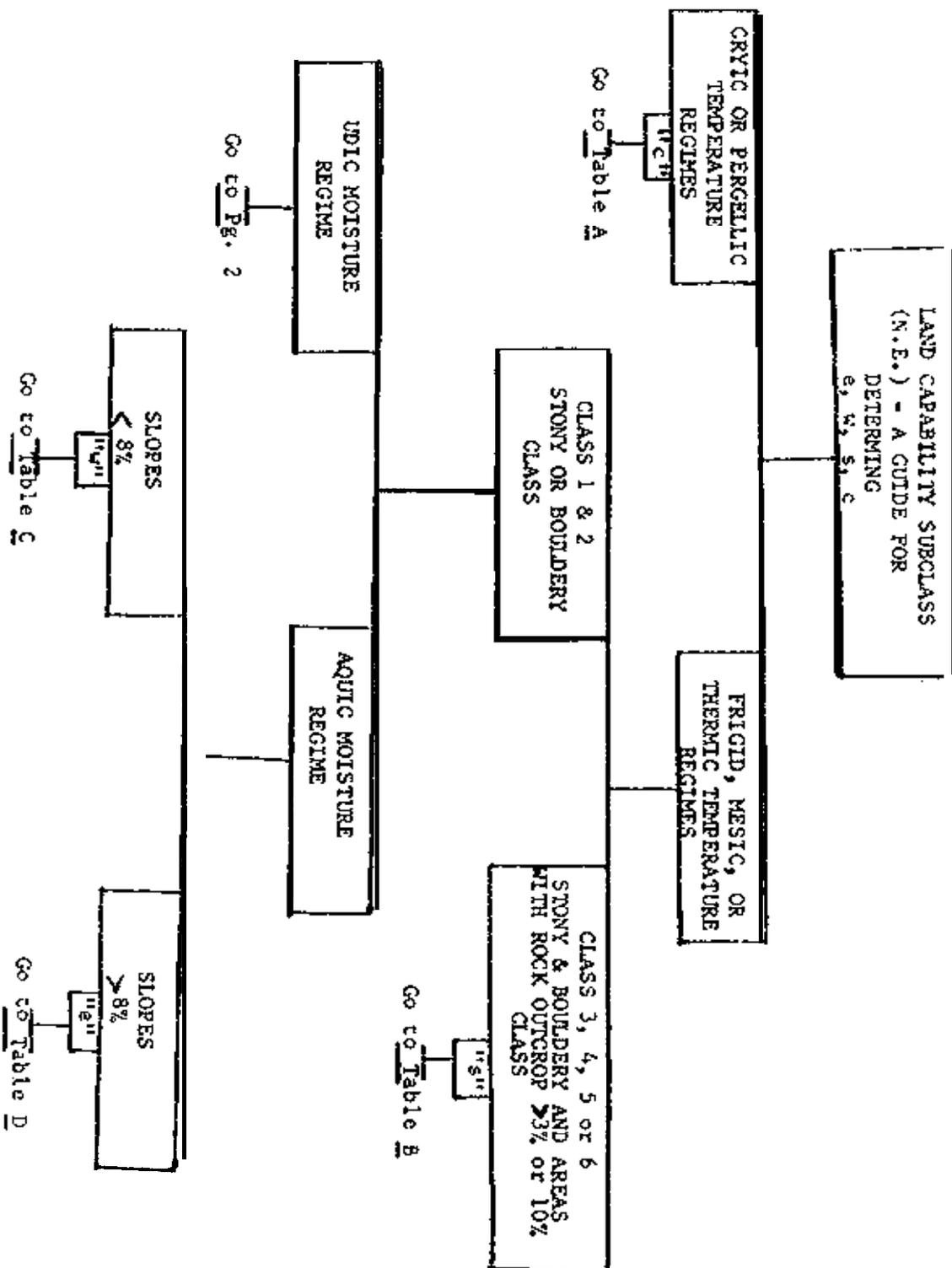
Due to past or present use, such as overgrazing, some soils with class 2 rock fragments may be eroding. Is it important to show this condition even though it may be a result of improper management?

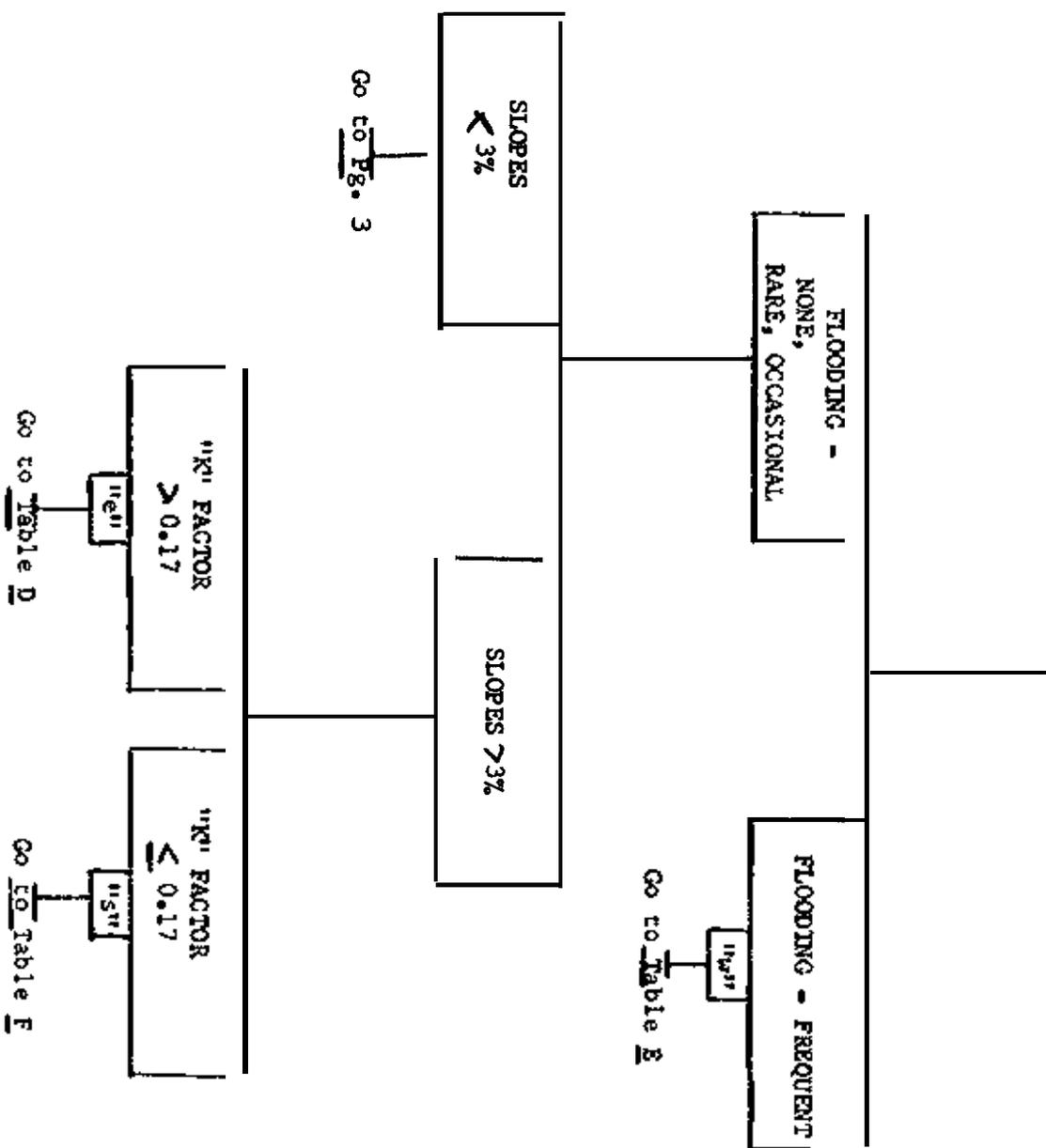
11. Richmond Bartlett and William A. van Eck also responded saying they would be unable to participate in the committee work this year.

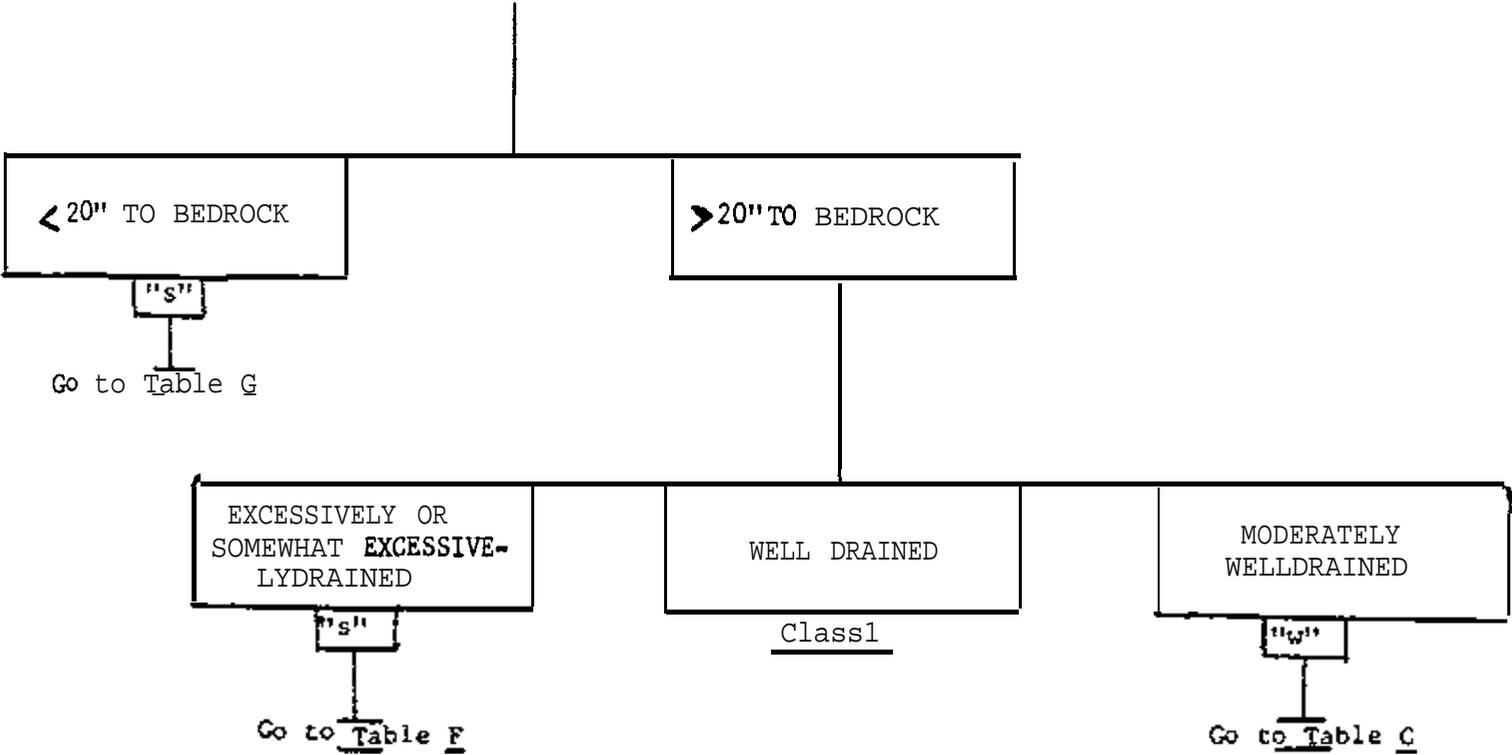
Recommendations:

- (1) It is the recommendation of this committee that the flow chart (Appendix 1) be tested during the next two years, checking all phases of soil series against this guide. It is further recommended that the guideline for determining capability class and subclass that was developed by Lloyd E. Garland in 1960, be updated and incorporated. The committee should report back to the conference in 1982, and recommend adoption or rejection of this guide or a revised one.
- (2) The committee endorses and recommends that, beginning in 1982, all soils be rated using an objective **scheme** such as the one presented in Appendix 1.
- (3) The committee recommends that subclass not be given more than one problem symbol. If additional information is needed in the land capability system, the land capability unit concept should be used.

