NATIONAL COOPERATIVE SOIL SURVEY

Northeast Soil Survey Conference Proceedings

Durham, New Hampshire
June 9-13, 1996

PROCEEDINGS OF THE

Northeast

Cooperative

Soil

Survey

Conference

Burlington, Vermont
June 9-13, 1996

Compiled by:
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Natural Resources Conservation Service
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NORTHEAST COOPERATIVE SOIL SURVEY CONFERENCE
Burlington, Vermont

June 9-13, 1996

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NORTHEAST COOPERATIVE SOIL SURVEY CONFERENCE

Burlington, Vermont
June 9-13, 1996

Agenda

Sunday, June 9, 1996

Thursday, June 13, 1996

Morning Moderator: Chris Smith

8:00 - 9:30am

9:30 - 9:40am Maine Report

9:40 - 9:50am New Hampshire Report

9:50 - 10:00am Vermont Report

10:00 - 10:30am **BREAK**

10:30 - 10:45am Technical Committee #1 Report

10:45 - 11:00am Technical Committee #2 Report

11:oo - 11:15am Tecnhical Committee #3 Report

11:15 - 11:30am Technical Committee #4 Report

11:30 - 11:45am NBC-50 Breakout Session Report

11:45 - 12:00am NRCS Breakout Session Report

12:oo - 1:00pm LUNCH

Afternoon Moderator: Ray Bryant

l:oo - 2:30am Panel Discussion:Functions of the MLRA Office
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Monday, June 10, 1996, Cont.

Afternoon Moderator: Margie Faber

1:15 - 1:25pm Connecticut Report

1:25 - 1:35pm Deleware Report

1:35 - 2:00pm Role of NC&GIS . . . . Dick Folsche

2:00 - 2:30pm Role of Soil Quality Institute. Maury Mausbach

2:30 - 3:00pm Global Change Initiative . . . . . . Loyal Quandt

3:00 - 3:30pm **BREAK**

3:30 - 5:00pm Technical Committee Meetings:
Committee #1 Room:
Committee #2 Room:
Committee #3 Room:
Committee #4 Room:

5:00 - 6:30pm Social - Hospitality Suite

8:00 - 9:30pm NBC-50 Meeting

Tuesday, June 11, 1996

Morning Moderator: Ev Stuart

8:00 - 10:00pm Technical Committee Meetings:
Committee #1 Room:
Committee #2 Room:
Committee #3 Room:
Committee #4 Room:

lo:oo - 10:30am **BREAK**

10:30 - 10:40am New York Report

10:40 - 10:50am Maryland Report

10:50 - 11:00am Massachusetts Report

ll:oo - 11:20am Wetlands Institute/Hydric Soils..Leander Brown

11:20 - 11:40am Canadian Soils Program . . . .Sherif Pahmy

11:40 - 12:00am International Activities . . . . Gail Roane
Paul Reich

12:00 - 1:00pm LUNCH

'VISION IS THE POWER TO SEE BEYOND THE OBVIOUS

When you close your eyes a signal races to your brain saying you want to pause a moment, shut out the clutter, **find** a comforting environment where you can think and rethink the situation. Often we want to **see** beyond the moment, to see the light at the end of the tunnel, to view the distant mountain. We want to know the future **will** be as good as, or better than this moment. Closing your eyes is a way to open your mind and your heart to other possibilities.

Once I had a vision of the world's greatest, most exciting Soil Survey Institute where people were welcome, ideas flowed freely. where everyone was excited and exciting, and **new** findings and meaningful relationships were almost daily events. Do I still have that vision? Most assuredly! It is. however, not likely within my life time because we have been unable, perhaps unwilling, to successfully build the commitment and support for such a dream. Currently it is beyond the obvious **- but** still not beyond the statistics of probability. Luxury is a perception and a **mindset** of those -who 'do not have'.

Visions change - they grow and expand, their components are modified. and ideas form and reform. Glimpses into that realm beyond the obvious are often distorted, sometimes masked. yet contain a brilliance and glitter of the better **world** -the brighter day - the sensible rational harmony of comprehensive understanding. To go there - to pass through the mists and proceed on -means that destination is not a place, and that success is not a" event. One is a process, and the other is a journey. Let ma talk about the progress of our Soil **Survey** journey - heading towards a successful destination.

No fact is devoid of a relationship, therefore our world of soils is one where soil-associated relationships are explored discovered. verified. and utilized in many ways. They range from simple basic scientific understanding to the complexities of multi-resource comprehension employed in so&-environmental decision making. Relationships - functional relationships - are the unwritten. unspoken means of measuring success. Remember that success is a process, not en event.

The relationship we truly believe in, is captured in a simplification of our mission statement. Our readily understandable mission is 'to help people understand soils'. Everyone can have a piece of the action - everyone. If we can't help you carry out your piece of this action, then we aren't being very successful. Our GPRA results will suffer if all of us are not successful. Defining relationships and measuring them are the keys to not just building a better government. they are vital to reach our **goals** -our destinations - our milestones - along the journey to a Sustainable America.

In the Soil Survey Program, we have identified four major thrust areas that we associate with a future. well functioning. happy, cheerful group of people **who** collectively are the National Cooperative Soil Survey. These four areas are the basic pillars of our strategic plan and our program plan to guide us along the **journey**.

The four thrust areas are:

1. Enhance quality of roll **survey information**
2. Accelerate **application** of **soil survey information**
3. Create **easy access** to **soil survey information,** and
4. **Aggressively** apply new technology **in Soil** Survey.

You quickly notice that these are actions. They are not statements of issues, rather they refer to desired outcomes. Enhancing quality, accelerating applications, creating easy access, and applying **new** technology are the things we are going to do to 'help people understand soils'. Information and knowledge will change people, and each area of thrust is designed to provide information to help people grow and change through **their** improved understanding of soils. The more they understand and the **better** they make wise resource decisions, the more the State of the Land **improves**.

To keep us on the right road, that is, headed where we want to go, we intend to **utilize** at least six supporting processes. Some people think of these processes almost as ends in themselves, however, introspection soon tells you that the 'bigger picture', the holistic view, is the right one.

To move forward with the thrusts, we must be successful with the following processes

1. Create and implement a National Cooperative Soil Survey research and development agenda. Building on a solid foundation makes a lot of sense. The idea here is to cooperatively maintain suitable foundations for the years ahead. We want to design and conduct good research and carefully evaluate the results to enhance our knowledge.

2. Develop and maintain a National Soil Information System (NASIS). We have been espousing that the soil program is,

Our fourth thrust is **to aggressively apply new technology In the roil survey.** To reinforce this thrust we think it is important to revisit and update some technologies such **as** remote sensing end **airphoto** interpretation. It means knowing and using sophisticated models that deal with landscape variability and scaling factors; it means making better use of global positioning systems and ground penetrating radar; and it **means** evaluating and employing other field tools as they become available. It also means learning how to make better use of the analytical capabilities of geographic information systems thereby enabling soil scientists to reach beyond the obvious of today into the fringes of tomorrow.

In my opinion, there are some encouraging developments going on. There are some positive signs, **some** awakening bells, that kindle the hopes of humankind for **a** better global tomorrow Let me mention four signs **of** encouragement.

(a) The US State Department has announced a policy of confronting and dealing with environmental crises and issues, as well as military and developmental issues. Throughout the world, **agriculture** is becoming a **significant environmental Issue.**

(b) Even the US is openly recognizing the rapid growth of the world's population as a major force of global **instability**. **Poverty,** hunger and poor heaith exacerbate the degradation of natural resources everywhere.

(c) Intelligent reasoned treatises about **strategies** for global **food security** over the next several decades are being circulated. The consequences of not taking **positive** actions for food security, beginning **today,are** indeed sobering; end

(d) The United Nations organizations are facilitating summits, agreements. and protocols on **how to** collectively manage a global **habitat** for **all** people. Unfortunately, you won't experience **it,** but your stewardship leadership **will** carry others on towards that vision.

The most **difficult** challenge **-** in fact the key challenge to realizing the 2020 vision for food,

Soil Survey Direction and the National Soil Survey Center

Soil Survey Staff

Presented by Thomas E. Calhoun
Northeast Regional NCSS Work Planning Conference

The National Cooperative Soil Survey (NCSS)

The soil (pedosphere) is the thin, critical interface between earth and atmosphere, supporting much of the terrestrial life of the planet, filtering much of the water we drink, and catalyzing many of the chemical transformations upon which we depend. Knowledge about characteristics of soils, and soil interactions with other factors, helps people predict and control the influences of human and natural phenomena as we seek to create a "Productive Nation in Harmony With a Healthy Land".

The NCSS helps people understand soils and their responses to a variety of natural and human influences. It accomplishes this through a multi-purpose science-based soil survey. NCSS products are:

(1) Information about the distribution and properties of soils, and of factors affecting the soil environment

(2) Predictions of soil behavior and of the natural systems of which they are a part, and,

(3) Guidance on how to apply the accumulated knowledge of soil survey.

A. Soil Survey Division Thrust Areas

1. **Enhance Quality of Soil Survey Information.**

   a. Continue MLRA Approach to Soil Survey - Erase Political Fault Lines and Fill in Voids in Data.

   b. Add Use Dependant end Temporal Soil Property Data for Soil Horizons.

   c. Create One Soil Survey For All U.S. Lands

   d. Create and Maintain National Standards for Soil Survey.

2. Accelerate Application of Soil Survey Information.

a. Develop Soil Survey Interpretations (R&D, NASIS, Training)

b. Create Technical Soil Services Program - State Soil Scientists in 34 states.

c. Provide Training to Develop Soils and Soil Survey Technical Skills of Field Office Staff.

d. Digitize 2500 Soil Surveys by 2000.

e. Re-engineer Publication Process.

f. Develop NCSS Role in Soil Quality Assessment (Baseline Indicators and Soil Condition Index)

g. Republish Soil Taxonomy.

3. Create Easy Access to Soil Survey Information.

a. Provide a National and International Soil Data Access Facility (WWW/INTERNET).

b. Provide a National and International Soil Data Capture and Standardization Software (Windows Pedon).

4. Aggressively Apply New Technology in Soil Survey.

a. Develop Remote Sensing Techniques for Soil Survey - ERDAS.

b. Develop GPS, GPR, etc. - Field Tools for Soil Survey

c. Develop GIS - Select/Query/Report Tools for Soil Survey.

B. <u>Supporting Processes</u>

1. Create a NCSS Research And Development (R&D) Agenda.

a. Develop a Comprehensive Listing of R&D Needs for NRCS and Partners.

b. Select and Prioritize NSSC R&D Activities from NCSS R&D Agenda.

c. Leverage NCSS R&D Agenda to Increase and Strengthen Partnerships and Accomplishments.

2. Develop and Maintain a National Soil Information System (NASIS).

a. Create NCSS Software Tools.

b. Create a NRCS and NCSS Networked Information System.

c. Integrate Data From Other Agencies and Institutions.

d. Maintain and Manage 17 Integrated MLRA Natural Resource Data Bases.

3. Provide for Resource (Human and Financial) Development.

a. Develop Leadership: Project Management and Team Skills of NSSC, MLRA, State and Field Office Soils Staff.

b. Increase Diversity Within Soil Science Discipline.

c. Increase Funding for Mapping, Digitizing, Technical Soil Services and Soil Survey Laboratory - Investigate sale of products and services.

4. Increase National and International Policy Influence.E n s u r e a s i t y

National Soil Survey Center Functional Group Assignments

(Initial Draft)

Data Base Population and Integration Group

. SHORT-TERM -- Assist the State, MLRA and Project Offtces by providing; consultation, procedures and, methods to populate and coordinate MUIR data elements. Assistance is provided based on the needs jointly agreed to by states and the NSSC. Preference should be given to data elements needed for FOCS. Priorities may vary by state, region or MLRA. This is not an NSSC driven process. A key contact person should he established in each of the 17 MO regions.

Develop Soils of U.S. and Ecological Region (MLRA) small scale maps and data bases as organizing principles for data base population and integration.

. MID-TERM -- Develop a strategy for each MO region to populate new data elements (albedo, moisture states, use dependant elements, etc...). Priorities may vary by state, region or MLRA. This is not an NSSC driven process. The key contact person in each of the 17 MO regions should lead the process.

. LONG-TERM -- Evaluate the purpose and need for additional data elements based on soil survey division, agency and NCSS strategies and direction.

Soil Taxonomy Group

. SHORT-TERM -- Publish a revision of Soil Taxonomy (AH-496) before the International Soil Science Congress in 1998.

. MID-TERM -- Evaluate the need for further additions to Soil Taxonomy. Evaluate the effectiveness of Soil Taxonomy, other land classification systems such as Land Capability Class and the need for other soil classification systems. Make recommendations for future direction. Use ASA symposia etc.

Interpretations Group

. SHORT-TERM -- Work with states to develop a strategy to train state and field staff on how to develop interpretations criteria, and evaluate interpretations results for all interpretations (Urban, Grazing lands, Forest, Agronomic, etc...) Training should be coincident with the NASIS 3.0 Release of the Interpretations Module.

Implement new national interpretations.

Coordinate with Soil Quality, Wetlands Science, Grazing Lands, and to some extent other institutes to develop interpretations and support activities, for example the development of a soil condition index. Support national program needs and requests, for example soil data for CRP sign ups.

Develop and coordinate Soil and Ecological Science Standards.

. MID-TERM -- Work with states, institutes, NCSS and others to document interpretations needs, and develop strategies for developing these interpretations including coordination across political boundaries.

. LONG-TERM -- Examine the basic fundamentals of soil interpretations, including why interpretations are made, what is accomplished, etc...

Information Architecture Group

. SHORT-TERM -- Work with states to implement (distribute, train, support and procure hardware and software) NASIS 2.0. Coordinate with others programs such as FOCS on software, hardware and data needs.

Coordinate design of software for NASIS 3.0 and 4.0.

. MID-TERM -- Develop an action plan for integrating all soil information data collection, management and distribution (field, lab, etc) from all NCSS sources and develop a system lifecycle plan. Integrate this strategy with other NRCS activities.

Evaluate the effectiveness of the National Soil Information System.

. LONG-TERM -- Develop scenarios for next generation Soil Information Systems.

Analytical/Research Laboratory Group

. SHORT-TERM -- Eliminate backlog and establish a 3 month turn around for characterization projects and a I month turn around for reference projects. Dedicate no less than 50 percent of capacity to state driven demand. Acquire and implement a LIMS. Refurbish Basement. Learn about process mapping.

. MID-TERM -- Begin Laboratory Process Mapping --
- Cycle Times
- Workload Flows
  * Peak Demands
  * Staffing vs. Demand Function
  * Routine vs. Special Handling

Develop plan to implement results of process mapping and other ideas.
* Establish Testing Criteria for "Good or Bad idea".

International - World Soil Resources, John Kimble

. SHORT-TERM -- Develop a strategy and funding for scientific exchanges. Evaluate and document what soil and soil survey assistance and expertise is needed for key target countries and develop a 5 year program for meeting those needs. Evaluate and document where expertise [subject area and scientist(s)] exists in other countries that will help advance the NRCS and Soil Survey Strategic Plan.

. MID-TERM -- Develop an action plan for establishing a world soil data access facility, including data acquisition plan.

Training - Earl Lockridge and Lea AM Pytlik

. SHORT-TERM -- Work with states to develop a needs assessment and training strategy for state and field soil scientists. Work with State Soil Scientists and other principle state staff to develop a needs assessment and training strategy for field office staff in soil, soil survey and related topics.

. MID-TERM -- Investigate training methods. Evaluate effectiveness of current training methods.

Investigations Group

. SHORT-TERM -- Develop proposal for segmentation of time between;

- Consultation/training - support to states and others
- Research - defined by NCSS and NSSC research agenda
- Support to NSSC functional groups and teams
- Support to the Soil Survey Laboratory

. MID-TERM --Define the NSSC component of the NCSS R&D Agenda

Soil Survey Research and Development (R&D) at tbe NSSC

Soil Survey R&D contributes to the understanding of soils and allows people to better serve changing agricultural, urban, and environmental needs. The research process includes global technology exchange, experimentation, development, delivery and training, to create, apply, and share the best possible science and technology.

NSSC research is done in cooperation with other NRCS scientists, universities, and other cooperating agencies and institutions. The soil survey program is focused on domestic resources, but the sharing of science and technology is global.

Reliable soil surveys require understanding and accurate prediction of distribution patterns. Reliable prediction of patterns requires an understanding of the processes and factors causing the patterns, and consistent, quality classification to organize that knowledge.

Reliable interpretations require predictions of soil behavior. This requires understanding of processes and properties affecting behavior. Soil survey R&D provides the understanding and technology to produce quality, multi-purpose, science-based products, and the logic and systematics to organize and deliver the knowledge.

Soil survey R&D develops and delivers:

(1) Procedures, standards, and systematics to assure quality in soil surveys information.
(2) Complex measurements, evaluations, and models that define natural processes and systems.
(3) Information to improve the technical capability of specialists to use these products
(4) Fact, relationships, and models that expand the application of soil survey information to current national and local concern

Current Concerns That are Driving Soil Survey R&D

Concern	Driving Forces	R&D Focus
Soil Quality	Need to define, monitor, and predict the status of the soil resource.	-Calculations from soil survey data -Methods of characterization -Predictive model development (WEPS, WEPP, RUSLE, etc.) and data to support them. -Biological Characteristics of soils
Water Quality	Need to define, monitor and predict the status of the water resource.	-Soil landscape hydrology data for soil survey (water movement) -Predictive models (NAPRA, NLEAP, NPURG and data to support them.

Climate Change	Soil information for carbon sequestration and and climate change models	-Impact of CRP -Inventory and maps of soil carbon' '-Methods to monitor soil climate -Predictions of soil impacts
Wetlands	**Need** to understand hydic **soils**	-Characterizing **redox** processes and water table regimes.
Soil Genesis/Landscape Evolution	Basic research needed to understand soil formation, processes and interactions as back stop for all NRCS programs.	-Soil Stratigraphic Studies **-Andisol** Studies -Hydrothermal Soils **-Anthropogenic** Soils -Soil Survey Project Questions -Use Dependant Temporal Properties
Soil Survey Lab and Field methods and Technology Development	Procedures and tools to help laboratory and field staff	-New Lab Characterization methods -Geophysical tool development **-GIS** tool development -Neuronetworking

erosion prediction models, and a host of other present and future simulations to predict sustainability are dependent upon soil survey data as input.

Research on the physical qualities encompasses the development and testing of survey procedures, and procedures for populating the NASIS data base. This requires collaboration with scientists who are familiar with model requirements, and with practitioners who are developing applications dependent upon the soil survey data base. It encompasses literature reviews and consultations with experts to determine which procedures and qualities are practical predictors. It also encompasses consultative work with those who wish to use the soil survey to assess soil qualities, or to predict effects of alternate land uses.

Topics:

a. Identifying the important land uses in order to stratify the information.
b. Identifying important soil qualities.
c. Field measurements, including intake rates and hydraulic conductivities.
d. Procedures for creating and populating the data base.
e. Protocols for use with interpretations.

Future Research will encompass pH effects of fertilizers, and the accompanying changes in nutrient availability, toxicities, and hydraulic conductivities. Research will include literature review, consultations, and testing of criteria for predicting susceptibility to change.

Soil Quality and Erodibility. This topic encompasses the methodologies and criteria for assessing and modelling (WEPP and WEPS) soil erodibility by wind and water. It is limited to collaborative work with scientists developing methodologies, and with practitioners applying predictive tools.

Topics:

a. Collaboration on setting up experiments to test soil erodibility.
b. Selection of soil properties to test for predictive value.
c. Selection of predictive criteria against known soil performance
d. Development of methods survey new predictive properties and populate the NASIS data base with new data elements.
e. Improvements in descriptive soil survey information to accommodate predictions, for example, developing ways to indicate locations of map unit components in the paths that water must take along a hillslope.

Water Quality and Soil Hydrology This topic encompasses the understanding of water movement and storage in landscapes in order to understand soil patterns, and potential changes in soil patterns with natural or induced changes. Water movement contours most of the erosion/deposition in most landscapes. Water infiltration, percolation, and storage affects much of the biological activity and movement of chemicals both over and though the soil.

Current emphasis is on methods and partnerships to consolidate and incorporate our knowledge of soil hydrology into soil survey products and consultation with model developers and those who are applying the model.

Topics:

a. Landscape models showing edaphic, physiographic and ecological influences as the basis for predicting effects of potential change.
b. Methods for measuring hydraulic conductivities.
c. Methods for calculating hydraulic conductivities from soil properties.
d. Data and methods for predicting and measuring seasonal and annual variations in 682.08 3 ?799927 36‡36

<u>Other Areas</u>.

East Region Activities -- Soil Survey
NRCS-USDA

Maxine J. Levin
Soil Scientist for
Oversight and Evaluation, East Region
Beltsville, MD

NE Regional Work Planning Conference
Burlington VT
June 9-13, 1996

"Land then is not merely soil; it is a fountain of energy flowing through a circuit of soil, plants and animals. Food chains arc the living channels which conduct energy upward; death and decay return it to the soil. The circuit is not closed."
Aldo Leopold, Sand County Almanac 1949

"Know the land, and know what it needs from you"
NRCS Chief--Paul Johnson 1995

NRCS Reorganization:

- **6** Regional Offices:
  - 12 states in the East Region(Same Configuration as Cooperative Ag Experiment Station system)

- 17 MLRA Offices:
  - 3 MLRA Office Areas in East Region: MO-12, MO-13, &MO-l4
  - 2 Host States in the East Region--Massachusetts and West Virginia

Functions:

- Purpose of the National Office and Centers -- Policy Formulation, Policy Implementation, Technology Transfer & Regional Training
- Purpose of tbc Regional Office -- Policy Assurance
- Purpose of the State Offices -- Policy Implementation & Soil Survey Interpretations; Administration & Supervision of Soil Survey Projects
- Purpose of tbc MLRA Office **(MO) --** Production Soil Survey Correlation & Manuscripts on a MLRA-Interstate Scale
- Purpose of the Institutes -- Technology Transfer & Training Pilots as part of National Science and Technology Consortium
- Purpose of the National Science and Technology Consortium-Coordination, Communication and Networking of National Office, Centers, Institutes, and Cooperating Scientists

USDA Reorganization Act of 1994--the Secretary's implementing guidance abolished the Soil Conservation Service and created the Natural Resources Conservation Service

- Decreased Headquarters functions and staff
- Streamlined administrative functions and processes
- Decreased supervisors and administrative staff
- Increased responsibility in the bands of state and field office employees

East Region Reorganization:

- Increased the proportion of field staff from **58% to 80%** by eliminating management and supervisory positions and moving more technical expertise to the field
- Reduced National **Headquarters staffing by 50%**
- Created a National Science and Technology Consortium to strengthen our technical capability at the field level and to ensure that our staff have access to new and emerging expertise and technology relevant to the needs of our customers
- Moved technical authority and responsibility from our National Technical Centers to our state operations to ensure that our programs are implemented with enough flexibility to address the needs of people and communities at the local level and to reduce costly technical reviews
- Created 3 interdisciplinary resource teams- a New England, a Mid-Atlantic, and an Urban Conservation team- to provide state-of-the-art interdisciplinary support to field personnel in delivery of service., technology transfer, training and quality assurance (2 Soil Scientists and 2 GIS Specialists are planned to be on these teams)
- Created 2 MLRA Soil Survey offices--Amherst, MA and Morgantown, WV
- Created 2 NRI coordination sites in conjunction with the MLRA Soil Survey Offices.
- Established the East Region Office with critical roles in multi-state and regional strategic planning to address natural resource issues; setting priorities with our local partners for the expenditure of conservation dollars; in developing partnerships among groups with like and diverse interests; in oversight and evaluation; and in streamlining administrative functions

Staffing in the East Region:

- **There** are presently 100 soil scientists in NRCS in the East Region:
  - 9 State Soil Scientists (2 have dual duties as MLRA Office Leaders)
  - 1 Soil Scientist, Regional Oversight &Evaluation
  - 10 State Office Soil Scientists (Statewide interpretations & data responsibilities)
  - 7 MLRA Office Data Quality Specialist Soil Scientists (MLRA regional correlation responsibilities)
  - 13 Resource Soil Scientists
  - 23 Project Leader Soil Scientists
  - 34 Soil Mappers
  - 1 Wetland Institute Soil Scientist
  - 1 Research Soil Scientist (NSSC--PA)
  - 1 IRT Soil Scientist
- About 11% of the positions are supported by reimbursable funds from sources outside of USDA
- There are 4 vacancies for Project Leaders, Resource Soil Scientists or Soil Mappers
- There are 2 Resource Soil Scientists that are District Employees

Attached is a directory of all the soil scientists working for NRCS in the East Region. The list changes quarterly. As soon as the Regional Office is hooked up electronically, the updated list will be kept on the server.

Training

- NRCS field and state office soil scientists in the East Region continue to have a need for training in computers (particularly NASIS software), digital remote sensing, soil interpretations, wetland delineations and hydric soil characteristics. With water quality and soil quality being two top resource issues in the East Region NRCS Strategic Plan, interpretations in these fields will need a focused effort

Mapping Program & Technical **Soil Services in** the East Region

- There are 14 soil survey updates in progress in the East Region. (Some projects are multiple counties such as the 8 counties in Connecticut or 3 counties in New Jersey).
- There are 11 progressive soil survey projects, some including multiple counties.
- Projected acres to be mapped in Fiscal Year 1996 are 1.86 million acres. This calculates to about 30,000 acres production per mapper per season (includes duties besides production soil survey)
- Projected acres to be digitized are 5.6 million or roughly 160 7 1/2 minute USGS quads. These digitized acres are to be SSURGO certified by the state soil scientists. There are plans to accelerate this effort nationally. This could shift regional priorities, personnel, and workload to accomplish recompilation of backlog.
- All state databases are projected to be converted to NASIS by January 1997.
- In the East Region, there was a total of $628,600 reimbursables to do production soil survey work (production mapping, recompilation, digitizing)

Farm Bill and Shifting Program Emphasis

- It is still too soon to project how the 1996 Farm Bill (Federal Agriculture Improvement and Reform Act of 1996) will affect Technical Soil Services activities in the East Region until the new rules are officially released in August 1996. My own speculation is as follows:

    - Sec. 384 repeals the current legal requirements for printing a specified number of soil survey reports. This opens the door for alternative products for soil survey publications such as CD-ROM interactive surveys that emphasize user interpretations. I hope that State Office Soil Scientists, Resource Soil Scientists, and some of the NCSS cooperators will start working in this direction for soil survey information dissemination.

    - Sec. 322 directs USDA to determine and certify wetland delineations on farmland. It allows the farmer more options to mitigate converted wetlands. Efforts in the East Region to train all field soil scientists in wetland delineation and hydric soil characteristics will continue. There will be more possibilities for resource soil scientist to work in wetland restoration and identification of areas suitable for mitigation banking.

    - Sec 332 &333 extends Conservation Reserve Program (CRP) and Wetland Reserve Program (WRP) until 2002. These programs will continue to need technical soil services to aid in identifying eligible HEL lands for CRP and wetlands or converted wetlands for CRP and WRP.

    - Sec. 334 establishes the Environmental Quality Incentives Program (EQIP). EQIP will put new emphasis on installing structural practices on Livestock operations to control agricultural waste and improve water quality. Technical soil services will provide assistance for this program through on site evaluations of potential soil problems and interpretations of soils for leaching potential.

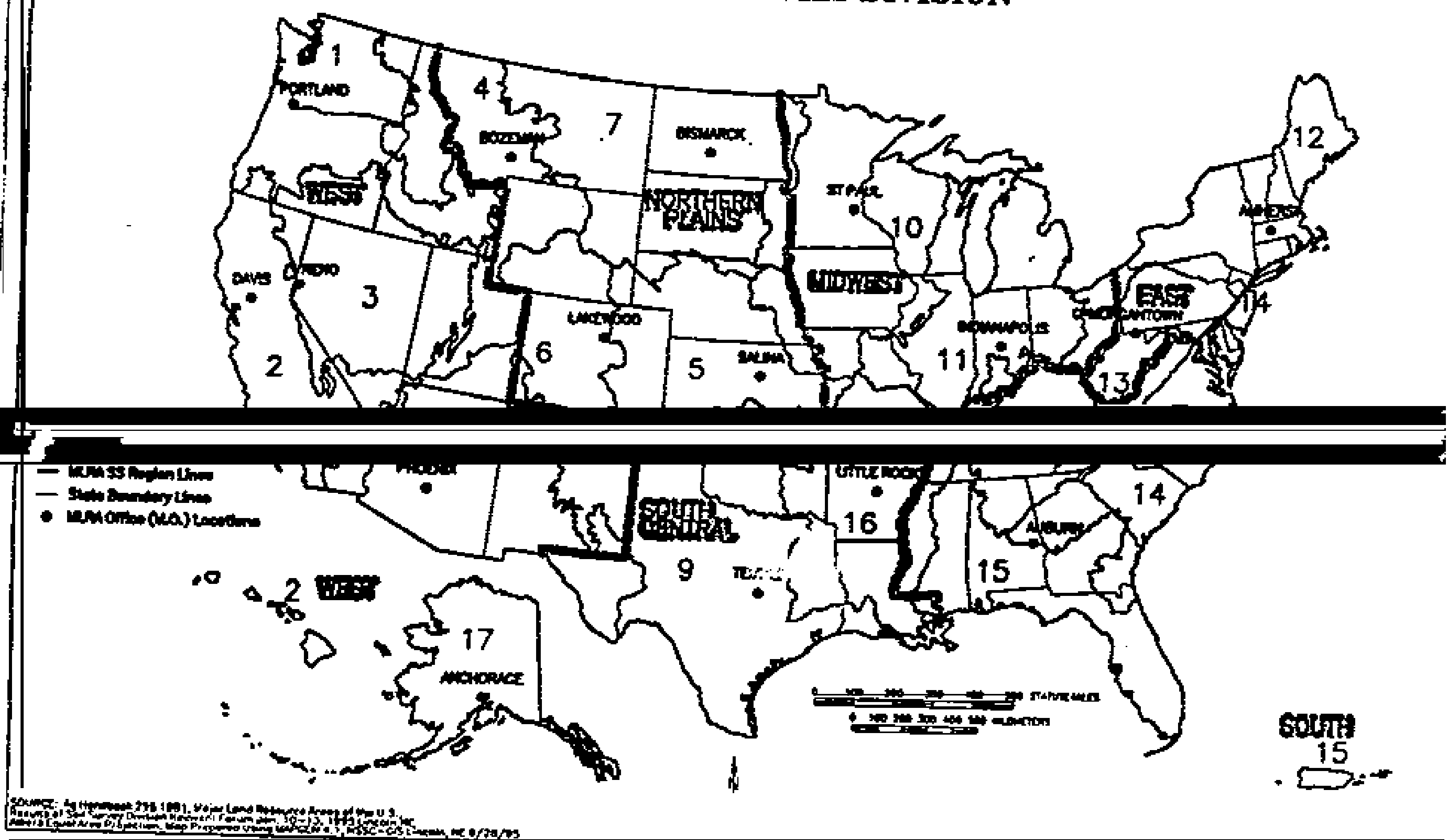
    - Sec. 352, 386, and 387 reauthorizes Forestry Incentives Program and establishes a grazing lands program and wildlife incentive program All 3 of these programs could use soil surveys as interpretive tools.

With the closing of the National Technical Centers, regional soil interpretations are now the responsibility of the state soil scientists in coordination with each other and the IRTS, Institutes and the National Soil Survey Center. There is still a strong need for technology transfer among the Universities, NCSS, the NRCS Institutes, NSSC and the states in the soil survey discipline.