Attachment
Appendix 1







1-6

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TABLE A

Phase	<u>Subclass</u>
Stony or bouldery, Class 1 & 2 0-25 percent slopes 25+ percent	VIC VIIC
Stony or bouldery, Class 3, 4, 5, or 6 All slopes	VIIc

TABLE B

<u>Stony or bouldery class</u>	<u>Subclass</u>
Class 3, 4, and 5	VIIIs
Class 6	VIIIS

TABLE C

<u>Post drainage condition</u>	<u>Subclass</u>
Slight to moderate limitation after drainage	IIW
Severe limitation after drainage	IIIW
Very severe limitation after drainage	IWV
Drainage not feasible for commonly grown crops	VW

TABLE D

<u>Coastal plain</u>	<u>Other</u>	<u>Subclass</u>
0-2 percent	0-3 percent,	I
2-5 percent	3-8 percent	IIe
5-10 percent	8-15 percent	IIIe
10-15 percent	15-25 percent	IVe
15-25 percent	25-35 percent	VIe
25+ percent	35+ percent	VIIe

TABLE E

<u>Drainage Class</u>	<u>Subclass</u>
Well and moderately well drained	VW
Somewhat poor and poorly drained	VIW
Very poorly drained	VIIW

TABLE F

<u>Available water (inches/30-inch depth)</u>	<u>Subclass</u>
2.5-3.75 -	11s
2.0-2.5 - with moisture retentive layer within 60"	111s
2.0-2.5 - no moisture retentive layer within 60"	IVs
<2.0 - with moisture retentive layer within 60"	IVs
<2.0 - no moisture retentive layer within 60"	VIIIs

TABLE G

	<u>Subclass</u>
Rock 10-20 inches of surface	111s
Numerous Rock outcrops (Class 2)	vs
Rock - shattered easily weathered shale - less than 10 inches of surface	IVs
Hard rock less than 10 inches of surface	VIIIs
Class 3 & 4 rockiness	VIIIs
Rock outcrop	VIIIS

Committee 2 Soil-Wetness Classes and Soil-Water States

Chairman R. V. **Rourke**, University of Maine

Vice Chairman F. D. Childs, SCS, WV

Committee Members

K.C. Bracey, USDA, FS, VA

C.F. Eby, SCS, NJ

D.S. Fanning, **University of Maryland**

W.F. Hatfield, SCS, W

G.W. Peterson, Pennsylvania **State University**

D.D. **Rector**, SCS, VA

W.E. Russell, USDA, **FS, WI**

J.W. Warner, SCS, NY

D.L. Yost, SCS, VT

H.D. Luce, **University of Connecticut**

Charge 1 Evaluate the proposed system of describing soil-wetness classes included in the revision of Chapter 4 of the new **USDA-SCS** Soil Survey Manual for **soils in the Northeast** selected **on a MLRA** basis.

Charge 2 Evaluate the adequacy of **existing soil moisture** data in light of the revision of Chapter 4 of the new Soil Survey **Manual**.

Charge 3 Evaluate the adequacy and institute the use of terms describing **the soil water state, i.e., dry, slightly moist,** very moist and wet.

DISCUSSION

Charge 1 There are soils in two **or more**

Currently, popular description of soil-wetness class is awkward and methods of presenting this information in the non-technical **section of the soil survey report** should be developed.

In forested sites, wetness-classes to a 3 meter depth would be of value. **This** would entail the addition of only one **more** class between 3 and 1.5 **meters and** would be of considerable use on sandy soils.

Charge 2 Adequate soil **moisture** release data is available in the Northeast for many soil mapping units. **There** is less data concerning soil-wetness. An effort **will have** to be made in the ensuing years to define the wetness-class of major soil series in the region.

Measurement should be taken at frequent intervals and would be at least on a weekly **basis to determine** the soil-wetness state.

Charge 3 The adequacy of four **soil water** states **is sufficient** to describe soils in the field. The consistency of descriptions between individuals, regions or states must be maintained. Dry or wet states have been defined. Soil water states between 15 and 0.3 bar and between 0.3 and **0.01 bar will** be increasingly difficult to separate **as moisture** tensions approach 0.3 bar values. **Relationship** between ease of **molding**, texture, organic content, and **porosity** will be of necessity be estimated in establishing the water state. Because of this problem, a three category system could be used until **adequate and** consistent methods **of** separation are developed.

Recommendations

Charge 1 A trial period is **needed to** test soil **wetness-**classes and demonstrate their usefulness. The effect of these classes in splitting soil series because of topographic position or **MLRA** as a result of varying wetness periods needs evaluation. The addition of a wetness class between 1.5 and 3 meters could be of value in certain instances.

Charge 2 Frequent monitoring of the wetness-class benchmark soils ranging from moderately well drained through somewhat poorly drained that cross **MLRA** lines should be used as a starting point **for** evaluation. Location **of sites** on experiment station farms **may** assure longevity and enhance cooperation.

The Technical Service Center should **assume** coordination in soil series selection.

Soil survey parties **should establish** observation point early in **the survey that soil** wetness-classes be determined before the end of **the survey**.

Soil dryness be field evaluated using the neutron probe, gypsum block or other **appropriate** method.

Perched water tables need to be noted and it will be necessary to install sealed observation wells with perforation restricted to the five depths areas: 3 to **1.5m**, 1.5 to **1m**, 1 to **0.5m**, 0.5 to **0.25m**, and **0.25m** to the soil surface.

Charge 3 A three class system be used to define soil water state (dry, moist, wet) until guidelines are developed to separate very **moist** from moist.

General Recommendation:

This committee should be discontinued as these charges will be evaluated as Chapter 4 of the new Soil Survey Manual is used in the field.

REPORT OF COMMITTEE 3

POST MAPPING ROLE OF SOIL SCIENTISTS

CHARGES

I. Determine the future needs for and the role of soil scientists (Federal, State, private) in the Northeast following the completion of field mapping.

II. Determine the experience and the academic and technical training needs of future soil scientists in a post **mapping** era.

Committee Members:

Peter E. Avers	Robert E. Francis
William F. Beers	Eugene Hanchett
P. Beers	Arthur B. Holland
Kenneth R. Olson	George Swecker
Sidney A. L. Pilgrim	Hugo Thomas
Fred P. Miller (Vice Chairman)	Arthur D. Kuhl (Chairman)
Dennis A. Darling	

CHARGE 1 - Determine the future needs for and the role of soil scientists (Federal, State, private) in the Northeast following the completion of field mapping and publication of soil surveys.

The soil survey workload in a area or state with completed soil survey reports includes such diverse activities as routine soil interpretations for resource planning and **onsite** investigation of soil problems, soil potential ratings, and RAMP and new mining programs in affected areas. It includes high intensity soils mapping where the published soil survey does not have sufficient detail. Also included are the digitizing of soils maps, keeping soil interpretations current. **recorrelation** and supplemental soil reports to extend the life of the soil survey, and keeping soil series and Soil Interpretations Records (SCS-SOILS-S) current with the state of the art of soil survey. Last, but certainly not least, soil characterization studies must be directed towards soil interpretations with less emphasis on soil classification.

The teaching needs in areas with completed soil surveys must be carefully analyzed. This includes field level training of resource planners in the many uses and in the **limits** of soil surveys up to and including university level training in all aspects of soil science.

All of the cooperators in the National Cooperative Soil Survey should be involved in determining these workloads. It is very important to make these decisions prior to the end of **mapping** and before the technical expertise of the local soil scientist has been lost due to retirement, change of job classification, or transfer to another area or state with an active soils mapping program.

Listing "feds that can be satisfied by specialists other than soil scientists and needs that can be satisfied only by soil scientists is a convenient method of quantifying Charge 1. These needs are as follows:

A. Soil survey needs that can be satisfied by specialists other than soil scientists:

1. Routine general soils interpretations from published soil surveys or unpublished soil surveys can be made by soil conservationists, resource planners, etc.

2. Soils maps can be digitized by trained technicians.

3. Engineering data from soil surveys and the estimated properties in the Soil Interpretation Records can be used by engineers to estimate the suitability of soils for engineering uses.

4. Geology of the parent material can be determined by geologists interpreting soil surveys.

5. The interdisciplinary cooperation between research and practical aspects of soil surveys can be provided by many specialists.

B. Soil survey needs that can be satisfied only by soil scientists:

1. Keep the soil resource data base current. This includes updating; Soil Interpretation Records (SCS-SOILS-S) and revising soil series descriptions. as needed.

2. Recorrelate and publish supplemental soil reports for outdated soil surveys.

3. Carry out soil characterization and field investigation work with special emphasis toward soil research directed toward soil interpretations.

4. Onsite investigations involving complex soil and/or land use conditions.

5. Specialized soil inputs into programs such as I&M, RAMP, PL-566, KC&D, RCA, etc.

6. High intensity soil surveys where greater detail is needed than present in the published soil survey.

7. Translate technical soils data such as soil classification and morphology information into more usable forms for the use of laymen and other technical disciplines.

a. Train soil survey data users such as soil conservationists, resource planners, and engineers in the use of soil surveys at the local level.

9. Prepare small scale soil and interpretation maps for statewide and regional use.

10. Provide soil scientists' input into interdisciplinary teams that use soil data in resource planning such as soil potentials.

11. Provide sophisticated soil data to resource planners where routine soil data are inadequate.

12. Support the NCSS objectives including program improvement and development.

13. Provide scholastic training at the college or university level in soil science.

CHARGE 2 - Determine the experience and the academic and technical training needs of future soil scientists in a post mapping era.

A. The work that field soil scientists do in the future will be quite different than the type of work they perform while soil mapping is in progress. There should also be a corresponding but lesser change in the work performed by soil scientists at higher levels such as state office and those employed in the academic fields. First considered is the needed training for field soil scientists both in public and private employment:

1. A Bachelor of Science degree in soil science or related sciences with at least 15 semester hours in soil related courses. Ideally, course work should include geology, geomorphology, hydrology, biology, engineering, and mineralogy. In addition, these soil scientists need training in management and effective public participation,

2. At least three or four years of field soil mapping experience, preferably with part of this experience as a soil survey party leader.

3. Experience and/or training in cartography and remote sensing.

4. Possess good communication skills and be articulate in both writing and speech.

5. Be familiar with at least the basic principles of land use planning, statistics, computer systems, team interactions, and advance soil management practices.

B. Training needs for soil scientists in higher positions such as state offices and in academic work:

These soil scientists need all the training listed for field soil scientists. In addition, a Master's or Doctor's degree is desirable, especially in the academic field. These soil scientists can greatly benefit from a wide range of experience such as working in different areas of the country and doing specialized research in soil genesis, morphology, or soil interpretations. In addition, they need management training appropriate to their positions.

Recommendations

1. The findings of the Committee be accepted--approved by the Conference.

2. The Committee be continued for the next Conference--approved by the Conference.

Suggested Charges for the Next Conference

1. Define how the post mapping soil scientist should carry out his duties.

2. Explore methods to support the NCSS in a post mapping era at the Federal, State, and land grant college level.

1980 NORTHEAST COOPERATIVE SOIL SURVEY CONFERENCE

UNIVERSITY PARK, PENNSYLVANIA JUNE 23-27, 1980

REPORT OF COMMITTEE 4

Soil Survey Interpretations Made at Categories

Above the Series Level

Chairman -- Oliver W. Rice, Jr.

Vice-Chairman -- Gerald W. Olson

Members --

John E. Foss

Nobel F. Peterson

Robert V. Joslyn

Bruce G. Watson

Niles A. McLoda

Harvel E. Winkley

Charles A. Reynolds

Charges

No. 1

Develop guidelines for making of soil survey interpretations at the family, subgroup, great group, and suborder levels in Soil Taxonomy.

No. 2

Develop guidelines for coordinating these interpretations.

No. 3

Answer the following question • Can these interpretations be **accommodated** on the SCS-SOILS-5 **form** as presently formatted?

Background

Before 1976, it was common for interpretations to be prepared for soils named for taxa above the series level and for miscellaneous areas to be published in soil surveys. Advisor SOILS-4, dated February 6, 1976, stated that tabled interpretations would no longer be prepared for such units and that the interpretations would be discussed in the mapping unit descriptions. The goal was to encourage the naming of map units as phases of series. The policy was formalized in NSH, Part I, Section 407 (4/25/76). Other references are in NSA, Part I, Draft Section 400, Part II, Section 302.7 (a) (2) and 302.5 (a) and (b).

In February 1980, the National Office stated that it was reasonable to relax the rules for map units named for taxa above the series level. The memo included other proposals, including the proposal to allow the preparation and publication of interpretations of a phase of a series qualified by a rocky modifier (a qualified unit) and interpreted as a single soil as well as for other kinds of units. Possible reasons for the proposed change are that the goal of encouraging the naming of map units as phases of series had been reached and that some of the TSCs wanted the rules relaxed.

The charges to our committee are applicable to maps prepared using Order 1 to Order 5 methods. The charges are especially appropriate for detailed and general soils maps of various kinds, including meso-intensity maps and so-called "Natural Soil Groups Maps."

However, because of the proposed policy changes that allow preparation and publication in current format tables of interpretations for map units named for taxa above the series level, the committee concentrated its effort on ADP prepared tabular soil survey interpretations for the map units in the soil survey interpretations for the map units in the soil surveys to be published at a scale of 1:20,000 or thereabouts.

The three kinds of map units with which we were concerned are:

1. Map units named as phases of a single taxon.

- A. Map units named as phases of a family. In the name of these units, either the full family name is used or the common name for a family (the series name that has been selected to represent the family.) Phases of a family have been used mainly in states served by the West Technical Service Center. I believe that units named as phases of a family have not been correlated in the Northeast. However, any guidelines developed should be applicable to such units. It seems likely that some of the units named for great groups or subgroups could probably have been correlated as phases of a soil family. A name of this kind of unit taken from a survey area in the West is: Vetter family, 20 to 60 percent slopes.

B. Map units named as phases of taxa above the family level. This kind of unit has been correlated in most states in the Northeast. There are usually wide ranges in some soil property within such units, although one or more properties, properties that place a **severe** limitation on the use of the soils, will have a relatively narrow range. It appears that many such units could be named as a complex or an association of phases of series if appropriate series were available and if the soils were studied enough to know their composition. How well the soils are characterized is a key element in assigning names to and deciding on the appropriate interpretation for the map units.

2. Map units named for miscellaneous areas.

3. Map units named for multiple taxa • complexes, associations and undifferentiated units.

The general subject of our committee has been dealt with by a number of previous work planning conference committees. regional and national. The reports of these committees contain excellent **statements** of philosophy and problems, but they did not set down criteria, procedures, and guidelines specific enough to be used as a guide in preparing publishable interpretations for units named for taxa above the series level.

Charge No. 1 to our committee asks that we develop guidelines. The chairman took this to mean that the **committee prepare** more than a discussion of the problems and principles of making interpretations for these kinds of units. These have been stated in the reports contained in the list of references. In these references, many good ideas have been presented, such as listing in the tables the percentages of components of mapping units, giving ranges for limits ratings, **i.e.**, mod-severe, etc. The ideas that would require changes in format were not considered simply because past suggestions have never gained wide acceptance. Because of the need to have criteria and use them soon, we were attempting to draw up guidelines that could be used pretty much in the existing format and for uses for which we now make interpretations.

Comnittce Action

As chairman, I solicited ideas from all committee members shortly after the committee was established. In March, I asked Dr. Gerry Olson, Vice-Chairman to be prepared to make a special report to the committee and the conference on the work of Mr. Mal Larimer, a soil scientist from Australia, who was doing special work at Cornell along the lines of the committee charges. At the same time, I asked all **committee** members to respond to material I prepared • material calculated to stimulate thinking and creativity. Although the written response from the committee members was not great, the discussion at the conference was **very** intense and thorough which indicated a strong interest and well-developed beliefs. The proposed **guidelines** were tested on a number of map units and were found to **give** reasonable results.

The committee and the conference believed it was necessary to carefully define the context in which the adopted guidelines were to be applied.

Committee discussion centered around specific aspects of use of phases of higher categories of Soil Taxonomy in detailed mapping and the making of more general soil maps. It was generally agreed that higher categories should not be used, except where absolutely necessary. In Soil Taxonomy, higher categories are progressively less and less useful for making interpretations and higher categories cannot be interpreted in the same detail as phases of series. The most useful are those linked to the soil series or variants as closely as possible and not to taxa of higher categories. It would be a mistake to map Soil Taxonomy categories over wide areas, because those would need remapping again in a few years. The difficulties of technology transfer in the Benchmark Soils Project (U. of Puerto Rico and U. of Hawaii) is illustrated by the principle -- "DETAILED RESPONSE DATA CANNOT BE EFFECTIVELY TRANSFERRED EXCEPT BY DETAILED SOIL MAPPING". The conference stressed very strongly that in all situations possible, map units be named for phases of series. To reinforce this idea, the conference prepared the following statement:

"Soil survey interpretations for categories above the series level should be used in soil survey reports for 3rd and 4th order surveys and only when absolutely necessary for such units in 1st and 2nd order surveys. In addition, interpretations for categories above the series could be used for small scale generalized or natural soil group maps."

Recommendations:

Committee Charge No. 1

Recommended guidelines for making interpretations for map units named as phases of taxa above the series level 1) included in tables in published soil surveys.

1. Soil interpretations can be made only for components 2) of taxa that are explicitly named in the mapping unit name and for which proportionate extent is given in the map unit description. Such units include consociation, complexes, associations of series, higher taxa and undifferentiated areas.
2. The guides (formerly called guide sheets) used for making the interpretations are those now contained in NSH, Part II, Section 403. 3)
3. Mapping unit interpretation for a given use-soil combination will be made only if the range of at least one soil property that would result in the most severe rating is known. 4) The ranges would be recorded in the map unit description and/or on Form SCS-SOILS-5.
4. Guidelines concerned with the span of soil property values:
 - A. A given use-soil combination will not be interpreted if the ranges of the soil properties determining the limitations class are wide enough to include SLIGHT, MODERATE and SEVERE.

The extremes of the span of the soil property value, say the last 15 percent, 5) are not to be used in the application of this rule.

- B. A given use-soil combination whose range of the soil property determining the limitations class spans major portions of two limitations classes will be assigned the more severe limitations class if more than 15 percent of the range is in the more severe limitations class.

Committee Charge No. 2

1. Interpretations for map units named as phases of taxa above the series level should be prepared on a survey by survey basis, and computer stored as permanent soil interpretations.
2. Coordination would be provided through the process of applying the guides from NSH, Part II, Section 403, using the proposed Charge No. 1. The TSC would have the responsibility of monitoring the interpretations.

Committee Charge No. 3

1. The recommendations for Charge No. 1 would not require changes in the format for Form SCS-SOILS-5 or for tables included in published soil surveys. They could result in additions and changes in the edit programs for producing the Rating Approximation and tables. Edit messages would list interpretations identified as questionable by the rules of Charge 1. The edit messages would give alternative interpretations assuming the range of the limiting property is narrowed to the next less severe limitations class. If ratings cannot be made because ranges in properties are not given, all limiting properties without ranges would be listed.

Other recommendations:

1. The present committee should be disbanded and a new committee with modified charges should be re-constituted for the next conference.
2. The new committee would evaluate the uses of recommendations of this conference.
3. The principal charge of the new committee would be to develop guidelines for making and presenting interpretations for generalized soil maps - those prepared by aggregating map units into meso-intensity and macro-intensity maps. The charges would include developing and testing procedures for interpreting aggregated units.

FOOTNOTES

- 1) The criteria presented and adopted should be applicable (not produce ambiguous or inconsistent interpretation) to every kind of unit in the soil survey area, including units named as phases of series. We would not want to propose stricter rules for units named for taxa above the series level than for units named for series.
- 2) In certain cases, a map unit named as a phase of a great group can be mentally divided into phases of subgroups within the survey area i.e., Udifluvents, loamy can be divided into Typic Udifluvents, loamy and Aquic Udifluvents, loamy.
- 3) This is one of the primary coordination devices.
- 4) In the case where the range of known soil properties indicates a MODERATE rating but an undefined soil property has the potential of making the rating SEVERE, no rating would be made.
- 5) The reason for using percentage of a range rather than percentage of the soil in each limits class is because we usually do not know the percentage of soils. This amount of information is the minimum required. We could make better interpretations by knowing more about the distribution of soil with soil property values within each limits class, and we should strive for this.

REFERENCES:

- Proceedings of National Technical Work-Planning Conference of the Cooperative Soil Survey; 1979; page 48.
- Proceedings of Western Regional Technical Work-Planning Conference of the Cooperative Soil Survey; 1972; page 122.
- Proceedings of Southern Regional Technical Work-Planning Conference of the Cooperative Soil Survey; 1972; Committee 3 report.
- Proceedings of National Technical Work-Planning Conference of the Cooperative Soil Survey; 1971; page 203
- Proceedings of National Technical Work-Planning Conference of the Cooperative Soil Survey; 1969; page 133
- Proceedings of National Technical Work-Planning Conference of the Cooperative Soil Survey; 1967; page 132

Oliver W. Rice, Jr.
Chairman, Committee 4

Committee 5

Evaluating the Adequacy of Older Published Soil Surveys

Committee 5 Members: C. H. J. Breeding, W. J. Edmonds, F. W. Hahnenberg, W. E. Hanna, W. C. Kirkham, G. H. Lipscomb, J. C. Patterson, L. H. Rivera, J. H. Ware, J. A. Fetwerda, R. L. Shields--Vice Chairman, and R. L. Cunningham--Chairman

Charges:

1. Develop guidelines for evaluating the adequacy of older published soil surveys for resource conservation planning.
2. Develop procedures for updating a published soil survey. These procedures will include, but are not restricted, to the following:
 - a. Field techniques for determining the adequacy of soil boundaries.
 - b. Field techniques for determining mapping unit composition.
 - c. Updating interpretations.

During our deliberations, we received NSH-Part II Procedure Guide, Section Z00, Soil Survey Operations Management Sec. 203 - Evaluating and Updating Published Soil Surveys. This guideline fulfills the objectives of the charges to Committee 5. The NSH does keep its directives general enough so that wide application is achieved. This section is included as a part of the Committee 5 report. The Committee recommends the following editing changes to the report:

Committee 5 Review of NSH - Part II
Procedure Guide Section 200
Soil Survey Operations Management

203: Evaluating and Developing Plans for Updating Published Soil Surveys.

In the Table of Contents:

203. 1 Evaluation

- (a) SHOULD BE: Soil Map Units and Soil Maps
- (b) SHOULD BE: Update Correlation
- (c) SHOULD BE: Soil Interpretations
- (d) ADD: Availability of Report

Reason: The process should first determine the adequacy of soil map units and soil maps before proceeding to taxonomic units or soil interpretations. Neither of the latter will be of added value unless maps are determined to be adequate. Sometimes the supply of reports can assist in determining if a report needs updating.

203. 1 Evaluation

SUGGESTED CHANGE IN OPENING SENTENCE: Published soil surveys older than 1970 should be evaluated at 10 years or less to determine suitability for meeting current needs. The evaluation will be done by SCS staff cooperators.

Reason: "Periodic" has different meanings and a reasonable time frame would be much more helpful.

SUGGESTED CHANGE IN ORDER OF (a) (b) and (c)

(a) Soil Map Units and Soil Maps

(b) Update Correlation

(c) Soil Interpretations

(d) Availability of Report

(a) to the last sentence ADD "for sectionized land."

(b) Update Correlation

Replace "Evaluate the" with "Develop modern"

CHANGE ORDER OF 2 STATEMENTS

(c) Soil Interpretations

REPLACE "accuracy" with "adequacy."
and ADD "and need for additional interpretations"
in the first sentence.

(d) Availability of Report

Supplies of a report should be checked to assist in developing an updating plan for the survey area. Very few reports on hand might imply a different attack to updating than if several thousand reports are available. Although reprinting can be done, updating may be considered at that time.