U.S. DEPARTMENT OF AGRICULTURE

NATURAL RESOURCES CONSE

MAJORUNDRESSOURCE AREA (MLRA) SOIL SURVEY REGIONS
USDA – NRCS SOILS DIVISION



MAP PRODUCED BY THE NATIONAL SOIL S

	A	B	D	E	F	G	H	I	J	K
1	LAST NAME	FIRST NAME	TITLE	PHONE #	FAX	VOICOM	E-MAIL	ADDRESS	CITY/STATE	ZIP
2	Kolesinskas	Xipan J	State Soil Scientist	860-487-4047	860-487-4054	9013-147	ctso300llop	16 Professional Park Rd	Storrs, CT	06268-1299
3	Gollung	Nancy	Soil Scientist	860-688-4099	860-683-1808	9013-400		627 River St	Windsor, CT	06095-3003
4	Parizek	Donald C	Soil Scientist	860-688-4099	860-683-1808	9013-405		627 River St	Windsor, CT	06095-3003
5	Staniewski	Glenn R	Soil Scientist	860-688-4099	860-683-1808	9013-410	ctsoilglenn	627 River St.	Windsor, CT	06095-3003
6	Faber	Marjorie	Assistant State Soil Scientist	860-688-4099	860-683-1808	9013-365	ctsoilmarge	627 River St	Windsor, CT	06095-3003
7	Parker	Charles D.	Assistant State Soil Scientist	302-856-7378	302-856-4381	679-1115		408 N. DuPont Hwy.	Georgetown, DE	19947-
8	Thompson	Bruce	State Soil Scientist, MO Leader	413-253-4370	413-253-4375	945-4015		451 West St	Amherst, MA	01002-2995
9	Averill	Albert H	Soil Survey Project Leader	413-773-3308	413-774-4949			55 Federal St., Rm 290	Greenfield, MA	01301-2546
10	Turenne	James D.	Soil Survey Project Leader	508-295-7962	508-291-2368			15 Cranberry Highway	West Wareham, MA	02578-1504
11	Fine	Shawn M.	Soil Scientist, MO	413-253-4354	413-253-4375	256-1260		451 West St	Amherst, MA	01002-2995
12	Fischer	Steven W	Soil Scientist, MO	413-253-4364	413-253-4375	256-1255		451 West St	Amherst, MA	01002-2995
13	Williams	C. Andrew	Soil Scientist, MO	413-253-4364	413-253-4375	256-1250		451 West St.	Amherst, MA	01002-2995
14	Slater	Meredith	Soil Scientist (term)	508-295-7962	508-291-2368			15 Cranberry Highway	West Wareham, MA	02576-1504
15	Fletcher	Peter C.	Soil Scientist	508-295-1481	508-291-2368	256-1140		15 Cranberry Highway	West Wareham, MA	02578-1504
16	Taylor	William H.	Soil Scientist	413-253-4371	413-253-4375	256-1275		451 West St.	Amherst, MA	01002-2995
17	Vacant		Soil Scientist	508-295-7962	508-291-2368			15 Cranberry Highway	West Wareham, MA	02578-1504
18	Vacant		Soil Scientist	413-773-3336	413-774-4949			55 Federal St., Rm 290	Greenfield, MA	01301-2546
19	Brown	James H.	State Soil Scientist	410-757-0861x324	410-757-0887	757-1445		339 Busch's Frontage Rd.	Annapolis, MD	21401-5534
20	Teachman	George E	Soil Scientist, US Army	410-671-1559	410-671-1680	757-2250		ATTN SFIM-AEC-ECN, Bldg. E4435	Aberdeen Proving Grounds, MD	21010-5401
21	Levin	Maxine J.	Soil Scientist, Regional Office	301-586-1348	301-586-1387	449-1420		11710 Beltsville Dr., Calverton Office Bldg #2, Suite 100	Beltsville, MD	20705-
22	Matula	Lenore J.	Soil Scientist, ACOE	410-962-5679	410-962-8024	757-2305	lenore.matula@	ACOE, CENAB-OP-RX, P.O. Box 1715	Baltimore, MD	21203-1715
23	Brewer	James E.	Soil Scientist	410-546-4731	410-860-8818	757-1825		2322 B. Goddard Parkway, Suite 3	Salisbury, MD	21801-8636
24	Burns	John L.	Soil Scientist	410-546-5731	410-860-8819			2322 B. Goddard Parkway, Suite 3	Salisbury, MD	21801-8636
25	Davis	Susan	Soil Scientist	410-222-7822	410-224-4586			2662 Riva Rd., Suite 150,MS#7001	Annapolis, MD	21401-7377
26	Demas	George	Soil Scientist	410-632-0839	410-632-2732			301 Bank St.	Snow Hill, MD	21863-1004
27	King	Phillip S.	Soil Scientist	301-797-4889	301-797-4821	757-2200		1260 Maryland Ave, Suite 101	Hagerstown, MD	21740-7252
28	Kraft	Joseph S.	Soil Scientist	301-797-4889	301-797-4821	757-2170		1260 Maryland Ave, Suite 101	Hagerstown, MD	21740-7252
29	Verdone	David R.P.	Soil Scientist	410-222-7822	410-224-4586			2662 Riva Rd., Suite 150,MS#7001	Annapolis, MD	21401-7377
30	Davis	John	Soil Resource Specialist	301-504-7387	301-504-8741	757-2265		Bldg. 513, BARC-East	Beltsville, MD	20750-
31	Coshard	William D.	Assistant State Soil Scientist	410-757-0861x342	410-757-0887			339 Busch's Frontage Rd.	Annapolis, MD	21401-5534
32	Robinson	Carl E.	Area Resource Soil Scientist	301-777-1494	301-777-7632	757-1805		11602 Bedford Rd. N.E.	Cumberland, MD	21502-8004
33	Kallock	Norman R.	State Soil Scientist	207-866-7245	207-866-7262	787-2223		5 Godfrey Dr.	Orono, ME	04473-1100
34	Flewelling	Lawrence R.	Soil Survey Project Leader	207-564-2321	207-564-2570	787-8125		1073 West Main St., Suite #7	Dover-Foxcroft, ME	04426-3717
35	Hedstrom	Gary S.	Soil Survey Project Leader	207-778-2053	207-778-5785	787-8130		2 Park St.	Farmington, ME	04938-1915
36	Miller	Jonathan W.	Soil Survey Project Leader	207-778-2053	207-778-5785	787-8140		2 Park St	Farmington, ME	04938-1915
37	Turcotte	David E.	Soil Survey Project Leader	207-564-2321	207-564-2570			1073 West Main St., Suite #7	Dover-Foxcroft, ME	04426-3717
38	Butler	Theodore H.	Soil Scientist	207-564-2321	207-564-2570			1073 West Main St., Suite #7	Dover-Foxcroft, ME	04426-3717
39	Clark	Donald O	Soil Scientist	207-564-2321	207-564-2570			1073 West Main St., Suite #7	Dover-Foxcroft, ME	04426-3717
40	Hoar	Wayne D.	Soil Scientist	207-778-2053	207-778-5785	787-8240		2 Park St.	Farmington, ME	04938-1915
41	Hodgman	Lindsey H	Soil Scientist	207-866-7245	207-866-7262			5 Godfrey Dr.	Orono, ME	04473-1100
42	Hughes	Paul A.	Soil Scientist	207-564-2321	207-564-2570	787-8245		1073 West Main St., Suite #7	Dover-Foxcroft, ME	04426-3717
43	Olson	Ronald W.	Soil Resource Specialist	207-947-6622	207-990-1957	787-8220		28 Gilman Plaza, Suite #2	Bangor, ME	04401-3516
44	Wilkinson	David E.	Soil Resource Specialist	207-783-8196	207-783-4104	787-8135		27 Westminster St.	Lewiston, ME	04240-5327
45	Hundley	Steven J.	State Soil Scientist	603-868-7581	603-868-5301	868-7645		2 Madbury Rd. Federal Bldg.	Durham, NH	03824-1499
46	Homer	Joseph W	Soil Survey Project Leader	603-788-4651	603-788-2536	868-7755		RR2, Box 235	Lancaster, NH	03584-9612
47	Whitcomb	Peter B.	Soil Survey Project Leader	603-225-8401	603-224-8260			10 Ferry St., Box 312	Concord, NH	03301-5081
48	Swain	Katherine L.	Soil Specialist	603-225-8401	603-224-8260	868-7705		10 Ferry St., Box 312	Concord, NH	03301-5081
49	Burke	Thomas H.	Soil Scientist	603-788-4651	603-788-2536	868-7760		RR2, Box 235	Lancaster, NH	03584-9612
50	Cannon	Mary Ellen	Soil Scientist	603-788-4651	603-788-2536	868-7750		RR2, Box 236	Lancaster, NH	03584-9612
51	Dudley	Karen H.	Soil Scientist	603-225-8401	603-224-8260	868-7765		10 Ferry St., Box 312	Concord, NH	03301-5081
52	Meyer	Phillip D.	Soil Scientist	603-225-8401	603-224-8260	868-7740		10 Ferry St., Box 312	Concord, NH	03301-5081
53	Taylor	Ronnie L.	State Soil Scientist	908-246-1171x170	908-246-2358	787-7115		1370 Hamilton St.	Somerset, NJ	08873-
54	Gladstone	Seth A.	Soil Scientist	609-561-3223	609-561-2786			251 Bellevue Ave	Hammonton, NJ	08037-
55	Smith	Chris	Soil Scientist	908-246-1171x175	908-246-2358			1370 Hamilton St.	Somerset, NJ	08873-
56	Goddard	Tyrone	State Soil Scientist	315-477-6526	315-477-6550	9015-6526		441 S. Salina St. Suite 354	Syracuse, NY	13202-2450
57	Ames	Steven E.	Soil Survey Party Leader	716-268-7125	716-268-7224	9015-1745		5425 County Route 48	Belmont, NY	14813-9758
58	Hernandez	Luis A.	Soil Survey Party Leader	718-987-2185	718-987-4589	9015-1585		High Rock Park Center, 200 Nevada Ave.	Staten Island, NY	10306-
59	Puglia	Paul S.	Soil Survey Party Leader	716-699-2326	716-699-5506	9015-1775		8 Martha St.	Ellicottville, NY	14731-1786
60	Seifried	Stefan T.	Soil Survey Party Leader	607-865-7161	607-865-5536	9015-1705		44 West St., Suite 1	Walton, NY	13856-1217
61	Silverman	Mark H.	Soil Survey Party Leader	518-885-6900	518-884-8101	9015-1665		Municipal Center, 50 W. High St.	Ballston Spa, NY	12020-1915
62	Smith	Gerald W.	Soil Survey Party Leader	518-962-8335	518-962-4002	9015-1675		87 Sisco St.	Westport, NY	12993-
63	Trevail	Theodore D.	Soil Survey Party Leader	518-561-7373	518-563-0867	9015-1670		8084 Route 22, Suite 1	Plattsburg, NY	12901-9601
64	Havens	Matthew	Soil Scientist	716-268-7125	716-268-7224	9015-1710		5425 County Route 48	Belmont, NY	14813-9758
65	Konopka	Paul E	Soil Scientist	518-885-6900	518-884-8101			Municipal Center, 50 W. High St.	Ballston Spa, NY	12020-1915
66	Page	Steven J.	Soil Scientist	518-962-8335	518-962-4002			87 Sisco St.	Westport, NY	12993-
67	Smith	Victoria	Soil Scientist	716-268-7125	716-268-7224			5425 County Route 48	Belmont, NY	14813-9758
68	Carlisle	Steven C	Assistant State Soil Scientist	607-255-2278	607-255-2644	9015-1035		Cornell University, 7th Floor, Bradfield Hall	Ithaca, NY	14853-
69	Indrick	Steven S	Assistant State Soil Scientist	315-477-6521	315-477-6550	9015-6521		441 S. Salina St. Suite 354	Syracuse, NY	13202-2450
70	Stein	Edward R	Area Resource Soil Specialist	607-547-8337	315-793-8272	9015-1515		100 Lomond Ct.	Utica, NY	13502-5948

	A	B	D	E	F	G	H	I	J	K
71	White	Edgar	State Soil Scientist	717-782-3869	717-782-4469	326-4705		Suite 340, One Credit Union Place	Harrisburg, PA	17110-2993
72	Chibirka	John	Soil Survey Party Leader	610-495-0394	610-495-5212			826 N. Lewis Rd., First Floor, Suite 200	Limerick, PA	19468-1326
73	Knight	William	Soil Survey Party Leader	814-623-9616	814-623-0481			702 W. Pitt St.,Fair Lawn Ct., Suite 4	Bedford, PA	15522-8600
74	Johnson	Lois	Soil Scientist	610-495-0394	610-495-5212			826 N. Lewis Rd., First Floor, Suite 200	Limerick, PA	19468-1326
75	Craul	Timothy A.	Soil Scientist	814-863-0129	814-863-7043			Pennsylvania State University, Dept. of Agronomy,Land Analysis Lab. 116 ASI Bldg	University Park, PA	16802-1278
76	Eckenrode	Joseph	Soil Scientist	814-863-7609	814-863-7043			Pennsylvania State University, Dept. of Agronomy,Land Analysis Lab. 116 ASI Bldg.	University Park, PA	16802-1278
77	Ellenberger	Ned B.	Soil Scientist	814-623-9616	814-623-0481			702 W. Pitt St.,Fair Lawn Ct., Suite 4	Bedford, PA	15522-8600
78	Rivera	Parcos	Soil Scientist	717-782-3439	717-782-4469			Suite 340, One Credit Union Place	Harrisburg, PA	17110-2993
79	Hudak	John	Assistant State Soil Scientist	717-782-3438	717-782-4469			Suite 340, One Credit Union Place	Harrisburg, PA	17110-2993
80	Stuart	Everett C.A.	Assistant State Soil Scientist	401-828-1300	401-828-0433	9023-130		60 Quaker Ln.	Warwick, RI	02886-
81	Gourley	Stephen H.	Soil Technology Coordinator	802-951-6796x236	802-951-6327	788-1090		69 Union St.	Winooski, VT	05404-
82	DeKett	Roger D.	Soil Survey Project Leader	802-748-5553	802-748-1621	788-1145		Federal Bldg.,Rm 216, 28 Main St.	St. Johnsbury, VT	05819-
83	Long	Robert	Soil Survey Project Leader	802-334-6278	802-334-1365	788-1100		Waterfront Plaza Ag Offices	Newport, VT	05855-
84	Villar	Thomas R.	Soil Survey Project Leader	802-457-1706	802-457-1705	788-1105		The Mill Rt. 4 East, PO Box 800	Woodstock, VT	05091-
85	Grayson	Carlnhia	Soil Scientist	802-334-6278	802-334-1365			Waterfront Plaza Ag Offices	Newport, VT	05855-
86	Stuart	Martha H.	Soil Scientist	802-457-1706	802-457-1705	788-1195		The Mill Rt. 4 East, PO Box 800	Woodstock, VT	05091-
87	Vacant		Soil Resource Specialist	802-254-5323	802-254-3307			28 Vernon St. #2	Brattleboro, VT	05302-8605
88	Delp	Charles H	Supervisory Soil Scientist	304-872-5511	304-872-4715			PO Box 10, 449 Water St., Rm 209	Summersville, WV	26651-
89	Carpenter	Stephen G.	State Soil Scientist, MO Leader	304-291-4152x120	802-291-4628	291-4301		75 High St., Rm 301	Morgantown, WV	26505-
90	Bell	James W. (Skip)	Soil Survey Party Leader	304-264-0858	304-267-8172			1450-2 Edwin Miller Blvd	Martinsburg, WV	25401-
91	DiGiglano	Timothy	Soil Survey Party Leader	304-675-4170	304-675-7787			224-C First St.	Point Pleasant, WV	25550-
92	Flegel	Donald G.	Soil Survey Party Leader	304-647-3643	304-645-4378	291-4518		118 W. Washington St., Rm 202, City Bldg	Lewisburg, WV	24901-
93	Thompson	Eric N.	Soil Survey Party Leader	304-528-0105	304-528-0130			2631 5th Street Rd.	Huntington, WV	25701-
94	Carte	Christine	Soil Scientist, MO	304-291-4152x173	802-291-4628	291-4528		75 High St., Rm 301	Morgantown, WV	26505-
95	Kingsbury	David	Soil Scientist, MO	304-291-4152x181	802-291-4629	291-4538		75 High St., Rm 301	Morgantown, WV	26505-
96	Pyle	Roy E	Soil Scientist, MO	304-291-4152x115	802-291-4628	291-4541		75 High St., Rm 301	Morgantown, WV	26505-
97	Topalanchik	Alex R.	Soil Scientist, MO	304-291-4152x112	802-291-4628	291-4181		75 High St., Rm 301	Morgantown, WV	26505-
98	Cole	Carlos P.	Soil Scientist	304-420-8082	304-420-9066			Route 5 Box1000, Mill Run Road	Parkersburg, WV	26101-
99	Dobos	Robert R.	Soil Scientist	304-291-4152x174	802-291-4628	291-4531		75 High St., Rm 301	Morgantown, WV	26505-
100	Estepp	Ronald	Soil Scientist	304-538-7583	304-538-7876			129 Main St.	Morefield, WV	26836-
101	Jenkins	Anthony B.	Soil Scientist	304-872-5511	304-872-4715			PO Box 10, 449 Water St., Rm 209	Summersville, WV	26651-
102	Vacant		Soil Scientist	304-264-0858	304-267-8172			1450-2 Edwin Miller Blvd	Martinsburg, WV	25401-
103	Pate	Robert H	Resource Soil Scientist	304-255-8295	304-255-1250			483 Ragland Rd.	Beckley, WV	25801-
105	Brown	Leander	Wetland Soil Scientist, Wetland Institute	301-497-5939	301-497-5911	757-1805		11400 American Holly Dr	Laurel, MD	20708-4014
106	Wulforst	John	Soil Scientist, SWCD	716-268-7831	716-268-7224			5425 County Route 48	Belmont, NY	14813-9758
107	Day	Lawrence	Soil Resource Specialist SWCD	607-865-7161	607-865-5535			44 West St., Suite 1	Walton, NY	13856-1217
108	Doolittle	James A.	Research Soil Scientist NSSC	610-975-4233	610-975-4200	445-6476		NSSL c/o USDA FS, 5 Radnor Corporate Center, Suite 200	Radnor, PA	19087-2878

National Soil Information System

NASIS
The Big Picture

Ken Harward, NASIS Project Manager, NRCS, Fort Collins, Colorado

Team USDA

TOPICS

- Federal Policy and Standards
- Corporate Database Management for NRCS
- National Soil Data Access Facility (NSDAF)
- NASIS Objectives and Timeline
- Hardware & Software for NRCS Soils Applications

Team USDA

Federal Policy & Standards

► National Performance Review

- (67) Federal agencies will develop and market databases to business
- Data is a valuable commodity
- (68) In partnership with state and local government and private companies. we will create the National Spatial Data Infrastructure (NSDI)
- The Federal Geographic Data Committee

Team USDA

Federal Policy & Standards

► Draft *Executive* Order

★ NSDI will provide • network of geospatial data from local and national sources. developed to standards. that will be accessible for a *variety of* uses

★ Budget crosscut

★ Non-federal partnerships

*Coordinate framework

Team USDA

Federal Policy & Standards

- Draft Executive Order
  - ★ National digital **geospatial** data framework
  - ★ Development of standards
  - **Adherance** to standards
  - **Geospatial** data **clearinghouse**
  - ★ **Compliance**

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Federal Policy & Standards

- Federal Standards (Categories)
  - **Geographic** Reference **(NAD83)**
  - ★ Information Content (Data Dictionary, Data Structure. Minimum **Dataset)**
  - ★ **Data Quality**
  - ★ Procedures / Rules (NCSS)
  - **Geospatial** Data Management (Access. Archive. Integration. **Metadata)**
  - *Transfer (SDTS)

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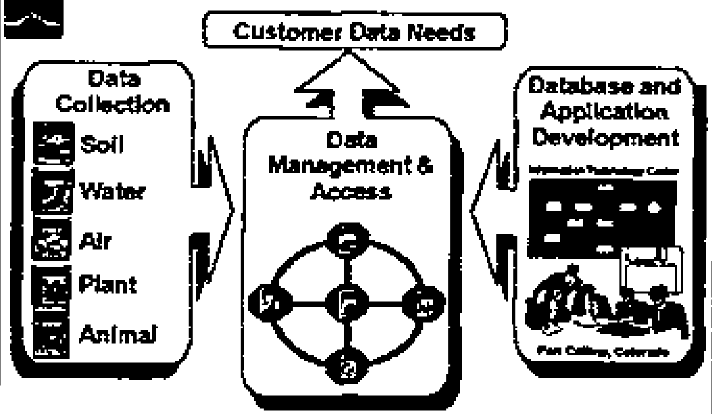
Components of an Information Management Framework



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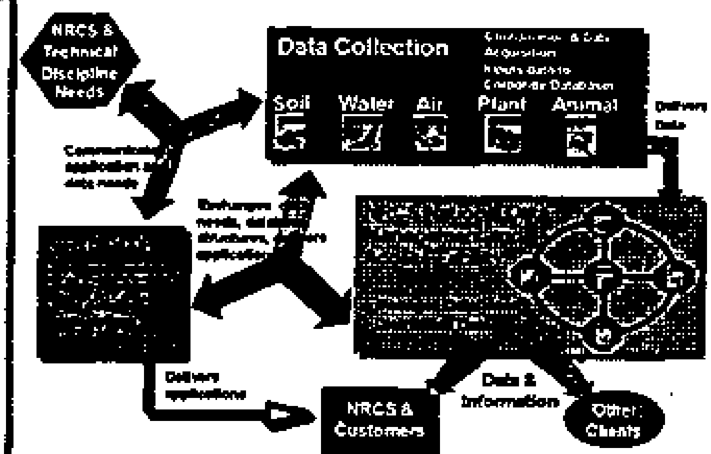
Meeting NRCS's Needs for Resource Data



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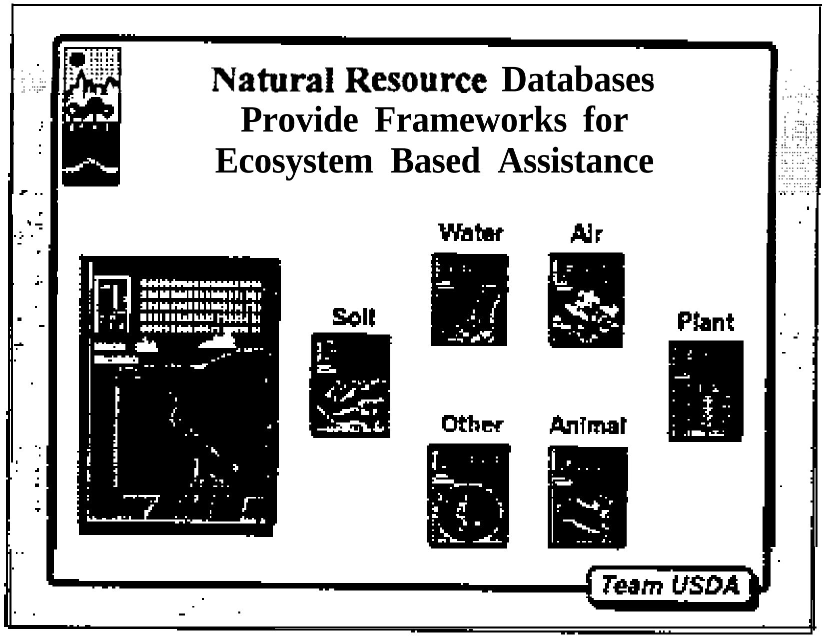
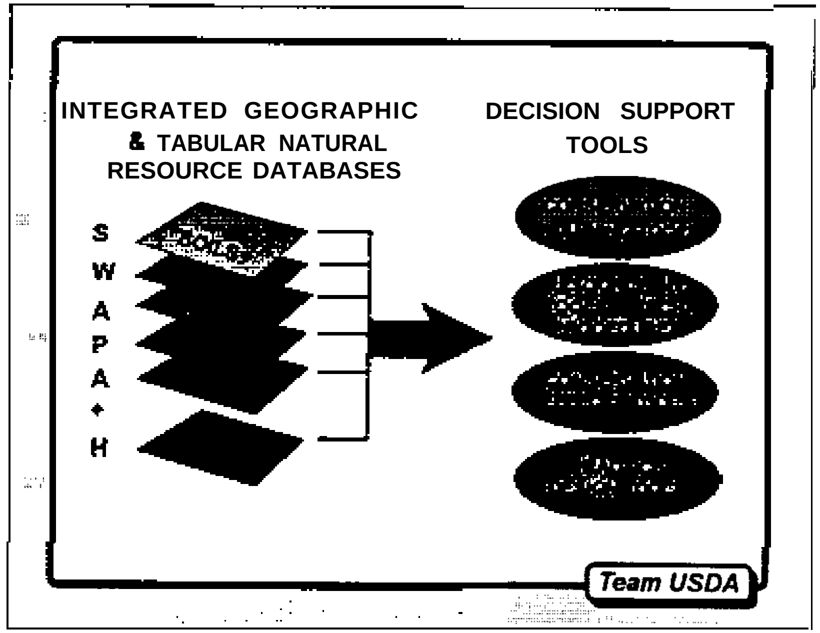
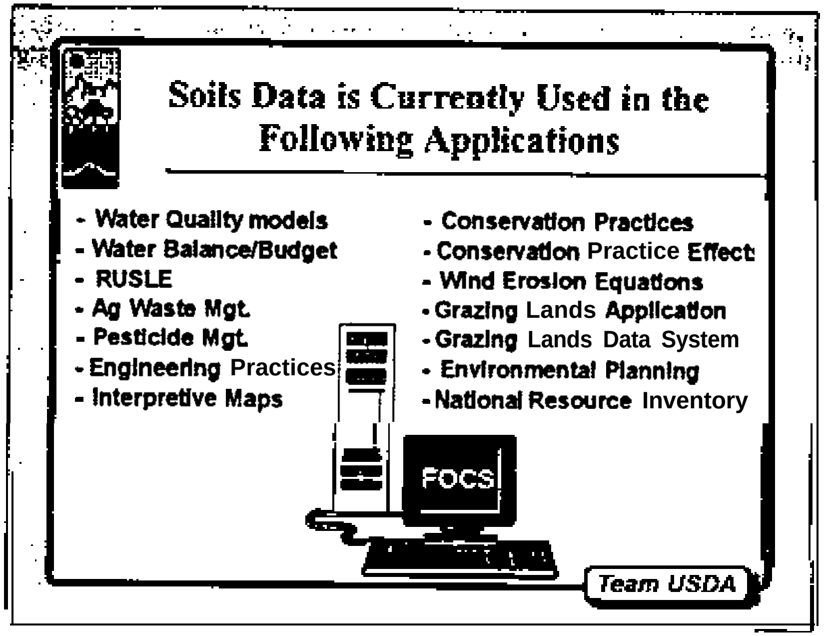

Natural Resource Databases
Provide Frameworks for
Ecosystem Based Assistance
Water
Air
Soil
Plant
Other
Animal
Team USDA


INTEGRATED GEOGRAPHIC
& TABULAR NATURAL
RESOURCE DATABASES
DECISION SUPPORT
TOOLS
S
W
A
P
A
+
H
Team USDA


Soils Data is Currently Used in the
Following Applications
- Water Quality models
- Water Balance/Budget
- RUSLE
- Ag Waste Mgt.
- Pesticide Mgt.
- Engineering Practices
- Interpretive Maps
- Conservation Practices
- Conservation Practice Effect
- Wind Erosion Equations
- Grazing Lands Application
- Grazing Lands Data System
- Environmental Planning
- National Resource Inventory
FOCS
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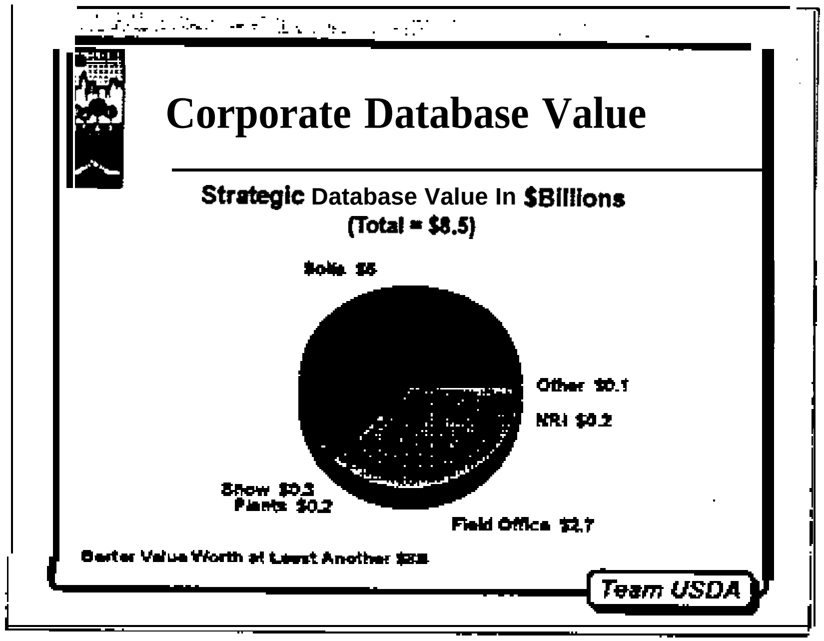
Corporate Database Value
Strategic Database Value In $Billions
(Total = $8.5)
Soils $5
Other $0.1
NRI $0.2
Snow $0.3
Plants $0.2
Field Office $2.7
Barter Value Worth at Least Another
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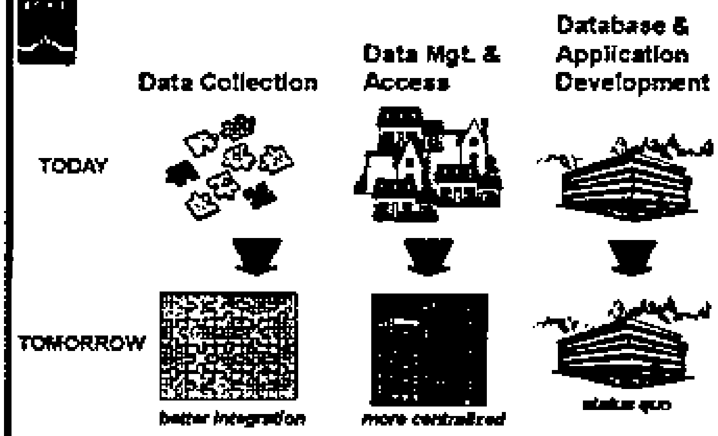
A Vision of the Future



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NSDAF

National Soil Data Access Facility

The Concept

*Anyone **requiring** or producing soil **geodata** shall have the ability to easily determine what **exists,** the **ability** to **easily** access this data. **and** the **ability** to **contribute** data to **the** National **Repository**

★ **All** of the **previously mentioned** standards would apply to data In thls facility

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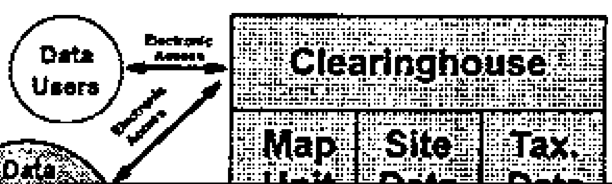
NSDAF



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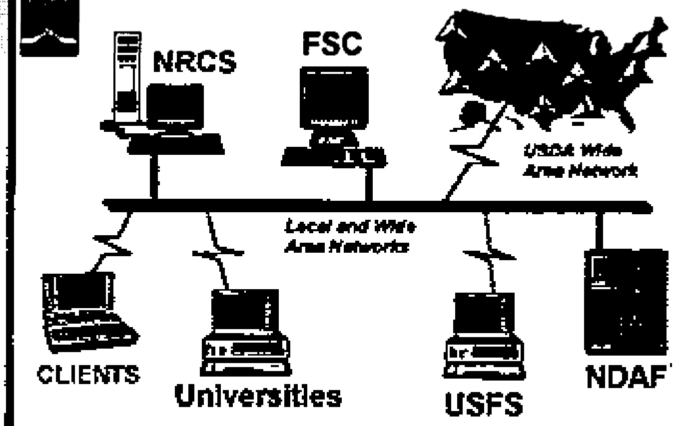
The Future of Data Access



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NASIS

Objectives

- ProvicJe a flexible and dynamic management system for soil data and information

-Improve the quality of soil data and information

-Improve automated map unit management

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NASIS

Current Status

★ NASIS 1.0 released to NRCS state offices October 1994.

★ NASIS 2.0 released to NRCS state offices October 1995.

★ NASIS 3.0 scheduled for release to NRCS offices October 1996.

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NASIS

Major Components by Release

1.0: Conversion from SSSD to NASIS, Dynamic Data Dictionary, NASIS Foundation, Security

2.0: Editing tools (cut, copy, paste, global functions), Query Tools, Standard Reports

3.0: Communications, Interpretations, limited Map Unit Description Reports

4.0: Data Accumulation, Manuscript Generation, Generalized Export & Download to FOCS

5.0: Data Aggregation, Data Comparison, GIS Functionality

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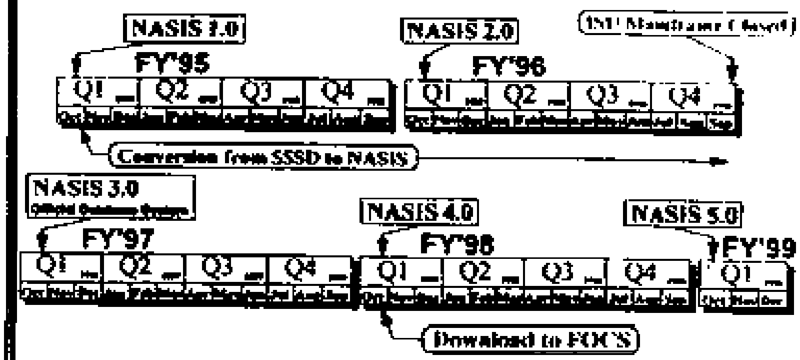
NASIS

Implementation Timeline



NASIS

Hardware & Software: *NRCS MLRA Soil Survey Offices (under development)*

- ★ Hardware: Separate database server and GIS machines, 8+ Gb Hard Drive. LAN. USDA Internet Connection, x terminals, PCS
- ★ software: Appropriate OS (Le., Solaris, HP-UX, etc.), Window Manager, Informix OnLine, NASIS, Office automation software

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NASIS

Hardware & Software: *NRCS State Offices*

- ★ Hardware: Sun SPARC Workstation, 2+ Gb Hard Drive, IAN. USDA Internet Connection
- ★ Software: Solaris, Motif Window Manager, Informix OnLine, NASIS & PEDON

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NASIS

Hardware & Software: *NRCS Project Offices*

A "complete' NASIS site

- ★ Hardware: Sun SPARC Workstation or Intel x86 PC, 1 to 2 Gb Hard Drive, USDA Internet Connection or hlgh speed modem (e.g., *Netblazer*)
- ★ Software: Solaris or UnixWare, Motif Window Manager (for Sun), Informix OnLine, NASIS & PEDON

Team USDA

NASIS

Hardware&Software: *NRCS Project Offices*

A "*remote*" NASIS *site*

- ★ Hardware: Intel x86 PC or X Terminal, high speed modem (e.g.. *Netblazer*) or USDA Internet connection, LAN may be required
- ★ Software: Windows 3.x or higher, X Windows emulator (to connect to an MLRA Soil Survey Office and run NASIS remotely), *DOS/Windows Pedon*

Team USDA

NASIS

The Future & NCSS Partners

- ★ **Architecture: Client /** Server
- ★ Hardware: Fart PC or **workstation,** Field Data Recorder, **Network** Connection **(i.e.,** Internet) **&/or** high speed modem (to connect **to a "NASIS site", the** NSDAF, or **the Internet), GIS/GPS equipment, Printers**
- ★ **Software:** GUI **environment** (UNIX, MS **Windows, Windows 95, NT,** etc.), SQL **Front** End Tools, **Analysis** Tools **(NASIS), GIS Tools, Data Collection Tools (PEDON)**
- ★ Usc: **Data** Access, Data Collection. Dab **Contribution, Data Analysis, Data Distribution**

Team USDA

Overview of NASIS Concepts

- The survey area name has been separated from the legend so that a survey area may have more than one legend.
- A single survey area may have multiple legends.
- The coincidence between soil survey areas and other area types can be recorded.
- Areas have been organized by *area type.*
- Map units have been separated into *mapunifs* and *data mapunifs so* that map unit symbols from different legends can be linked to the same map unit data.

Overview of NASIS Concepts

- *Mapunits* and *data mapunits* are linked through a correlation table.
- Database security is accomplished through a concept called “owned objects” and the use of record locking and column protection.
- The role of the Dataset Manager (DSM) has changed from editing soil data to managing assignment of users to groups.
- Some NASIS data elements are found in different tables than in SSSD.

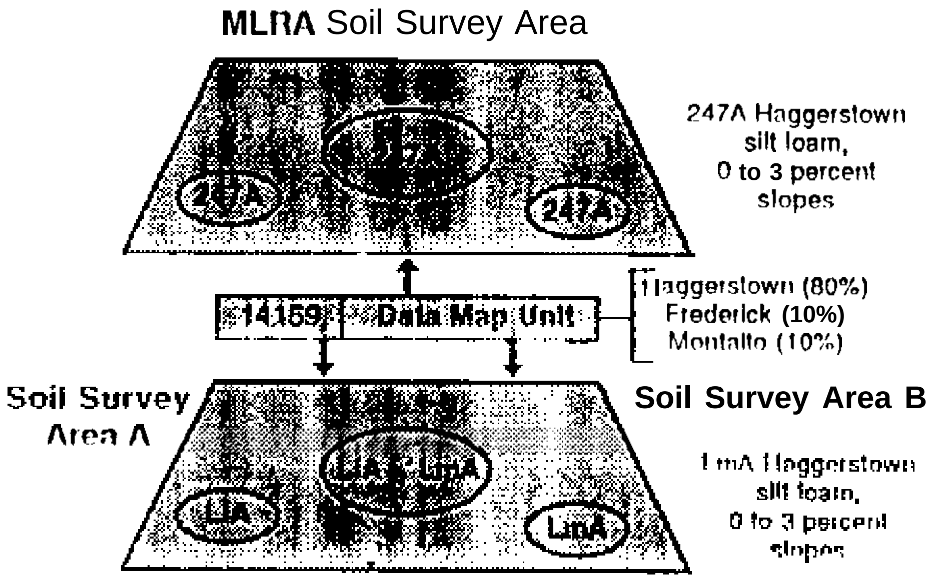
Overview of NASIS Concepts

- Flooding, ponding. soil moisture, and soil temperature are now recorded by month.
- Any data element that has multiple entries now has its own table.
- All water tables are now recorded as soil moisture *state* in the soil moisture table.
- Information about inactive map unit symbols (called “additional” symbols) is retained in the database.
- Inclusions are “other components”, and layers have horizon nomenclature.

Overview of NASIS Concepts

- Map units can have an unlimited number of components, and components can have an unlimited number of horizons.
- You can record representative values (RVs) for some data, in addition to high and low values.

Multiple Legends, Coordinated Legends, and Joining Soil Survey Areas



NASIS 2.0 Capabilities

- Convert NASIS 1 .O Data to 2.0
- Create and Edit Areas, Legends, Map Units, and Map Unit Data
- Correlate Map Units in an Ongoing Survey
- Maintain Complete Correlation Records
- Maintain Multiple Map Unit Legends
- Join Map Units Between Survey Areas
- Maintain Security of Data

NASIS 2.0 Capabilities

- Write Custom Queries
- Perform Global Editing Functions
- Produce Standard Soils Reports

What's New in Release 2.0

- Cut, Copy, and Paste
- Global Editing
- The Select Manager
- The Query Editor
- Report Generator
- Resolving Data Conflicts
- I lighlight Selection Model

What s New in Release 2.0

- Load-All Behavior
- Delete / Fail Rules
- Boolean Data Type
- Clearing Records in an Edit Session
- Sorting Rows on Demand
- Where Used Report
- Enhanced Online Help
- Table and Data Element Changes

Table Changes - New Tables

- Component Landform
- Component Parent Material
- Component Parent Material Group
- Component Taxonomic Family Mineralogy
- Component Erosion Accelerated
- Query Table

Table Changes - Tables Dropped

- Component Drainage Table Changed to Drainage Class Element (In the Component Table)
- Data Mapunit Farmland Classification Table Changed to Farmland Classification Element (In the Data Mapunit Table)
- Mapunit History Text Table Changed to Text Element (In the Mapunit History Table)

New Data Elements

- Local Phase Criteria
- Runoff
- Erosion Class
- Earth Cover Kind
- Albedo
- Taxonomic Particle Size Modifier
- Taxonomic CEC Activity Class

New Data Elements

- Several State Data Elements
- Bulk Density at 15 Bars
- Satiated Water

Why SSSD Will Not Suffice

- No Capability to Handle MLRAs
- Inadequate Security Scheme
- Does Not Directly Support Ecosystem-Based Models (Representative Values)
- Uncontrolled Environment (Data Quality Issue)
- Lack of Coordinated Data Between SSSD and Database at ISU
- Lack of Coordination of Soil Survey Symbols Between Published Soil Surveys and Electronic Soil Databases (Including FOCS)

What Products Does NASIS Provide That We Cannot Get Anywhere Else

- Management of MLRAs
- Enhanced Security of Data
- Interpretations Tailored to Local Conditions
- Data Dictionary Driven Interface Allows Addition of New Tables and Data Elements Without Having to Reprogram Any Modules
- Coordination of Soil Survey Data Between Published Soil Surveys, Electronic Soil Databases, and End Users (Including FOCS)
- Soil Survey Database (Information System) for the National Cooperative Soil Survey

NRCS Soils Information Available Through the Internet

The following is a list of Internet WWW addresses for NRCS soils information along with a brief description of the information available at each listed site. Through links from the main NRCS home page, most NRCS information can be reached. Other addresses are listed to provide a more direct link to specific information.