203. 2 Plan for Updating

(b) last 3 words SHOULD READ: "issue as needed."

(e) Remapping

In the 3rd paragraph ADD after last paranthesis ")
for the remapped area.

Committee 5 need not be continued.

R. L. Cunningham

HSH - PART II
PROCEURE GUIDE
SECTION 200

DRAFT

Attachment to
Committee 5
Report.

SOIL SURVEY OPERATION MANAGEMENT

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203 Evaluating and Developing Plans for Updating Published Soil Surveys

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203 EVALUATING AND DEVELOPING PLANS FOR UPDATING PUBLISHED SOIL _____

203.1 Evaluation

The periodic evaluation of published soil surveys will be done and documented by SCS staff and appropriate cooperators. An evaluation is valid only if there are standards against which the existing material can be compared. Current and potential needs of users will be identified and used as standards for the evaluation. If remapping is planned, it must also be verified that the remapping can improve existing soil maps for the purposes intended in a cost effective manner. Published soil surveys occurring in the same Major Land Resource Area or similar area, will be evaluated to a common base to ensure the data can be compared, transferred, and integrated. Updating requirements will be a part of all State Annual Soil Survey Planning Conferences. A detailed plan for all updating is jointly developed with cooperators and users. The evaluation will include :

- (a) Soil Interpretations - Review the kind and accuracy of the soil interpretations. Some interpretations may now be available and applicable that were not included in the latest publication. Criteria for some interpretations may also have been revised since some older soil surveys were published. Land use changes and increased knowledge about soil response to different uses may also cause the need for updating the soil interpretations.
- (b) Taxonomic Units - Evaluate the concepts of the taxonomic units and determine adequacy for defining soil map units and for supporting the soil interpretations.

Determine if the taxonomic unit descriptions are adequate to accurately classify the soils in Soil Taxonomy.

- (c) Soil Map Units and Soil Maps - Evaluate the composition of map units and the variation between delineations of each unit. Determine if map unit descriptions adequately characterize the map units. Identify inadequate map units and occurrence in the survey area. A systematic sampling method that can be documented will be used. A transecting procedure of an intensity to determine the composition for naming the map units and support soil interpretations for intended uses is generally adequate.

Evaluate the accuracy of map unit boundaries and the suitability of map detail. Determine areal extent of the deficiencies and the degree of improvement that can be attained with updating procedures. This might be accomplished by randomly selecting tracts of land, such as 1 square mile, and remapping to meet current needs and objectives. Record all costs of remapping. Compare new mapping with existing mapping and evaluate if cost of new mapping and the additional information gained can be justified in comparison to other alternatives for updating present information.

If existing soil map unit boundaries are suitable, evaluate the base used for the soil map. If base map deficiencies are the major problem with the existing soil map, then determine the alternatives bases are available for preparing an updated soil map.

203.2 Plan for Updating

Published soil surveys that are out of print and do not need supplementing can be reprinted using procedures in NSH, Section 600. When an evaluation identifies deficiencies of a published soil survey and supports the need for updating, a plan will be developed detailing actions that will be taken to correct deficiencies. The TSC Head, Soil Staff, will provide technical coordination. The following actions, singularly or in combination, will be taken as needed to make soil information adequate for current needs,

- (a) Update Soil Map Base - Where only the soil map base is inadequate. Obtain a new base and transfer soil delineations and symbols. Issue new soil maps as needed.
- (b) Update Soil Interpretations - Where only the soil interpretations are inadequate, prepare new or revised interpretations, and issue as needed.
- (c) Recorrelate - Recorrelate when deficiencies in concepts of taxonomic units or map units are needed to support new or revised soil interpretations. As a minimum, the changes will be reviewed at the TSC when the updated material is to receive limited local distribution. Final correlation procedures, as stated in HSH, Section 300, are generally needed only when extensive remapping or supplemental mapping is done and the revised material is expected to be distributed statewide or broader.
- (d) Supplemental Soil Mapping - When more detailed soil information is needed for areas of limited extent, document the purposes, map and record the supporting data, such as legend, map unit descriptions and interpretations. Issue supplemental information as needed on a local basis to achieve objectives.
- (e) Remapping - The conditions that determine a decision to partially remap with limited local distribution of the revised soil maps and supplemental text or to resurvey and publish an entire area cannot be precisely defined for all situations. Many variables can exist for each soil survey area needing some remapping and all possible combinations are beyond advance definition. Rarely will there be a need to remap every acre in a published soil survey, yet at some lesser level of need, it becomes more practical and efficient to remap and publish the entire area using the existing information in the most efficient manner. When remapping is needed for only a few scattered areas, it usually is more practical to map on an individual request basis.

When partial remapping is done, document supporting data, correlate, and prepare a supplemental text (including soil interpretations). Issue updated soil maps and text to meet objectives.

When resurveying an area or parts of two or more areas equivalent to a survey area as defined in NSH, Section 201.1 is planned, approval of the Director, Soils Staff, is required before committing SCS resources. Requests for approval are made by submitting to the Director, Soils Staff, a draft memorandum of understanding specifically documenting how the resurvey will improve the existing material to meet current needs (see NSH, Section 202.1(b)(2)). When approval is obtained, use procedures that apply to surveying an area for the first time.

203.3 Format for Supplements to Published Soil Surveys

- (a) Text - No standard format is prescribed for supplements to published soil surveys. Supplements in which the SCS is a cooperator will meet the technical standards of the NCSS and be edited by the SCS before publication. The format for individual parts of the supplement will be the same as that given for soil survey text in NSH, Section 603.1(a)(2). A supplement will:

Be prepared at minimum cost to achieve specific local objectives;

Be given a title the same as the original soil survey publication except the words "Supplement To" are added;

Avoid duplication of material in the original text;

Make direct reference to the soil maps and legend in the original soil survey publication;

Have an explanation of why and how the original soil survey is being supplemented along with the date of the supplement.

- (b) Maps - When more than a few map unit delineations shown on the published soil map need revision, then supplemental soil maps will be prepared. The areas revised will be clearly identified on record copies of the old maps and on copies of the old maps for distribution. New maps and legends will meet NCSS standards and will be placed in the supplement together with new or revised soil descriptions if necessary.

If soil maps are revised on a request basis, only the revised mapping is transferred to a record copy of the published soil survey maintained in the field office. Maps in the record copy will be unbound in a looseleaf 3-ring binder.

203.4 Memorandum of Understanding for Soil Survey Areas to be Supplemented and Publication Procedures

A memorandum of understanding for the soil survey area is prepared for areas where supplemental text or maps are to be prepared for public distribution, or the area is to be remapped and published. Procedures in NSH, Section 202.1, will be followed.

The survey area is changed from published, "F" or "S," in the CASPUSS program to progressive, "G," when a memorandum of understanding for the survey area is signed.

COMMITTEE 6

Soil Water Terminology and Hydrologic Modeling

Committee Chairman: Thomas E. Calhoun

Committee Vice-Chairman: Daniel D. Fritton

Members:

L. A. Douglas	J. C. Sencendiver
D. G. Grice	P. L. Veneman
D. E. Hill	W. R. Wright
K. J. LaFlamme	R. D. Yeck
D. E. McCandless	T. Brumback

CHARGE ONE

Propose clear definitions for "perched" water table and "apparent" water table, and "**real**" water table.

Background:

Clear understanding of any subject depends on well-defined terms. This is particularly true of technical subjects such as soil-water relations. There is confusion on the meaning of the terms "perched," "apparent," and "real" water tables. For example: Evidence of a zone in the soil without free water beneath a zone in the soil with free water indicates the presence of a perched **water table.**

The following definitions were proposed by the committee:

Soil Water Table: The upper limit of the soil that is saturated for more than one month within a depth of two meters.

Perched Water Table:

1. The water table of a saturated layer of soil **over** an unsaturated layer of soil within the series control section.
2. Temporary water table caused by underlying slow permeable or impervious soil layers.
3. The upper limit of the soil that is saturated for **more** than one month and is underlain, within two meters, by a zone that is unsaturated or seeming unsaturated zone.
4. The water table of a saturated layer of soil which is separated from an underlying saturated layer by an unsaturated **layer**.
5. The upper surface of a body of free **ground** water in a **zone** of saturation separated by unsaturated material from an underlying body of ground water in a differing **zone** of saturation.

Apparent Water Table:

1. This term is to be used when you feel the soil is saturated throughout the series control section once the water table has been encountered.
2. Height of the ground water as measured in an unlined bore hole with a diameter of at least 2 cm.
3. The upper limit of the soil that is saturated for more than one month and is not underlain, within two **meters**, by an unsaturated or seeming unsaturated zone.
4. The upper surface of ground water or that level below which the soil is saturated with water; locus of points in soil water at which the hydraulic pressure is equal to atmospheric pressure.
5. The upper surface of a **zone** of saturation except where that surface is formed by an impermeable body.
6. The upper surface of the permanent ground water where the hydrostatic **pressure** equals the atmospheric pressure; this level is indicated by the height of the ground water in an unlined bore hole with a diameter of at least 2 cm.
7. The upper surface of a body of free ground water in a zone of saturation when the body of ground water is not confined by an overlying impermeable formation. Where an overlying confining formation exists, the **aquifer** in question has no water table. It is not the water surface.

Recommendations by the Committee

1. The term "real" water table is not needed.
2. Water table should be defined as:
"The upper surface of free water, or that level in the ground where the water is at atmospheric pressure."
3. Apparent water table should be defined as:
"A water table that is not underlain by an unsaturated zone within the depth of observation."*
4. Perched water table should be defined as:
"A water table, caused by a slowly permeable layer, underlain by an unsaturated zone. The normal depth of observation is to two meters below the soil surface."

* Apparent water tables as presently defined may not always qualify as apparent under this proposed definition.

5. The committee recommends that these three definitions be submitted to the next National Soil Survey Planning Conference for their consideration, and that these definitions or similar definitions as decided on by the National Conference be included in the Soil Survey Manual.

CHARGE TWO

Recommend a procedure or develop a hydrologic model to determine the number of drought days in soils at depths that relate to rooting depth.

Background:

Soil-water stress measurements are needed to help understand soil-plant relationships. There are soils in the Northeast that need supplemental irrigation during the cropping season. These needs vary with the crop grown and with the year. Most crops produce higher yields if they are not stressed by insufficient moisture. In some soils, a few days without precipitation can cause moisture stress even though the available moisture may not have dropped to the permanent wilting point. With the climatic and soils data presently available it should be possible to determine the time and duration of moisture stress. The soil moisture regimes established in Soil Taxonomy do not supply the needed information.

The following comments were made by the committee members:

1. Need to determine when moisture stress begins for various crops on various soils. Develop curves for each soil and crop based

on rainfall history. Construct a probability of moisture stress occurring by soil, and time of year.

2. Consider moisture tension at spring thaw to be close to maximum, Using rooting depth and evapotranspiration, a moisture deficit or oversupply could be predicted from precipitation and estimated infiltration.
3. Redefine charge 2 to include the possible prediction of total moisture regime.
4. We should be emphasizing the collection of data used in such models, not the development of the models. Accurate information on soil water holding capacities, depths of root zones for various crops and soils, soil infiltration rates, soil drainage rates, and moisture retention curves are needed.

Recommendations by the Committee

1. Since meteorological and hydrologic models such as the Palmer Drought Index already exist and have been applied to the Northeast, it is concluded that this **committee** should not develop or recommend a mode. Instead, the committee recommends that an increases emphasis be placed on collecting the kinds of information needed for evaluating soil-water relationships to include excess water and environmental quality aspects in addition to plant aspects. Examples of information needed for hydrologic models are as follows:

- a. In situ permeability both saturated and unsaturated.
- b. Direction and pathway of soil-water flow especially when channel flow is observed.
- c. Potential for recharge and **wastewater** disposal.
- d. Field water content of soil horizons at the wet (field capacity) end of the plant available water scale after rainy periods.
- e. Field water content of soil horizons at the dry (wilting point) end of the plant available water scale during droughts.
- f. More accurate profile descriptions showing rooting depth by crop and soil.
- g. Soil water relationships on a long **term** basis.