1. NRCS home page (http://www.ncg.nrcs.usda.gov/welcome.html)

This is the main page for information about the Natural Resources Conservation Service.

2. NASIS (http://www.itc.nrcs.usda.gov/nasis)

This page provides information on the National Soil Information System, currently being implemented for managing soil survey database information.

3. NRCS Node to NSDI (http://www.ncg.nrcs.usda.gov/nsdi_node.html)

This page contains information on various NRCS spatial and attribute data including the PLANTS database, hydrography, 1992 NRI, soils, and water and climate, plus other miscellaneous information.

4. NSDAF (http://www.statlab.iastate.edu/soils/nsdaf)

This page provides direct access to the soil survey attribute data (MUIR), official series descriptions (OSD), and national list of hydric soils, plus information on various other soils data.

5. PLANTS (http://plants.usda.gov)

This page provides direct access to the official USDA plants database.

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Ames, Iowa 50011

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NORTHEAST COOPERATIVE SOIL SURVEY
USDA *FOREST* SERVICE UPDATE
Submitted by: Connie Carpenter
June 1996

ECOMAP

The map "Ecological Units of the **Eastern** United **States -** First Approximation" (Keys et. al 1995) has just recently been published. Hard copies are available from most Forest Service offices. I want to thank the people in thie **room** that have made **this** first approximation **possible** in such **a** short amount of time. **CD-ROM** data **is** in **press** to supplement the published map and subsection map unit tables. It contains an ARC file with **a GIS** coverage, narrative section descriptions, and subsection map unit tables in ASCII format.

The tables accompanying the map **are** very brief

Wetland Best Management Practices

The Northeaster" Area of the Forest Service released a publication called "Forested Wetlands: functions, benefits, and the use of best management practices" NA-PR-01-95. It provides some instruction on hydric soils and recommends best management practices which maintain the hydrologic functions of wetland ecosystems. Another best seller from Dave Welsch, the author of the Riparian Forest Buffer publication. US Forest Service Radnor, PA

Trees Affect Hydrology in Urban Environments

Robert Neville, Urban Forestry, has been working to parameterize a hydrological model to adequately reflect the influences of trees and forested cover on runoff amounts and intensities in urban and urbanizing areas. This watershed wide analysis, being developed in Maryland, requires as a" input parameter information on the soil permeability, inflitration, and water holding capacity. Robert is located in Durham, NH.

Ecological Classification end Inventory and Location of Potential Research Natural Areas.

Research natural areas are designated to preserve unique physical, biological, or geological resources and to preserve ecosystem processes for the purposes of scientific study. Certain inherent capabilities of ecosystems depend upon the functional linkage (e.g. transfers of heat, moisture, nutrienta, sediment, seed, etc.) among diverse but contiguous systems and some environmental values accrue to ecosystems by the mere juxtaposition of diverse areas. for thie reason, the WMNF, working with the spatial Analysis Laboratory et the University of Vermont, is seeking to identify areas with a certain landscape level integrity that would represent the range of structural characteristics found throughout the forest and capture most of the ecological processes through a coarse filter approach to landscape diversity.

The GIS analysis process included:

1) Delineating areas large enough to encompass several contiguous landscape level units, at least 10,000 contiguous acres within Management Area (WA) 6.2.: MA's in 6.2 are areas where natural processes are meant to dominate.
2) Use the ELT maps to establish the range of diversity, that is identify the type, abundance, and distribution ecological land types within each of these areas.
3) Merge this information with information on trail density (low, moderate, high, within MA 6.2 only hiking trails are allowed to identify potential "landscapes" which could meet the purposes of Research Natural Areas.
4) Wait for NH Heritage to complete gie based data base of occurrences of threatened, endangered and sensitive species which can also be merged with density and diversity to begin a more rigorous assessment of potential RNA's.

For more information contact Steve Fay, White Mountain National Forest, Laconia, NH.

ECS and Nutrient Depletion

WMNF has a continuing responsibility to maintain the long term productivity of the land under NFMA. A significant issue to consider is cation depletion in the soil. Historically, the WHNF has monitored the results at Hubbard Brook Experimental Forest or other locations to fulfill this responsibility. In addition, the WMNF is facilitating research activity by making our ECS maps available in a GIS format, providing land use history information, and permitting research activity. Several project significant to national forest management include:

* Nitrogen Saturation Studies by Christy Goodale. This work may alter the view on what sites are most susceptible to acid deposition, and perhaps to a limited extent, forest harvesting. It may be a basis for altering standards and guides in the Forest Plan.

• Soil Parent Materiel Mineralogy by Scott Bailey. This work may characterize the base cation distribution on the forest, and do so in a map form, end suggest places more, or lees, vulnerable to acid deposition and forest harvesting impacts. It has implications toward stream chemistry and aquatic impacts. It may lead toward development of standards and guideline in forest plan revision.

* Foliar Chemistry by M. Smith and R. Hallet. This work may lead to a better understanding of the impacts of acid rain on forest growth under different air quality impact scenerio's.

For more information on these topics and their relavance to forest soils contact Steve Fay, White Mountain National Forest, Laconia, NH.

Acid deposition and Forest **Health.**

1. Northeastern coniferous forest soils have always been acidic with naturally low concentrations of essential calcium (Ca) and magnesium (Hg) (Johnson and Fernandez, 1992).

2. Recent analysis shows much less **Ca** and **Mg** in spruce-fir forest **soils** than reported prior to 1950 (Shortle and Bondietti, 1992).

3. Decreased Ca and Wg in the root zone of **conifers** can be attributed to increased leaching, replacement of **Ca** and **Mg** by aluminum (Al), and decreased atmospheric deposition of **Ca** and **Mg** (Likens and others, 1996).

4. Acid deposition tends to leach essential Ca **and Mg** out of the tree root zone. Acid deposition **also** causes naturally-occurring and potentially toxic Al to bind to roots and soil, further displacing Ca and **Mg** (Lawrence and others, 1995, 1996; Smith and others, 1995).

5. Decreased availability of **Ca** and **Mg as** well **as** increased availability of Al stresses **forest** trees. This stress can cause trees to be more vulnerable to other **stressors** such **as** winter injury, defoliators, root rote, and the leaching of essential elements from foliage (Cronan and Grigal, 1995; Hinocha and others, 1996a; Shortle end Smith, 1988).

6. High elevation spruce-fir sites have shown the greatest impact due to rooting characteristics and shallow soils, naturally low amounts of stored Ca and **Mg,** increased acid deposition from cloud exposure, and increased frequency and severity of additional **stressors (Mohnen,** 1992; **Peart** and others, 1992).

7. Although lowland spruce and hardwood forests may be **less** obviously impacted, the same chemical **processes** are occurring in those forest soils. Research on the effect of these chemical processes on the biology of other types of forests is being planned and carried out **(Minocha** and others, 1996b; Shortle and others, 1995; Smith and others, 1996).

References:

Cronan, C.S. and D.F. Grigal. 1995. Use of calcium/aluminum ratios

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Hinocha, R., W.C. Shortle, G.B. Lawrence, H.B. David, S.C. Hinocha. 1996b. Putrescine: a marker of stress in red spruce trees. Pages 119-130 in J. Horn, R. Birdsey, and K. O'Brian (eds.) Proceedings of the 1995 meeting of the Northern Global Change Program. U.S. Dep. Agric. Gen. Tech. Rep. NE-214.
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Peart, D.R., N.S. Nicholas, S.M. Zedaker, H.W. Miller-Weeks, T.G. Siccama. 1992. Pages 125-191 in C. Eagar and M.B. Adams (eds.) Ecology and Decline of Red Spruce in the Eastern United States. Springat-Verlag, New York.
Shortle, W.C. and E.A. Bondietti. 1992. Timing, magnitude, and impact of acidic deposition on sensitive forest sites. Water, Air, and Soil Poll. 61: 253-267.
Shortle, W.C. and K.T. Smith. 1988. Aluminum-induced calcium deficiency syndrome in declining red spruce. Science 240: 1017-1018.
Shortle, W.C., K.T. Smith, R. Hinocha, and V.A. Alexeyev. 1995. Similar patterns of change in stemwood calcium concentration in red spruce and Siberian fir. Jour. Biogeography 22: 467-473.
Smith, K.T., W.C. Shortle, R. Hinocha, and V.A. Alsxeyev. 1996. Dynamics of calcium concentration in stemwood of red spruce and Siberian fir. Pages 230-238 in J. Horn, R. Birdsey, and K. O'Brian (eds.) Proceedings of the 1995 meeting of the Northern Global Change Program. U.S. Dep. Agric. Gen. Tech. Rep. NE-214.
Smith, K.T., W.C. Shortle, and W.D. Ostrofsky. 1995. Aluminum and calcium in fine root tips of red spruce collected from the forest floor. Can. J. For. Res. 25: 1237-1242.

Prepared by Kevin T. Smith, Research Plant Physiologist, NE-4505.

Calcium Weathering and Depletion

One approach to evaluation of regional patterns in susceptibilitity is to develop a GIS model of chemical weathering potential. Existing coverages of climatic parameters and soils (containing physical parameters such as thickness and texture) can be used to

Foliar and soil nutrient relationships in red oak and white pine forests

Calcium deficiency is a concern on sandy white pine and red oak sites in the northeastern United States. Soils may have been depleted of nutrient cations by acid precipitation and intensive land use. Studies into the nutrient growth relationships have been conducted on deep loamy sands (Adams or Windsor series) in red oak and white pine stands aged 40-110 years. All had been previously harvested and farmed. Plots ranged from New York to Maine.

A conservative approach to management is suggested for these sandy sites at this time. Management recommendations for harvesting are to avoid whole tree harvests, consider thinning instead of clearcutting, plan harvests so that leaves remain on site and minimize impacts to organic horizons. In addition, white pine is more productive (of timber) than red oak on these sites and harvest of white pine results in less Ca removal over a rotation than red oak due to differences in the foliar calcium concentration.

Associated with this work on foliar and soil relationships are efforts to predict elements in white pine and red oak foliage with "ear infrared reflectance spectroscopy and the development and testing of methods to digest forest soil and foliage for total Al, Ca, FE, K. Hg, H", P, and N.

References

Hallett, R.A. and J.W. Hornbeck, 1996 (in press). Foliar and soil nutrient relationships in red oak end white pine forests. Northeaster" Forest Experiment Station, P.O. Box 640, Durham, NH.

Hallett, R.A., H.E. Martin, and J.W. Hornbeck, 1996 (in press). Predicting elements in White pine and red oak fliage with near infrared relectance spectroscopy. Northeastern Forest Experiment Station, P.O. Box 640, Durham, NH.

Hallett, R.A., J.E. Hislop, J.W. Hornbeck, 1996. Microwave digestion of forest soils and foliage: Total Al, Ca, Fe, K. Mg, H", P and N. Northeaster" Forest Experiment Station, P.O. Box 640, Durham, NH.

NRCS-A-3A75-6-34

MEMORANDUM OF UNDERSTANDING

AMONG THE

U.S. DEPARTKENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
FOREST SERVICE
AGRICULTURAL RESEARCH SERVICE

AND THE

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
U.S. GEOLOGICAL SURVEY
FISH ANU WILDLIFE SERVICE
NATIONAL BIOLOGICAL SERVICE
NATIONAL PARR SERVICE

AND TEE

U.S. ENVIRONMENTAL PROTECTION AOENCY

RELATIVE TO

DEVELOPING A SPATIAL FRAMEWORK OF ECOLOQICAL UNITS OF THE UNITED STATES

Thia Memorandum of Understanding (HOW) is entered into by the Department of Agriculture, Natural Resources Conservation Service (NRCS), Forest Service (FS), and Agricultural Research Service (ARS); the U.S. Department of the Interior, Bureau of Land Management (ELM), U.S. Geological Survey (USGS), Fish and Wildlife Service (FWS), National Biological Service (NBS), and National Park Service (NPS); and the U.S. Environmental Protection Agency (EPA).

I. PURPOSE

This HOU documents and defines the responsibilities of the cooperating agencies to develop a common spatial framework for defining ecological units of the United States. It also provides a vehicle for other Federal agencies with natural resource management responsibilities to become part of the cooperative effort nationwide.

II. BACKGROUND AND BENEFITS

A. All Agencies--

1. The growing interest by Federal and State agencies in adopting a more integrated ecological approach to resource management has clarified the need for a common spatial framework for defining ecological units. This common framework will provide a basis for interagency coordination and will permit individual agencies to structure their strategies by the regions within which natural biotic and abiotic capacities and potential6 are similar. These ecological units transcend local, State, and national boundaries.

2. Considering the broad responsibilities and interests of all agencies, it is desirable and mutually beneficial to cooperate and integrate interdisciplinary technical information on environmental factors such as soils, vegetation, geology, geomorphology, water, climate, and others into a common ecological framework, with associate

descriptions and digital data bases. Development of a common ecological framework will be consistent with standards developed by the Federal Geographic Data Committee (FGDC) according to the Office of Management and Budget (OMB) Circular A-16 and Executive Order 12906 (Coordinating Geographic Data Acquisition and Access: The National Spatial Data Infrastructure) signed April 11, 1994.

3. Cooperating agencies will use the framework for defining ecological unite, with associated narrative descriptions and digital date bases to (a) reduce duplication of effort and promote effective, efficient, and scientifically sound management of natural resources; (b) geographically organize and share research, inventory, and monitoring information; (c) facilitate coordinated approaches to characterization and assessment of the Nation's land and water; and (d) enhance program management and technical coordination among parties representing private, tribal, State, and Federal interests.

B. NRCS will benefit from a common national framework for defining ecological unite in the coordination and delivery of its ecosystem-based assistance(EBA) strategy through enhanced technical assistance for all of its activities and programs that affect the environment. Furthermore, NRCS is charged with providing direction and leadership for the National Cooperative Soil Survey and for the production and delivery of soils and certain other related natural resource data to the Nation. Collaboration to develop a common national framework for defining ecological unite will significantly contribute to refinement of the State Soil Geographic Database (STATSGO) for all States and to the update of the Agricultural Handbook 296, Land Resource Regions and Major Land Resource Areas of the United States.

C. FS has adopted a national Hierarchical Framework of Ecological Units to facilitate an ecological approach to natural resource management. FS expects that involvement in a collaborative effort to develop a common interagency framework for defining ecological units will serve to enhance the coordination of multi-agency plans and ecological assessments. Further, the collaborative effort will enhance resource management partnerships, enable more effective and efficient application of research results, sharing a data and spatial information with others, and improve quality of technical assistance to State and private forestry interests.

D. BLM recognizes that in discharging- obligations for the management of public lands under their jurisdiction, the Agency has a need for information on the nature, distribution, and interrelationships of soil, vegetation, geology, and other biological and physical components of the environment that may contribute to and influence the health and sustainability of these lands.

E. USGS has a commitment to the development of scientifically credible, objective information on natural hazards, stream flow, and water quality, energy, minerals, geology, geography, map information, and digital cartographic data bases. Within the context of this commitment, the Agency

J. ARS will benefit from a common national framework for defining ecological units because this will provide a common basis for the coordination and delivery of natural resources and other ecologically sensitive technology to action agencies and research partners. Furthermore, this collaborative effort will help identify research to address enhanced resource management, the selection of ecologically sensitive technology partnerships, allow enhanced application of research results, facilitate the sharing of spatial and other similar data, and contribute to the overall quality of technology transfer efforts by ARS and in its collaboration with other Federal and State agencies and partners.

III. RESPONSIBILITIES

A. A common spatial framework for defining ecological units of the United States based on naturally occurring and recognizable features such as soil, geology, geomorphology, climate, water, and vegetation will be developed. Guides for this work will include the National Hierarchical Framework of Ecological Units (EcoMAP, 1993) developed primarily by the Forest service; the Land Resource Regions and the Major Land Resource Area (MLRA) framework (USDA Agriculture Handbook 296, 1981, revised 1984) developed primarily by NRCS; the EPA Ecoregion Framework (Omernik, 1995); and other references, es appropriate, depicting biological and physical components of the environment.

B. Development of a common spatial framework for defining ecological units will necessitate recognition of the differences and functions of the three existing guides listed under A above, and that commonality and refinement of these guides will be the basis for evolution of the common spatial framework and related data bases. signatory agencies will collaborate on a State-by-State and/or regional project basis using interagency standards and procedures until a set of common and joined ecological units is developed for the entire Nation.

C. As part of the initial and ongoing effort , maps of ecological units will be developed and published at common scales, along with text in an appropriate format. Projected scales are 1:3,500,000 for a national map, 1:1,000,000 for regional or State level maps, end 1:250,000 for more detailed maps. All cooperating agencies and key participants will be listed as authors on all published maps end descriptive materials. Any maps end interim products will be clearly marked with caveats as drafts or approximations, and the extent to which use end interpretations can be made for the given scale. Digital data sets in formats meeting available FGDC standards will be published.

D. Participating agencies will make final maps and association descriptions and digital data bases available to the public, nongovernmental organizations, and other government agencies.

IV. OROANIEATION AND FDNCTIONS

A. Signatory agencies will collaborate in the development of a common spatial framework for defining ecological units at all levels, as appropriate, to establish policy, develop technical guidelines, and assure consistency and quality of final products.

B. The following organizational structure, with each team consisting of representatives from each signatory agency of the MOU, will guide the interagency effort:

1. A National Interagency steering Committee, with primary functions to include: (a) development of strategic interagency policy and guidelines; (b) providing national coordination and guidance to the National Interagency Technical Team; (c) seeking priority support for projects from within respective agencies; and (d) ensuring that final products are available for dissemination.

2. A National Interagency Technical Team, with primary functions to include: (a) development of national standards, guidance, and procedures for mapping, descriptions, maps, and data bases; (b) providing technical oversight for the mapping effort; (c) coordination with State/Regional Coordinators to ensure consistency and quality; and (d) ensuring integration of regional products into the National Framework.

3. Agency State/Regional Coordinators, consisting of agency technical representatives most familiar with the specific geographic areas, with primary functions to include: (a) assembling and leading interdisciplinary agency teams; (b) implementing national standards and procedures; and (c) developing, coordinating and correlating the mapping, descriptions, and data bases effort on a State-by-State and/or regional basis, as appropriate, with other States/Regions and partners.

C. Other Federal and State agencies and conservation organizations will be encouraged to become partners or participate at the national, State, or regional levels, as appropriate.

V. FUNDING

This MOU defines in general terms the basis on which signatory agencies will cooperate, and as such, does not constitute a financial obligation to serve as a basis for expenditures. Expenditure of funds, human resources, equipment, supplies, facilities, training, public information, and expertise will be provided for by each signatory agency to the extent that their participation is required and resources are available.

VI. PERIOD AND TERMS OF MOU

A. This MOU shall become effective on the date of the last signature. The MOU will remain in effect for a period of five years, at which time it will be reaffirmed, if appropriate. Agencies not specifically named above may become participants by agreeing to the terms of this WOU, as stated, end by providing a separate and dated signatory page for incorporation (see addendum). The effective date of their participation shall be the date of their signature.

B. This MOU may be amended, extended, or modified through a" exchange of correspondence and upon full agreement with all signatory agencies.

VII. PROVISION

All activities under this MOU will be in compliance with the Drug Free Workplace Act of 1988 (Public Law 10-690, Title V, subtitle D).

VIII. AUTHORITIES

This NOU is entered into under the following authorities:

A. All Agencies: The Economy Act of June 30, 1932, as emended (P.L. 97-258, 31 U.S.C. 1535-1536).

B. NRCS - The Soil Conservation and Domestic Allotment Act of April 27, 1935 (P.L. 74-46, 49 Stat. 163, 16 U.S.C. 590a-f).

C. FS - The Forest and Rangelend Renewable Resources Planning Act of August 17, 1974 (88 stat. 476) as amended by the National Forest Management Act of October 22, 1976 (90 Stat. 2949, 16 U.S.C. 1600-1614).

D. BLM - The Federal Land Policy and Management Act of October 21, 1976, (90 Stat. 2713, 43 U.S.C. 1737b).

E. USGS - Office of Management and Budget Circular A-16, a8 revised 1990.

F. FWS - The Fish and Wildlife Coordination Act of March 10, 1934, 48 Stat. 401, 16 U.S.C. Sections 661 et. seq. (P.L. 79-732). Fish and Wildlife Act of 1956 (16 U.S.C. 742a-d, 742e-j-2). Federal Land Management Act of 1976 (FLPMA), 43 U.S.C. section 1701 et. seq.

G. NBS - Fish and Wildlife Coordination Act of March 10, 1934, 48 Stat. 401, 16 U.S.C. Sections 661 et. seq. (P.L. 79-732). Fish and Wildlife Act of 1956 (16 U.S.C. 742a-d, 742e-j-2). Federal Land Management Act of 1976 (FLPMA), 43 U.S.C. Section 1701 et. seq.; P.L. 94-579 (October 21, 1976) Section 307(a) Studies, Cooperative Agreements and Contributions (43 U.S.C. Section 1737 Implementation Provisions).

H. NPS - The National Park System Organic Act of August 25, 1916, 39 stat. 535, as amended.

I. EPA - Clean Water Act of June 30, 1948 (62 Stat. 1155, as amended, including Federal Water Pollution control Act Amendments of October 18, 1972 (86 Stat. 896). and the Water Quality Act of February 4, 1987 (101 Stat. 76); 33 U.S.C. 1251-1387.

J. ARS - Department of Agriculture Organic Act of 1862 (7 U.S.C. 2201, 2204); the Research and Marketing Act of 1946, as amended (7 U.S.C. 427, 1621); adn the Food Security Act of 1985 (7 U.S.C. 3318).

PAUL W. JOHNSON
Chief
USDA Natural Resources Conservation Service

DATE

JACK WARD THOMAS
Chief
USDA Forest Service

DATE

MICHAEL P. DOMBECK
Acting Director
USDI Bureau of Land Management

DATE

GORDON EATON
Director
USDI Geological Survey

DATE

ROBERT J. HUGGET
Assistant Administrator
Office of Research and Development
U.S. Environmental Protection Agency

DATE

ROGER KENNEDY
Director
USDI National Park Service

DATE

NRCS A-3A75-6-34

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WOLLIE BEATTIE
Director
USDI Fish and Wildlife Service

DATE

RONALD PULLIAM
Director
USDI National Biological Service

DATE

FLOYD P. HORN
Administrator
USDA Agricultural Research Service

DATE

NRCS A-3A75-6-34

Addendum: Agreement to Participate

MEMORANDUM OF UNDERSTANDING

RELATIVE TO

DEVELOPING A SPATIAL FRAMEWORK OF ECOLOGICAL UNITS
OF THE
UNITED STATES

AGENCY:

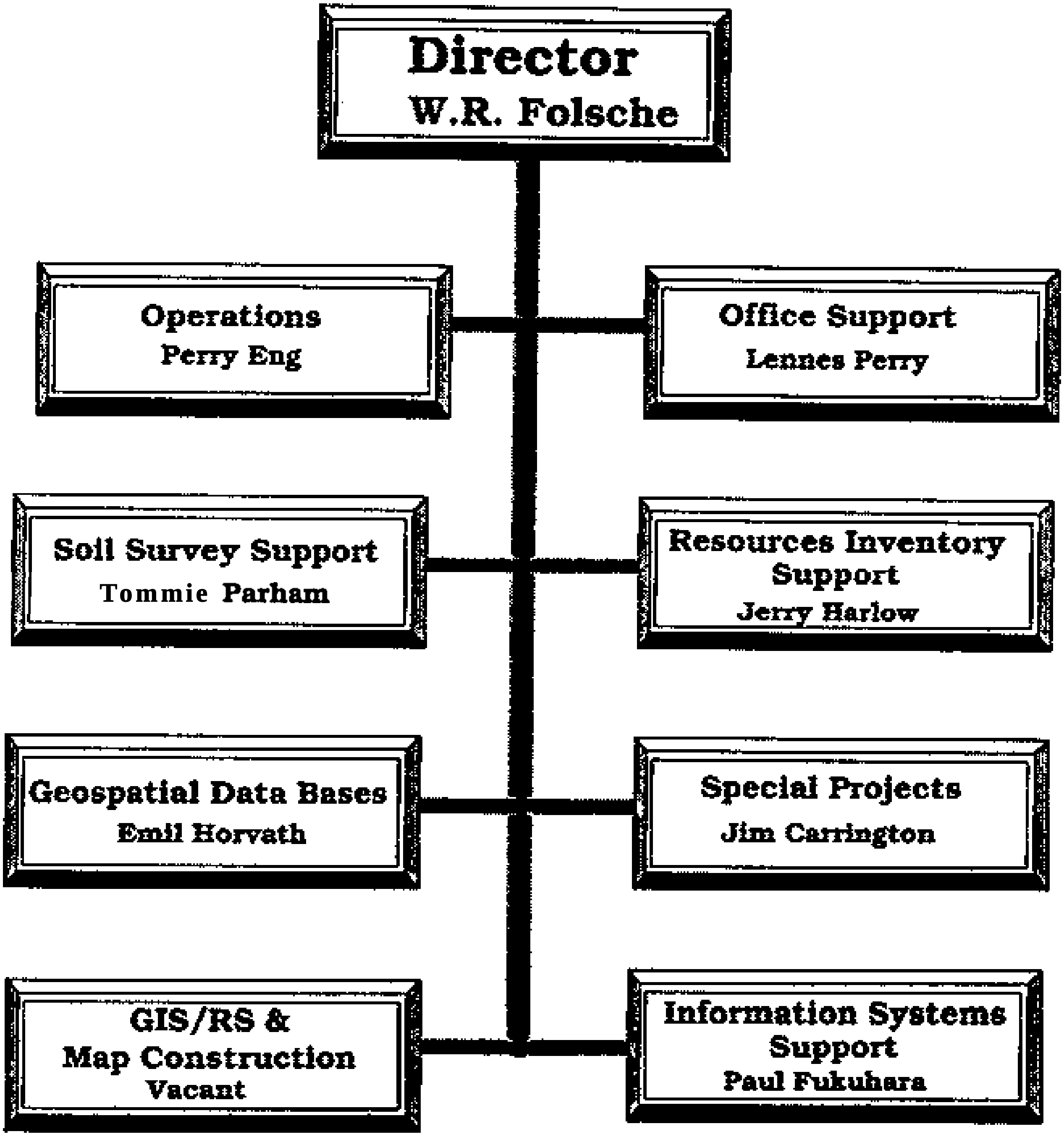
BACKGROUND AND BENEFITS (PART II):

AUTHORITY (PART VIII):

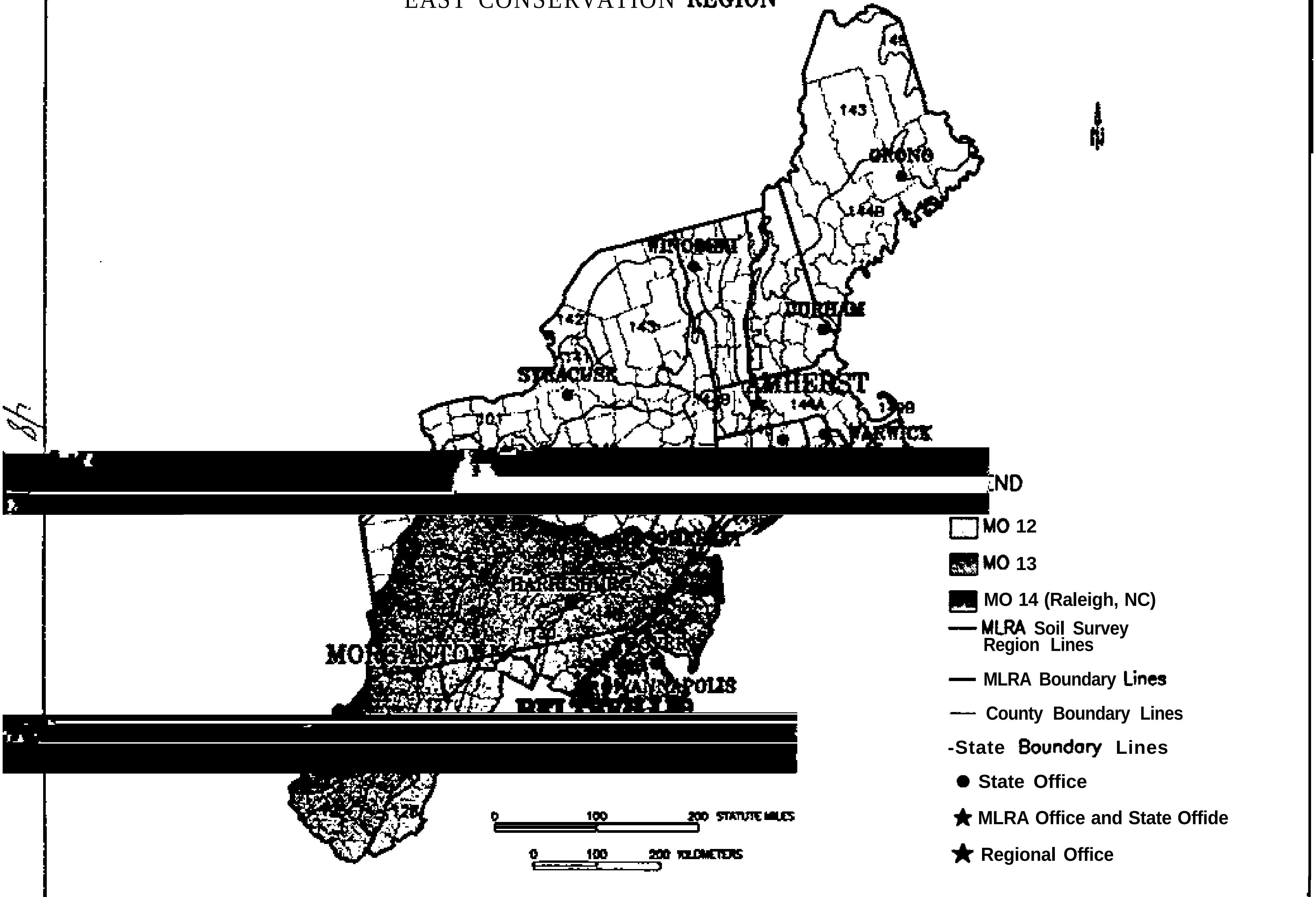
AGENCY CONTACT:

______________________________ ______________________
DATE

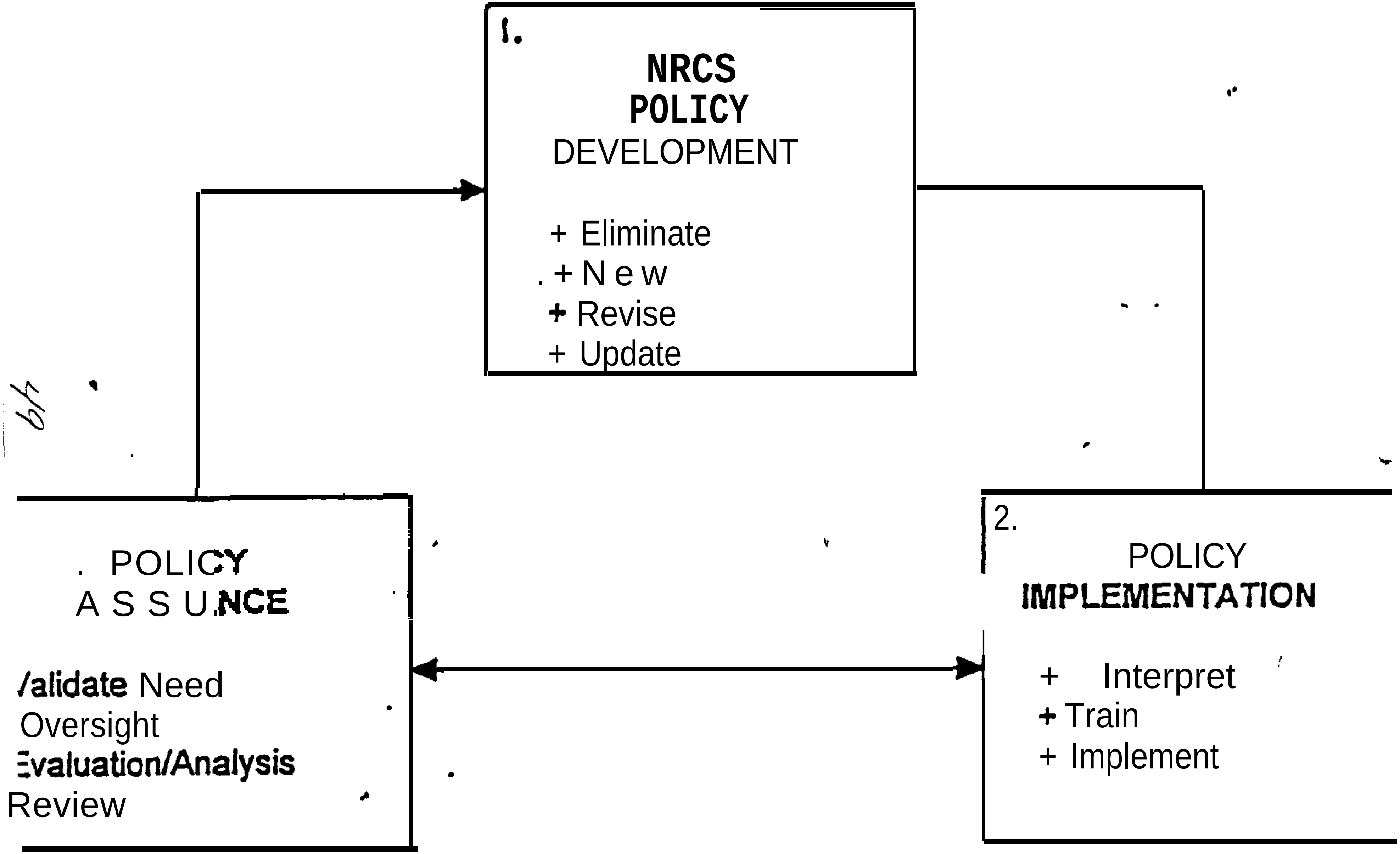
National Cartography & Geospatial Center



MLRA SOIL SURVEY REGIONS (MO) FOR THE EAST CONSERVATION REGION



SOURCE: Ag Handbook 296 1981, Major Land Resource Areas of the U.S.
Results of Soil Survey Division Reinvent Forum Jan. 10--13, 1995 Lincoln,NE



1.
NRCS
POLICY
DEVELOPMENT
+ Eliminate
+ New
+ Revise
+ Update
2.
POLICY
IMPLEMENTATION
+ Interpret
+ Train
+ Implement
POLICY
ASSU.NCE
/alidate Need
Oversight
Evaluation/Analysis
Review

East Reeion Reorganization:

- Increased the proportion of field staff from 58% to 80% by eliminating management and supervisory positions and moving more technical expertise to the field
- Reduced National Headquarters staffing by 50%
- Created a National Science and Technology Consortium to strengthen our technical capability at the field level and to ensure that our staff have access to new and emerging expertise and technology relevant to the needs of our customers
- Moved technical authority and responsibility from our National Technical Centers to our state operations to ensure that our programs are implemented with enough flexibility to address the needs of people and communities at the local level and to reduce costly technical reviews
- Created 3 interdisciplinary resource teams-- a New England, a Mid-Atlantic, and an Urban Conservation team-- to provide state-of-the-art interdisciplinary support to field personnel in delivery of service, technology transfer, training and quality assurance (2 Soil Scientists and 2 GIS Specialists are planned to be on these teams)
- Created 2 MLRA Soil Survey offices--Amherst, MA and Morgantown, WV
- Created 2 NRI coordination sites in conjunction with the MLRA Soil Survey Offices.
- Established the East Region Office with critical roles in multi-state and regional strategic planning to address natural resource issues; setting priorities with our local partners for the expenditure of conservation dollars; in developing partnerships among groups with like and diverse interests; in oversight and evaluation; and in streamlining administrative functions

Staffing in the East Region:

- There are presently 100 soil scientists in NRCS in the East Region:
  - 9 State Soil Scientists (2 have dual duties as MLRA Office Leaders)
  - 1 Soil Scientist, Regional Oversight & Evaluation
  - 10 State Office Soil Scientists (Statewide interpretations &data responsibilities)
  - 7 MLRA Office Data Quality Specialist Soil Scientists (MLRA regional correlation responsibilities)
  - 13 Resource Soil Scientists
  - 23 Project Leader Soil Scientists
  - 34 Soil Mappers
  - I Wetland Institute Soil Scientist
  - 1 Research Soil Scientist (NSSC--PA)
  - 1 IRT Soil Scientist
- About 11% of the positions are supported by reimbursable funds from sources outside of USDA
- There are 4 vacancies for Project Leaders, Resource Soil Scientists or Soil Mappers
- There are 2 Resource Soil Scientists that are District Employees
- There is a plan to add 300 entry-level technical specialists nationwide to NRCS in the next 2 years. Depending on need in the states and availability of applicants, at least 15% of new hires could be soil scientists.

Attached is a directory of all the soil scientists working for NRCS in the East Region. The list changes quarterly. As soon as the Regional Office is hooked up electronically, I will keep an updated list on the server.

Training

- NRCS field and state office soil scientists in the East Region continue to have a need for training in computers (particularly NASIS software), digital remote sensing, soil interpretations, wetland delineations and hydric soil characteristics. With water quality and soil quality being the 2 top resource issues in the East Region NRCS Strategic Plan, interpretations in these fields will need a focused effort.

Mapping Program & Technical Soil Services in the East Region

- There are 14 soil survey updates in progress in the East Region. (Some projects are multiple counties such as the 8 counties in Connecticut or 3 counties in New Jersey).
- There are 11 progressive soil survey projects, some including multiple counties,
- Projected acres to be mapped in Fiscal Year 19% are 1.86 million acres, This calculates to about 30,000 acres production per mapper per season (includes duties besides production soil survey)
- Projected acres to be digitized are 5.6 million or roughly 160 7 1/2 minute USGS quads, These digitized acres are to be SURRGO certified by the state soil scientists. There are plans to accelerate this effort nationally. This could shift regional priorities, personnel, and workload to accomplish recompilation of backlog.
- All state databases are projected to be converted to NASIS by January 1997.
- In the East Region, there was a total of $628,600 reimbursables to do production soil survey work (production mapping, recompilation, digitizing)

Farm Bill **and Shifting Program Emphasis**

- It is still too soon to project how the 1996 Farm Bill (Federal Agriculture Improvement and Reform Act of 1996) will affect Technical Soil Services activities in the East Region until the new rules are officially released in August 1996. My own speculation is as follows:

  - Sec. 384 repeals the current legal requirements for printing a specified number of soil survey reports. This opens the door for alternative products for soil survey publications such as CD-ROM interactive surveys that emphasize user interpretations. I hope that State Office Soil Scientists, Resource Soil Scientists, and some of the NCSS cooperators will start working in this direction for soil survey information dissemination.

  - Sec. 322 directs USDA to determine and certify wetland delineations on farmland. It allows the farmer more options to mitigate converted wetlands. Efforts in the East Region to train all field soil scientists in wetland delineation and hydric soil characteristics will continue. There will be more possibilities for resource soil scientist to work in wetland restoration and identification of areas suitable for mitigation banking.

  - Sec 332 &333 extends Conservation Reserve Program (CRP) and Wetland Reserve Program (WRP) until 2002. These programs will continue to need technical soil services to aid in identifying eligible HEL lands for CRP and wetlands or converted wetlands for CRP and WRP.

  - Sec. 334 establishes the Environmental Quality Incentives Program (EQIP). EQIP will put new emphasis on installing structural practices on livestock operations to control agricultural waste and improve water quality. Technical soil services will provide assistance for this program through on site evaluations of potential soil problems and interpretations of soils for leaching potential.

  - Sec. 352,386, and 387 reauthorizes Forestry Incentives Program and establishes a grazing lands program and wildlife incentive program. All 3 of these programs could use soil surveys as interpretive tools.

- With the closing of the National Technical Centers, regional soil interpretations are now the responsibility of the state soil scientists in coordination with each other and the IRTS. Institutes and the National Soil Survey Center. There is still a strong need for technology transfer among the Universities, NCSS, the NRCS Institutes, NSSC and the states in the soil survey discipline.

Return to our Home Page
Natural Resources Conservation Service

NATIONAL CARTOGRAPHY AND GEOSPATIAL CENTER

Fort Worth, Texas
W. R. Folsche. Director

The mission of the **National Cartography and Geospatial Center (NCG) is to** support the Natural Resources Conservation Service mission by providing technical leadership in cartographic and geospatial products. services, and tools.

NCG provides primary support for the following:

- Soil Mapping, Publication, and Digitizing
- National Resources Inventory and Analysis
- Geospatial Database Development
- Digital Orthophotography
- Watershed Boundary Mapping and Digitizing
- Storage, Access, and Dissemination of Digital Data
- GIS Application Development
- Remote Sensing and GPS
- WWW
- Map Construction
- Aerial Photography

The NCG Technology Report provides information on our products, services, and technological advances.

Note: If your browser does not support tables, please use this link.

NCG Contacts	NCG Directory	NCG Organization	NCG Strategic Plan	WWW Resources	Comments

HARMONY
A PARTNERSHIP WITH A HEALTHY LAND

Return to the NRCS organizational listing.
http://www.ncg.nrcs.usda.gov/ncg.html
April 23, 1996

NATIONAL CARTOGRAPHY AND GEOSPATIAL CENTER
South National Technical Center, Fort Worth. TX
501 Felix Street, Building 23
P. 0. Box 6567
Fort Worth, Texas 76115-0567

Phone: (817) 334-5292
FAX: (817) 334-5469

3/96

SUBJECT	CONTACT (extension #,name)
Aerial Photography	3048 Christner 3049 McWilliams
ARC/INFO	3061 Nechero 3020 English 3080 Justice 3023 Griffin
Archiving Soils Maps	3043 Parham
Block Diagrams	3059 Hocker
Carto 19's (Order Control)	3034 Willis 3032 Eng
Climatic Data	3135 Prochnow
Compilation Materials	3049 McWilliams
Conservation Maps	3068 Darling
Conservation Practice Standards Coordination	3608 Rickman
Contracting (MF & Digitizing)	3094 Taylor
Contracting (Litho)	3055 Gaster
Data Dessimination	l-800-672-5559 3135 Prochnow 3020 English
DEMs	3018 Carrington 3017 Crabtree 3023 Griffin
DLGs	3080 Justice 3007 Fukuhara
Electronic Pubiishing	3067 Mattinson 3054 Massey
Global Positioning Systems (GPS)	3014 Rasher 3011 Hallbauer
GRASS - Fort Collins	(303) 282-1440

Hydrologic Units (11/14 digit)	TBD
Institute Liaison	
GLTI	3110 Harlow
NRIA	3110 Harlow
SQI	3043 Parham
SSI	3032 Eng
WLI	3028 Horvath
WSI	3009 Plunk
LTPlus	3017 Crabtree 3096 Whitney
Map Finishing.	3094 Taylor
Map Scanning/Digitizing	3027 Quinonez
MAPGEN	3058 Boyse 3169 A. Brown
National Centers Liaison	
NPDC	3028 Horvath
NSMC	3043 Parham
NSSC	3043 Parham
Nwcc	3028 Horvath
NRI/PSU Digitizing	3018 Carrington
Orthophotography	3049 McWilliams 3048 Christner 3023 Griffin
Photo Interpretation	3018 Rasher 3009 Plunk
QA Soils Data	3082 Owen
Remote Sensing	3011 Hallbauer 3023 Griffin 3009 Plunk
SSURGO Support (data entry/certification)	3082 Owen
STATSGO, SSURGO (technical support)	3008 Minzenmayer
Thematic Maps	3061 Nechero
TIGER data (Census)	3018 Carrington
Water Quality Modeling	3079 Holub
World Wide Web	3135 Prochnow 3076 Sibley

SOIL QUALITY INSTITUTE
Maurice J. Mausbach
Prepared for
Northeast Cooperative Soil Survey Conference
Burlington, Vermont
June 10-13, 1996

INTRODUCTION

Thank you for inviting me to your work planning conference. I will briefly discuss the structure and functions of the Science and Technology Consortium (STC) of which the institutes are a part, but will concentrate on the soil quality institute and a major project that we are working on with other partners in the STC.

Perhaps more than any one document or source the National Research Council (NRC) book entitled "Soil *and Water Quality: An agenda for Agriculture"* has raised the awareness of the importance of soil quality to the environment, agriculture, and the quality of life for future generations. The writers state that:

> *Protecting soil quality, like protecting air and water quality, should be a fundamental goal of national policy.*

The authors go on to state that soil and water quality are inherently linked and that protecting soil quality is the first step in protecting water quality. The NRC listed many challenges among which were the need to quantitatively define soil quality, to develop measurement and assessment tools, and to develop a monitoring system to track trends in the quality of the nation's soil resources. The authors of the report expressed concern that policies oriented to controlling erosion and maintaining productivity are too narrow and must be expanded to other aspects of soil such as salinity, compaction, acidification, and loss of biological activity.

Why did the NRCS establish a soil quality institute? One of the main reasons is that soil quality, soil condition, soil landscape integrity, and soil-plant interactions are essential considerations for the application of holistic-based assistance to the mission of the Natural Resources Conservation Service (NRCS). Soil Quality adds meaning to the NRCS vision, *"aproductive nation in harmony with a quality environment."* In addition, the NRCS, together with its partners, has three areas of expertise that provide a foundation for the development of the Soil Quality Institute (SQI):

(1) The National Cooperative Soil Survey Program provides the basic information on soil properties/interpretations, soil-landscape relationships, and geographic distribution of soils at three scales (SSURGO, STATSGO, NATSGO) as a base for evaluating soil quality;

(2) The National Resources Inventory provides the statistical sample basis for monitoring and assessing the state of the nation's soil resource and a database of previous assessments (trends) of soil quality. NRCS staff at all levels provide the expertise for conducting the assessment; and

55

(3) The technical assistance delivery system for private sector land managers is the most extensive in the Federal Government. This is accomplished by over 60 years of partnerships with Conservation District and experience in providing assistance to private land owners and operators on the protection of the soil resource.

SOIL QUALITY INSTITUTE

The Soil Quality Institute (SQI) was designed after consultation with individuals from potential partnering agencies including the Agriculture Research Service, Forest Service, Environmental Protection Agency, Universities, and NRCS staff. We contacted all of the 1860 and 1890 Land Grant Universities by letter to obtain their suggestions for developing the institute and to inquire about their research activities with respect to soil quality. We also worked with a team of about 15 NRCS individuals to develop the mission and function statements of the institute.

The soil quality institute is small with a total of 6 scientists at three locations. The staff was finally completed in mid February 1996. The staff includes:

- **Maurice J. Mausbach,** Director - Located at the National Soil Tilth Laboratory, Ames, IA. In addition to administrative and leadership responsibilities, I will function as a pedologist working with Agricultural Research Service (ARS) scientists, collaborate with the others in the STC on developing a system to monitor soil quality over time, and develop technical tools on soil quality for NRCS field staff.
- **Debra Hendriks, GIS** specialist - Located at the National Soil Tilth Laboratory, Ames, IA. Debra is a geologist who will utilize existing geographical information including soil survey to develop tools for evaluating soil and related resources concerns on a watershed basis.
- **Arlene Tugel,** Soil Scientist - Located with the Crops and Soil Science Department, Oregon State University, Corvallis, OR. Arlene will address landscape issues concerning soil quality and will work on the biological aspects of soil quality for western systems.
- **Cathy Seybold,** Soil Scientist - Located with the Crops and Soil Science Department, Oregon State University, Corvallis, OR. Cathy has a background in chemical movement in soils and will concentrate on the use of models in developing soil quality assessment tools.
- **M. Lee Norfleet,** Soil Scientist - Located at the National Soil Dynamics Laboratory, Auburn, AL. Lee will work on soil quality concerns, indicators and technical tools for soils in the southeastern U.S.
- **Mike Hubbs,** Agronomist - Located at the National Soil Dynamics Laboratory, Auburn, AL. Mike will develop tools for evaluating the effects of conservation and cropping systems on the quality of soil and related resources and the use of models in projecting the effects of conservation systems on soil quality.

The Soil Quality Institute will provide leadership in soil quality; build partnerships; and acquire, develop and transfer technology and information. We are focusing on issues that have national and multi-state applicability and are relevant to the field. We will seek out emerging technologies for future incorporation into the NRCS program. These technologies will be developed for multiple scales including on-site, watershed, and ecosystem/regional/national levels. Our shared vision, **"Soil quality as the foundation of a productive nation in harmony with a quality environment"** leads us to look at soil quality in the broadest sense possible.

The mission of the soil quality institute is:

> Cooperate with partners in the development, acquisition, and dissemination of soil quality information and technology to help people conserve and sustain our natural resources and the environment.

We have developed a business plan centered on the following initiatives for 1996:

1. Collaborate with other institutes, centers, NRCS employees, agencies and the research community on soil quality.
2. Determine customer needs and solicit feedback on our products.
3. Develop science-based tools and guidelines for assessing, inventorying, and monitoring soil quality (NRI, CTA, NCSS, etc. programs) at scales that include on-site (on-farm), watershed, and ecosystem/regional/national levels.
4. Develop resource management approaches that address the interaction of soil with other resources including water, air, plants, animals, and humans, and include cumulative impacts.
5. Enhance customer awareness of the importance of a healthy soil resource base.

This initiatives have been developed through feedback received at the soil quality and watershed science planning meeting at St. Louis last November. At this meeting, we received feedback from all levels in the NRCS and partners on products and assistance needed from the institutes. We have identified the following major products for this year:

- Initiate a soil quality/National Resources Inventory pilot study at various areas in the U.S.
- Review the literature on soil quality and provide an annotated list and summary of the literature to the field staff.
- Test the soil health kit developed by John Doran and the field methods of Bob Grossman with interested field staff.
- Develop educational materials on soil quality such as a primer on soil biology.
- Began developing tools to assess the effects of management systems on soil quality using the conservation practice physical effects (CPPE) matrix in the Field Office Technical Guide.

Most of the preceding information is available on our home page. You can access our home page either from the agency home page

PILOT STUDY - SOIL QUALITY/NATIONAL RESOURCES INVENTORY

The pilot study will evaluate soil quality measurements and interpretive indices using the scientific, spatial framework of the National Resources Inventory (NRI) sample database. The goal of the pilot project is to test the feasibility of sampling soils and measuring soil quality indicators at points within the NRI sampling framework. This includes development and evaluation of necessary protocols to monitor the status and changes in soil quality as a result of various land uses; and the development of a framework to assess soil quality and interpret the results. The pilot project evaluates a national application and adaptation of current research on indicators of soil quality.

Specific objectives are:

1. Test operational aspects, such as:
   - Soil quality indicators, their scope and applicability to the sample frame
   - Sampling design for estimation of soil quality indices over large areas
   - Plot design for soil quality measurements
   - Resource allocations necessary to incorporate soil quality measurements in NRI (personnel, equipment, laboratory, and budget requirements)
2. Develop a framework and process for interpreting the data to include:
   - Area wide interpretation of data by using the MLRA approach
   - Soil specific interpretation by testing a benchmark soil approach
   - Soil quality indices of soil quality
   - Application of interpretative models such as EPIC or CENTURY for projecting future trends from existing data and data collected at soil quality measurement sites
   - Assessment of seasonal variability of indicators
   - Assessment of within site variability of indicators
3. Develop a long-range plan for assessing and measuring soil quality in future NRI's and related resource inventories.
4. Develop interagency partnerships for measuring long term trends in soil quality.
5. Prepare prototype report

Scope:

The pilot study will be conducted in four Major Land Resource areas (MLRA's) of the country. Sampled MLRA's represent various major land uses, soils, and conservation and farming systems. The study in 1996 has two general approaches:

1. MLRA Wide Assessment of soil quality. Results will be interpreted by summarizing the effects of land use and conservation and farming systems over all soils in the MLRA. Approximately 100 Primary Sample Units (PSUs) will be drawn at random to represent each MLRA. This approach will be used in:
   - MLRA 9, The Palouse and Nez Perce Prairies located in eastern Washington and western Idaho
   - MLRA 105 Northern Mississippi Valley Loess Hills - Driftless area, located in northeastern Iowa, southeastern Minnesota, and southwestern Wisconsin

oil Series (benchmark soil) assessment of soil quality. A method to define the effects of land use and conservation and farming systems on the quality of a specific soil series will be assessed. The soil series selected will be representative of a larger group of soils that function similarly so that results for the study can be extended to other similar soils. Up to 100 points that are representative of the specified soil series will be randomly selected. The study areas include:

- MLRA 67, the Central High Plains in Colorado, Wyoming and Nebraska. The Ascalon soil will be used in the study and land use includes irrigated corn, alfalfa, sugar beets, and vegetables, dry land grains, and native short and mid grass range.
- MLRA 77, the Southern High Plains in Texas and Oklahoma. The Amarillo soil will be sampled in the study. The land use is irrigated crops, dry land grains and cotton, and range land.
- Possible additional area is MLRA 136, the Southern Piedmont, Virginia, North Carolina, South Carolina, and Georgia

Methods:

The initial sampling scheme includes:

- 100 Primary Sampling Units (PSU) per pilot study area or a total of 400 to 600 PSU's
- 2 points at each PSU will be sampled for a total of 800 to 1200 points. At each point two samples at different depths from the upper 25 cm of the soil will be sampled for a total of 1600 to 2400 soil samples.

The following measurements are planned:

Soil Quality Indicator	Responsible Unit
Root restricting layers	Field Team
Landscape position (site characteristics)	Field Team
Pedon description soil classification	Field Team
Land cover/use	Field Team
Tillage	Field Team
Relative weed density	Field
Weed species present	Field
Conservation/farming system (residue conditions)	Field
Bulk Density	Field (laboratory - NSSC)
Organic C and N	NSSC/partner laboratories
CEC	NSSC/partner laboratories
Extractable Al and bases	NSSC/partner laboratories
pH	NSSC/partner laboratories
Texture (clay, silt, sand %)	NSSC/partner laboratories
Electrical conductivity, SAR	NSSC/partner laboratories
Aggregate stability	NSTL/Partner laboratories
Potentially Mineralizable N	NSTL/Partner laboratories
Microbial biomass	NSTL/Partner laboratories
Basal respiration	NSTL/Partner laboratories

Total and active bacteria and fungi*		Oregon State
VAM root colonization*		Oregon State
Nematodes*		Oregon State
Protazoa*		Oregon State

Proposed soil quality evaluation framework

Soil Quality is defined as:

The

cycling and supply requirement of soils is much different for intensive corn and soybeans as compared to grazing lands.

Natural Resources Conservation Service

Soil Quality Institute

Business Plan
FY-96

February 29, 1996
Revised March 11, 1996

Message from the Soil Quality Institute (SQI) team

We, the members of the SQI team, are enthused and willing to face the challenge of integrating soil quality/health into the programs of NRCS and into the stewardship ethic of all who use our natural resources. Together we have developed a shared vision and mission to help guide us. We have begun to scope market needs, resource concerns and emerging technologies. We anticipate that the soil quality needs of NRCS will be as diverse and complex as the soils, land uses, climates and publics of the country. Together we have identified five initiatives to focus our objectives and frame our business plan. We have only just begun this journey; we ask for and will conscientiously accept your comments, suggestions, criticisms, compliments, encouragements and partnerships.

Soil Quality Institute Business Plan

The Soil Quality Institute will provide leadership in soil quality; build partnerships; and acquire, develop and transfer technology and information. The institute will focus on issues that have national and multi-state applicability and are relevant to the field. It will seek out emerging technologies for future incorporation into Natural Resource Conservation Service programs Technologies will be developed for multiple scales including on-site, watershed and ecosystem/regional/national levels. Our vision, "Soil quality as the foundation of a productive nation in harmony with a quality environment" will lead us to look at soil quality in the broadest sense possible.

Mission

Cooperate with partners in the development, acquisition and dissemination of soil quality information and technology to help people conserve and sustain our natural resources and the environment.

Initiatives - FY 96

The following initiatives build the framework for the activities of the Soil Quality Institute. The desired outcomes discussed in the business plan reflect both short term and long term goals. Action items for FY % that will contribute to the fulfillment of the outcomes are described for each initiative.

1. **Collaborate with other institutes, centers, NRCS employees, agencies and the research community on soil quality.**

2. **Determine customer needs and solicit feedback on our products.**

3. **Develop sciencobased tools and guidelines for assessing, inventorying, and monitoring soil quality (NRI, CTA, SS, etc programs) at scales that include on-site (on-farm), watershed, and ecosystem/regional/national levels.**

4. **Develop resource management approaches that address the interaction of soil with other resources including water, air, plants, animals, and humans, and include cumulative impacts.**

5. **Enhance customer awareness of the importance of a healthy soil resource base.**

INITIATIVE 1. Collaborate with other institutes, centers, NRCS employees, agencies and the research community on soil quality.

Background: The Soil Quality Institute is located in Ames, Iowa, Auburn, Alabama, and Corvallis, Oregon. This distributed structure facilitates our access to the research community as well as to the many regional soil quality concerns of this country. Potential partners at these three locations include Iowa State University, Auburn University, Alabama A&M, Tuskegee University, Oregon State University, Agricultural Research Service (National Soil Tilth Lab, National Soil Dynamics Lab. National Forage Seed Production Lab). US Forest Service, Environmental Protection Agency, and Cooperative Extension Service.

Desired Outcomes: Our desired outcome is a strong collaborative relationship with the research community that fosters reciprocal expression of technology and research needs and partnership ventures in technology acquisition, development and transfer. We will have an expanded network that reaches beyond the communities of Ames, Auburn and Corvallis to address the wide variety of soil quality needs that reflect the diverse and complex nature of soils, climates, land uses and cultures in this country.

Action Items	Who	Target Date
A. Network with soil quality researchers and practitioners.		
1. Present paper on National Resources Inventory sampling and assessment for soil quality at the annual meetings of the Soil Science Society America.	Mausbach Seybold	10/96
2. Present paper at the International Soil Quality Symposium in Australia.	Norfleet	4/96
3. Make presentations on soil quality and the Soil Quality Institute to local, state and regional groups.	All	9/96
4. Participate in National Cooperative Soil Survey Work Planning conferences and subcommittees.	Seybold	6/96
5. Continue to participate on the Soil Science Society of America committee on soil quality.	Mausbach	9/96
6. Attend conferences such as Ecology Society of America, STEEP, Beltwide Cotton Conference.	All	9/96
B. Develop collaborative relations with other institutes and centers; identify potentials to share resources and opportunities to partner in technology acquisition and development.		
1. Participate with other institutes in workshop on collaboration.	All	1/96
2. Co-host joint information and planning meeting with the National Soil Survey Center.	All	2/96
3. Identify potential partnerships in arid regions of the country to address soil quality concerns on irrigated lands.	Tugel	6/96

Initiative 2. Determine customer needs and solicit feedback on our products.

Background: Successful integration of soil quality into the programs of NRCS and with the land management systems of the country is dependent upon meeting customer needs. Our internal customers include NRCS employees who provide technical assistance, those who inventory the status and bend of our resources, those who survey soils and develop soil databases, and those who develop policy and programs. Our customers outside of NRCS include conservation districts, land owners and managers, extension agents, and resource management consultants, as wel! as many state and federal agencies.

Desired Outcomes: Our desired outcomes include effective communication ethics and networks between the Soil Quality Institute and our customers that facilitate the identification of customer needs, encourage the mutual sharing of innovative solutions to resource problems, and provide feedback loops to i- quality products.

Action items	Who	Target

Initiative 3. Develop sciencebased soil quality tools and guidelines for assessing, inventorying, and monitoring (NRI, CTA, SS, etc programs) at scales that include on-site (on-farm), watershed, and ecosystem/regional/national levels.

Background: As we approach the 21st century, resource managers, policy makers and stewards of the land are asking questions about the status and trends in the quality of our soil resource base. Our customers want to know the current status or condition of the soil, whether the status is improving or declining, what the status should be, and where the impaired soils occur in this country. NRCS currently has incomplete information to answer these questions. Techniquea, tools and monitoring programs to answer these questions are needed at multiple scales to answer the questions that are relevant on-site, for a watershed, and for the ecosystem/regional/national levels.

Desired Outcomes: We envision some method(s) of measurement for soil quality that will identify potential or desirable levels of certain features in healthy soils. Appropriate field tools and techniques as well as laboratory analyses will be identified for use in national resource inventories, soil survey, and inventory and assessment phases of conservation planning Assessment and monitoring guidelines for interpretation of inventory data will accompany field tools and inventory protocols.

Action Items	Who	Target Date
A. Develop indicators, measures of soil quality and procedures to assess the condition of the soil that are applicable to *on-site*, watershed and ecosystem/regional/national scales.		
1. Define soil quality and the concept of reference condition.	Seybold	9/96
2. Write concept paper on quantification of soil quality and present al symposia on carbon sequestration.	Seybold Mausbach	9/96
3. Test the soil quality indicators field kit.	Seybold Norfleet McQuaid	9/96
4. Evaluate possible criteria for development of a soil quality region map of the US using GIS analysis techniques.	Hendriks Mausbach Norfleet	9/96
5. Collaborate on project to identify indicators of soil quality on alternative vegetable cropping systems and test field kit.	Seybold	9/98
6. Evaluate alternatives and develop method to define soil quality reference condition and potential for soils in the 19% NRI pilot.	Norfleet Seybold	12/96
B. Develop inventory and monitoring protocols for soil quality in order to determine the status and trends of the health of the soil resource.		
1. Collaborate with NRIA institute, NSSC. ARS on a 19% pilot to incorporate sampling and assessment for soil quality into the National Resources Inventory.	Mausbach Seybold Norfleet	6/96
C. Develop strategies with the NSSC to evaluate soil quality parameters for inclusion in soil survey activities and databases.		
1. In collaboration with the NSSC. assist OSU soil ecologist with the development of a soil food web database.	Tugel	9/96

Initiative 4. Develop resource management approaches that address the interaction of soil with other resources including water, air, plants, animals, and humans, and include cumulative impacts.

Background: Conserving and enhancing soil quality are fundamental first steps to sustained long-term resource use that is in balance

Initiative 5. Enhance customer awareness of the importance of a healthy soil resource base.

Backmound: Soil health and soil quality are reflected in the time honored concept of stewardship for the land. Now more than ever, it is important to manage our soil resource wisely. Global population growth, improving economies, and freer trade will increase the market for American products. These increased demands on our soil to produce may place marginal or fragile lands at risk. and result in abusive management of existing highly productive lands.

Desired Outcomes: Informed soil quality practitioners, knowledgeable policy makers, and an enlightened public are a part of the country's future and fundamental to the attainment of the soil quality goals of the agency.

Action hems	Who	Target Date
A. Review available research in soil quality to acquire information on the science of soil quality aod to identify research that can be converted into practical applications.		
1. Review literature on soil quality and prepare a written summary for distribution.	All	9/96
B. Develop and transfer information on soil biology **and** its role in soil quality.		
1. Develop a primer on soil biologic components and their significance to soil quality in collaboration with a partner soil ecologist.	Tugel Seybold Hubbs	9/96
C. **Develop and transfer soil** quality information **and training materials.**		
1. Develop Soil Quality Fact Sheets with NSSC and ARS.	All	2/96
2. Develop and distribute a brochure on the benefits of soil quality.	Mausbach	3/96
3 Prepare an information packet on soil quality and the SQI for NRCS and partners.	Tugel Hendriks	9/96
4. Prepare a poster display on the Soil Quality Institute.	Mausbach Tugel	10/95
5. Develop marketing strategies for soil quality awareness	Tugel	9/96

(REVISION-JAN. 2, 1996)

ON-FARM MEASUREMENT OF SOIL QUALITY INDICES -

BULK DENSITY, SOIL WATER CONTENT, WATER-FILLED PORE SPACE, EC, pH, NO_3-N, INFILTRATION, WATER HOLDING CAPACITY, AND SOIL RESPIRATION

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SOIL QUALITY EVALUATION SITE DESCRIPTION

SITE

OVERVIEW OF SOIL QUALITY SAMPLING

1) The major intent of initial sampling is to *screen* management sites to identify which soil characteristics are the most important determinants of soil quality as related to soil productivity and environmental quality. Thus, it is neither prudent nor practical to sample each site exhaustively in this initial screening. However, for row crop situations, soil sampling and placement of the infiltration rings and respiration chambers should be done such that the major effects of tillage, residue management, fertilizer placement, and machinery traffic patterns will be accounted for and evaluated. Thus, placement of cylinders in row and inter-row locations (also wheel track and non-wheel track) should be done to assess the effects of varying management.

2) To maximize relevance of information obtained, comparison between varying management and sites, and facilitate interpretation of results, soil respiration should be measured before and after soil wetting at each site where infiltration is run. A pre-irrigation soil water content and bulk density are obtained in areas adjacent to the irrigation rings through use of a small sampling tube. If the soil is too hard or stony to use the tube the hand trowel can be used to excavate a hole 3" deep (7.6 cm), taking care to not compact the soil surrounding the hole. The volume of soil removed is then determined by lining the hole with plastic wrap and measuring the volume of water it will contain using the 140 ml gas sampling syringe to add the water. Soil bulk density can be calculated from the dry weight of soil occupying this volume. The soil in the tube or that removed from the hole, is then mixed and a subsample (measured scoop) used for in-field analysis of electrical conductivity, pH, and NO_3-N as described in detail later. The remaining sample is then stored in a plastic bag for determination of soil weight and water content later (remember to add in weight of scoop of soil used in field analysis). The rest of this sample can then be sent to the laboratory for analysis of soil texture, total organic C & N, microbial biomass, and potentially mineralizable N.

3) Since only the surface 3 inches (7.6 cm) of soil for a given management system is evaluated in the soil quality screening test it is also wise to take a composite sample of 6 to 8 cylindrical soil cores to a foot depth (30.5 cm) with a soil core sampler. These cores are randomly sampled within specific areas of each management situation which is being evaluated. These cores can be sectioned into O-3, 3-6, and 6-12 inch depth increments and saved in sealed plastic bags for later analysis of water content, ES., pH, NO_3-N, Total organic C & N, microbial biomass, soil texture, and potentially mineralizable N. If carefully taken and sectioned, these cores can also be used to estimate soil bulk density using the calculated volume of soil contained in each core, as

determined by the inside diameter of the auger coring tip, and the oven-dry weight of soil sampled.

4) Specific Sampling Schedule

a) Install infiltration rings to a 3" depth in the field and measure the initial soil respiration before wetting the soil. (For two rings, it will take about 40 minutes to complete this phase).

b) Next, take the Infiltration measurement for the first inch (2.54cm) of water which is added. This requires about 10-15 minutes for two rings but time for infiltration may vary from less than a minute to over 1 hour. Irrigation with a second inch of water can be done as soon as the first inch has infiltrated and the time has been noted. Need for this second irrigation is determined by the soil water content at time of first irrigation. If soil was already wet and became saturated after the first irrigation, the second irrigation is usually unnecessary unless a 'ponded' infiltration rate is needed. Use your best judgment.

c) During the time of respiration measurement or after irrigation, soil samples for other soil quality measures are taken using small tube or a trowel to sample soil adjacent to the infiltration rings. During this time, soil cores from a larger area can also be taken to a depth of 30 cm and cornposited by selected depth increments, if desired. A deep core (1-1.5 m) can also be taken with a soil auger during this time to identify depth of topsoil, depth of rooting, soil textural changes, evidence of compacted layers, and presence or absence of carbonates.

d) A post-irrigation respiration measurement is made at least 6 hours, but preferably 16-24 hours, after soil wetting. During this time, soil in the infiltration ring is protected from rain or evaporation losses by capping the ring loosely with a respiration chamber lid. After the respiration measurement, soil from the infiltration ring is then sampled for water content, bulk density, and field water-holding capacity (which is equal to the soil water content 16 to 24 hours after the soil is saturated with water).

SPECIFIC STEPS IN TAKING SQ SAMPLES

1) Select 'representative' areas in field from which to sample.
- If tillage or residue management are important features of the present management you may want to set up comparisons for row and interrow locations which may vary considerably for tillage and residue management and wheel traffic.
- A 1/8 inch diameter brazing rod can be used to 'probe' the surface soil in different areas to identify compaction areas which should be assessed separately.

2) Soil Respiration Measurement:
- Install infiltration ring (beveled edge down) to 3" depth in soil using wood block and hand sledge. Check depth using line marked 3" up on ring & distance from top (2")
-Cover infiltration ring with lid and note time.
- After 1/2 hour, install soil thermometer into soil through lid of chamber, and draw 100ml of headspace sample (do this over about a 15 second time period) through an 'opened' 0.1% CO2 Draeger gas detection tube using the 140 ml syringe for suction. (The detection tube is opened by using the hole drilled in the syringe plunger handle to break off each end of the tube. The detection tube is connected to the chamber on its intake end by a piece of latex tubing and needle inserted through the rubber septum on the chamber lid and on the other end is connected to the syringe with another piece of latex tubing. This must be assembled such that the arrow on the side of the detector tube is pointing towards the syringe).
-Read CO2 as % by volume off the N=1 scale (100ml) of the Draeger Tube as indicated by the furthest advance of a violet color change down the tube. If the advancing color line is not parallel with the gradation lines, 'guesstimate' it's average position. Record soil temperature and % CO2 at time of sampling.
- A post-wetting measurement of soil respiration should be repeated at least 6 hours but preferably 16 to 24 hours after irrigation as described in section 3.

3) Soil Infiltration measurement
- Gently firm soil on surface around inside wall of infiltration ring if disturbed during installation of the ring.
- Lie inside of ring with handiwrap so that the soil is completely covered.
- Add 444 ml distilled water (equal to 1" or 2.54 cm of water) from calibrated pint bottle.
- Measure and record distance from top of water surface to top edge of ring if you use this ring for measuring soil bulk density or soil respiration.
-Pull handiwrap out of container and record the time it takes for the 1" of water to infiltrate the soil (end time is when the soil surface is just glistening).
- If the soil was not saturated after adding the first inch of water you should add a second inch of water and record the time for infiltration.
- Soil bulk density and water holding capacity can be measured by taking the wet weight of soil and water content of soil in the ring 16 to 24 hrs after the last wetting.
- Aluminum tubes work well for taking these samples in wet soil. Push and rotate the tube to a 3" depth in soil and measure distance from soil surface to lip of tube, it should be 2" if properly installed. Lift the large ring out of the soil with a shovel or by digging a trough with a trowel and undercutting 1/2 to 1" below ring. Pivot ring on its side, cup one hand over top of the tube to prevent soil loss, push the tube up and out of the ring of soil, invert the tube, and trim excess soil flush with tube bottom with a knife. Remove the soil in the 3" segment of the tube (volume equals 324 ml or cm3) and place in a sealed plastic bag for weighing and determination of water content (which at this point is equal to the field water-holding capacity) at a later time.