2. In order to implement the above information collection, the committee recommends that a regional project proposal dealing with these issues be developed involving some combination of SCS and the experiment stations to be presented to EPA and perhaps others for funding. Peter **Veneman** has offered

to lead the proposal writing effort with Ron Yeck. The proposal should be completed and presented at the January 1981 meeting of the Northeast Soil Research Committee to develop the regional project base for further efforts.

3. Having met its charges, it is recommended this committee be disbanded.

Committee 7

General Soils Map and Bulletin of the Northeast

Committee Membership

General Editor - Ed Ciolkosz

(A) **Bulletin Chairman - Bob Cunningham**

- Chapter 1 Physiography - John Sencindiver and Ed Ciolkosz
- Chapter 2 Soil Classification - F. Ted Miller and Loyal Quandt
- Chapter 3 Entisols - Bill Wright, Lew Douglas, and John Ferwerda
- Chapter 4 Inceptisols - John Foss and Bruce Watson
- Chapter 5 Spodosols - Ron Yeck, Bob Rourke, and Sid Pilgrim
- Chapter 6 Alfisols - Art Kuhl and Fred Gilbert
- Chapter 7 Ultisols - Bob Cunningham and Del Fanning
- Chapter 8 Histosols - Dave Hill and Peter Veneman
- Chapter 9 Mollisols - Bill Hatfield and Gary Petersen
- Chapter 10 Soil Interpretations - Oliver Rice, Jerry Olson and Vin Van Eck

(B) **Map Chairman - Horace Smith**

Committee members - Fred Miller, Bob Rourke, Ed Sautter and Gene Grice

Charges

1. To draft and publish a soils map of the Northeast.
2. To draft and publish a bulletin on the soils of the Northeast.

Report

1. **Map Committee (Horace Smith, Chairman)**
 - a) The Map Committee is in the process of drafting a general soil map for the Northeast. The map, which will be at a scale of 1:2,500,000, will be about 25 x 30 inches. It will be folded and placed in the back of the Soils Bulletin. The Map Committee's goal is to have the first draft of the map and legend completed and distributed to the Bulletin Chairman and individuals responsible for writing chapters in the bulletin by early January, 1981. The bulletin chapters can then be massaged to fit the map legend. For the most part, this map will be a broad generalization of the current general soils maps for the Northeast states. The map scale will determine the taxonomic level of the map unit names.
2. **Bulletin Committee (Bob Cunningham, Chairman)**
 - a) Titles and authors of the chapters of the bulletin are given above. The senior authors will have the major responsibility for writing the chapter. The bulletin chapters should be patterned after the 1973 publication, Southern Cooperative Series Bulletin Number 174 "Soils of the Southern States and Puerto Rico" edited by Stan Buol. Copies of this publication are available from Stan Buol, Dept. of Soil Science, North Carolina State University,

Raleigh, NC 27607. Target date for the first draft of the chapters to be in to the bulletin committee chairman (Bob Cunningham) is June 1, 1981.

- b) To date the first draft of two chapters (Ch. 3, Entisols and Ch. 5, Spodosols) has been received.

Committee 8

Northeast Soil Characterization Study

Committee Members

Ed Ciolkosz, Chairman (Penn State Univ.)
Ken Olson (Cornell University)
John Foss (University of Maryland)
Bob Rourke (University of Maine)
Peter Veneman (University of Massachusetts)
Bill Wright (University of Rhode Island)
John Sencindiver (West Virginia University)
Ron Yeck (SCS National Soil Survey Lab)
Dick Cronce (Penn State University)
Mel Findlay (Argonne National Laboratory)

Charges

1. To collect, distribute and analyze 10 soil samples for standard soil characterization analyses.
2. To evaluate the data for laboratory to laboratory reproducibility.

Report

1. The following 10 samples were distributed to the soil characterization labs listed above (7 University labs, National SCS lab and Argonne lab).

NESCS-1 Groveton Ap	NESCS-6 Gilpin B2
NESCS-2 Groveton B2ir	NESCS-7 Honeoye B2
NESCS-3 Hagerstown Ap	NESCS-8 Vergennes Ap
NESCS-4 Hagerstown B2	NESCS-9 Vergennes B2
NESCS-5 Gilpin Ap	NESCS-10 Sassafras B2

All of these samples except #7 (Honeoye B2) were a part of the NE 96 project on heavy metal-soil interactions.

2. The data was analyzed by Dick Cronce and his report is attached.
3. The conference recommended that this study be continued with additional samples and a report given at the 1982 conference. Dick Cronce has been appointed the chairman for the continuation of this study.

NORTHEAST SOIL CHARACTERIZATION STUDY

**Richard Cronic - Director, Soil Characterization
Laboratory, The Pennsylvania State University**

Soils data generated by soil characterization labs are used extensively by a wide range of users for various purposes. Soil Conservation Service research utilizing their research. Information generated by (Research) Tj 1

Table 1. Soil samples analyzed and their taxonomic classification.

Series	Horizon	Classification
Groveton	AP	coarse-loamy, mixed, frigid Typic Haplorthod
Groveton	B2ir	
Wagerstown	AP	fine, mixed, mesic, Typic Hapludalf
Hagerstown	B2	
Gilpin	AP	fine-loamy, mixed, mesic, Typic Hapludult
Gilpin	B2	
Honeoye	B2	fine-loamy, mixed, mesic, Glossoboric Hapludalf
Vergennes	Ap	very fine, illitic, mesic, Glossaquic Hapludalf
Vergennes	B2	
Sassafras	B2	fine-loamy, siliceous, mesic Typic Hapludult

Table 2. Soil characterization labs involved in the study.

University of Rhode Island
 SCS National Soil Survey Laboratory
 Argonne National Laboratory
 University of Maine
 University of Massachusetts
 The Pennsylvania State University
 Cornell University
 University of Maryland
 West Virginia University

Results and Discussion

Statistical levels of significance resulting from a statistical analysis are used to determine the probability of finding real differences in the data. The statistical levels of significance indicate that if you say there is a difference between two populations, you might be wrong 5% of the time (0.05 level) or 1% of the time (0.01 level). The other possibility is that there is no significant difference (NS) between the populations. Values of F are calculated to determine the level of significance and, in general, the larger the F value, the greater will be the significance of the factor. Tables 3, 4 and 5 show the F values and statistical levels of significance of the experimental factors for each of the soil parameters analyzed. The data show that there were highly significant differences (0.01 level) between labs in the determinations of sand, silt, clay, organic carbon, 15 atmospheric moisture, Ca, K, H, CEC, percent base saturation, and pH in H₂O, 1 N KCl and 0.01 M CaCl₂. There were significant differences (0.05 level) between labs in the

Table 3. F values and the statistical levels of significance of the experimental factors for sand, silt, clay, organic carbon, and 15 atm moisture.

Factor	Sand		Silt		Clay		Organic Carbon		15 atm Moisture	
	F	Sig	F	Sig	F	Sig	F	Sig	F	Sig
tab	14.01	**	7.17	• *	3.32	• *	3.61	**	10.51	**
Rep(Lab)	1.11	NS	0.41	NS	0.80	NS	0.63	NS	3.77	**
Soil	12984.21	***	2921.38	***	3227.91	**	2829.46	**	1181.43	**
Lab x Soil	20.02		8.28		5.92	**	9.25	**	11.25	**

* = Significant at 0.05 level.
 ** = Significant at 0.01 level.
 NS = Not significant.

Table 4. F values and statistical levels of significance of the experimental factors for Ca, Mg, Na, K, and H.

Factor	Ca		Mg		Na		K		H	
	F	Sig	F	Sig	F	Sig	F	Sig	F	Sig
Lab	31.22	**	2.89	*	1.81	NS	26.62	**	31.85	**
Rep(Lab)	6.89	**	0.31	NS	1.89	NS	1.92	NS	0.81	NS
Soil	1453.59	• *	2102.82	• *	485.92	• *	211.94	**	637.47	**
Lab x Soil	22.87	**	40.30	**	76.02	**	15.69	**	3.34	**

* = Significant at 0.05 level.
 • * = Significant at 0.01 level.
 NS = Not significant.

Table 5. F values and the statistical levels of significance of the experimental factors for CEC, %B.S., and soil pH in H₂O, in KCL and 0.01M CaCl₂.

Factor	CEC		% B.S.		pH					
					H ₂ O		1N KCL		0.01M CaCl ₂	
	F	Sig	F	Sig	F	Sig	F	Sig	F	Sig
Rep(Lab)	10.80	NS	46.63	***	20.60	***	4.00	***	20.82	***
Soil Lab x Soil	949.36	12.38	1648.51	7.82	1213.98	***	805.70	***	1687.73	26.37

* = Significant at .05 level.
 ** = Significant at .01 level.
 NS = Not Significant.

determination of Mg. There was no significant difference between labs for the determination of Na. There were no significant differences between the replications within labs (Rep(Lab)) for sand, silt, clay, organic carbon, Mg, Na, K, H, and CEC. There were highly significant differences between the replications within labs for 15 atm moisture, Ca, percent base saturation, and pH in H₂O, 1 N KCl and 0.01 M CaCl₂. There were highly significant differences between the soil samples for all parameters determined. There was also a highly significant lab x Soil report interaction for all parameters. The significance of the repli-

cation within a lab (Rep(Lab)) factor indicates that the replication of an analysis within a soil characterization lab contributes the least amount of variability to the data. Because of the relatively close grouping of the data within any one lab, the individual groupings in the data from several labs can be distinguished from each other. This

to each other. Some differences in the data due to labs is expected due to minor differences in methodology and other common sources of analytical variability such as varying lab technique.

The fact that statistically significant differences between labs exists must be interpreted in perspective with the particular reason for the analysis. Whether or not these differences are of practical significance will depend on the levels of a parameter that wish to be differentiated. In other words, the range in values that exist due to the variability in the lab analysis must be compared to the desired level of difference. Table 8 shows the average values obtained by individual

soil characterization labs for each soil parameter determined. These values are the average of all the soil samples analyzed. The tables also show the average deviation from the mean in the analysis for each individual lab (shown as a \pm figure). The small letters indicate whether or not the average analytical results from one lab differ significantly from that of another lab. The mean values at the bottom of the tables are the averages of all soils and all labs. The average deviation from this mean indicates the expected variability in the data upon repeated analysis of a single sample by any one of the labs involved. Data not followed by \pm symbols indicates the sample was not run in duplicate and blanks (no data) indicate no analyses was performed.

comparing data generated by two labs, for example, the clay data from lab 1 to clay data from lab 4 (Table 6), you have to consider that there will be an inherent difference in the data of up to 2.9 percent clay to the differences between these two labs and that the data from labs 1 and 4 will themselves vary by 1.4 and 2.3 percent, respectively. Therefore, a difference of less than 3 percent clay is probably not a real difference when comparing data from these two labs. As a result, it is meaningless to try to differentiate soils by using a less than 3 percent clay difference. The data shows that the data from these soil characterization labs differ

somewhat in their ability to reproduce each others data. The general trend

Table 6. Sand, silt, clay, organic carbon, and 15 atm moisture data for individual laboratories over all soils. Column values followed by the same letter indicate no significant difference at the 0.05 level using Duncan's multiple range test.

Lab	Percent				
	Sand	Silt	Clay	Org. Carbon	15 atm. Moist.
1	21.4 ± 1.3 a	54.2 ± 1.7 b	24.4 ± 1.4 b	1.23 ± 0.20 a	12.70 ± 2.15 b
2	23.2 ± 2.1 b	54.3 ± 2.6 b	22.5 ± 2.1 a	1.28 ± 0.05 a	11.12 ± 1.07 a
3				1.99 ± 0.17 d	
4	25.9 ± 0.9 cd	52.6 ± 2.9 b	21.5 ± 2.3 a	1.23 ± 0.15 a	13.12 ± 0.64 b
5	24.3 ± 1.4 bc	53.3 ± 2.3 b	22.4 ± 1.5 a	1.42 ± 0.09 b	10.24 ± 0.45 a
6				1.74 c	
7	20.7 ± 0.7 a	56.7 ± 3.3 c	22.6 ± 3.0 a	1.22 ± 0.13 a	12.61 ± 0.77 b
8	25.7 cd	52.2 b	22.1 a		
9	27.5 d	46.7 a	25.7 b		10.73 ± 0.90 a
MEAN	23.7 ± 1.28 (5.4%)	53.5 ± 2.55 (4.8%)	22.8 ± 2.07 (9.1%)	1.35 ± 0.13 (9.6%)	11.75 ± 1.02 (8.7%)

Table 7. Ca, Mg, Na, K and H data for individual laboratories over all soils. Column values followed by the same letter indicate no significant differences at the 0.05 level using Duncan's multiple range test.

Lab	meq./100 am				
	Ca	Mg	Na	K	H
1	6.61 ± 0.31 b	1.49 ± 0.14 b	0.08 ± 0.01 ab	0.18 ± 0.02 ab	9.10 ± 1.72 c
2	5.13 ± 1.81 a	1.60 ± 0.11 b	0.12 ± 0.04 b	0.21 ± 0.04 b	9.18 ± 1.29 c
3	5.08 ± 0.76 a	0.37 ± 0.02 a	0.06 ± 0.03 ab	0.17 ± 0.02 ab	16.60 ± 1.40 d
4	9.36 c	1.68 b	0.15 b	0.42 c	7.09 a
5	8.12 ± 0.67 c	1.80 ± 0.39 b	0.01 ± 0.00 a	0.12 ± 0.04 a	8.08 ± 0.66 b
6	9.36 c	1.67 b	0.10 ab	0.19 ab	
7	11.32 ± 0.74 d	2.37 ± 0.11 c	0.08 ± 0.02 ab	0.36 ± 0.00 c	7.50 ± 0.75 ab
8					
9					
MEAN	1.45 ± 0.86 (11.5%)	1.61 ± 0.15 (9.3%)	0.08 ± 0.02 (25%)	0.22 ± 0.02 (9.12)	9.16 ± 1.16 (12.72)

Table 8. CEC, % Base Saturation, and pH in H₂O, in KC1 and 0.01 M CaCl₂ data for individual laboratories over all soils. Column values followed by the same letter indicate no significant difference at the 0.05 level using Duncan's multiple range test.

Lab	CEC (meq/100 gm)	% Base Saturation	pH		
			H ₂ O	1N KC1	0.01 M CaCl ₂
1	17.38 ± 1.93 ab	47.60 ± 4.30 c	5.93 ± 0.23 c	4.94 ± 0.15 b	5.47 ± 0.36 b
2	16.25 ± 1.68 a	43.36 ± 8.54 b	5.84 ± 0.34 c	4.89 ± 0.25 b	5.44 ± 0.27 ab
3	22.29 ± 1.99 c	24.06 ± 2.95 a	5.60 ± 0.10 ah	4.60 ± 0.00 a	
4	18.70 b	61.24 e	5.64 ± 0.08 b		
5	18.13 ± 1.50 b	53.70 ± 2.41 d	6.00 ± 0.04 c		5.58 ± 0.10 b
6	19.70 bc	57.47 de	5.37 a	4.73 ab	5.18 a
7	21.65 ± 1.22 c	61.36 ± 2.04 e	6.28 ± 0.11 d	4.69 ± 0.26 a	5.84 ± 0.11 c
8					
9					
MEAN	18.77 ± 1.66 (8.8%)	50.68 ± 4.05 (8.0%)	5.88 ± 0.15 (2.5%)	4.80 ± 0.16 (3.3%)	5.55 ± 0.21 (3.8%)

Table 9. Linear regression equations calculated to estimate the average deviation from the mean for the percent sand, silt and clay, the pH in H₂O, 1 N KC1 and 0.01 M CaCl₂, the meq/100 g of extractable H, and the % base saturation.

Parameter	Linear Regression Equation	R ²	Level of Sig.
sand (%)	avg. dev. = 1.65 - (0.002)(% sand)	0.00	0.91
silt (%)	avg. dev. = 0.34 + (0.027)(% silt)	0.45	0.03
clay (%)	avg. dev. = 0.85 + (0.013)(% clay)	0.17	0.24
pH (H ₂ O)	avg. dev. = -0.28 + (0.083)(pH)	0.68	0.01
pH (1 N KC1)	avg. dev. = -0.48 + (0.134)(pH)	0.48	0.02
pH (0.01 M CaCl ₂)	avg. dev. = -0.15 + (0.067)(pH)	0.41	0.05
Extr. H (meq/100 g)	avg. dev. = 0.20 + (0.079)(extr. H)	0.79	0.01
Base Saturation (%)	avg. dev. = 7.50 - (0.039)(% B. S.)	0.37	0.07

is that a couple of labs are significantly lower than the rest, a grouping of 3 or 4 labs are not significantly different from each other, and a couple of labs are significantly higher than the rest. Again, the ranges and groupings vary with the particular analysis. The ability of the individual labs to reproduce their own data also varied and the relative precision of an individual lab as compared to the other laboratories varied with the particular analysis. This type of information was generated primarily to be used by the individual labs in an evaluation of their own performance.

Over all labs involved in the analysis the variability in the data varied with the particular analysis. The sand contents of the soil samples showed an average deviation of $\pm 1.28\%$ (5.4% relative), the silt contents deviated by $\pm 2.55\%$ (4.8% relative) and the clay contents deviated by $\pm 2.07\%$ (9.1% relative). The organic carbon and 15 atmospheric moisture contents showed average deviations of $\pm 0.13\%$ (9.6% relative) and $\pm 1.02\%$ (8.7% relative), respectively.

The exchangeable Ca data for the soil samples varied by ± 0.86 meq/100 g (11.5% relative), Mg by ± 0.15 meq/100 g (9.3% relative), Na by ± 0.02 meq/100 g (25.0% relative), K by ± 0.02 meq/100 g (9.1% relative) and extractable H by ± 1.16 meq/100 g (12.7% relative). The cation exchange capacity values varied by ± 1.66 meq/100 g (8.8% relative) and the percent base saturation varied by $\pm 4.05\%$ (8.0% relative). The pH values in H₂O, 1 N KCl and 0.01 M CaCl₂ varied by ± 0.15 (2.5% relative), 0.16 (3.3% relative) and 0.21 (3.8% relative) pH unit, respectively.

This information is valuable in the assessment of soil characterization data. Instead of making decisions based only on the absolute values reported, it must be considered that values, as determined by one or more soil characterization labs, may vary within certain known limits. These mean \pm values given at the bottom of tables 6, 7 and 8 give the range that any given piece of soils data may have. For example, if you characterize a soil and find that the percent base saturation is 30 percent, this study shows that in reality, due to the variability in the lab data, the true value may range by ± 4.05 percent, or from 26 to 34 percent. If the clay percentage in the particle size control section is shown to be 25 percent, in reality this percentage ranges by ± 2.07

(Table 9) to examine how much of the variation in the data is explained by the regression equations, F tests (Table 9) were performed to see if the relationships in the data were significant.

Figure 1 gives the plots of the average deviation from the mean in the data versus the percent sand, silt and clay. The figure also shows the resultant regression line for each parameter. The regression analysis (Table 9) shows that due to the wide spread in the data around the lines, there is no significant linear relationship between the average deviation in the data and the level of sand or clay. There is, however, a significant relationship at the 5 percent level between the average deviation in the data and the percent silt. The regression equation describing this line is shown in Table 9. Although this relationship is significant at the .03 level there is still considerable scatter in the data as indicated by the relatively low R squared value of 0.45. An exact fit of the data would give an R squared value of 1.00, and an R square value of greater than 0.70 or 0.80 is normally thought to indicate good relationships in data. The data does show, however, that as the level of silt increases, there is a corresponding increase in the variability of the data.

Figure 2 gives the plots of the average deviation from the mean in the data versus the pH in H₂O, 1 N KCl, and 0.01 M CaCl₂. The figure also shows the resultant linear regression line for each parameter. The regression analysis (Table 9) shows that significant relationships exist between the average deviation from the mean and the level of the soil pH. This is true for all three methods of determining the soil pH. This relationship was stronger for the soil pH in H₂O ($R^2 = 0.68$ and significant at the 0.01 level) than for the soil pH in 1 N KCl ($R^2 = 0.48$ and significant at 0.02 level) or the soil pH in 0.01 M CaCl₂ ($R^2 = 0.41$ and significant at 0.05 level). Although the relatively low $R^2 =$ values indicate considerable noise in the data, all three pH methods show that as the pH level increases there is a corresponding increase in the average deviation from the mean. This is expected because as the pH of the soil approaches the neutral point, the system is often less buffered and therefore more prone to noise in the data. These results indicate that when reviewing soil pH data by any of these three methods, we can be more confident in soil pH values in the strongly or very strongly acid range than for those in the neutral or slightly alkaline range. This fact might also be considered when attempting to estimate the percent base saturation by using soil pH values.

Figure 3 shows the plot of the average deviation from the mean versus the level of extractable H and the resultant linear regression line through these points. The regression analysis (Table 9) shows that this relationship was the strongest of all the parameters investigated ($R^2 = 0.79$ and significant at 0.01 level). The linear regression equation describing the line on Figure 3 states that as the level of extractable H increases, there is a corresponding increase in the variability of the data. This is of particular importance because of the use of the extractable H value in calculating the percent base saturation using the sum of the cations method. This trend in the data is also transferred to the base saturation data as a result of the calculations.

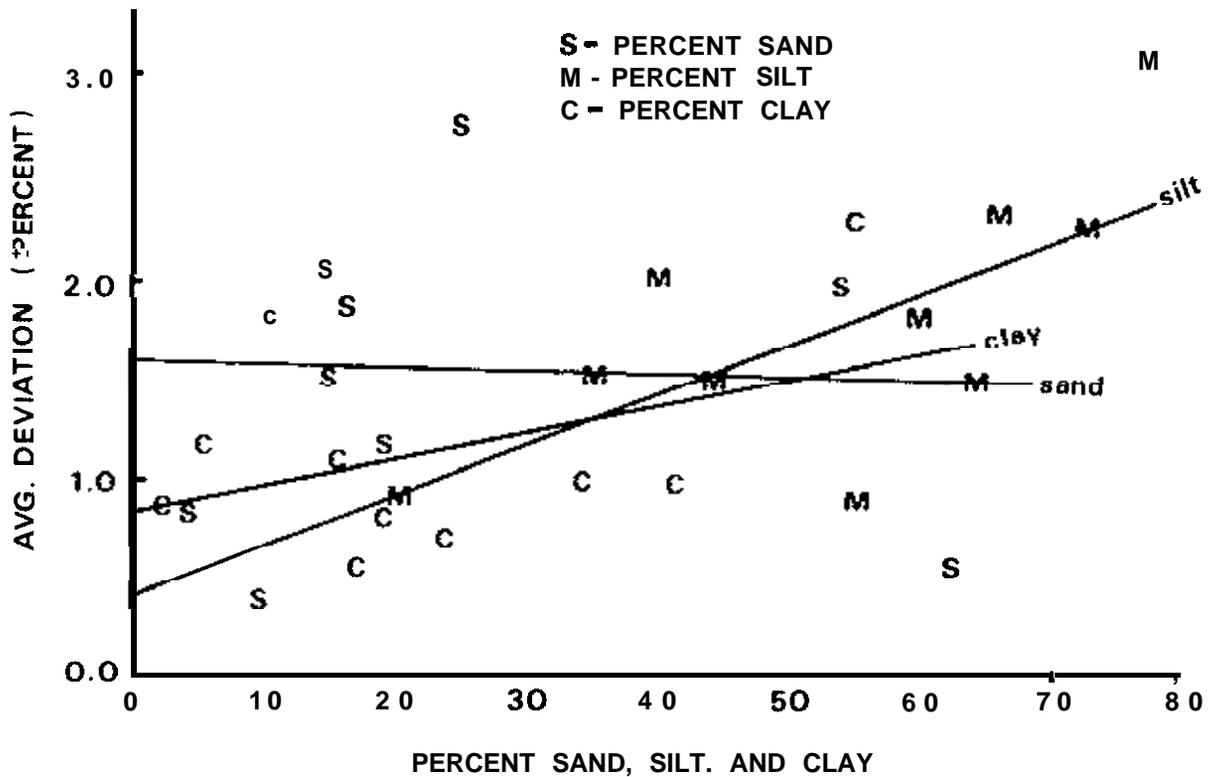


Figure 1. Average deviation from the mean in the data versus the percent sand, silt and clay, and the resultant linear regression line through the points.