4) Soil water content, soil bulk density, EC, pH, and Soil nitrate using small tubes.

- Press tube into soil to a 3 inch depth as marked by line scribed on outside (if no fluffing or compaction occurred, the distance from upper can lip to soil surface should be 2").
- Carefully lift tube out of soil with a shove1 or trowel, rub excess soil from outside of tube with a gloved hand, then cover top with hand and invert tube to enable trimming excess soil from bottom with a flat bladed knife.
- Dump soil into a plastic bucket and mix thoroughly.
- Take a subsample of soil (leveled measure scoop) and place remaining soil in a sealed plastic bag to determine weight of soil and soil water content at a later time.
- Transfer scoop (29.5 cm3 coffee measure) of mixed soil to a 120 ml (4 oz.) plastic bottle.
- Add a level scoop of distilled water.
- Cap plastic bottle and shake vigorously 25 times.
- Let the soil/water mixture in the bottle stand for 5 minutes.
- Open bottle and measure Electrical Conductivity in topmost solution with standardized EC pocket meter. (Divide reading on display by 10 to get reading in mmhos/cm)
- After reading EC, take pH reading in the topmost solution using standardized Ph pen.
- Rinse pocket meters with distilled water after use.
- Filter soil/water mixture through Whatman #5 paper folded to nest in a funnel.
- Catch extract in a test tube or catsup cup, then transfer 1 or 2 drops to an AquaChek nitrate test strip pads with an eyedropper. Compare nitrite test pad to color chart on bottle after 30 seconds; after 60 seconds compare nitrate test pad to color chart and record NO_3-N value for the extract as ppm. Estimate results if color falls between two color patches. This value is the Nitrate-N concentration in the extract which approximates the concentration in soil (ppm or µg per g) since a 1:1 soil to water dilution was used. A more precise method of calculating soil nitrate concentration is described in the calculations section. If the NO_3-N concentration exceeds the highest scale (50ppm) the sample can be diluted with distilled water using the eye dropper for measurement.

  Example: 1 volume of 100 ppm extract + 1 volume distilled water (mix thoroughly in catsup cup) will read 50 ppm on test strip.

CALCULATIONS:

Soil Water Content:

Use a microwave oven to dry soil for determining water content. Dry soil by placing sample (30 g or less) in a glass container and place in microwave for two four minute cycles at full power. Open microwave door and vent humid atmosphere in oven between cycles.

Soil water content (g/g) = $\frac{\text{(wt. of Moist soil wt. of Oven dry soil)}}{\text{wt. of oven dry soil}}$

Soil bulk Density:

Soil bulk density (g/cm^3) = $\frac{\text{Oven dry wt of soil}}{\text{volume of soil}}$ (Note 1 ml = 1 cm3)

Volume of soil = 324 cm3 for 3" of small tubes or 1333 cm3 for 3" of large rings.

Oven dry wt of soil = (weight of moist soil weighed in field)/(1+ decimal water content)

Soil water-filled pore space = $\frac{\text{Volumetric water content}}{\text{Soil porosity}}$ = $\frac{\text{(soil water content x soil bulk density)}}{\text{(1- (soil bulk density/ 2.65))}}$

(One g of water has a volume of 1 cm^3)

75

Note- Aerobic activity of plants and microorganisms increases with increasing water content up to 0.60(60%) WFPS. Above 0.80(80%) WFPS . . .

denitrification predominate and gas diffusion into and out of the soil is restricted such that soil respiration measurements are unreliable.

Estimated Pounds/acre soil nitrate **N=**

(ppm extract **NO_3-N**) x (cm depth of soil **sampled/10**) x soil bulk density x **0.89**

(Note- 1 inch equals 2.54 cm)

A more accurate estimate for soil nitrate content can be obtained using the exact weight of dry soil contained in the extraction scoop as calculated from the soil water content. In this case the

exact ppm soil **NO_3-N** = **(ppm extract NO_3-N)** x **(volume** of water in **extract & soil)** / dry weight of soil extracted

where: dry weight of soil extracted = (weight of soil in scoop) **/(1+** soil water content)

volume of water = 29.5 + (dry weight of soil x soil water content)

Exact Pounds/acre soil nitrate N=

(exact ppm soil **NO_3-N**) x (cm depth of soil **sampled/10**) x soil bulk density x 0.89

(Note- 1 inch equals 2.54 cm)

Soil Respiration **(lbs** C/Acre/day):

For Large Rings (5" tall) = PF x TF x **(%CO_2-.035)** x 116.4 (2" can headspace = 889 **cm^3**)

PF = Pressure factor = (Inches of Mercury, raw barometric pressure) / (29.9 inches of Hg)

(This adjustment factor is only needed at high altitudes where elevation > 3000 feet)

TF = Temperature factor = (degrees C soil temperature at sampling + **273)/** 273

(This is equal to 1.09 at a soil sampling temperature of 25 degrees C)

Respiration rate can serve as an indication of the rate of decomposition of recently incorporated cover & green manure crops or crop or animal residues as well as serving as an indicator of soil function and the adverse effects of various management practices. It should be noted, however, that soil respiration is sensitive to soil wetness and temperature. Comparisons in the field can be put on a comparable basis for different water or temperature conditions with the following relationships:

Between 15 and 35 degrees C, Biological activity generally doubles with each 10 degree Celsius rise in temperature. Therefore respiration rates measured at different temperatures should be adjusted to a common temperature, for example 25 C, before being compared.

For **meas.** temps. **(T_M)** of 15 to 25C : Respir. at 25C = **(Repir.** at TM) x (1 + (25 - TM)/ 10)

For **meas.** temps. **(T_M)** of 25 to 35C : Respir. at 25C = (Repir. at TM) /(1 + (TM - 25)/ 10)

Likewise biological activity in soil will increase with soil water content until a point is reached where higher water content interferes with soil aeration and the activity of oxygen requiring organisms (both plants and microorganisms). Our research indicates that the activity **of** oxygen requiring microorganism.5 (majority of soil organisms) increases in a consistent manner with increasing soil water content above 0.30 (30%) Water-filled pore space (WFPS) and reaches a maximum at **0.60 (60%)** Water-filled pore space. Further increases in water content above **60%** WFPS result in a decline in measurable respiratory activity to 40% of maximum at 0.80 **(80%**) WFPS. To compare readings at different water contents calculate the Non limited respiration rate at 60% **WFPS**:

Between 30 and 60% WFPS = Measured respiration rate x **(60/** measured **%WFPS)**

Between **60** and 80% **WFPS** = Measured respiration rate / [(80 - %WFPS) • 0.03) + 0.4

= Measured respiration rate I [2.8 - (0.03 x measured % WFPS)]

Test Kit EQUIPMENT Inventory-

&z?)	Supplier	Cost
1 - Tape measure (6'), Stanley	Wal-Mart	$4.00
2 - Dinner & Butcher knife, tablespoon	Home or Thrift Stores	$1.00
3 - Garden trowel	Heavy Duty	$5.00
4 - notebook, pen, marking pen	Retail stores	$2.00
5 - Small calculator (Ex. TI-503)	Wal-Mart	$4.80
6 -Calibrated scoop (29.5 ml)	Wal-Mart/ K-mark	$ 2.00
7 - 1-qt Zip lock storage bags (25)	Grocery Store	$ 2.25
8 - Deionized or Distilled water (gal)	Grocery Store	$ 0.90
9 - Squirt bottle	Whatman or Fisher	$ 2.00
10- Four 120 ml plastic vials for shaking soil or making standards		NC
11- Electrical Conduc. Pocket meter	Whatman (p-sensor 4)	$45.00
0.01M KCL standard (1.41 dS/m) for EC meter (reads 14 on #4 meter)		NC
12- Screwdriver for calibrating meters	Hardware or make	$2.00
13- Standard pH Pocket meter w ATC	Whatman	$49.50
(pH 4, 7, and 10 pH standards)		NC
14- pH 7.0 buffer (10 capsules)	Whatman	$7.00
15- Aqua Chek nitrate-N test strips (25)	Spectrum technologies	$14.00
16- Whatman #5, 12.5 cm filters (100)	Whatman	$13.00
17- 65 mm Nalgene funnels (2)	Whatman	$ 3.30
18- 8 catsup cups for catching extracts & diluting samples		NC
19- Two eyedroppers or transfer pipettes		NC
20- 140 ml syringe, tubing, & needles for gas sampling,	Medical Supply	$ 5.00
21- 0.1% CO2 detection tubes (10)	Draeger Supplier	$34.75
22- Soil thermometer (-10-100C)	Whatman (197C0138)	$11.50
23- Two, Infiltration rings- 5" tall & 5 7/8 in (14.92cm) cut from Al irrig. pipe volume of 2" segment of ring = 889 cm3.		$4.00
24- Two ring lids (#10 can) for respiration chamber + stoppers;		NC
25- 2 lb hand sledge	Surplus store	$ 4.00
26- 8" long hardwood 2X4"	Scrap pile	NC
27- Two one Pint plastic pop bottles (mark at 444 ml)	Recycle	NC
28- 12" wide roll of Handy Wrap.	Grocery Store	$1.75
29- 2 Aluminum soil sampling tubes (3" dia. x 5" length) for measuring bulk density.	Irrrigation or plumbing Supply	
30-		

Catalog No. ______ Date
9578-3

Lincoln NE

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7- Miscellaneous Supplies

Supplier: Ben Meadows and Co.
3589 Broad Street
Atlanta, GA 30341

Phone order: (800) 2416401; Technical (800) 2416401; FAX order (800) 628-2068

The following items came from the 1994-95 Ben Meadows sales Catalog

Catalog #	Pg#	Item & Description	Date
220100	173		
220110	173		

Update: **11/28/94**

	DATA SHEETS for SOIL QUALITY ESTIMATIONS in the FIELD, USING USDA-ARS SOIL QUALITY TEST KIT									
	(Measurements in "bold" type done in field)				**LOCATION=**				**SAMPLING DATE=**	
							SOIL SERIES=			
	1) SOIL RESPIRATION at INITIAL WATER CONTENT (1/2 hour incubation time)								Soil Porosity	
	Treatment	**Ring or Can**	**Inches of**						1 -	
	/ Area	**CAN SIZE**	**head Space**	**Start time**	**End time**	**Soil °C**	**%CO2(n=1)**	lbs C/A/d*	(SBD/2.65)	WFPS*
1										
2										
3										
4										
-										
6										
	'Calculations: Large **ring = (" HS/2")** x PF x [(Soil **°C +273)/273]** x **(%CO2-0.035)** x 116.4 **= lbs CO2-C/A/d**									
	PF =		**PF =** Pressure Factor = 'raw' barometric pressure Inches Hg / 29.9 in (H2O CONTENT & SBD FROM PART 3)							
			WFPS= (Soil H20 content X SBD)/(1-(SBD/2.65))							
	2) **INFILTRATION** TIMES FOR 1" H20.									
	Treatment	Ring or Can	" above	**FIRST INCH OF**	WATER	1st INFIL.	INFILTRATION OF SECOND 1' **H2O**			2nd **INFIL.**
	/ Area	**CAN SIZE**	**1"** water	**Start time**	**End time**	T1ME(MIN.)		**Start time**	**End time**	**TIME(MIN)**
'										
2										
3										
4										
5										
6										
	3) **SOIL WATER STATUS & BULK DENSITY- INITIAL** WATER **CONDITIONS**							D	Soil H20	Soil Bulk
	Treatment	**Wet Soil** +	Wt. of wet	Weigh Dish	Wet **Soil+T**	**Dry** Soil + T	**(W+T)-(D+T)**	Dry **Soil** Wt.	Content, c/g	Density
	I **Area**	**bag, g**	Soil'. g	Tare, g **(T)**	**(W+T),g**	**(D+T),** g	g of H20	**(D+T)-T**	g **H2O/D**	**g/cm3**
'										
5										
6										
	. (Wet soil + Bag) - **Sag wt.**			**Bag wt. =**						
	Soil bulk density = [(Wet wt. **field Soil)/(1+decimal** H20 content)]/ Volume of **soil** sampled **[324** cm3 for 3" seg. of **Aluminum** tube]									

Update: 1 1/28/94

	4) SOIL ELECTRICAL CONDUCTIVITY, pH, and NO3-N									
			Readings for 1:1 soil:water mix.			Soil H2O		ml H2O in		
	Treatment / Area	Wt. of soil in scoop,g	E.C. dS/m	pH	Soil NO3-N ppm (est.)	Content (g/g) (See part 3)	Wt. o.d. soil in scoop,g*	Scoop of soil*	Soil NO3-N ppm (exact)†	Soil NO3-N† lbs/A/depth
1										
2										
3										
4										
5										
6										

*Wt. o.d. soil in scoop = Wet wt./(1+ decimal H2O content) ; ml H2O in soil = (Wt. o.d. soil in scoop) x (decimal water content)

† exact ppm NO3-N = [(ppm extract NO3-N) x (29.5ml + ml H2O in soil)] / dry wt. of soil extracted

Soil NO3-N, lbs/A/depth sampled = (Exact ppm soil NO3-N) x (cm depth of soil sampled) x soil bulk density x 0.089

	5) SOIL RESPIRATION at least 6 hours after IRRIGATION (1/2 HR INCUBATION TIME)								Soil Porosity	
	Treatment / Area	Ring or Can CAN SIZE	Inches of head Space	Start time	End time	Soil °C	%CO2(n=1)	lbs C/A/d*	1 - (SBD/2.65)	WFPS*
1										
4										
5										
6										

*Calculations: Large ring = (" HS/2") x PF x [(Soil °C +273)/273] x (%CO2-0.035) x 116.4 = lbs CO2-C/A/d

PF = WFPS= (Soil H2O content X SBD)/(1-(SBD/2.65))

	6) SOIL WATER STATUS & BULK DENSITY- Preferably 16 h after irrigation								Soil WHC	Soil Bulk
	Treatment / Area	Wet Soil + Bag, g	Wt. Wet Soil* g	Weigh Dish Tare, g (T)	Wet Soil+T (W+T),g	Dry Soil + T (D+T), g	Wt. of H2O, g W+T)-(D+T	Dry Soil Wt. (D+T)-T	H2O Content g H2O/D	Density g/cm3
1										
2										
3										
4										
5										
6										

* (Wet soil + Bag) - Bag wt. Bag wt. =

Soil bulk density = [(Wet wt. field Soil)/(1+decimal H2O content)]/ Volume of soil sampled [324 cm3 for 3" seg. of Aluminum tube]

PILOT STUDY PLAN

MEASURING AND ASSESSING SOIL QUALITY VIA THE NATIONAL RESOURCES INVENTORY SAMPLING FRAME

Developed by

Soil Quality Institute', National Soil Tilth Laboratory (ARS), Natural Resources Inventory and Analysis Institute', Natural Resources Inventory Division', and National Soil Survey Center'

Draft version 2.1

June 4, 1996

INTRODUCTION:

Preservation of our nation's soil resources is basic to the survival of a society. Lowdermilk, in his treatise "Conquest of the Land through Seven Thousand Years" states: ***"if the soil is destroyed, then our liberty of choice and action is gone, condemning this and future generations to needless privations and dangers."*** Lowdermilk goes on to stress that it is the responsibility of the nation to protect the physical body of the soil resource, while it is more of a landowner/manager responsibility to protect its fertility.

More recently the national research council in the book, "Soil and Water Quality: An Agenda for Agriculture" suggest that protecting soil quality, just as protecting air and water quality, should be a goal of national policy. They stress that maintaining and enhancing soil quality is a fundamental first step to improving the environment.

Unlike air and water quality, there is no national program to assess and monitor soil quality. The Environmental Protection Agency's Environmental Monitoring and Assessment Program (EMAP) was an attempt to establish a program to monitor environmental quality of which soil was a part. What remains of this program, however, has been redirected from monitoring environmental quality to fundamental research on indicators of environmental health.

It is crucial that policy makers have information on the quality of the nation's soils, on trends in the quality of its soil resources, and on the impacts of environmental programs on soil quality to make policy decisions that will maintain or enhance the quality of the nation's soil resources. It is also important to know how soil quality impacts the quality of air and water resources to address possible remedial measures.

Goals and objectives.

To provide information needed by policy makers, soil quality assessment must be integrated a established framework. The pilot study will evaluate soil quality measurements and interpretive indices using the scientific, spatial, and historical framework of the National Resources Inventory (NRI) sample database. This pilot project adapts soil quality measurements and protocols developed by the research community. Pilot results will be analyzed for possible

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[1] **National Science and Technology Consortium. Natural Resources Conservation Service**

expansion to a larger study area for the 1997 NRI and subsequent inventory and measurement activities.

The goal of the pilot project is to test the feasibility of sampling soils and measuring soil quality indicators at points within the NRI sampling framework. This includes development and evaluation of necessary protocols to monitor the status and changes in soil quality as a result of various land uses; and the development of a framework to assess soil quality and interpret the results. The pilot project evaluates a national application and adaptation of current research on indicators of soil quality.

Specific objectives are:

1. Test operational aspects, such as:
   - Soil quality indicators, their scope and applicability to the sample frame
   - Sampling design for estimation of soil quality indices over large areas
   - Plot design for soil quality measurements
   - Resource allocations necessary to incorporate soil quality measurements in NRI (personnel, equipment, laboratory, and budget requirements)

2. Develop a framework and process for interpreting the data to include:
   - Area wide interpretation of data by using the MLRA approach
   - Soil specific interpretation by testing a benchmark soil approach
   - Soil quality indices of soil quality
   - Application of interpretative models such as EPIC or CENTURY for projecting future trends from existing data and data collected at soil quality measurement sites
   - Assessment of seasonal variability of indicators
   - Assessment of within site variability of indicators

3. Develop a long-range plan for assessing and measuring soil quality in future NRI's and related resource inventories.

4. Develop interagency partnerships for measuring long term trends in soil quality.

5. Prepare prototype report

Scope:

The pilot study will be conducted in four Major Land Resource areas (MLRA's) of the country. Sampled MLRA's represent various major land uses, soils, and conservation and farming systems. The study in 1996 has two general approaches:

1. MLRA Wide Assessment of soil quality. Results will be interpreted by summarizing the effects of land use and conservation and farming systems over all soils in the MLRA.

Approximately 100 Primary Sample Units (PSUs) will be drawn at random to representeach MLRA. This approach will be used in:

- MLRA 9, The Palouse and Nez Perce Prairies located in eastern Washington and western Idaho. Proposed time of sampling is during the months of May and June. The land uses include winter wheat, spring wheat, dry peas, lentils, freezer peas, barley and range. Soil quality concerns include wind and water erosion.
- MLRA 105 Northern Mississippi Valley Loess Hills - Driffless area, located in northeastern Iowa, southeastern Minnesota, and southwestern Wisconsin. Proposed time of sampling is from June 1 to July 15, 1996. Land uses include corn, soybean, pasture, and woodland. Soil quality concerns include erosion and leaching of nutrients and other chemicals.

Methods:

Field Procedures

Laboratory analysis:

Soil Quality Indicator	Method	Responsible Unit
Root restricting layers	Observe depth to root restricting layer	Field Team
Landscape position (site characteristics)	Observation	Field Team
Pedon description soil classification	Observation	Field Team
Land cover/use	Observation	Field Team
Tillage	Observation	Field Team
Relative weed density	Observation	Field
Weed species present	Observation	Field
Conservation/farming system (residue conditions)		Field
Bulk Density		Field (laboratory - NSSC)
Organic C		NSSC/partner laboratories
Organic N		NSSC/partner laboratories
CEC		NSSC/partner laboratories
Extractable Al and bases		NSSC/partner laboratories
pH		NSSC/partner laboratories
Texture (clay, silt, sand %)		NSSC/partner laboratories
Electrical conductivity		NSSC/partner laboratories
SAR		NSSC/partner laboratories
Aggregate stability		NSSC/partner laboratories
Potentially Mineralizable N		NSTL/partner laboratories
Microbial biomass		NSTL/partner laboratories
Basal respiration		NSTL/partner laboratories
Total and active bacteria and fungi*		Oregon State
VAM root colonization*		Oregon State
Nematodes*		Oregon State
Protazoa*		Oregon State

* On MLRA 9 samples only

Other researchers will be encouraged to collaborate and participate in the project.

Proposed soil quality framework

Soil Quality is defined as:

> *The capacity of* a *specific kind of soil, to function within natural or managed ecosystem boundaries, to sustainplant and animal productivity, maintain or enhance water and* air *quality, and support human health and habitation.* (Karlen, et. al, in press)

The five soil **functions** are:

- **Sustaining** biological activity, diversity, and productivity;
- Regulating and partitioning water and solute flow;
- Filtering and buffering, organic and inorganic materials, including industrial and municipal by-products and atmospheric depositions;
- Storing and cycling nutrients and other elements within the earth's biosphere; and
- Providing support for plant, animal, and human life

The definition of soil quality has two forms:

- The first form is that soil quality is an inherent characteristic of a soil. Each soil has a natural ability to function as governed by its soil forming processes. This inherent characteristic is defined by a range of values for indicators that reflect the full (ideal) potential of a soil to perform specific functions.
- The second form of the soil quality definition is the health or condition of a soil. If a soil is functioning at **full** potential for a specific land use, it can **be** said to have excellent health or condition, while if it is functioning much below it's potential it can be said to have impaired or poor health or condition. The health or condition of a soil is measured by comparing the current state of an indicator of soil quality to the projected reference value for a soil functioning at full potential. The health or condition can also be measured over time by following trends in the values of the indicators of soil quality.

The range in values of an indicator of a soil functioning at full potential can be predicted by summarizing information **from** research reports, soil survey characterization data, and knowledge about **the** pedogensis of a soil (Figure 2). These values representing the full potential of a soil can be represented as a simple range, a scoring function (Table 1) as used in systems **engineering,** or as a membership **function** as in fuzzy logic. Ideally, these full-potential values should be developed for each individual soil. Operationally, however, it is more realistic to develop the **full-potential** values for groups of soils that perform similarly for a particular land use. The full-potential values will also require adjustments for the functional demands of specific **land** uses. For example, the nutrient cycling and supply requirement of soils is much different for intensive **corn** and soybeans as compared to grazing lands.

Reference values can be developed for the ideal or natural state of the soil, for the specific land use, and for reclaimed soils. For the most part, we will be concentrating on specific land uses of the soil. In this scenario, we are assuming that a soil managed using Best Management Practices represents the full potential of the soil to function for the **particular** land **use**. Using this assumption, ranges in soil indicator properties and scoring **functions** are developed for each indicator (Figure 1).

Soil Quality Assessment Framework

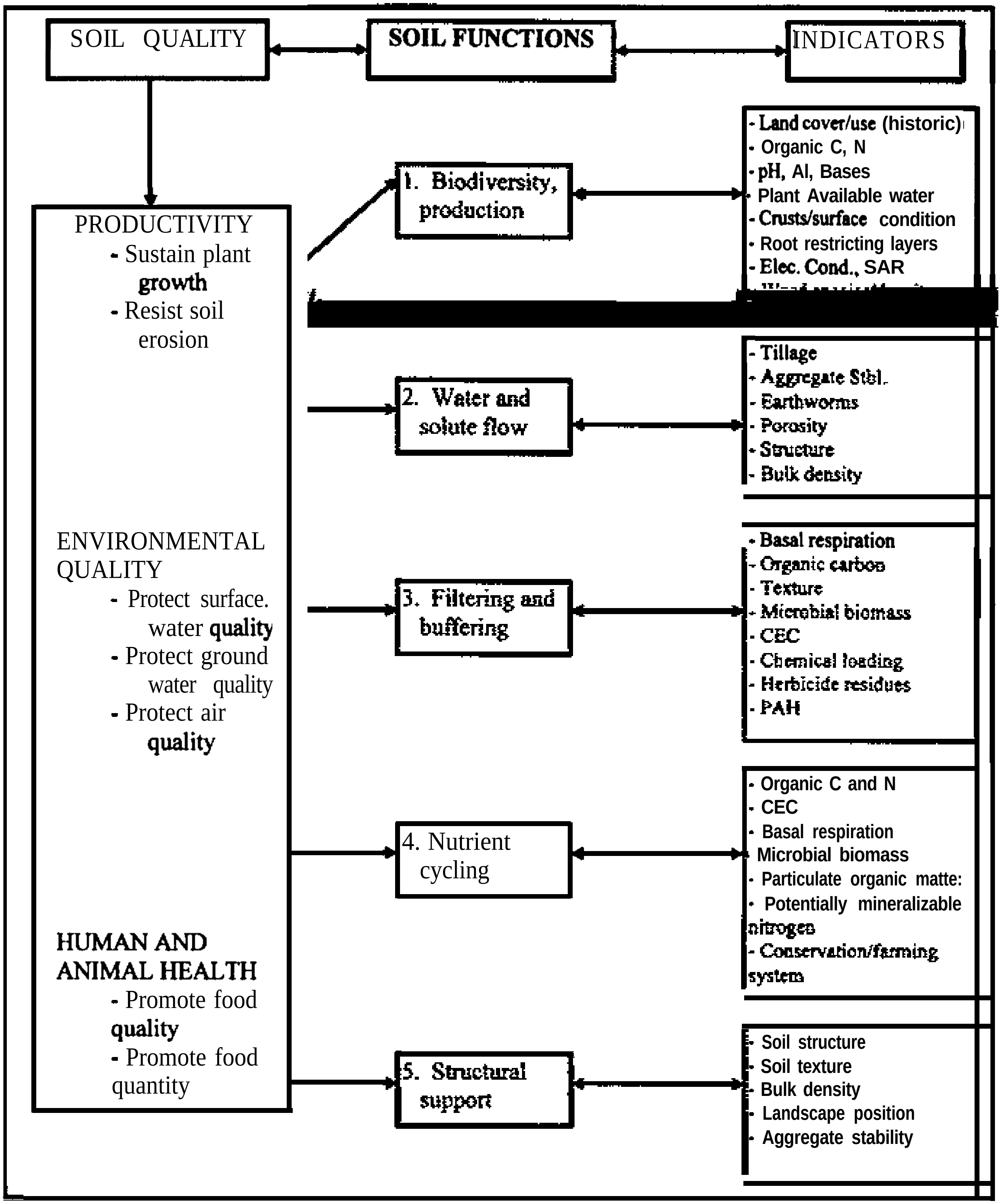


Figure 2.

ASSIGNMENT OF REFERENCE VALUES

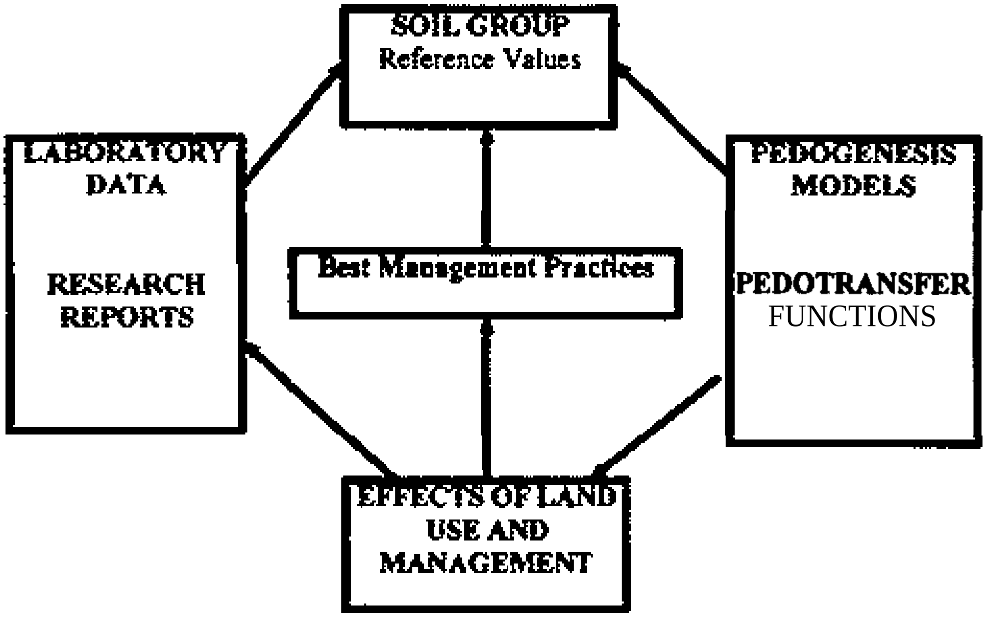
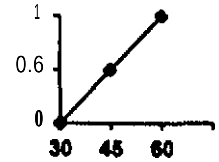
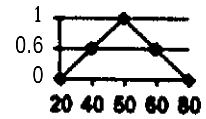
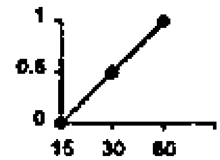


*Table 1. Soil Quality **Indicators** and Example Scoring Functions (**after** Seybold et al., **1996**)*

Indicators	Functions	Range limits	Scoring Function
Physical % Stable Aggregate	Regulating and partitioning water and nutrient flow	30 - 60	
Porosity - surface 75 mm	Regulating and partitioning water and nutrient flow	20-80	
Porosity - 0 - 500 mm	Regulating and partitioning water and nutrient flow	20-80	
Chemical Total C in surface 75 mm (mg/cc)	Storing and cycling nutrients and other elements, Regulating and partitioning water and nutrient flow	15-50	
Total C in upper 500 mm (mg/cc)	Storing and cycling nutrients and other elements, Regulating and partitioning water and nutrient flow, filtering, buffering, degrading, immobilizing, and detoxifying organic and inorganic materials	5-20	
pH surface 250 mm	Sustaining biological activity, diversity, and productivity, Storing and cycling nutrients and other elements	5.5 - B.2	

May 4, 1995

To: Ronnie Clark, State Conservationist, Bismarck, ND
Mike Ulmer, Assistant State Soil Scientist, Bismarck, ND
Myron Senechal, State Resource Conservationist, Bismarck, ND
Doug Gasseling, State Agronomist, Bismarck, ND
Dean Fisher, State Conservationist, Huron, SD
Jerry Schaar, State Soil Scientist, Huron, SD
Jeff Hemenway, State Agronomist, Huron, SD

BE: Response of Soil Quality Questionnaire's from NRCS field offices

I would like to take this opportunity to express sincere thanks for the cooperative effort John Gardner and myself had with the participating NRCS field offices in North and South Dakota for evaluating the soil quality test kits. The effort was useful, and much practical knowledge about the kits, and soil quality, was gained by us and the NRCS field offices. The field office personnel expressed great interest in soil quality and they perceived the importance of the subject and it's role in the NRCS future.

Earlier this year John Gardner and myselfdeveloped a soil quality questionnaire for the participating NRCS field offices in ND and SD. I interviewed the field office personnel in ND, and sent the questionnaire to the participating field offices in SD. To each field office, I also sent copies of three NRCS publications regarding this subject: 1. 'NRCS Action Plan, Providing Ecosystem-Based Assistance for the Management of Natural Resources'; 2. 'The Soil Resource and the NRCS'; 3. 'Soil Quality/Soil Health'. Enclosed is the questionnaire with a summary of comments after each question.

Two general themes are expressed in the comments to the questions. Fist, the field office personnel need much training on the subject of soil quality. Second, local benchmark soil quality data is needed before soil quality policy can be implemented.

The training needed includes the understanding ofconcepts, especially interpretation of indicator data, e.g. what does the data mean and what does it relate to? The field office personnel also expressed a need for training on the mechanics and procedures used to measure indicator variables. They prefer this training be done in the field as a hands on *experience. They also* expressed a need for training on the usefulness of soil quality information and conversion of indicator data to usable information for the producer. As a first step toward this end, I recommend two books published by the Soil Science Society of America, 'Defining Soil Quality for a Sustainable Environment'. SSSA Special Publication No. 35 is an excellent concept reference, and was published in 1994. 'Handbook of Methods for Assessment of Soil Quality' is a methods book and will be published in late 1995.

North Dakota at the Carrington, North Central (Minot), and Williston Research Extension Centers; the ARS Northern Great Plains Research Lab at Mandan, and sites at North Dakota State University, Fargo. I am aware of sites in South Dakota at the Dakota Lakes Research Farm, Pierre; Bonnie Sivage Farm, Hays, and the Northern Grain Insects Lab, Brookings.

I feel this questionnaire and cooperative effort is very timely and pertinent in light of NRCS reorganization and the Ecological Based Assistance (EBA) Action Plan (I am aware that the EBA term will be replaced). As it states, the NRCS will 'Develop training, cross training, maintenance plans, and materials that provide technically competent, technically diverse skills based on need', 'Use key ecosystem health indicators to measure performance', 'Support actions of other agencies, institutions, and groups in implementing EBA', and 'Support USDA activities by establishing coalitions

NRCS Field Office Soil Quality Questionnaire

Answers to questions are in the form of a range of numbers of 1 tbrougb 5.
1 = Strongly agree, 2 = agree, 3 = neutral, 4 = disagree, 5 = strongly disagree.
Please circle most appropriate number rod give comments to all questions.

I. Concepts of soil quality as a conservation guide.

A, Do you understand and feel comfortable with tbc concepts encompassing soil quality? I 2 3 4 5 comment:

Average = *1.8*

Comments: Somewhat

Understand concepts, have <u>*much*</u> *difficulty converting soil quality data into meaningful information for theproducw.*

We are in the learning process, gathering information.

Much to learn yet, need to know how tests relate to soil quality and farm management.

Feel comfortable with the concept, need tools and interpretation.

I agree with the majority of the concept.

Soil quality when looking at a total environmental approach.

1. **Do you know and understand the current definition of soil quality?**

I 2 3 4 5 comment:

Avwoge = 2.1

Comments: NRCS has its own working *definition.*

Need standard terminology, soil health is temporary, soil quality is more *permanent, watw and soil quality have negative connotationsfor the producw.*

The term soil health would be betterfrom a producw standpoint.

It is *scientifically clear.*

Capacity of soil

Comments:

Need training, producers want to know what soil quality is going to do for them, and NRCS field office personnel need training to tell them.
Good tool, need more one-on one field time
It would be easy to demonstrate poor soil quality.
Not for all procedures.
Could aid in informing clientele on importance of soil.

2. Is it useful for qualifying

More knowledge about indicators and how different farming systems affect each indicator.
Producers need something straight forward.
More information on each test and what causes the problem and what could be done to cure it.
Four or five key indicators for a specific area that can be measured and managed I would stress the importance of long-term soil health care
Training would be useful for NRCS personnel.

a. What standard indiuton (MDS)? comment:

Comments: Penetrometer for field demonstration.
Need more training to determine which indicators we need
Easy tests.
I am not sure.
% organic matter, water holding capacity, bulk density, earthworms, etc.

b. Manual describing concepts and indicators? 12 3 4 5 comment:

Average = 1.7

Comments: Add usefulness to farmers to manual
Keep it simple and straight forward.
Explain the relevance of indicator values to the producer.
I am not sure.

II. Mechanics of determining soil quality.

A. How do you envision estimating soil quality at a given site? comment:

Comment: Quick indicators that can give important information.
Need computers to access NRI data base.
Resource concerns worksheet and site specific practice effects worksheets.
Need local benchmark data
Up to NRCS management Depends on given staff and NRCS priorities.

I'm willing to perform as much sampling as it takes to establish reliable benchmarks. However, supervisors should be asked this question first.

2. **Would visual qualitative indicators be useful? 1 2 3 4 5 comment:**

Average = 2.2

Comments: Yes, because ik quick.

What are you going to use visual indicators for?

Litter, ground cover, tilth.

Usually visual inspections aren't very accurate.

Must be convenient

3. **What tools might be able to btlp you with qualitative indicators? comment:**

Comments: Moisture probe to compare different production systems at a given date

Anything to make it easier to understand

a. Color charts? 12 3 4 5 comment:

Average = 2.2

Comments: New electronic instruments are *better.*

Too *variable*

Color charts don 't work for all people.

As a measure *of* organic mutter.

b. Guide for aggregate size and stability? 12 3 4 5 comment:

Average = 2.4

Comments: Especially for non soil scientists.

Link *to quality of* organic matter.

Too variable.

c. Checklist, list of questions? 1 2 3 4 5 comment:

Average = 1.8

Comments: Simple concise *questions, leave out scientific* jargon.

Must *understand concepts first, need* training.

Use checklist with clientele

4. **Which indicators do you feel arc important? comment:**

Comments: Organic *matter, Infiltration, pH,* Nitrate

Respiration is *interesting, but what does it mean?*

Respiration shows microbial activity.

Respiration is *nebulas*

Aggregate stability.

Need benchmark sites

Color and thickness of surface horizon.

a. Erosion indicators? 12 3 4 5 comment:

Avaage = I. 6

Comments: Main concern.

Visual inspection of carbonates.

NRCS has an erosion index.

Tons *of soil loss means nothing.*

b. Surface soil aggregation/appearance? 1 2 3 4 5 comment:

Average = *1.8.*

Comments: Surface appearance doesn't always tell whale story.

c. *Senses, touch,* smell? 12 *3 4* 5 comment:

Avwage = 2.4.

Comments: Takes lots of experience.

5. Whnt role do you see the soil quality test kit performing? comment:

Comments: Mainly *education.*

Perhaps with FFA classes or Extension sponsored events

a. Teaching tool? 12 3 4 5 comment:

Average = 1.5.

Comments: Goad teaching tool.

Need training touch to sell soil *quality if you* don *'t know what you are selling.*

Good in small *groups, a dozen or less.*

Easy to show effects of different practices.

Hands on device.

b. On site inspection? 12 3 4 5 comment:

Average = 2.8

Comments: There are time restraints

Takes too muck time.

Must be site selective e.g. wheel vs. non-wheel track

Would need to measure indicators over time, 5 years plus.

Always best to be in *the field.*

Not sure.

6. Do you feel the aced for a composite soil quality index? 1 2 3 4 5 comment:

Average = 2.5.

Comments: *Govt.* agencies *need a composite index. Not usefulfor theproducer.*

Just drawing an arbitrary line like *HEL.*

Need some index as a basis *of comparison, but should have* <u>*separate*</u> *indexes for each indicator.*

May be useful or dangerous

The mare information the *better.*

Only *for comparison purpose-s*

a. Qualitative? 1 2 3 4 5 comment:
Average = 2.3.
Comments: *Somewhat useful to producer.*
Better for average *person.*

b. Quantitative? 12 *3 4* 5 comment:
Average = 2.5.
Comments: Beneficial to NRCS personnel, not meaningful *to the producer.*
Better information and accuracy.

7. Do you feel the need for predictive tools? 12 3 4 5 comment:
Average = *2.8*
Comments: Need both on site inspection and predictive tools.
Can not test all producers soils
Predictions are always hard
Would the predictions be accurate?

a. Algorithms like RUSLE and RWEQ to predict a soil quality outcome?
12 *3 4* 5 comment:
Average = *2.7*
Comments: I like *this idea.*
Would be useful like *RVSLE.*
One size does not fit all, still need on site inspection.
May need algorithm for national policy implementation.
Need to impadpmduca at local level, on site work has priori&
Do not know if algorithm *would be useful, especially for producer.*
Farmer would question results Must have good understanding of algorithm first.
Based on localized criteria (benchmark sites) - not universal
Could open the door to mandates and legislation and regulation.
Dangerous, too many variables.
Easy to work *with.*
I do not believe the soils database can accurately predict soil *quality because of* its *general nature.*

III. Developing a soil quality network
A. Would the SWCD's be able to work with NRCS on the soil quality concept?
12 3 4 5 comment:
Avaage *2.0.*
Comments: I am not sure about it being *done at more than the NRI type level.*
Depends on which district you are talking about
Depends on the personnel *within district boards.*
Could work, needs money and labor.
Only if the SWCD's deem it useful.
We already are.

B. Could soil quality criteria be added to current measures of compliance (current - percent residue cover, soil quality - f)? 12 3 4 5 comment:

Average = 3.7.

Comments: A change in *soil quality would take too long of a time frame.*
Premature to talk about criteria
Dump HEL definitions and develop an all encompassing soil *quality criteria.*
Not good to regulate soil *quality. Must sell* soil *quality.*
Takes time to improve soil.
- Soils are too variable
Can not be accurately measured or *predicted*

C. Could or do you work with the local extension agent on soil quality education? 12 3 4 5 comment:

Average = 2.0:

Comments: This would be good
Yes, we already are
Depends on *agent.*
Agents are not concerned with non production aspects
I presently do not, but would be willing.

D. What training of field office personnel is necessary? comment:

Comments: *Concepts training, e.g. respiration, more* in *depth manual would be useful*
What so the indicators and tests mean to the producer?
Need to tie into soil types, need benchmark soils
Training in the field would be best
What constitutes a healthy soil, specifier
Specific training *to NRI level.*
Purpose of *test kit and interpretation of results of tests*
Defining soil quality, concepts and procedures.
Need understanding of what indicators mean.
Need well trained people in *the field.*
Most personnel are knowledgeable on the subject
What results should be expected?
Depends on the role soil quality will carry.
Soil quality indicators and measuring them against a *norm* or *standard*
Use of test kit, what the parameters should be.
If we incorporate it into the NRI, just train how to do tests

E. How feasible is the development of a local • g or resource alliance to educate, and use soil and water quality as a conservation guide? 12 *3 4* 5 comment:

1. What groups could be in the alliance? comment:

Average = 2.2.

Comments: Might be feasible, good idea

Good as an overall ag **alliance,** *but not a* **soil** *quality alliance.*

Could be a **mechanism** *to push* **soil** *quality.*

Enough alliances already. Inform current alliances about soil quality, and they can "run with the *ball'!*

I am not sure as currently planned and written that it would be usefulfor the average farmer/rancher.

Implement dealers, conservation districts, chemical and fertilizer reps, Extension service, NRCS, ARS, Rankers, no-till and ridge till associations, crop consultants.

a. NRCS, SWCD, **Extension Service, experiment stations, ASCS county committees, sustainable ag groups, organic nod no-till farming groups, sportsman's clubs? comment:**

IV. Current NRCS soil quality policy.

A. Are you familiar with the "NRCS Action Plan of 1994"? comment:

B. Art you familiar with "The Soil Resource and the NRCS" draft report? comment:.

C. Are you familiar with the report "Soil Quality/Soil Health" from the National Soil Survey Center? comment:

GLOBAL CHANGE INITIATIVE FOR NORTHEASTERN STATES

Loyal A. Quandt 1/

Soil, the outermost layer of the earth' crust, is a dynamic and complex mixture of organic and inorganic constituents that support life and provides critical elements that affects our environment. Global databases on world soil resources that affect economic productivity and environmental quality has received a great amount of attention during this decade.

Quantative information is needed on soil distribution, at least at order and suborder level, at different scales,

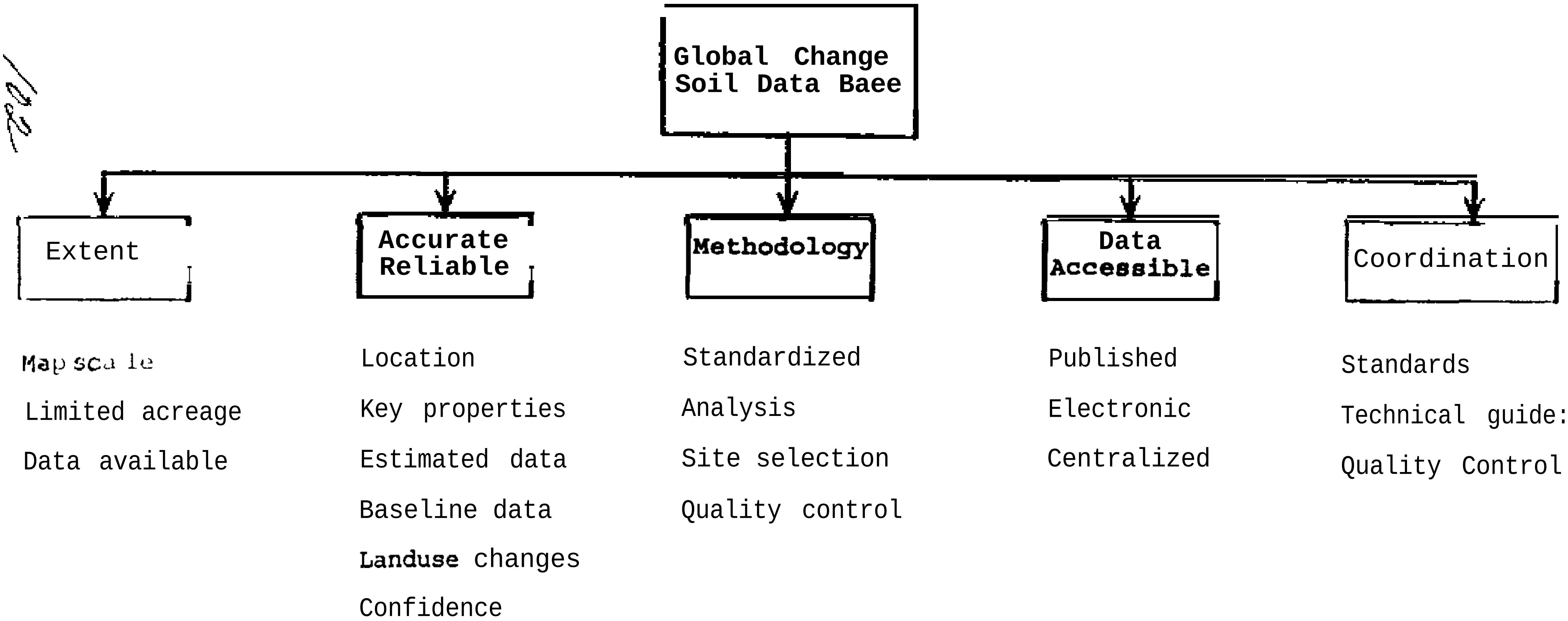


Figure 1. Evaluating soil resource data bases for assessing the Global Change Initiative.

The extent of organic materials were not obvious on previous organic carbon maps due to the scale of the maps. In some areas soils with organic surface layers received a low priority for soil mapping, consequently, little data was available.

The indexing process of soil laboratory data has shown that there are inaccurate legal descriptions. Some laboratory reports also indicate a lack of organic carbon analysis and the estimated organic matter information on the Soil-5 records may lack supportive data.

The gain or loss of organic carbon levels is difficult to determine because of landuse changes, baseline data is not available and in some cases soil sampling techniques were designed to evaluate other soil properties.

Standardized methods for describing, collecting and measuring soils properties are needed. Analytical procedures, site selection and quality control measures are also important specifications that must be established in the project plan.

The organic carbon (matter) data should be available in published reports, available for electronic transfer and storage in a centralized location(s). These factors are critical for the Global Change projects.

The entire Global Change project will require close coordination of technical Standards and Guidelines for collecting organic carbon data. The data will be evaluated, indexed, stored and made available for conservation and environmental programs.

Training Soil Scientists

The correct techniques and procedures for describing and determining organic properties in the field, collecting the soil samples for analysis, and evaluating the data are very importance for obtaining relaiable and accurate data. Staff members from the National Soil Survey Center and state staffs provided training to New Hampshire, Maine, Vermont, New York and West Virginia soil scientists on the procedures for recognizing organic componds in the soil profile (illluviation processes), identifiying organic layers, and determining the the biomass portion above the mineral soil surface.

Summary of Global Change Projects in the Northeaet

The following is a brief summary of Global Change activities in the Northeast Region (1991-1996):

Indexing Laboratory Data

This was a Cooperative effort by Soil Scientists from NRCS and Universtities to review, classify and index over 700 pedons of soil laboratory data and storing this information in a data base system. The states involved are:

Maine	New Hampshire	Vermont
Massachusetts	New York	Maryland
West Virginia	Virgina	New Jersey

Soil Investigation Projects

Maine - evaluate the movement of organic coupounds in soils at coastal to higher elevations and impact it has with classifing soils as Humods or Orthods - 120 soil samples. University of Maine and NRCS.

New Hampshire - evaluate the organic carbon distribution in soils with mesic, frigid and cryic soil temperature regimes; poorly and very poorly drainage conditions; and relational information associated with landuse changes (Pasture vs. Woodland) and impact it has with classifing as spodic or histic - 120 samples. NRCS and University of New Hampshire.

Vermont - evaluate the organic carbon distributionb in soils with mesic, frigid and cryic soil temperature regimes; relational information associated with six different parent materials - 120 samples. NRCS and University of Vermont.

New York - evaluate the organic carbon distribution in soils with frigid, cryic soil temperature regimes; poorly to well drained conditions; and relational information associated with four different parent materials and impact it has with classifing as spodic or histic - 60 samples. NRCS and Cornell University.

West Virginia - evaluation of organic carbon in frigid soils of the Mid-Appalachian region in comparison with data from mesic soils; relational information associated with landuse changes (Pasture-woodland-cropland) and impact it has with classifing as spodic or histic - 102 samples. Graduate program with the University of West Virginia and NRCS.

Maryland - special study on " Impact of Sea Level Rise on Soil Quality in Coastal Fringe Areas" - periodic tidal inundation of upland soils adjacent to coastal marshlands with possible association with Global Climate changes. University of Maryland.

Results of Global Change Projects

The organic carbon data will be stored in database programs, used in the soil correlation process and included with soil interpretation records. The data will be evaluated to determine what impact landuse changes have on the acquisition and sequestration of organic carbon and with the following soil properties:

1. Infiltation of water
2. Stability of soil aggregates
3. Avaiability of macro and micro-nutrients
4. Soil aeration
5. Extractable bases
6. Phosphorous and other chemical retention in soil

The organic carbon soil data will also be used in database programs to predict:

1. Water runoff and erosion
2. Quality of water in streams and lakes
3. Reduction in flooding
4. Global climate changes

We are very pleased with the professionalism shown by all the soil scientists involved with these projects. All the soil scientists were willing to share ideas and experiences and were vey cooperative in the processes for determining the organic soil properties.

WETLAND SCIENCE INSTITUTE

Insight

March 1996 — Billy M. Teels, Director

Articles in this publication:

ACCESS TO WETLAND SCIENCE INSTITUTE HOME PAGE

The Wetland Science institute (WLI) now has an Internet Home Page. We plan to develop and update our information through this medium and will use it as the primary means of distributing this and future editions of the *Insight* (newsletter). The Wetland Science institute (WLI) Home Page on the World Widc Web can be accessed directly using the Uniform Resource Locator (URL) and entering http://159.189.24.10/wetsci.htm or. it can be accessed by: I) stepping down from the USDA home page at (http://www.usda.gov/) to USDA Agencies and Programs, and 2) selecting the Natural Resources Conservation Service (NRCS) home page (http://www.ncg.nrcs.usda.gov/), and 3) selecting the Wetland Science Institute from the NRCS Workforce Organization section. The WLI is found under Institutes. The WLI home page is both housed and served by the Patuxent Wildlife Research Center, which is part of the US Dept. of Interior's National Biological Service.

Comments or questions about this home page should be forwarded to Billy M. Teels, Director of the Institute (Internet address: Billy_Teels@nbs.gov.).

WETWND RESOURCE ASSESSMENT

in a recent memo, Chief Paul Johnson, announced a plan to reinvent the way we do strategic planning and resource assessment in NRCS. According to Chief Johnson, "The message is clear: Resource assessment is at the core of everything we do in NRCS. from conservation planning to policy making, The National Resources inventory and RCA Appraisal have helped to shape national policy. But today our customers need new and different kinds of information to become the natural resource stewards they want to be. They need information about the quality of soils. the quality and quantity of water. and the health of grasslands, riparian areas, wetlands, and forests."

Role of WLI in Resource Assessment

The Chief's plan recognizes the importance of science-based information as a means of helping landowners meet their stewardship goals and in characterizing the "state of the land". In the plan the Institutes have been charged with developing new and scientifically based tools to assess soil quality and the health of our watersheds, grating land, wetlands, and other resources.

Wetlands are complex living ecosystems. broadly held to be valuable because of the many functions they perform. The accurate assessment of wetland resources requires a thorough understanding of how wetlands work and just what it is that we are trying to assess. Wetland assessment is often complicated by a common misunderstanding of three closely related terms often used to characterize the wetland resource: wetland function. wetland values and wetland health.

These three related terms are in fact distinct and should be considered separately to avoid muddling the picture when it comes to resource assessment. Let's cake a look at the definition of each term and the related activities that the WLI is pursuing.

Wetland functions are the ecological activities or tasks that wetlands perform. Wetland functions include: water storage. maintenance of water tables. nutrient assimilation. retention and removal of imported substances, and provision of fish and wildlife habitat. They are inherent and performed naturally without regard to human values or needs.

The President's 1993 Wetland Policy has set a national goal of increasing the quality and quantity of our wetland resource. If we are to ever meet that goal. we must have the capacity to measure accurately the net change in wetland function resulting from both degradation and restoration on a national scale. In addition. we should have the capability to measure gains and losses on a local scale for single projects. The WLI is actively working with other Federal agencies and the private sector to develop regionally based techniques for wetland functional assessment using the hydrogeomorphic (HGM) approach. A description of HGM. how it works. where it can and cannot be used. and examples of its indicators. has been artfully crafted for the November-December 1995 and January-February 1996 editions of the National Wetlands Newsletter by Dr. Mark Brinson. the author of the HGM Classification system.

Related. but not the same, are the societal values attached to wetlands (wetland values). Wetland values are the qualities of wetlands determined by society to be desirable. important. or perhaps unimportant. These values have indeed been placed on wetlands due. at least in part. to the significant functions that wetlands perform. in fact. as a society we have come to appreciate wetlands and their functions so much that we currently recognize them as resources worthy ofspecial attention. as evidenced by the policies developed for their protection and restoration. it is important to acknowledge that those policy decisions are often value driven and may or may not be based on science. The methods used to assess wetland resources. on the other hand, must always be science based and not value-laden, so that an accurate characterization of the resource can be made unhindered by changing societal values.

Often associated with wetland values are their worth in economic terms. If wetlands are truly valuable, then we should be able to describe their worth in dollars and cents. However, wetlands are not bushels of wheat or cords of wood. The functions that they provide are mostly ecological and more abstract and difficult to quantify. The WLI is currently working with the NHQ Economics Division to develop techniques to utimate the economic values of wetlands. In this effort, as with making policy, a strong common denominator must be an accurate portrayal of wetland functions on which to base the political or economic decisions.

Yet another concept, and one that is even more abstract and difficult to understand, is wetland health. Wetland health is the overall condition of well being of the resource itself. According to Brinson. 'there is a tendency to view individual wetlands as bundles of functions rather than as the internally complex and highly integrated ecosystems that they really are". Because wetlands are living ecosystems they can also die and may exhibit various degrees of health. When wetlands gel sick, it is often the result of human disturbance. For example, wetlands may become severely degraded when agricultural practices cause an accumulation of toxic chemicals or sediments. in those instances, wetlands perform a valuable function by retaining and breaking down the pollutants into something less harmful to the environment. However, In tbrt process wetland health may become diminished because of the disturbance and the opportunity to perform. Certainly the life and health of those wetlands would be better if the disturbance dld not occur. Therefore in analyzing the "state of the land" our assessments should address not only the functions that wetlands provide. but also the condition of the resource itself. in other words wc should be concerned with wetland health as well as wetland function.

Although wetland health is an abstract concept that cannot be measured directly it can be characterized by the ecosystem's stability, its ability function within its potential, and its ability for self maintenance and repair. The accurate assessment of a wetland's health requires a method that integrates biotic responses to environmental stresses through the examination of patterns and processes from individual to ecosystem levels. Measuring the health of wetlands. or other ecosystems, is in a sense analogous to measuring human health. When blood pressure. white blood cell counts, and the results of stress tests fall within acceptable ranges, good health may be indicated. Good health. however, is not a simple function of these attributes. Rather, the system-whether it is a human system or a wetland-can be considered healthy when its inherent potential is realized. its condition is stable, its capacity for sell-repair is preserved, and minimal external support for management is needed.

A number of methods have been developed to assess the health of other aquatic ecosystems most of which rely on biological indicators to derive a health index. The WLI is cooperating with other scientific institutions in Maryland to assess wetland health through the development of monitoring protocols and health indicators. The project will focus on restored wetlands of the mid-Atlantic region. The protocols will provide a standard method to document the use and inhabitation of wetlands by wildlife and a standard method of health analysis relying heavily on biological indicators.

Although the protocols are being developed for a specific set of wetlands. they are intended as templates for wetland health assessments elsewhere. It is anticipated that the protocols will be applied to other classes of wetlands and in other regions. with appropriate modifications, in much the same *manner* as HGM. Once completed, the protocols should provide a much needed procedure to help NRCS detect. and more importantly enable our partners to detect. where wetland problems arc. how severe they are. and to aid in the process of health restoration.

HGM STAMPEDES ONTO THE NORTHERN PRAIRIE

The first operational Hydrogeomorphic (HGM) wetland functional assessment model in the nation will be presented at a training session to be held in Jamestown, ND the week of June 23.1996. This will be the culmination of over a years cooperative effort by the NRCS Wetland Science Institute. NHQ Wetlands Division, the COE. USFWS, state and field staff in ND, and the private sector.

Functional assessment of wetlands is used to • stimate the level of wetland performance of hydrological, biogeochemical, and various habitat properties and processes. On agricultural sites, the Food Security Act exempts certain activities II agencies to develop and carry out a national implementation plan for HGM and is also leading the development of a regional depressional model for the Rainwater Basin in Nebraska. The Rainwater Basin effort will be for that specific subclass of depressional wetlands and the reference domain will be limited to south central Nebraska. The similarities that exist between the Rainwater Basin and the Playa Lakes in the southern High Plains (such as hydrology, landscapes, and land use patterns) should enable rapid development of an HGM model for the Playa Lakes region.

NRCS needs to be involved in the development of these models for a number of reasons. FSA wetland programs will be using these models for minimal effect determinations, to assess impacts and determine mitigation needs, and evaluate the functional aspects of wetland restoration projects. Also. we need to provide the necessary soils expertise to make the models accurate and applicable. Because HGM subclasses can be defined by soil properties and certain soil properties can be used to assess wetland functions, it is critical that NRCS soil scientists become involved in the HGM effort.

Special thanks to the Vrea -- your efforts are appreciated!

This article borrows heavily from the articles authored by Dr. Mark Brinson, previously referenced in this document.

WETLAND MONITORING PROTOCOLS AND *WETLAND* HEALTH ASSESSMENT

Currently there are many Federal programs restoring wetlands under the Administration's wetland initiative. Partnerships have been utablished among Federal and State agencies. and public and private organizations to accelerate wetland restoration to meet the goal of increasing the quality and quantity of wetlands as stated in the President's Plan. These activities are conducted. for example, through the Partners for Wildlife Program and the North American Waterfowl Management Plan of the Fish and Wildlife Service. and the Conservation Reserve Program and Wetland Resewe Program of the Department of Agriculture. As a result, significant numbers of wetlands have been restored and enhanced in recent years throughout th country, particularly in agricultural landscapes where wetlands have been previously converted *to* cropland. Restoration/enhancement accomplishments of almost 900,000 acres were reported during the four-year period of 1989-1992 (Report of the Interagency Committee on Wetlands Restoration and Creation, 1992). *In* addition, since funding the Natural Resources Conservation Service's (NRCS) Wetland Reserve Program in 1992, wetlands are being restored on agricultural land at an even more rapid rate.

various types ofdegradation (nonpoint source pollution, point source pollution, channelization, and gravel mining, etc.). The IBI technique relies heavily on the biota as integrators of the combined effects of all environmental stresses by using community characteristics, such as population structure (species richness. trophic structure, etc.), community metabolism (species tolerance, percent diseased individuals. etc.). and standing crop (numbers or weight of organisms per unit area) to calculate an overall index to represent ecosystem health.

The protocols will be developed using a set of reference wetlands as a benchmark for comparison. Protocols for selected vertebrate and invertebrate classes will be written, detailing methods for field sampling and data analysis. Indicators (metrics) and corresponding scoring criteria will be developed under each protocol to represent various degrees of wetland health that will be tied to conditions observed in the reference base. The reference base will include restored wetlands of the same hydrogeomorphic class in an array of conditions, including those in highly disturbed and relatively undisturbed environments.

Once developed. the protocols will allow for a rapid assessment of health for a regional class of wetlands. Although developed for restored wetlands of the mid-Atlantic. it is anticipated that the protocolscan be used for other wetland classes and in other regions with the appropriate modifications. Similar to how IBI has been used in other ecosystems. the indices for wetlands may perhaps be projected beyond the boundaries of wetlands to provide information about the health of watersheds. This may be particularly true for wetlands which are the recipients of runoff in closed basins. The protocols will be field tested and refined to enable their rapid employment by trained NRCS field staff and wetland scientists of other agencies.

VEGETATING RESTORED WETLANDS

As discussed in a previous article, significant numbers of wetlands are currently being restored under the President's initiative for wetland conservation. Much emphasis has been given to re-establish the precise hydrologic conditions to help ensure the successful restoration of those wetlands. By comparison, less attention has been given lo the successful re-establishment and management of vegetation. Vegetation is critical to many wetland functions. Vegetation is key in filtering sediments, providing wildlife food and rover, assimilating nutrients, and reducing erosion. The kin& of vegetation used in wetland restoration projects is extremely important in achieving full wetland functionality.

Many long-term ecological studies have demonstrated that diverse, long-lived, easily managed cover that is attractive to a wide array of wildlife is most easily created by planting adapted native species in a way that mimics the establishment of natural plant communities in an area. Since adapted native species are virtually permanent. there is no need to reseed after several years. The cost of reseeding is avoided as is the risk of exposing the land to erosion during stand establishment. In addition, native plants typically have better long-term performance on tracts that have inherent fertility and soil structure limitations that challenge revegetation attempts.

The most extensive use of native herbaceous plants in wetland restoration has occurred in the Upper Midwest. There. the concept of sculptured seeding has been applied to establish a specific site-and the northeastern United States in cooperation with the Plant Materials Program and WLI. In addition the WLI has signed a memorandum of understanding on July 5. 1995 with National Biological Service's (NBS) Patuxcnt Environmental Science Center (PESC), Fish and Wildlife Service's (FWS) Chesapeake Bay Field Office (CBFO), and NRCS Maryland State Office (MSO) to develop, test. communicate and implement wetland technology necessary for the restoration, creation and enhancement of wetlands in the Chesapeake Bay region. A goal under that partnership is the establishment of a ready source of seed, plants, and other germ plasm for planting in wetlands restored in the mid-Atlantic region.

As a result. in August of 1995 a cooperative agreement was signed between NRCS and the University of Maryland to work with the WLI and the NRCS Plant Materials Program to develop a grass seed mix of native ecotypes tor the mid-Atlantic region in four years. The mixture will be designed for the berms and levees of wetland restoration projects. as well as the adjacent uplands. The resulting vegetation will provide a significant improvement in herbaceous cover on lands currently dominated by cool season annuals and weeds associated with agricultural fields. Gwen Meyer. formerly with the National Plant Materials Center. is leading the project working with Dr. Harry Swartz of the University of Maryland. Gwen is using the project as part of her requirements for an MS in Agronomy al the University of Maryland.

As of March 1996, 12 different species of native grass seed has been collected from 18 different locations in eastern Maryland and Delaware (see table I on page 11). Ground is being prepared at two locations for replicated plantings of the collected seed which is scheduled for planting in April and May 1996. Also included will be three NRCS plant material releases from the Big Flats. New York Plant Materials Center. The experiments will include weed control. planting date and fertility treatments. This spring and fall will also include more seed collection and the purchase Of a seed stripper. For further information please contact. Gwen Meyer. NRCS, Wetland Science Institute. (301) 497-5591.

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NORTHEAST **WETLAND** FLORA

The *Northeast Wetland*

The *Northeast Wetland Flora* for general distribution. At this time the Western Wetland Flora, the Midwestern Wetland Flora, and the Southern Wetland Flora are out of print. Only the Southern Wetland Flora is currently scheduled for reprinting. Copies of the *Northeast Wetland Flora* can be requested from the Wetland Science Institute for distribution to field staff. field offices, and local or state government stall who have a need to identify wetland flora.

TIDBITS:

Memorandum of Understanding with the Wildlife Habitat Council

The Wetland Science Institute Headquarters at Patuxent was the site for the March 12.1924 signing of a Memorandum of Understanding between NRCS and the Wildlife Habitat Council to encourage landowners to manage private lands for the benefit of wildlife. The Memorandum was signed at the Institute by Chief Paul Johnson and Executive Director of the Habitat Enhancement Council. Joyce Kelly. The purpose of the MOU is to establish a general framework of cooperation between NRCS and the Wildlife Habitat Council to:

1. Enhance wildlife habitat and wetlands on corporate and private lands.

2. Advance public and private awareness and appreciation of wildlife and wetland issues and needs.

3. Work with private industry and corporations to encourage their participation in the enhancement, conservation, and development of wildlife habitat and wetlands on unused industry and corporation lands.

4. 4. Work with private industry and corporations to encourage incorporation of wildlife habitat and wetlands into existing and new corporate development plans.

Pete Heard, of the NHQ Watersheds and Wetlands Division, has been tasked by the Chief to lead this effort. In support of the agreement, NRCS and the Council intend to hold six regional workshops across the nation. These workshops will he held thls summer in Boston, Chicago, Denver, San Francisco, Houston, and Atlanta. The purpose of these workshops will be to present corporate land managers, agency personnel, and others with information on wetlands and wildlife programs, including agency responsibility and technical assistance. These workshops will build cooperative efforts and spur enhancement of wetland and wildlife values nationwide. The FWS, Corps, and EPA will also be participating.

Wildlife Scoping Team

In a separate but related effort, Pete Heard has also been asked by Chief, Paul Johnson, to lead another effort in establishing a Scoping team to determine what the agency should he doing for wildlife and Its habitat nationwide. He asked Pete and the team to consider all species, not just species of economical importance, lo determining how we should approach the management of the landscape for wildlife on private lands and how we should be building partnerships to accomplish these goals.

The Scoping tam met March 12-13, at the Patuxent Wildlife Visitor Center with the Chkf and Under

valuable "take aways" from the meeting, We now know the names, faces, locations, and areas of interest of practically all the Institutes employees. We developed Institute values statements to describe what the Institute's stand for and believe in. Those values statements have been transmitted to all Institute employees under a cover signed by all Institute Directors. We began to learn what each Institute will work on and identified projects of potential collaboration. We met others who we will be working with closely in and outside the Technology Consortium, and now have a better understanding of how we can work together accomplishing agency goals. We worked hard on developing business plans that will guide us through the rest of the year and into the next. All Institutes now have final versions (as final as a dynamic business plans ever are) which will be shared with partners and NRCS counterparts in the near future. The Institute Directors came away from thesession with a sense of great hope. knowing that we have assembled some of the most capable people in the agency to ensure our scientific credibility.

Developer Convicted of Destroying Maryland Wetland,

On February 29. a US District Court jury convicted developer James J. Wilson and his two companies of criminally destroying over 70 acres of wetlands in

field level technical soil scientists, regional wetland/riparian team soil scientists and NEDS cadre members.

Instructors for the workshops include: Dr. Mike Vepraskas (North Carolina State University), Dr. Peter Venneman (University of Massachusetts), Dr. Jimmy Richardson (North Dakota State University), and Dr. Herb Huddleston (Oregon State University). The sessions are scheduled for the following dates and locales:

- June 3 - 7; Lincoln. Nebraska
- August 5 - 9; Amherst, Massachusetts
- September 23 - 27; Sacramento, California

A letter has been sent out to all the State Conservationists requesting nominations for participant% Be on the look out for the request. NRCS has the leadership role for hydric soils -- that makes these sessions extremely important For additional information contact: Mike Whited, WLI, do USDA-FS, Agro-Forestry Center, E. Campus, University of Nebraska, Lincoln, NE 68583-0822, (402) 437-5178 ext. 37.

Hydrology Tools Training

Four training sessions on the application of wetland hydrology fools have been *scheduled for FY-96. One* of those courses (Little Rock, AR) has *now* been canceled; however, the remaining four courses will still be held according to the following schedule:

- March 25 - 29; Portland, Oregon
- May 20 - 24; Columbus, Ohio
- June 17 - 21; St. Paul, Minnesota
- July 15 -19; Harrisburg, Pennsylvania

This course provides multi-agency participants training on selection of appropriate tools for hydrologic analysis and how to use the tools. Tools covered include onsite field indicators. remote sensing, observation wells, streamflow and lake gauge analysis, runoff predictions, determining scope and effect of drainage, and application of DRAINMOD. For more information, please contact: Don Woodward, Conservation Engineering Division. P.O. Box 2890, Washington, DC 20013, (202) 720-2520.

Wetland Restoration Training

The five wetland restoration courses for FY-96 will b held according to the following schedule:

- June 10 - 14; Vicksburg, Mississippi
- June 17 - 21; Vicksburg, Mississippi
- August 19 - 23; Brookings, South Dakota
- August 26 - 30; Brookings, South Dakota
- September 16 - 20; Portland, Oregon

Thls course provides instruction on the assessment, planning, and Implementation of wetland restoratio and enhancement projects. The course emphasizes wetland ecology, planning for wetland functions, restoration design (including

Wetland Hydrologist Position (Oxford. MS), Readvertised

The WLI Wetland Hydrologist (interdisciplinary) position slated for Oxford, has been Readvertised.. The person selected for this position will lead WLI initiatives to develop and improve hydrologic techniques for wetland delineation and restoration We are anxious to fill this position to resume work begun in wetland hydrology prior to the establishment of WLI.

The vacancy announcement (No: NRCS-96-1 19) has been advertised government-wide, with the opening date for applications scheduled for March 25, 1996 and closing date for April 15, 1996. Wc encourage all interested parties to send thelr completed applications to:

Manager, Operations Branch
Natural Resources Conservation Service
P.O. Box 2.990. Rm. 6218S
Washington, DC 20260

Plant Materials Evaluated for mid-Atlantic Wetlands

	NATIVE GRASS SEED			
	GENUS	COMMON	COLLECTION SITE/ SOURCE	DATE
1	*Andropogon scoparius*			
	var littoralis	coastal bluestem	Ocean City, MD	10/23/95
2	*Andropogon ternarius*	bushy bluestem	Sussex Co., DE	11/4/95
3	*Andropogon virginicus*	broomsedge	Beltsville, MD	Nov-95
4	*Chasmanthium laxa*	slender wildoats	1 mile E of Barclay, MD	10/23/95
5	*Dichanthelium spp.*	deertongue		Spring '96
6	*Elymus virginicus*	Virginia wildrye		Spring '96
7	*Erianthus giganteus*	sugarcane plumegrass	N. Bethany Beach	10/23/95
8	*Erianthus brevibarbis*	brown sugarcane	N. Bethany Beach	10/23/95
9	*Panicum amarulum*	beach grass	1 mile S of Dewey Beach, DE	10/23/95
10	*Panicum anceps*	beaked panicum	Patuxent Wildlife Ctr. [illegible]	9/12/95
		beaked panicum	St. Michael's, MD [illegible]	9/15/95
		switchgrass	[illegible]	[illegible]
11	*Panicum virgatum*			
12	*Paspalum floridanum*	paspalum	St. Michael's, MD [illegible]	9/15/95
		paspalum	Bethany Beach, DE	Fall '95
		[illegible]	[illegible]	[illegible]
13	*Schizachyrium scoparius*	little bluestem	NAL Beltsville, MD [illegible]	[illegible]
		indiangrass	Soldiers Delight, MD	10/6/95
14	*Sorghastrum nutans*	indiangrass	Bethany Beach, MD	10/10/95
		indiangrass	1 mile E of Barclay, MD	10/23/95
		purpletop	combined @ Beltsville, MD	[illegible]
15	*Tridens flavus*	eastern gamagrass	Kent Co. Maryland [illegible]	9/15/95
16	*Tripsacum dactyloides*	eastern gamagrass	St. Michael's, MD [illegible]	9/15/95
	PLANT MATERIALS CENTER RELEASES :			
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
19	*Panicum virgatum 'Shelter'*	switchgrass	St. Mary's, WV	

TABLE 1

REPORT ON ATLANTIC CANADA'S SOIL SURVEYS
TO
NORTHEAST COOPERATIVE SOIL SURVEY CONFERENCE
BURLINGTON , VERMONT, U.S.A
JUNE 9 - 13 , 1996.