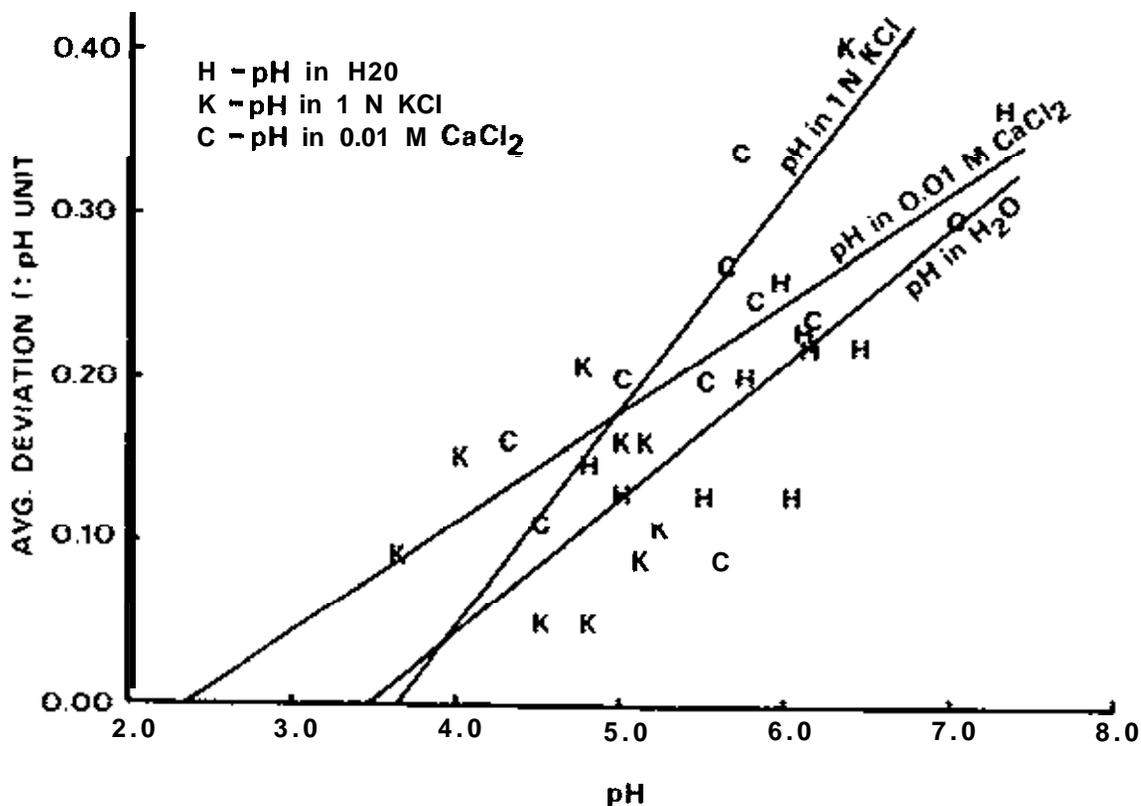


Figure 2. Average deviation from the mean in the data versus the pH in H₂O, 1 N KCL and 0.01 M CaCl₂ and the resultant linear regression line through the points.

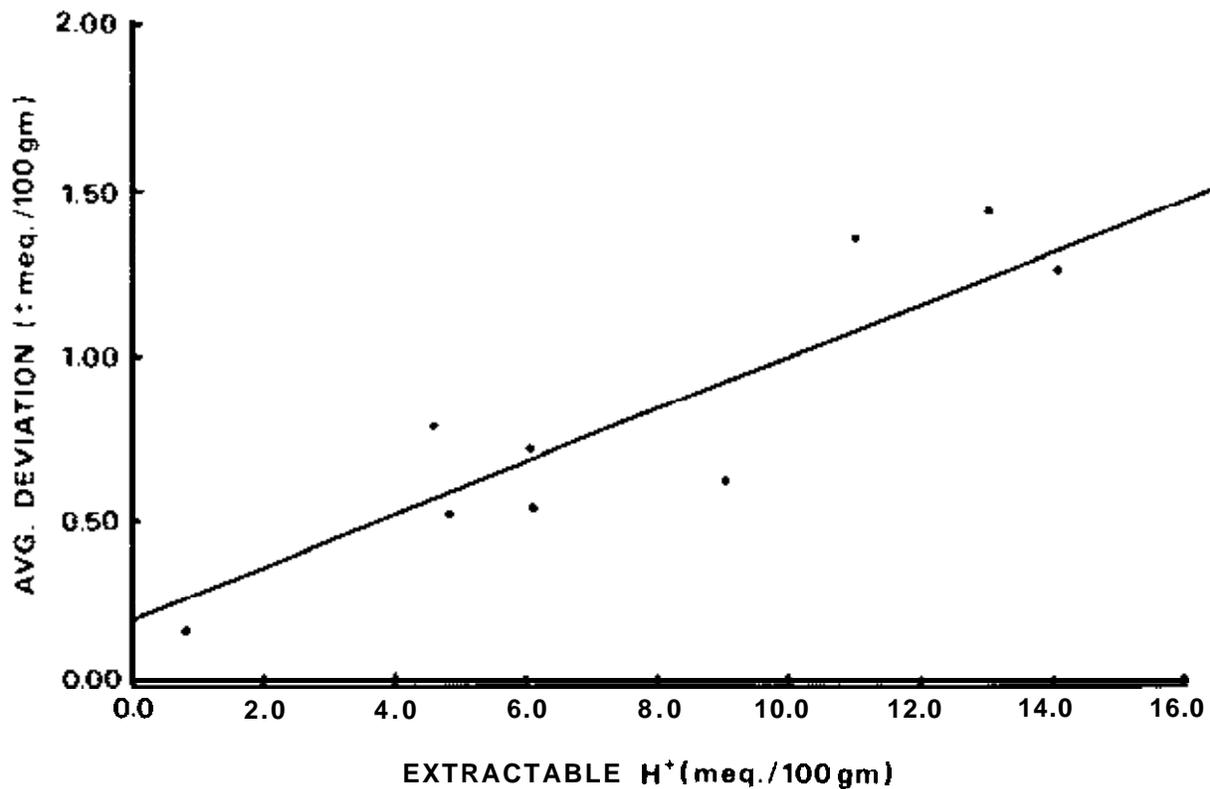


Figure 3. Average deviation from the mean in the data versus the level of extractable H and the resultant linear regression line through the points.

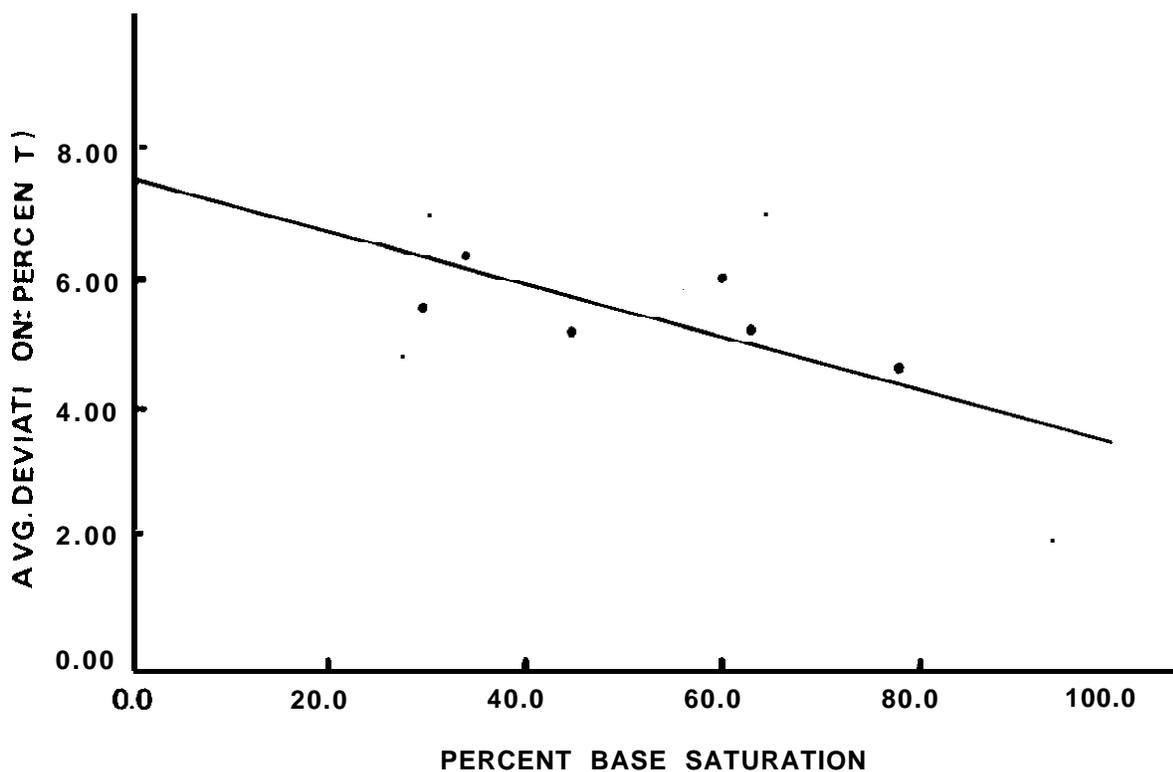


Figure 4. Average deviation from the mean in the data versus the percent base saturation and the resultant linear regression line through the points.

Figure 4 shows the plot of the average deviation from the mean versus the percent base saturation and the resultant linear regression line through the points. The regression analysis (Table 9) shows that although there was considerable noise in the relationship ($R = 0.37$), the relationship of increasing variability in the data with lower base saturation is significant at the 0.07 level. The regression equation as well as the raw data (Figure 4) indicate that we can be less confident in taxonomic breaks around the 35 percent base saturation point than at the 60 percent base saturation points, both of which are used in our present taxonomic system. At 35 percent base saturation the average deviation from the mean is approximately $\pm 6\%$. This variability should be considered when considering problems involving the alfisol-ultisol break as often occur in the setting up of mapping legends and during correlation procedures.

The investigations of the variability versus the level of the parameter indicates that for the parameters investigated, several show significant changes in the average deviation in the data with the level of the parameter and several did not. Because of the varying effects this will have on the average relative variability in the data with the level of the parameter, the average relative variabilities reported in this study are probably only useful in the comparison of the precision of one type of analysis to another. In this respect the analysis performed in this study may be placed in three groups. The expected relative variability in an analysis of silt or pH in H₂O, 1 N KCl or 0.01 M CaCl₂ is less than 5 percent. The expected variability in an analysis of sand, clay, organic carbon, 15 atmosphere moisture, Mg, K, CEC, and percent base saturation ranges from 5 to 10 percent. An analysis of Ca, Na and H may vary by more than 10 percent.

As has been discussed, there were significant relationships between the average deviation from the mean and the level of the parameter for the soil pH by all three methods, the percent silt, the extractable H, and the percent base saturation. When reviewing these types of data, the estimate of the variability in the lab data can be further refined through the use of the regression equations given in Table 9. For example, a soil with an extractable H value of 3 meq/100 g will vary by ± 0.44 meq/100 g (eq. 1).

$$\text{eq. 1: } 0.20 + (0.079)(3 \text{ meq/100 g}) = \pm 0.44 \text{ meq/100 g}$$

However, a sample with an extractable H value of 10 meq/100 g will vary by ± 0.99 meq/100 g (eq. 2).

$$\text{eq. 2: } 0.20 + (0.079)(10 \text{ meq/100 g}) = \pm 0.99 \text{ meq/100 g.}$$

Tables 10, 11 and 12 show the average analysis for each of the 10 soil samples analyzed by the labs in this study. The tables also give the average deviation in the data for every parameter of every soil. The data show that the different soils vary greatly from each other in most of the characteristics determined. Because of this wide range in natural variability as compared to the relatively small variability due to the analytical methods, all of the soils were found to be significantly different from all other soils about 83 percent of the time.