PRESENTEDBY:

SHERIF H. FAHMY, M.SC
LAND RESOURCE OFFICER
AGRICULTURE AND AGRI-FOOD CANADA
FREDERICTON RESEARCH CENTER
FREDERICTON
NEW BRUNSWICK
CANADA

STATUS OF NATIONAL SOIL SURVEY IN CANADA:

The future of the national soil survey program is uncertain.

I- Federal soil survey units located in provinces and territories are reassigned the reporting to local or closest research centers. (previous reporting was to The Center for Land and Biological Resources Research (CLBRR) , head office Ottawa' Central Experimental Farm).

2- Cooperative arrangements are being established with different research centers to continue on with selected activities , but the future structure and organization is yet to be finalized . At present. there is no voice for federal soil survey that has a national responsibility.

3- The local research centers have varied mandates and soil survey/inventory activities are being incorporated into their respective programs.

4- Coordination of national soil survey and related activities (at least for the vear 1996-1997) is being handled by the Canadian Soil information Network (_______

The previous overheads indicated the direction of the federal (National) soil survey. Most activities are directed towards use or applications of the information in the NSDB (Forest Soils of New Brunswick 1995 .)

STATUS OF ATLANTIC CANADA SOIL SURVEYS

New Brunswick:

21 Published soil survey reports since 1940 to date at varying scales of 1 :1 ,000,000 to more detailed 1:20,000 scale . Most recent report was published early in 1996 . Very little active field inventory work (0.4 py) is being conducted in remapping the parts of the potato producing region of the province at a scale of 1:20,000 all mapping is mainly for agricultural lands.

Most inventory work in N.B. is in the completion of standardized digital data sets for previously mapped areas and in the interpretation of soil survey information for agriculture and forestry uses. Some of the more recent applications includes: Land suitability for potato land expansion , Environmental farm planning , and Forest site classification .

Major efforts are being concentrated on research programs to enhance soil survey interpretations and to reduce the cost of field work of any future remapping of agriculturally blocked areas. These include the following : The use of remote sensing technology (SARA, IR.) in soil moisture modeling, soil drainage mapping, and farming systems identification . Soil degradation particularly soil water erosion under potato production.

Nova Scotia:

Activities are related to land resource data base development and interpretation of, land use suitability and soil degradation potential. It includes :

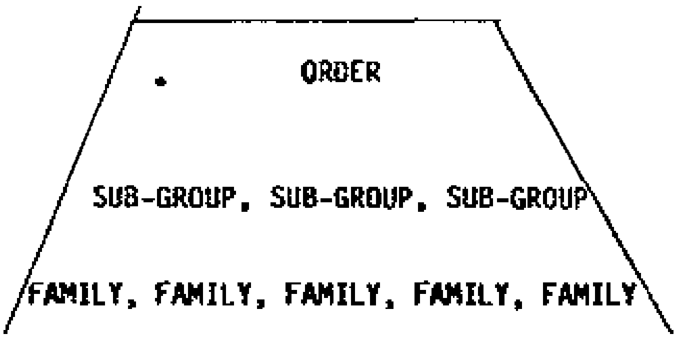
Compliments of:
Agriculture Canada
Soil Survey
P. O. Box 20280
Fredericton, N. B.
E3B 4Z7

Mr. S. Fahmy, P. Ag.

THE CANADIAN SYSTEM OF SOIL CLASSIFICATION

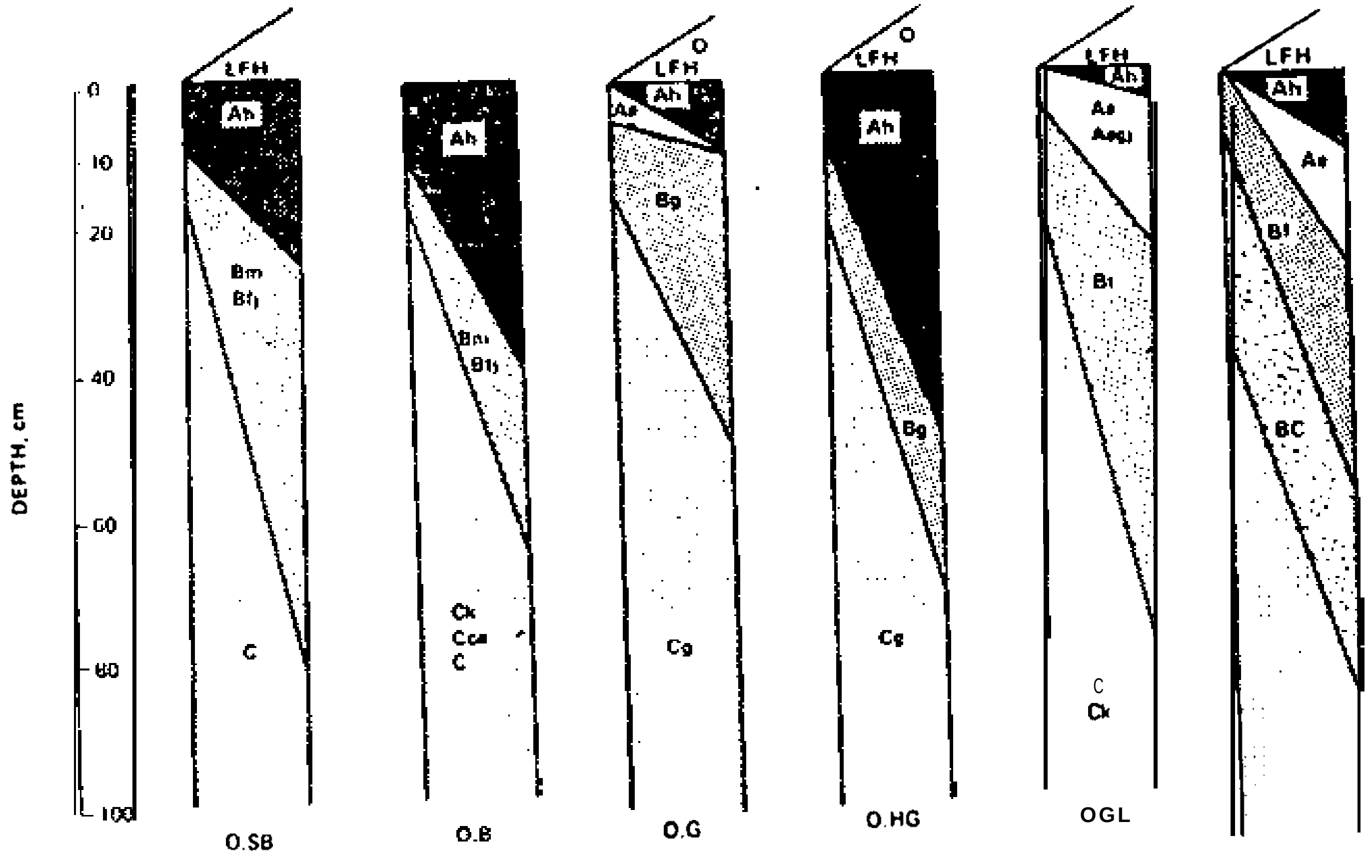
THE CANADIAN SYSTEM OF SOIL CLASSIFICATION HAS PROGRESSED FROM THE YEAR 1914 UNTIL ITS PRESENT FORMAT OF THE

THE DEVELOPMENT OF SOIL TAXONOMY HAS BEEN
[illegible]



ORDER	GREAT GROUP
BRUNISDLIC	MELANIC, EUTRIC. SOMBRIC MD DISTRIC
CHERNOZENIC	BROWN. DARK BROWN, BLACK AND DARK GRAY
CRYOSOLIC	TURBIC. STATIC MD ORGANIC
GLEYSOLIC	HUMIC, GLEYSOL AND LUVIC
LUVISOLIC	GRAY BROWN AND GRAY
ORGANIC	FIBRISOL, MESISOL, HUMIC MD FOLISOL
PODZOLIC	HUHIC. FERRO-HUHIC MD HUMO-FERRIC
REGOSOLIC	REGUSAL AND HUMIC
SOLONETZIC	SOLONETZ. SOLODIZED MD SOLOD

BRUNISOLIC ORDER:	HAVE A Bm HORIZON ALTERED BY HYDROLYSIS, OXIDATION OR SOLUTION OR ALL THREE TO GIVE A CHANGE IN COLDUR.
CHERNOZENIC ORDER:	NAVE THE FAMOUS CHERNOZENIC A HORIZON ORGANIC C 1-17%, BASE SATURATION > 80%.
CHYOSOLIC ORDER:	PERMAFROST WITHIN 1 M DEEP YITH EVIDENCE OF CRYOTURBATION CAUSING SORTED OR NONSORTED NETS, CIRCLES, EARTH HUMMOCKS, ETC.
GLEYSOLIC ORDER:	HAVE GLEYEING WITHIN THE UPPER SO CM MATRIX COLOUR OF LOW CHROMA AND/OR PROMINENT MOTTLES OF HIGH CHROMA.
LUVISOLIC ORDER:	HAVE A B_t HORIZON, AN ILLUVIAL HORIZON ENRICHED WITH SILICATE CLAY (CLAY SKINS).
ORGANIC ORDER:	OF ORGANIC MATERIAL, PEAT, MUCK OR BOG. ORGANIC C > 17% COULD EXTEND TO > 160 CM DEEP.
PODZOLIC ORDER:	HAVE THE FAMOUS B_f PODZOLIC B ENRICHED WITH F_e AND Al > 0.6% IN FINE TEXTURED SOILS OR 0.4% IN COARSER TEXTURED SOILS.
REGOSOLIC ORDER:	WEAKLY DEVELOPED GENETIC HORIZONS DUE TO YOUNG AGE, RECENT ALLUVIUM, COLLLUVIUM OR NATURE OF MATERIAL, E.G. PURE QUARTZ.
SOLONETZIC ORDER:	HAVE A B HORIZON VERY HARD WHEN DRY OF PRISMATIC OR COLUMNAR MACROSTRUCTURE, SALINIZED ND HIGH IN Na.


DEPTH, cm
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C
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O
LFH
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Ae
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Cg
O.G
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LFH
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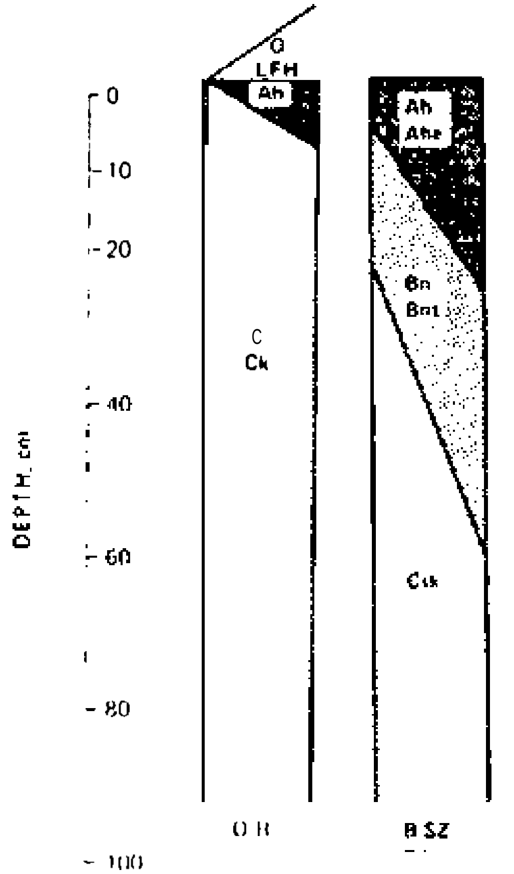
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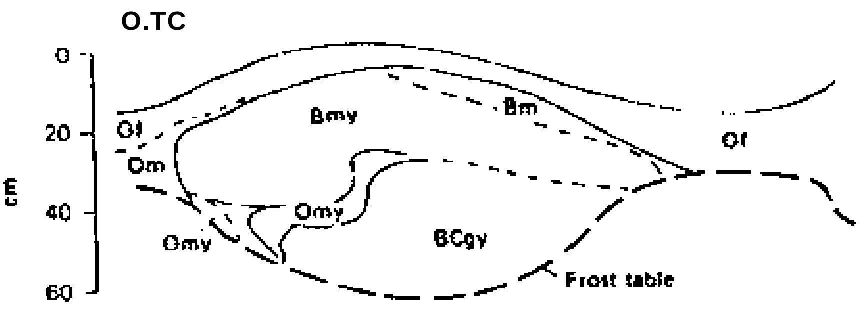
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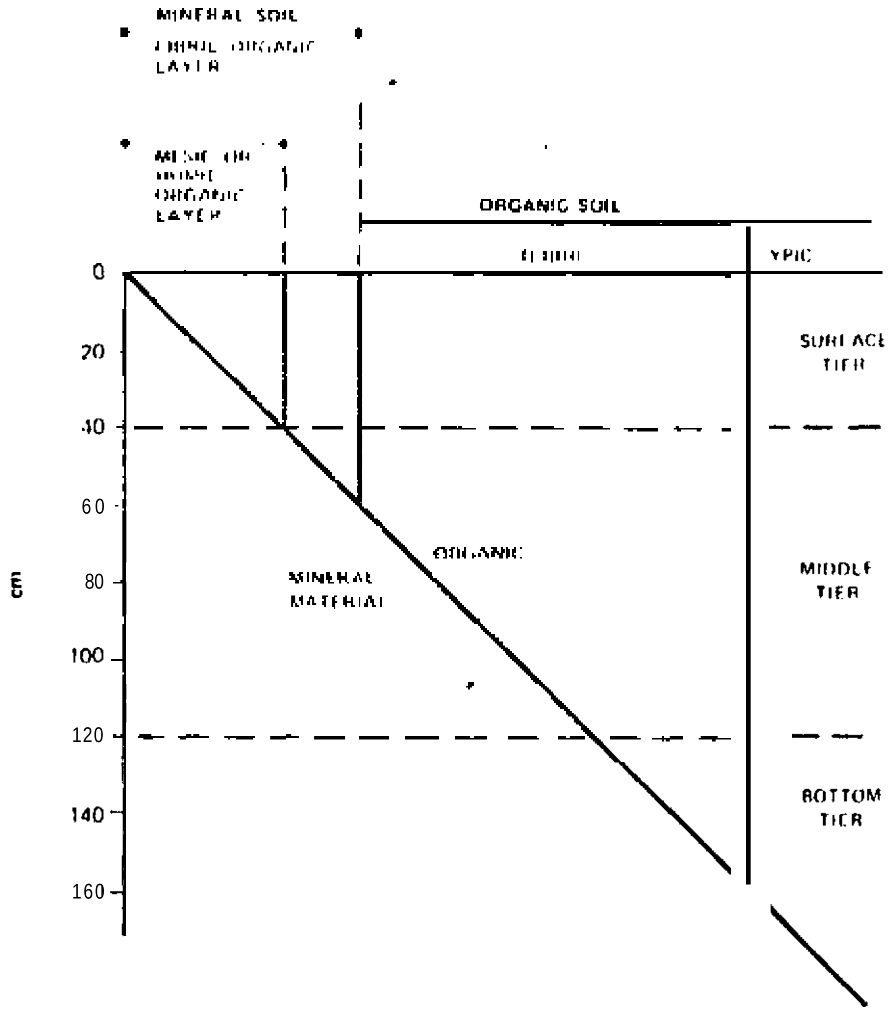
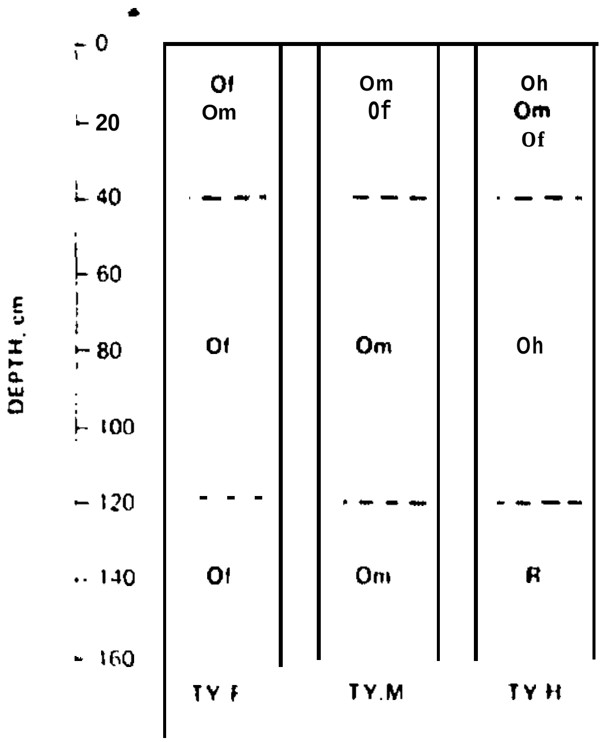


Fig. 31. Diagrammatic representation of depth relationships involved in Organic soil classification.



KEY TO PREVIOUS DIAGRAMS

		SUB GROUP	ORDER
(1)	O.SB	ORTHIC SOMBRIC BRUNISOL	BRUNISOLIC
(2)	O.B	ORTHIC BROYN	CHERNOZENIC
(3)	O.G O.HG	ORTHIC GLEYSOL ORTHIC HUMIC GLEYSOL	GLEYSOLIC
(4)	O.GL	ORTHIC GRAY LUVISOL	LUVISOLIC
(5)	O.HFP	ORTHIC HUMO - FERRIC PODZOL	PODZOLIC
(6)	O.R	ORTHIC REGOSAL	REGOSALIC
(7)	B.SZ	BROWN SOLONETZ	SOLONETZIC
(8)	O.TC	ORTHIC TURBIC CRYOSOL	CRYOSOLIC
(9)	TY.F TY.M TY.H	TYPIC FIBRISOL) TYPIC MESISOL) TYPIC HUHICOL)	ORGANIC

Global Soil and Climate Databases

USDA-Natural Resources Conservation Service, Soils Division, World Soil Resources, and International Conservation Division

Introduction

One of the major thrusts of the World Soil Resources (WSR) office since its inception in 1980, was to develop a global database on soils. The reason for this was to provide the database[1] to support its efforts to refine Soil Taxonomy (the US system of soil classification) for its better use and application in the tropics. With the development of Decision Support Systems by the other AID Project called the International Benchmark Sites Network for Agrotechnology Transfer (IBSNAT), WSR was requested to provide the soils database for their DSSAT (Decision Support System for Agrotechnology Transfer). By the late eighties, the database was becoming increasingly in demand by not only those persons working with crop simulation models but also by those working on Global Climate Change and all its ramifications. Both these modeling groups wanted the major soils of the world characterized and WSR set this as its goal. Towards the end of the eighties, development of spatial databases became feasible and WSR immediately equipped itself to meet this challenge. Many international agencies and organizations rely on WSR for its global database and as such WSR has become the defacto custodian of global soils data. WSR is a part of the International Geosphere Biosphere Program of the International Council of Scientific Unions and is consulted for information on soils of the world.

BRASS -- A Data Management System

WSR is developing the Biophysical Resources Appraisal Support System (BRASS). In the initial design of the prototype BRASS, the input data are identified with two types of databases: weather and soil. Eventually land cover and land use will be added. As a user chooses the event, location and spatial scale for his or her decision, the chosen area is categorized according to international classifications identified with each of the database types. As part of the initial design of the prototype BRASS, any current or future information source could be easily incorporated into its structure with little change to the user interface. By adhering to such a design, a user can continue to use the same BRASS interface program as new information sources and models are added, and old sources are modified or deleted. This approach accelerates the transfer of new information from the field or lab with a minimal amount of additional training on the part of the user.

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[1] Since 1992, the USDA Global Climate Change program has provided some financial support to maintain the databases.

An operational prototype version of BRASS will soon be available. For the moment it comprises climatic data for 27,000 stations from around the world, a digitized soil map of the world, the pedon database of WSR, and some of the Global Climate Change (GCC) models that are available.

BRASS -- Climate Database

The climate database in BRASS is linked to a model which computes the following and is shown in table 1 for a station in Vermont:

- soil moisture regimes
- soil temperature regimes
- length of growing season with beginning and end
- moisture stress severity index
- temperature stress severity index
- climate stress severity index
- soils according to FAO legend or Soil Taxonomy

These variables are available for the 27,000 stations. Interpolated maps, using a sophisticated kriging procedure which considers elevation and aspect, is included in BRASS and we have the capability to produce global or regional maps of any of the variables. BRASS enables the development of interpretative maps using expert knowledge and the soils and climate databases. Examples of interpretive maps include Global Wetlands, Global Acid Soils, and Global Land Stresses. The BRASS system also enables the assessment of "What-If' scenarios by utilizing some currently available general circulation models which predict changes in climate after a doubling of CO_2 levels in the earth's atmosphere.

BRASS -- Pedon Database

BRASS provides access to descriptions and laboratory data of 3,500 pedons which were sampled by NRCS soil scientists and analyzed at the National Soil Survey Laboratory, Lincoln, NE.

BRASS -- Digital Map Data

The BRASS program can also interface with the FAO Soil map of the World. The 1:5,000,000 scale map is digitized and is on a 2 minute raster grid cell. A digital climate map based on an interpolation of the 27,000 BRASS climate stations is also accessible.

Creation of the climate map lead to the conversion of the FAO soil map to Soil Taxonomy and the resulting map is also included.

US Dept. of Agriculture
Soil Conservation Service

WORLD SOIL RESOURCES
PO Box 2890, Washington DC 20013

DETERMINATION OF CLIMATIC REGIME ACCORDING TO SOIL TAXONOMY (USDA,1974) USING FRANK NEWHALL SYSTEM OF COMPUTATION

Water holding capacity 150 mm.
Soil temperatures were estimated from air temperatures.

Country: USA (VERMONT)
Station: BURLINGTON WSO , Lat 44°28 N, Lon 73°09 W, Elev. 101 m

Precipitation: 856 mm
Evaporation (Thornthwaite): 600 mm

Mean air temp. : 6.7 °C
Mean soil temp.: 8.7 °C
Mean soil temp. (Summer) : 17.0 °C
Mean soil temp. (Winter) : -0.6 °C

Soil temp. regime : Mesic
Soil moisture regime : Udic
Subdivision : Typic Udic
Pedo-Climatic Domain : DW5