Table 10. Sand, silt, clay, organic carbon and 15 atm moisture data for individual soils over all laboratories. Column values followed by the same letter indicate no significant difference at the 0.05 level using Duncan's multiple range test.

Soil	Percent				
	Sand	Silt	Clay	Org. Carbon	15 Atm Moist
Groveton Ap	16.9 ± 2.8 d	77.0 ± 3.1 j			
Groveton B2ir	25.2 ± 2.8 f	72.5 ± 2.3 i			
Hagerstown Ap	14.3 ± 2.1 c	65.9 ± 2.4 h			
Hagerstown B2	14.3 ± 1.6 c	44.2 ± 1.5 d			
Gilpin Ap	19.2 ± 1.2 e				
Gilpin B2	16.5 ± 1.8 d	1.8 f			
Honeoye B2	53.3 ± 2.0 g				
Vergennes Ap	9.8 ± 0.4 b				
Vergennes B2	4.1 ± 0.8 a				
Sassafras B2	62.7 ± 0.6 h				

Table 12. CEC, % Base Saturation, and pH in H₂O, in KCL and in 0.01 M CaCl₂ data for individual soils over all laboratories. Column values followed by the same letter indicate no significant difference at the 0.05 level using Duncan's multiple range test.

Soil	CEC (meq/100 gm)	% Base Saturation	pH		
			H ₂ O	1N KCL	0.01 M CaCl ₂
Groveton Ap	29.71 ± 1.28 h	44.45 ± 5.27 e	6.02 ± 0.13 f	5.18 ± 0.11 f	5.64 ± 0.09 e
Groveton B2ir	18.77 ± 0.72 f	26.90 ± 4.92 a	6.09 ± 0.22 g	4.99 ± 0.16 e	5.71 ± 0.34 f
Hagerstown Ap	16.53 ± 1.12 d	33.66 ± 6.43 d	5.47 ± 0.13 c	4.49 ± 0.05 c	5.16 ± 0.21 c
Hagerstown B2	17.48 ± 0.99 e	28.27 ± 5.57 b	4.77 ± 0.15 a	3.59 ± 0.09 a	4.30 ± 0.16 a
Gilpin Ap	14.75 ± 1.56 c	59.13 ± 6.06 f	6.11 ± 0.22 g	5.13 ± 0.09 f	5.82 ± 0.25 g
Gilpin B2	12.90 ± 1.20 b	63.55 ± 7.04 h	5.96 ± 0.26 e	4.74 ± 0.21 d	5.63 ± 0.27 e
Honeoye B2	13.32 ± 3.35 b	93.39 ± 2.08 j	7.33 ± 0.36 i	6.32 ± 0.54 g	7.00 ± 0.32 i
Vergennes Ap	24.07 ± 2.41 g	61.97 ± 5.26 g	5.75 ± 0.20 d	4.80 ± 0.05 d	5.50 ± 0.20 d
Vergennes B2	29.68 ± 0.13 h	77.50 ± 4.72 i	6.45 ± 0.22 h	5.01 ± 0.16 e	6.17 ± 0.23 h
Sassafras B2	6.90 ± 0.61 a	30.09 ± 7.35 c	5.02 ± 0.13 b	3.97 ± 0.15 b	4.47 ± 0.11 b

Conclusions

The soil characterization data generated by the laboratories in this study show that statistically significant differences exist between labs for all the soil parameters determined except Na. Within laboratories, however, there is a relatively high level of precision in the analytical data. In general, the expected average deviation in the data from any of the laboratories included in this study ranges from 5 to 10 percent but is as low as ± 2.5 percent and as high as ± 25.0 percent. The total variability in the data from within and between laboratories was found to vary somewhat with the level of several of the parameters. This fact causes the confidence in the data to also vary over the level of the parameter and this is of particular importance in the use of the extractable H and resultant percent base saturation data. Although variability exists between and within laboratories, this variability is small compared to the natural variability between the soil samples analyzed in this study and the soil samples analyzed were significantly differentiated from each other about 83 percent of the time.

Recommendations

It is recommended that this study be continued until the 1982 work planning conference. The university personnel involved in this study should come to an agreement on what additional information is needed and the number and types of soil samples to be included in this further study. Perhaps the methods utilized by the laboratories involved should be compared in order to determine possible beneficial aspects of the methods producing the lowest variability with the least labor input.

Reference

Goodnight, James H. 1979. GLM Procedure Reference. In SAS Users Guide, 1979 edition. Jane T. Helwig and Kathryn A. Council (eds.). SAS Institute, Inc., Raleigh, N.C. pp. 237-263.

Conference Business Meeting and Summary

Business meeting conducted by Ed Sautter, recorded by Ed Ciolkosz - 132

Conference summary by F. Ted Miller

- 136

BUSINESS MEETING

The business meeting was called to order at 10:15 a.m. on June 27, 1980 by Chairperson Ed Sautter.

1. Ed Ciolkosz announced that the format for the proceedings of the 1980 conference will be sent out to the speakers, committee chairman and experiment station representatives shortly after the conclusion of the conference (attached is a copy of this letter).

2. The location of the 1982 conference was discussed and it was decided that it will be held in New York State, probably at Cornell University in Ithaca. It was also decided that it will be associated with the Northeast American Society of Agronomy meetings (probably the week before the NEASA meetings).

3. Fred Gilbert was named vice chairman for the 1982 conference.

4. John Sencindiver was named the second experiment station NE representative to the National Soil Survey Conference, The first representative is the experiment station conference chairman or vicechairman.

5. Membership of the Northeast Soil Taxonomy Committee is as follows:

<u>Name</u>	<u>Location</u>	<u>Period*</u>
F. Ted Miller (chairman)	SCS, Broomall, PA	permanent
John Sencindiver (1)	West Virginia Univ.	1979-82
Peter Veneman (2)	Univ. of Mass.	1980-83
Jim Baker (3)	Va. Polytechnic Inst.	1981-84
Walter Russell (4)	F. S., Milwaukee, Wis.	1979-82
Bruce Watson (5)	SCS, Burlington, Vt.	1980-83
Fred Gilbert (6)	SCS, Syracuse, N. Y.	1981-84

- (1) replaced Ed Ciolkosz (1976-79)
- (2) replaced Bill Wright (1977-80)
- (3) replaced Harvey Luce (1978-81)
- (4) replaced Ed Sautter (1976-79)
- (5) replaced Dick Googins (1977-80)
- (6) replaced Carl Eby (1978-81)

*Term is for three years. The term ends on January 1st of the concluding year.

6. The conference format and number of committees was discussed. In general the participants liked the format and smaller number of committees. A considerable amount of discussion centered around a technical vs. non-technical conference format, and it was concluded that the conference should continue as a technical conference, although more experts from other fields such as engineering, geology and forestry should be asked to serve on the committees.

7. Opinions were asked for on the question of giving people a choice of a committee or if committee assignments given directly by the steering committee would be acceptable. No strong feeling either way was voiced by the conference. Some comments were voiced about having a greater input on the steering committee from the experiment stations. The suggestion was taken under advisement.

8. Ted Miller announced that the NE Soil Taxonomy committee was going to have a lot of work to do in the near future. There are many proposals and problems that will have to be resolved in the next few years in soil classification.

Meeting adjourned at 11:47 a. m

THE PENNSYLVANIA STATE UNIVERSITY
119 TYSON BUILDING
UNIVERSITY PARK, PENNSYLVANIA 16802

College of Agriculture
Department of Agronomy

To: Speakers, Committee Chairman, Experiment Station Representative of
the 1980 Northeast Soil Survey Conference

From Edward J. Ciolkosz (Conference Vice-Chairman)

Date: July 16, 1980

Subj: Proceedings of the 1980 Conference

As most of you know, the proceedings of our conference are assembled and distributed by the vice-chairman. The vice-chairman does not print the proceedings. Thus, we ask you to type, reproduce, and send to the vice-chairman (E. Ciolkosz for the 1980 proceedings) your talk, committee report or experiment station report.

In order to get continuity in the proceedings, please follow the instructions given below in preparing your materials.

All Information (Talks, Committee reports and Expt. Station reports.)

1. 8 1/2 x 11 paper
2. Single space typing
3. Printed on both sides (front and back)
4. One inch margins right and left.
5. 150 copies
6. Do not staple the pages together, send them as separate sheets.

Talks (papers, etc.)

1. Format as indicated under All Information.
2. At the top of the 1st page.
 - a. Title of talk
 - b. Author and organization of the author (SCS Washington D. C., Pennsylvania State University, etc.)
 - c. Body of the talk or paper.

Committee Reports

1. Format as indicated under All Information.
2. At the top of the 1st page.
 - a. Committee number
 - b. Committee title

3. Followed by committee members (indicate chairman and vice-chairman and committee charges.
4. Followed by the committee report plus recommendations.
5. Pagination
 - a. Paginate the committee reports with the committee number plus page number in the bottom center of the page. For example, 2-1, 2-2. etc.

Experiment Station Reports

1. Format as indicated under All information.
2. At the top of page one:
 - a. Name the Agr. Expt. Station. For example, Maryland Agriculture Experiment Station Report.
 - b. Author
3. Followed by the Report.
4. Pagination
 - a. Paginate the report using the Post Office abbreviation of your state plus the page number (in lower center of page). For example MD-1, MD-2, etc., MA-1, MA-2, etc.

EJC/las

CONFERENCE SUMMARY

F. Ted Miller
Head, Soils Staff
SCS, Northeast TSC

As you know, the National **Cooperative** Soil Survey has always been a dynamic program. We have had to continually make adjustments to meet the increasing demand for **soils** information to an increasingly more learned and sophisticated clientele. Our progress in meeting this demand is the result of the excellent cooperation of participants of the **National** Cooperative Soil Survey. Conferences such as the one we are just concluding are the key to the effectiveness of this cooperation.

I believe we have had an excellent conference. The general presentations on the first day were very good. **We had very** good committee reports and exceptionally good committee discussions throughout the week. I wish to **personally** thank each of you, **committee** chairman, members, and participants, for the efforts you have **made to make** this a successful conference. I also wish to thank our gracious hosts, here at Penn State, for making this a very enjoyable experience. as well. I believe they deserve a special round of **applause** for the excellent tour on **Wednesday** afternoon. It will go down in my book as the best organized tour that I have ever attended.

In conclusion, I would like to leave you with the following thoughts:

1. Although **we** did have considerable discussion this week on the future needs of soil survey, I believe this will receive even greater attention in the years ahead. **We** need very broad and innovative views on future work as **we** begin to complete mapping in the **Northeast**. We should not confine ourselves just to the traditional **items** of remapping, recorrelating, and re-publishing. Rather, we need new and innovative approaches to **making** our soil surveys **more** useful.
2. **We** all recognize the importance of close **communication** with our peers. That's the basis of our conferences - to discuss and exchange ideas. We **must** not, however, lose sight of the importance of interaction between us as soil scientists and those who use our soil surveys. We need more dialogue between us and the user similar to the presentation made on Tuesday by Leonard Tritt of Pennsylvania Department of Environmental Resources. I suggest we give this some consideration in planning our next conference.
3. Several of you have expressed concern as to how **we** get the needs in soil survey that **we** have discussed here relayed to our Administrators. The only thought I have at the **moment** is to encourage each of you to brief your supervisor on the major topics discussed here at our conference.. I certainly plan **on** doing that.

Again, thanks to each of you and **have** a safe and pleasant trip home.

Appendix

By-laws of the Northeast Cooperative Soil Survey Conference ·

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List of Attending Participants

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**BY-LAWS OF 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 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 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.

List of Participants

1980 Northeast Soil Survey Conference

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