Growing season: 185 days, from MAY 09 to NOV 13
MSSI: 0.00 TSSI: 0.47 CSSI: 0.47

TEMPERATURE CALENDAR

(-: T<5) (5: 5<T<8) (8 : T>8)

```
1*******10********20********30

------------------------------   JAN
------------------------------   FEB
------------------------------   MAR
------------------------------   APR
888888888888888888888888888888   -5555555888888888888888888888   MAY
                                 JUN
888888888888888888888888888888   JUL
888888888888888888888888888888   AUG
                                 SEP
888888888888888888888888888888   888888888888888888888888888888   OCT
8888555555555-----------------   NOV
------------------------------   DEC
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MOISTURE CALENDAR

(: DRY) (:M/D) (: MOIST)

1*******10********20********30

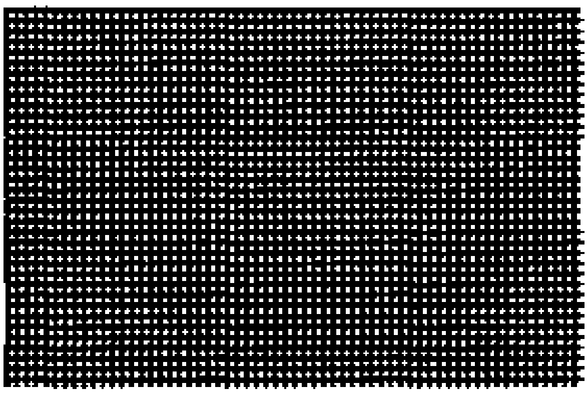

TABLE SOIL MOISTURE REGIME

Number of cumulative days that the moisture control section						Highest number of consecutive days that the m.c.s is			
during one year is			when soil temp is above 5 °C			moist in some parts		dry after summer solstice	moist after winter solstice
DRY	M/D	MOIST	DRY	M/D	MOIST	YEAR	T>8		
0	0	360	0	0	192	360	176	0	120

Spatial Databases -- GIS

WSR has the capability to process and analyze geographic data using PC-ARC/INFO, UNIX GRASS, and IDRISI. A sample of some of the digitized material we maintain is listed below. To maintain this library, we try to acquire digitized materials from around the world. We also digitize a few maps ourselves or do it on contract. These digitized materials are normally only available to others when the institution that provided us with the material has given us the permission to distribute. In such instances, we refer the request to the original institution.

Digital Soil Maps

Country	Scale	Country	Scale
Africa	1:5M	Indonesia	1:2.5M
Albania	1:200K	Malawi	1:500K
Burundi	1:250K	Romania	1:1M
Cimanuk watershed	1:100K	Slovakia	1:1M
Czech Republic	1:1M	Thailand	1:1M
Hungary	1:1M	Yugoslavia (former)	1:1M

Our customers

During the last few years, the institutions that have used our databases are as follows:

1. US Agency for International Development -- Office of Agriculture
2. US Agency for International Development -- Africa Bureau
3. USAID/Jakarta
4. World Bank, Asian Development Bank
5. Department of Defense
6. NOAA
7. NASA
8. National Geographic Society
9. University of Hawaii
10. University of Puerto Rico
11. North Carolina State University
12. Texas A&M University
13. Purdue University
14. Ohio State University
15. Iowa State University
16. United Nations Environment Program
17. Food and Agriculture Organization

18. International Centers: ICRISAT, ICRAF, IITA, CIAT,
19. Private Sector: DESFIL-CHEMONICS, Agr-Consultants Intl., others
20. National Universities and National Agriculture Research Systems in LDCs

Publications of WSR staff (only **those dealing with databases)**

1. Eswaran, H., E. Van den Berg, and P. Reich. 1992. Organic carbon in soils of the world. Soil Sci. Soc. Amer. J. 56:

2. Eswaran, H. and E. Van den Berg. 1992. Impact of doubling of atmospheric CO2 on length of growing season in the Indian Subcontinent. Pedologie, 42: 289-296.

3. Eswaran, H. 1992. Role of soil information in meeting the challenges of sustainable land management. J. Indian Soc. Soil Sci. 40:6-24. (18th. Dr. R.V. Tamhane Memorial Lecture).

4. Eswaran H. 1992. Sustainable agriculture in Kerala: some thoughts and considerations. Proc. of the 4th. Kerala Science Congress, Trivandrum, Kerala, India, Ed. C.G. Ramachandran Nair. Publ. State Committee on Science, Technology, and Environment. 330-332.

5. Eswaran, H. and P. Reich. 1993. Variability in soil and climatic conditions in IBSRAM's Vertisol Network sites in Africa. Report on the 1992 Annual Meeting on Management of Vertisols in Africa. Eds. E. Pushparajah and C. Elliot. Publ. IBSRAM, Bangkok, Thailand. 141-166.

6. Eswaran, II, E. Van den Berg, and R. Almaraz. 1993. Global distribution of Aridisols and their characteristics. In: Proc. Intl. Workshop on Classification and Management of Arid-Desert Soils. Publ. China Science and Technology Press. 388-399.

7. Eswaran, H. 1994. Soil resilience and sustainable land management. In: Greenland, D.J. and Szabolcs, I. (eds.) 1994. Soil Resilience and Sustainable land use. 21-32. CAB-International, Wallingford.

8. Beinroth, F.H., H. Eswaran, P.F. Reich, and E. Van den Berg. 1994. Land related stresses in agroecosystems. In: (Eds. Virmani, S.M., J.C. Katyal, H. Eswaran, I.P. Abrol) Stressed Ecosystems and Sustainable Agriculture. Oxford & IBH Publ. Co. New Delhi, India. 131-148.

9. Eswaran, H, E. Van den Berg, P. Reich, and P. Zdruli. 1994. Land resource assessment and monitoring for sustainable agriculture. Publ. (Eds. Deb, D.L., G. Narayanasamy, P.S. Sidhu, MS. Sachdev, and R.K. Rattan) Indian Society of Soil Science, Diamond Jubilee Symposium Proceedings. New Delhi, India. 31-41.

10. Eswaran, H., E. Van den Berg, P. Reich, and J. Kimble. 1995. Global soil carbon resources. In: (eds. Lal, R, J. Kimble, E. Levine, and B.A. Stewart). Soils and Global Change. Advances in Soil Science. 27-44. Lewis Publ. Boca Raton.

11. Eswaran, H., S.M. Virmani, and I.P. Abrol. 1995. Issues and challenges of dryland agriculture in Southern Asia. In: (Eds. A.S.R. Juo and R.D. Freed. Agriculture and the Environment: Bridging Food Production and Environmental Protection in Developing Countries). ASA Special Publication No. 60. American Society of Agronomy, Madison WI. 161-180.

FOR MORE INFORMATION CONTACT:

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e-mail: preich@usda.gov

Recent Changes
to

Soil Taxonomy

Bob Ahrens and Bob Engel

Changes to the Family

Particle-size classes and their substitutes

- Previously, Ultisols were the only mineral soil order that did not distinguish fine and very fine families. Experience has shown that this separation is meaningful and should be used uniformly in all taxa with the same exceptions applying to all soils. This change will affect the family classification of many Ultisols.

Mineralogy

1. Kandi and kanhap great groups of Alfisols and Ultisols are now included in mineralogy classes previously used only for Oxisol taxa. This will combine all soils with low activity clays into the same group of mineral classes since the clay activity definition for oxic and kandic horizons is the same.
2. Because Andisols are defined in part by poorly ordered or amorphous material, crystalline mineral names used for taxa in other orders are not appropriate for Andisols. Instead amorphic, ferrihydritic, glassy, and mixed classes are introduced for a better depiction of soil material. The criteria were developed by pedologists in New Zealand. More weathered Andisols are in ferrihydritic or amorphic glasses and less weathered Andisols in the glassy class.
3. Whole-soil (fine-earth fraction). New mineralogy classes were introduced and a definition changed to classes based on the whole-soil (fine-earth fraction).

   A. Magnesic replaces serpentinitic and the definition is expanded to include Magnesium rich minerals The name serpentinitic implied only the mineral serpentine
   B. Glauconitic is based on the amount of glauconite pellets both volume and weight percent limits are given.
   C. Isotic includes those soils that have appreciable amounts of poorly ordered minerals, but do not meet the criteria of the substitutes for particle-size classes. These soils have unique properties including high 1500 kPa to clay ratios. One of the criterion uses pH values by NaF because this test is a simple index of andic soil materials. However, free carbonates in the soil can result in high NaF pH values, so calcareous soils are excluded from the isotic class.
   D. Parasesquic includes some soils that were previously in the oxidic class. The oxidic definition did not provide meaningful separations. The parasesquic class has no required clay to iron ratio but the total Fe203 equivalent plus gibbsite must be greater than 10 percent The definition does not require any limits on quartz or weatherable minerals.

4. The following classes based on the less-than 0.002 mm fraction have been changed.
   A. Halloysitic requires more than 50 percent 1: 1 minerals plus allophane and more halloysite than any other single mineral
   B. Kaolinitic requires more than 50 percent 1: 1 minerals and more kaolinite than any other single mineral.
   C. The montmorillonitic class has been renamed smectitic. Montmorillonite, beidellite and nontronite are the dioctahedral expanding 2: 1 minerals in the smectite group. All have been detected in the clay fractions of soils. In fact montmorillonite and beidellite commonly occur together. The group name smectite (smectitic) is more appropriate since species are rarely differentiated. The definition has been simplified and clarified to require only more smectite than any other single kind of clay
   D. The definition of vermiculite also has been changed to require only more vermiculite than any other single kind of clay mineral.
   E. Chloritic classes are deleted from Soil Taxonomy. This should present no classification problems since no chloritic families have been established.
5. The following changes were made to the classes based on the 0.02 to 2.0 mm fraction.
   A. The definition of micaceous is changed to include pseudomorphs of mica in mineral grain counts. In some soils, appreciable mica has weathered to kaolinite but the mica platy or flake morphology has been maintained. Physical properties such as shear strength are affected by these platy particles.
   B. The paramicaceous class was established to include those soils that have properties resulting from significant mica and mica pseudomorph content, but they do not make the greater than 40 percent limit. Low shear strength is still an important property of soils that meet the criteria of paramicaceous.

Cation Exchange Activity Classes

Ratios of tine-earth cation exchange capacity at pH 7 to percent clay are used to define classes of cation exchange activity. These classes are used as a component of the family name in mixed and siliceous mineralogy classes of loamy, loamy-skeletal, clayey-skeletal, clayey, fine, and very fine particle-size classes in all taxa except Oxisols and kandi and kanhap great groups of Alfisols and Ultisols. These classes by definition are subactive.

Family Keys

All of the components of the family with the exception of the contrasting particle-size classes have been arranged in the form of a key. The key must be followed to correctly classify a soil. The “key” format should eliminate some of the confusion that has existed in the past with some of the components of the family.

Application

A number of soil series will need to be reclassified because of NSTH 18. The components of the family name are listed below in the same sequence in which the components appear in the family name.

Particle-size classes, mineralogy classes, cation exchange activity classes, calcareous and reaction classes, soil temperature classes, soil depth classes, rupture resistance classes, Classes of coatings, and classes of cracks.

Cation exchange Activity Class follows the mineralogy class in the family name. For example, Fine, mixed, active, mesic Typic Hapludalfs. The control section for cation exchange activity classes is the same as that used to determine the particle-size and mineralogy class. For soils with strongly contrasting particle-size classes, where both named parts of the control section use a cation exchange activity class, the class associated with the particle-size class that has the most clay is named. For example, in a pedon with a classification of loamy over clayey, mixed, active, calcareous, thermic Typic Udorthent, the cation exchange class, active, is associated with the clayey part of the control section. Note that commas replace the parentheses around the calcareous class. For soils with strongly contrasting particle-size classes, the mineralogy for both named particle-size classes or their substitutes are given, unless they are the same. For examples, ashy over clayey mixed, active, mesic Typic Vitraquands or clayey over loamy-skeletal, smectitic over mixed, superactive, thermic Vertic Ustochrepts. In the first case active refers to the clayey part and in the second example superactive refers to the loamy part, because no class is used with smectitic mineralogy.

Paralithic Contact

A paralithic (lithic like) contact is a contact between soil and paralithic materials where the paralithic materials have no cracks or the spacing of cracks that roots can enter is 10 cm or more. It differs from the densic contact and the lithic contact in that the material forming a densic contact slakes when air dried fragments are submerged in water and the material forming a lithic contact is in a strongly cemented or more cemented rupture resistance class (rock fragments).

Paralithic Materials

Paralithic materials are relatively unaltered (do not meet requirements for any other named diagnostic horizons or any other diagnostic soil characteristic) materials that have a very weakly cemented to moderately cemented rupture resistance class. Cementation, bulk density, and the organization is such that roots cannot enter except in cracks. Paralithic materials have at their upper boundary a paralithic contact if the paralithic materials have no cracks or if the spacing of cracks that roots can enter is 10 cm or more. Commonly these materials are partially weathered bedrock or weakly consolidated bedrock such as sandstone, siltstone, or shale. Paralithic materials can be used to differentiate soil series if the materials are within the series control section. Fragments of paralithic materials, 2.0 mm or more in diameter, are referred to as pararock fragments.

Densic Contact

A densic contact (L densus thick) is a contact more between soil and densic materials that has no cracks or the spacing of cracks that roots can enter is 10 cm or. It differs from both the lithic contact and the paralithic contact in that air dried fragments of the material forming a densic contact slake when submerged in water.

Densic Materials

Densic materials are relatively unaltered (do not meet requirements for any other named diagnostic horizons or any other diagnostic soil characteristic) materials that have a noncemented rupture resistance class. The bulk density or the organization is such that roots cannot enter except in cracks. These are mostly earthy materials such as till, volcanic mudflows, and some mechanically compacted materials such as mine spoils. Some noncemented rocks can also be densic materials, if they are dense or resistant enough to prevent roots from entering except in cracks. Densic materials have at their upper boundary a densic contact if the densic materials have no cracks or the spacing of cracks that roots can enter is 10 cm or more. Densic materials can be used to differentiate soil series if the materials are within the series control section.

Ortstein - Summary of Properties

Ortstein has all of the following:

1. Consists of spodic materials, and
2. Is in a layer that is 50 percent or more cemented, and
3. Is 25 **mm** or more thick.

Fragipan - Summary of Properties

To be identified as a fragipan, a layer must have all of the following characteristics:

1. The layer is 15 cm or more thick and
2. It. has evidence of pedogenesis within the horizon or, at a minimum, on the faces of structural units; and
3. It has very coarse prismatic, columnar, or blocky structure of any grade, has weak structure of any size **or** is massive. Separations between structural units that allow roots to enter have an average spacing of 1 0 cm or more on the horizontal dimensions; and
4. Air-dry fragments of the natural soil fabric, 5 to 10 cm in diameter, from more than 50 percent of the horizon slake when they are submerged in water; and
5. It has, in 60 percent or more of the volume a firm or firmer consistence, a brittle manner of failure at or near field capacity, and roots virtually absent.

Fragic Soil Properties

Soil aggregates with fragic soil properties must:

1. Have evidence of pedogenesis within the aggregates or at a minimum on the faces of the aggregates; and
2. Slake when air-dry fragments of the natural fabric, 5 to 10 cm in diameter are submerged in water; and
3. Have a firm or firmer consistence and a brittle manner of failure when soil water is at or near field capacity; and
4. Restrict the entry of roots into the matrix when soil water is at or near field capacity.

An example of how fragic soil properties are used in SOIL TAXONOMY:

IAKC. Other Endoaqualfs that have fragic soil properties;

1. In 30 percent or more of the volume of a layer 15 cm or more thick that has its upper boundary within 100 cm of the mineral soil surface; or
2. In 60 percent or more of the volume of a layer 15 cm or more thick.

Fragic Endoaqualfs

Lamellae - Summary of Properties

A lamella is an illuvial horizon less than 7.5 cm thick formed in unconsolidated regolith more than 50 cm thick. **Each lamella** contains an accumulation of oriented silicate clay on or bridging the sand and silt grains (and coarse fragments if any are present). Each **lamella** is required to have more silicate clay than the overlying eluvial horizon.

Iamellae occur in a vertical series of 2 or more and each **lamella** must have an overlying eluvial horizon (An eluvial horizon is not required above the upper most **lamella** if the soil is truncated).

Lamellae - Summary of Properties

Lamellae may meet the requirements of either a cambic or an argillic horizon. A single **lamella** is a cambic horizon if the texture is very tine sand or loamy very tine sand or finer. A combination of two or more lamellae will meet the requirements of an argillic horizon if there is 15 cm or more cumulative total thickness of lamellae that are 0.5 cm or more thick and that have a clay content of either:

Three percent or more (absolute) higher than in the overlying eluvial horizon (e.g. 13 percent versus 10 percent) if any part of the eluvial horizon has less than 15 percent clay in the fine earth fraction, or;

Twenty percent or more (relative) higher than in the overlying eluvial horizon (e.g. 24 percent versus 20 percent) if all part of the eluvial horizon have more than 15 percent clay in the fine earth fraction.

Future plans

7th edition of the "Keys" summer 1996

New Edition of the "Green Rook" summer 1998

Active International Committees

Permafrost Affected Soils (COMPAS)

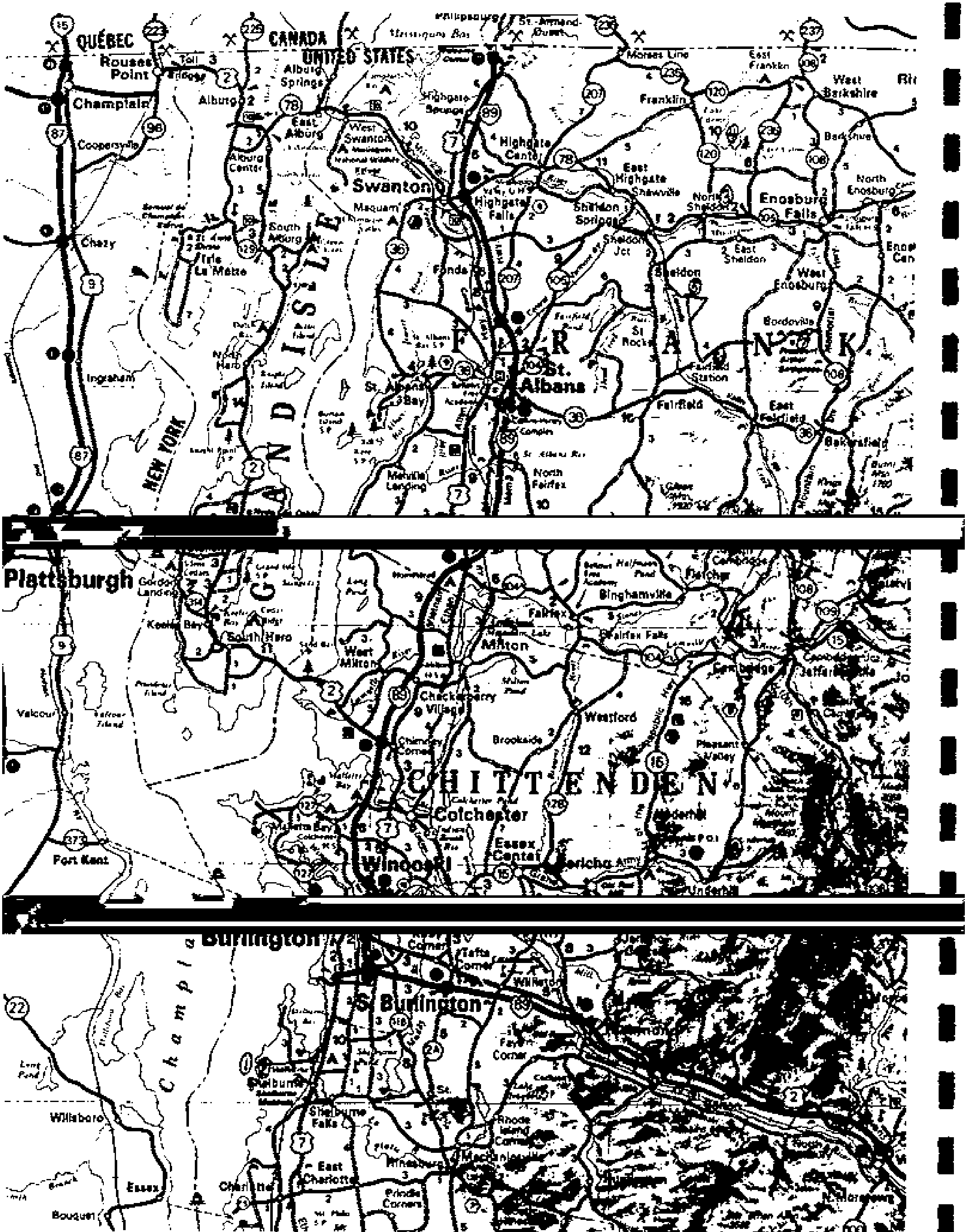
Moisture and Temperature Regimes (ICOMMOTR)

Anthropedogenic(ICOMANTH)

3:45 to 4:30 STOP 8: Proctor Maple Research Center.
Tour and Presentation of Activities of the Proctor Maple Research Center.

Presenters: Summer Williams, Assistant Director
Steve Gourley

4:30 to 5:15 Return to Living/Learning Center



QUÉBEC
CANADA
UNITED STATES
Rouses Point
Champlain
Coopersville
Chazy
Ingraham
NEW YORK
Alburg
Alburg Springs
East Alburg
Alburg Center
South Alburg
Isle La Motte
West Swanton
Swanton
Highgate Springs
Highgate Center
Highgate Falls
East Highgate
Sheldon Springs
Sheldon Jct
Sheldon
Franklin
East Franklin
West Berkshire
Berkshire
North Sheldon
Enosburg Falls
North Enosburg
West Enosburg
Bordoville
Fonda
St. Albans
St. Albans Bay
FRANKLIN
Fairfield Station
Fairfield
East Fairfield
Bakersfield
North Fairfax
Melville Landing
Plattsburgh
Gordon Landing
Keeler Bay
South Hero
West Milton
Milton
Fairfax
Fairfax Falls
Binghamville
Fletcher
Cambridge
Checkerberry Village
Chimney Corner
Westford
Brookside
Pleasant Valley
CHITTENDEN
Colchester
Essex Center
Jericho
Winooski
Underhill
Valcour
Port Kent
Burlington
S. Burlington
Williston
Shelburne
Shelburne Falls
East Charlotte
Charlotte
Hinesburg
Willsboro
Essex
Bouquet
Champlain

Stop 2. **Shelburne** Farms **Field Site**

Manure Management on Grass Hay to Improve Nutrient Use Efficiency and Water Quality
Shelbume Farms, Shelbume, VT, W. Jokela, S. Bosworth, and J. Aleong

Field studies were established at two locations in NW Vermont to evaluate manure application methods for grassland aimed at improving nitrogen utilization efficiency from manure and reducing adverse water quality impact. The study compares liquid dairy manure, either broadcast or banded, three rates of composted dairy manure (10, 20, and 40 tons per acre), and N fertilizer rates (0, 25, 50, and 75 lb N per acre each harvest). The Shelbume Farms site is situated on a Palatine silt loam (loamy-skeletal, mixed, mesic Typic Eutrochrept), while the second site is on a Vergennes clay (very tine, illitic, mesic Glossaquic Hapludalf). In the banded manure treatment, liquid manure is applied with drop hoses attached to a "trailing feet", which place the manure in narrow bands beneath the grass regrowth about 12 inches apart. This technique, developed in Europe, can potentially reduce losses of ammonia-N from manure by 30 to 80%. Preliminary results from this study (Shelbume Farms site only) show increased orchardgrass yields from most manure, compost, and N treatments. Measured NH3 loss rates were quite high (1 to IO kg/ha/h) from broadcast manure, much less from banded application, during the first 3 hours after application. Bates of NH3 loss were much lower after 24 hours. (This project is funded, in part, by USDA Hatch funds and the University of Vermont Agricultural Experiment Station.)

Galloway

SOIL SERIES: Palatine Variant DATE: June 6, 1996

CLASSIFICATION: Typic Eutrochrepts F-loamy, ...

NOTES: This soil is representative of the soils in the UVM research plot. It differs from the Palatine series in that it is not skeletal and doesn't have a mollic epipedon. In Chittenden County this soil was included in Palatine map units. In is now mapped seperately as the Galway series.

Ap--0 to 12 inches; dark brown (10YR 4/3) channery silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; many very fine roots; 20 percent rock fragments; neutral (pH 7.0 in H2O); abrupt smooth boundary.

R--26 inches; shale bedrock.

Lower Missisquoi River HUA
INTEGRATED CROP MANAGEMENT (ICM) DEMONSTRATION FARM PROGRAM

The Integrated Crop Management Demonstration Farm Program is an effort, primarily by UVM Extension, to work intensively with a small group of dairy farmers to encourage adoption of nutrient and pest BMPs. It has consisted of two main parts -- a crop management services program and on-farm field demonstrations. Extension has also conducted various other education activities aimed at the agricultural and general public.

Stop 3: Steve and Richard Dodd Farm, Sheldon, VT.
Lower Missisquoi Hydrologic Unit Area Project.

Lower Missisquoi Integrated Crop Management Service Program

Nineteen farms have been part of the Lower Missisquoi ICM Program during one or more of the past four years, ten to fourteen each year. A whole farm nutrient management plan, which included nutrient, pest, and/or other crop management services, was developed annually for each farm from 1991 to 1994. The Crop Management Services Program was designed to be a pilot program that would eventually become self-sustaining so that it would continue beyond the funding period of the HUA. In an attempt to accomplish that goal, ICM services were offered free of charge in the first year to encourage participation without financial risk, but in successive years farmers were required to pay an increasing share of the cost of the services. That goal became a reality in the 1995 growing season with formation of the Missisquoi Crop Management Association.

The Missisquoi Crop Management Association

The Missisquoi Crop Management Association is a farmer owned and operated crop management association formed in September of 1994 to ensure that crop management services would still be available in the region. The establishment of the Association was the culmination of many months of work by a core group of farmers from the Crop Management Services program, facilitated by the project technician_ Sarah Cushing. The technician was hired by the Association to perform services and manage the daily affairs of the business. At this time the Missisquoi Crop Management Association has twelve members, some of whom are past Missisquoi Crop Management Service participants. The Association is offering the same services as were offered by the Missisquoi ICM service, but the abiity to pick and choose services has been greatly increased.

Richard and Steve Dodd are starting their second year as members of the Missisquoi

Demonstrations Field Trials

d) Direct Incorporation of Liquid Manure as a Sidedress on Corn
e) Direct Incorporation of Liquid Manure for Fall and Spring Application on Corn

Direct Incorporation of Liquid Manure for Fall and Spring Application of Corn
Steve and Richard Dodd farm, Sheldon, VT.

A study was established in October of 1995 to compare different options for application of liquid manure on corn either after harvest in the fall or before planting in the spring. The site is on the Steve and Richard Dodd farm in Sheldon on a field mapped as a Raynham silt loam (coarse-silty, mixed, nonacid, mesic Aeric Haphquept). Treatments include three fall manure application methods (shallow sweep incorporation, s-tine/field cultivator incorporation, and surface application), spring application with immediate incorporation (s-tine), and N fertilizer pre-plant. The immediate incorporation methods are expected to improve utilization of N in manure by reducing volatilization of ammonia-N and reduce loss of phosphorus and nitrogen via surface runoff.

SOIL SERIES: Raynham Variant DATE: June 6, 1996

CLASSIFICATION: Aquic Dystrochrepts clayey over loamy, mixed, frigid

DIAGNOSTIC FEATURES: Ochric epipedon - 0 to 10 inches
Cambic horizon - 10 to 32 inches

MAP UNIT NAME: Georgia stony loam, 3 to 8 percent slopes

MAP UNIT SYMBOL: GeB

AREA: Town of Sheldon, Chittenden County, Vermont

ATLAS SHEET: 18

LOCATION: 50 feet east of VT route 20 and 1500 feet north of the Missisquoi River

LATITUDE: 44-54-45 North LONGITUDE: 72-54-20 West

VEGETATION: Corn Field

WATER TABLE: > 57 in. FLOODING: None

PERMEABILITY: Moderate (0 to 10 in)
Slow (10 to 57 in) DRAINAGE: Poorly drained

MOISTURE: Moist

PARENT MATERIAL: Lacustrine over
Compact glacial till ELEVATION: 420

PHYSIOGRAPHY: Sideslope RELIEF: Concave-convex

SLOPE: 5 % ASPECT: Southeast, 140

NOTES: This soil is located on the boundary between a Georgia and Raynham map unit. The upper 36 inches is representative of the soils in the UVM research plot. It differs from the Raynham series in that it has a glacial till substratum and is higher in clay.

PEDON DESCRIPTION

Ap--0 to 10 inches; very dark grayish brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; common very fine roots; 5 percent rock fragments; neutral (pH 6.6 in H2O); abrupt wavy boundary.

Bw--10 to 32 inches; brown (10YR 4/3) silty clay; moderate thin platy structure; firm; common very fine roots; common, fine, distict, dark yellowish brown (10YR 4/6) masses of iron accumulation in the matrix and many, fine, faint, grayish brown (10YR 5/2) clay flows along ped surfaces; 2 percent rock fragments; moderately acid (ph 5.8 in H2O); clear wavy boundary.

BC--32 to 36 inches; brown (10YR 4/3) silty clay and lenses of olive brown (2.5Y 4/4) fine sandy loam; weak thin platy structure; firm; few very fine roots; common, fine, distict, dark yellowish brown (10YR 4/6) masses of iron accumulation in the matrix and many, fine, faint, grayish brown (10YR 5/2) clay flows along ped surfaces; 2 percent rock fragments; moderately acid (ph 5.8 in H2O); clear wavy boundary.

Cd--32 to 57 inches; olive brown (2.5Y 4/4) channery fine sandy loam; massive; firm; common, fine, prominent, light olive gray (5Y 6/2) iron depletions and strong brown (10YR 4/6) masses of iron accumulation in the matrix; 20 percent rock fragments; moderately acid (ph 5.8 in H2O).

Stop 6: **Cushing Farm**

Manure and Fertilizer Effects on Yield and Nutrients in Runoff on Grass Hay
Sarah Cushing farm, Fairfield, VT.

Both fertilizer and manure are possible sources of nutrients for grass hay, but they are also subject to losses in surface runoff, thereby potentially contributing to eutrophication of surface waters. This trial was established to compare liquid dairy manure and fertilizer as the primary nutrient source on mixed grass hay. We are measuring availability of nutrients to plants as measured by yield response and nutrient uptake and loss of nutrients (phosphorus, nitrogen) in surface runoff. The site selected is on a long-established mixed grass-broadleafspecies hay field in Fairfield, VT. The soil is a moderately well drained Tunbridge-Peru stony fine sandy loam (coarse-loamy, mixed, frigid Entic Haplorthod/Aquic Fragiorthod) with an 8 to 10% slope, giving it a fairly high potential for surface runoff.

Treatments consist of the following: a) control (no nutrients added), b) fertilizer applied according to UVM recommendations (40-50 lb N/acre per application (two or three applications per year), 40 lb P_2O_5, and 180 lb K_2O/acre, and c) liquid dairy manure, applied at a rate to supply nutrients, especially N, approximately equivalent to the fertilizer treatment. Each plot actually consists of a main plot (6 x 20 ft) used for crop yield determinations and soil sampling and a miniplot (1 x 2 m), surrounded by a sheet metal barrier, immediately down slope from the main plot from which surface runoff is collected and analyzed for phosphorus and nitrogen.

Forage yields were increased significantly (by at least 50% in most cases) by both fertilizer and manure treatments in all harvests in all years. The yield effect of nutrient application increased over the course of the experiment, more than doubling yields in the third year. The three-year average showed an 80% increase in yield from fertilizer or manure with no difference between the two nutrient sources.

Manure and fertilizer application also affected soil test levels. At the end of the first year (1993) available P, K, and Mg showed increases from manure and/or fertilizer, primarily in the O-3 inch layer. By fall of 1995 the effects of fertilizer and, especially, manure appear to be even greater -- a doubling of available P, K, and Mg levels compared to the control in the O-3 and 3-6 inch depth. Of particular note and concern from a water quality perspective is the increase in available P soil test in the manure treatment from “medium” to a “high” level over the course of the three-year study. This is the inevitable result of applying manure to meet the N needs of the crop. The amount of P and K present in manure, relative to that of N, is greater than the ratio needed by the crop, especially with the high NH_3 volatilization losses common from surface application on perennial forages. In this study the result was an application of almost four times the P and twice the K from the manure treatment as from the recommended (and applied) fertilizer.

Runoff collection results from the last two years have been limited and rather incomplete. This has been the result of a predominance of precipitation events of low amount and intensity (and therefore low runoff) in 1994 and some technical problems with the runoff collectors in 1995.

However, in 1993 runoff water was obtained from a number of events from mid-June until October, and samples were collected and analyzed for N and P. Average weighted concentrations (total mass divided by total runoff volume) for the June through August period showed two to three times higher P concentrations from the manured or fertilized plots compared to the control.

This demonstration trial has shown that either fertilizer or manure can produce dramatic yield increases of forage on a grass-broadleafmeadow that has been under managed for years. However, the high rates of manure required as the exclusive source of N can result in excessive P loading, with the potential of adverse water quality effects. A better approach may be application of lower manure rates supplemented with N fertilizer.

STOP 8: Proctor Maple Research Center.

SOIL SERIES: Cabot Variant DATE: June 6, 1996

CLASSIFICATION: Aquic Dystrochrept coarse-loamy, mixed, frigid

DIAGNOSTIC FEATURES: Ochric epipedon - 1 to 5 inches
Cambic horizon - 5 to 23 inches

MAP UNIT NAME: Cabot extremely stony silt loam, 3 to 25 percent slopes

MAP UNIT SYMBOL: CbD

AREA: Town of Underhill, Chittenden County, Vermont

ATLAS SHEET: 25

LOCATION: 4,000 feet east of Pleasant Valley Road and 6200 feet north of Stevensville Brook

LATITUDE: 44-31-30 North LONGITUDE: 72-51-50 West

VEGETATION: Sugar maple, striped maple, paper birch, American beech

WATER TABLE: > 44 in. FLOODING: None

PERMEABILITY: Moderate DRAINAGE: Moderately well drained

MOISTURE: Moist

PARENT MATERIAL: Glacial Till ELEVATION: 1480

PHYSIOGRAPHY: Footslope RELIEF: Concave

SLOPE: 10 % ASPECT: NNW, 290

NOTES: This soil is a representative inclusion in a Cabot map unit. These soils were formerly classified as Peru soils but do not fit the new criteria for spodic horizons. This is a common problem in many of the surveys that were correlated in New England prior to 1992.

PEDON DESCRIPTION - The surface is covered by 2 inches of loose litter.

Oa--0 to 1 inches; black (10YR 2/1) muck; very strongly acid (pH 4.6 in H2); abrupt wavy boundary.

A--1 to 5 inches; very dark grayish brown (10YR 3/2) very fine sandy loam; weak fine granular structure; friable; many very fine and few fine to coarse roots; 5 percent rock fragments; very strongly (pH 5.0 in H2O); abrupt wavy boundary.

Bw1--5 to 10 inches; dark yellowish brown (10YR 4/6) gravelly very fine sandy loam; weak fine and medium subangular blocky structure; friable; common very fine and few fine and medium roots; 20 percent rock fragments; strongly acid (ph 5.2 in H2O); abrupt wavy boundary.

Bw2--10 to 23 inches; dark yellowish brown (10YR 4/4) gravelly very fine sandy loam; weak fine subangular blocky structure; friable; common very fine and few fine and medium roots; 20 percent rock fragments; very strongly acid (ph 5.0 in H2O); abrupt wavy boundary.

Cd--23 to 44 inches; olive brown (2.5Y 4/3) gravelly fine sandy loam; massive; firm; few very fine roots; common, fine, faint, grayish brown (2.5Y 5/2) iron depletions and common, fine, prominent, dark yellowish brown (7.5 YR 4/6) masses of iron accumulation in the matrix; 20 percent rock fragments; very strongly acid (pH 5.0 in H2O).

To: **NRI East State Coordinators**

From: **Drew Adam, NRI** Amherst ~~JA~~ June 12, 1996

Subject: **NRI Forum -** June 11

I know that many of you were unable to see the NRI forum that was broadcast yesterday and so I am sending along my notes of that meeting to you. I also have made a tape of the broadcast as well and would be happy to loan it to you upon request.

Forum participants: Nathan Roberts, moderator, **Chief Paul Johnson, Rich Duesterhaus,** a panel consisting of **Peter Smith, Jeff Goebel, Craig Cor,** director of NRCS Resource Assessment and Strategic Planning Team, **Margaret Maizel,** executive director of National Center for Resource Innovations (user of **NRI),and** Fee **Busby, NRCS** grazing lands specialist.

To start off, **Chief Johnson** discussed the agency's mission of caring for the health of the land much like " National Health Care" cares for the people's health. In order to do this properly we must; 1) know where we are **(NRI)** 2) work with our partners and 3) provide assistance by making "house calls" to our customers. He sees that out of the Blue Ribbon Panel's recommendations that the **NRI** is directly linked to Strategic Planning and to where this agency must go in the future. Then Rich Duesterhaus, via phone from the Southeast, called in to discuss the improvements of the NRI as it moves towards a continuous inventory. He mentioned the creation of the six new Institutes, including the Natural Resources Inventory and Analysis Institute which exists to improve our ability to inventory, monitor and assess status, conditions, and trends of natural and related environmental resources. Following that was a **five** minute NRI video that gave a basic overview of the **NRI** process.

After the video, there was a moderated panel discussion consisting of the five people mentioned above. **Peter Smith** began the discussion appealing to the non-NRCS audience, inviting them to begin to use the NRI data. So far it has largely been an internal resource, however the marketing of the "NRI Graphic Highlights" has been a big success running in several major newspapers, magazines, posters, etc. throughout the country. Other marketing strategies however have been slowed down by the budget. For example, there had planned to be several regional forums throughout the country but only this one satellite telecast could be arranged. Technology will help us market NRI in the future by accessing the data on compact discs (CDs), use of the Internet and products from the NRIDAS software. Peter reiterated that the strategic plan calls for NRI to be a continuous inventory, no longer on a five year cycle plus there will be several focused subsamplings.

Next, **Craig Cox** talked about making NRI more reflective of the users needs. There is a need to change NRI to make larger payoffs. An example of this would be utilizing better wetland data for strategic planning. Another example would be for water quality purposes, e.g., tracking the fate of water, how it gets to and leaves the data point. Craig then discussed how NRI is changing from the "data set" image to the more dynamic "sample frame", where this new sample frame can now be linked to other inventories. We need to be more responsive to just what the conservationists needs are.

Margaret Maizel, who has done much natural resource planning and analysis work in the Chesapeake and Great Lake Watersheds, then talked about NRI's strength as an historic data base that she has integrated with other data sources to create some important recommendations regarding natural resource planning in these areas. Her use of GIS to display the data has had some very nice results. Some of the other data sources she has linked NRI data to has been from STATSGO, EPA, ERS, NAS and others. She sees NRI data being used for ecological modeling purposes.

Jeff Goebel concentrated his talk on the use of the personal digital assistants (PDA's) for data collection in 1997 and how this technology will not only make data collection easier but should make the results more accurate and acceptable. PDA software can require certain questions be answered. NRI data has the advantage of keeping track of resource conditions for almost two decades and now when new questions arise we can go back and do "what if" scenarios.

Fee Bushy, a special assistant to the chief, has used NRI data in assessing the health of the rangeland. As a result of this work, recommendations have been made and are in the process of being implemented. Other federal agencies such as the FS, BLM and others are now going the field to collect additional data. NRI has been beneficial in tracking and improving the quality and health of grazing lands.

After the panel's discussion on different aspects of the NRI the phone lines were open for viewers to call in with questions and comments I will try to recapture the questions that were asked but the answers often came from more than one individual and were difficult to recapture. An interesting side note; all calls came from states west of the Mississippi and so some of the issues discussed were not entirely relevant to east states needs. Questions asked;

- Will enhanced wetland and biological data be collected ?

- Can you link temporal data such as weather information to the NRI ?

- Will there be any training of the users on accessing the NRI and how to use it ?

- Can you link the soil surveys and attribute data to the NRI ?

- Can you use enhanced remote sensing technology to collect future data elements

- Will NRI begin to meet some of the concerns and needs of urban conservation such as measuring the amount of water being used in typical suburban households

- Will the NRI expand sampling into the Pacific Basin and start to collect data on monitoring the coral reefs ? (I'll volunteer for that!)

- If new data elements are designed or new sites identified, are there ways of obtaining historic data on them ?

- Will there be any enhanced wetland data collection ?

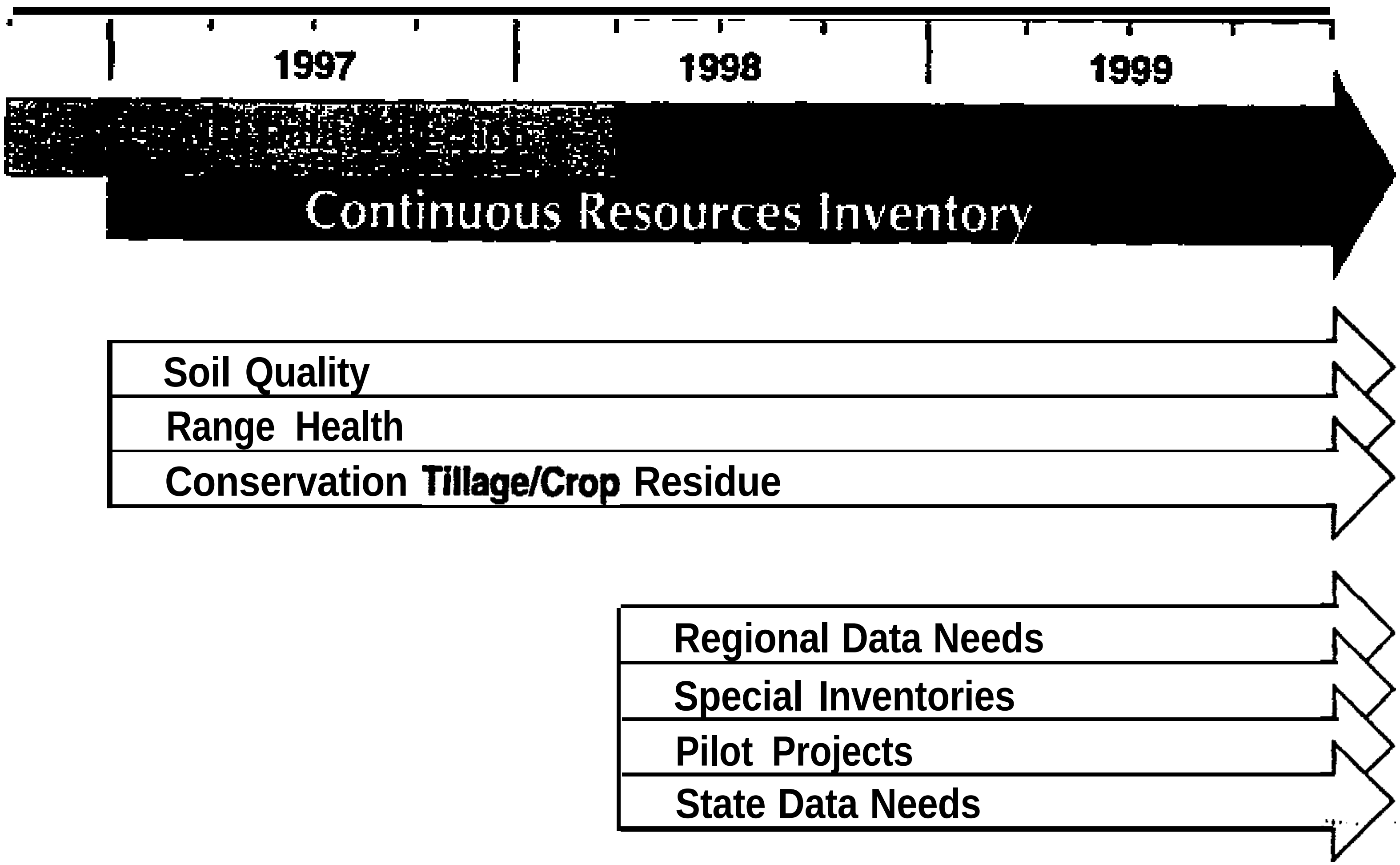
Present at the Amherst downlink site were; **Drew Adam, NRI** specialist, **Joe Bagdon, NRCS (NAPRA),** Cecil **Currin,** MA State Con., **Jennifer Dempsey,** American Farmland Trust (APT), **Barbra Hobson, MA** Dept. of Food and Ag, **and Cathy Price GIS** specialist, NRCS. A phone line was made available as well as handouts on NRI Highlights, the data element questionnaire, the NRI timetable for the future, and a copy of a report showing the products of the NRIDAS.

Discussion continued for about forty five minutes afterward regarding the content of the broadcast, clearing up any misconceptions or questions raised by the forum and any specific questions or potential data elements that might be submitted. Questionnaires were handed out and encouraged to be submitted now or in the near future. Jennifer Dempsey, APT, asked whether the NRI identified not only prime farmland but statewide and unique farmland and trends on their status throughout the northeast. Barbra Hobson, MA Food and Ag was interested in the integrity of soil attribute data link and how that relates to the NRI. There was a misconception that NRI data could somehow be spacially linked to give the user accurate location as to where the PSU's are located. It was noted that presently, the location is classified information.

cc. Jim Benson, NHQ

1997 National NRI Sample
300,000 PSU's ±

9,000 PSU'S	National Reliable Data
100,000 PSU'S	State Reliable Data
300,000 PSU'S	MLRA Reliable Data



15:2

A SUMMARY OF PROJECT OFFICES IN MO 12

Thomas Villars, Soil Survey Project Leader
Woodstock, Vermont

Presented as part of a Panel Discussion on the roles of the MLRA office, State office, and Project office
Northeast Cooperative Soil Survey Conference
Burlington, Vermont June 13, 1996

In order to speak on behalf of all project offices, a questionaire was sent to 16 PO's in MO12. All 16 offices responded to the questionaire and a summary of their responses are presented here.

STAFFING

How many people are on the project office staff?

- 1 person - 5 offices
- 2 persons - 6 offices
- 3 persons - 3 offices
- 6 persons - 1 office
- 7 persons - 1 office

Eleven of the 16 offices have one or two people -- this is not a" efficient way to staff a" office. as has bee" mentioned at different times. Seven offices report that they are not fully staffed. All but two of the off ices are co-located with field offices or other agencies.

What percentage of the survey is complete in the PO's?

- Less than 25% complete - 2 offices
- 25 - 50% complete - 2 offices
- 50 - 75% complete - 2 offices
- More than 75% complete - 8 offices

With half of the offices being over 75:: complete. this makes implementing changes related to mapping techniques and technologies at the PO level not too practical. It also indicates that in the "ear future. there will be a significant number of staff beginning new assignments.

Eleven offices report that they are behind schedule, some by as many as 5 to 7 years, based on the target dates in the original MOU's. For whatever reasons, NRCS has not met its obligations in regards to completing surveys by agreed-upon target dates.

COMPUTERS

Every office has a computer. The similarities end there. however. The age, size and capabilities of the computers in the project offices vary widely. Eleven offices have stand-alone computers for soils activities; the others share a computer with field office operations.

How old are the project office computers?

1 - 2 years - 4 offices
3 - 5 years - 5 offices
6 - 9 years - 3 offices
10 years and older - 4 offices

Three offices have 640k of RAM, B offices have 4 to B mb of RAM and 3 offices have 16 mb of RAM (two offices did not respond to this question). What all of this means is that some offices cannot run many of the basic programs used in soil survey operations, while other offices are on the cutting edge of computer technology.

PHOTOGRAPHY

Aerial photography is one of the mast critical 'tools' in soil mapping. A recurring problem is the lack of up-to-date photography at the proper scales with excellent clarity (leaf off, etc.). A quarter of the project offices are using photography flown 30 years ago.

Four offices are using photos with a scale of 1:12000, three offices are using 1:18000 photos, and 6 offices are using photos with a scale of 1:24000(3 offices did not respond).

How old are the aerial photographs used in mapping?

1990 and newer -5 offices
1985 to 1990 - 5 offices
1980 ta 1984 -1 office
1968 - 1 office
1962-63 - 3 offices

FIELD MAPPING TOOLS

When asked to describe the equipment used in fieldwork. the answers were surprisingly consistent: augers. spades. and probes are the tools of the field soil scientist. It is worth pausing to consider the current dichotomy in soil survey: al though the "value-added" products of soi 1 survey are intensely automated, computerized and processed using the most up-to-date technologies, the initial step of collecting the raw data that goes into the making of a soil map is still done in much the same way it was done thirty to fifty years ago, with simple hand tools. This important fact deserves some consideration, since any value-added product is only as good as the initial product.

One office did report using Global Positioning Systems (GPS) and ground penetrating radar (GPR) on a regular basis.

Acres mapped yearly by staff varies widely, depending on the Order of the mapping, whether it is part of the "once-over" or part of an update, and other responsibilities of the staff.

INTERPRETIVE MATERIALS GIVEN TO CLIENTS

The products currently provided to people requesting soil survey information at the project office level are relatively standard across the MO. Copies of soil maps, SOILS-S's (yes, many offices are using these, although they are soon to be 'discontinued'), map unit descriptions, and interpretive tables are products most commonly provided. While most offices felt that these products met the customers needs, it is this author's feeling that we could be doing better in this area. Some offices report that soil maps are copied on the office copier and that the quality is poor. Others stated that clients often ask for special interpretations, rather than the standard ones available. No office reported providing digital data; all the products are paper-based.

SUMMARY

The project office is where "the rubber meets the road," as far as the soil survey is concerned. It is where the mapping is carried out, where the manuscripts are written. and where the public can get soils information for a wide range of applications. The project office is made up of a small specialized staff performing a wide range of activities, including soil mapping, writing the soil survey report, providing NRCS "O1" support such as hydric soil determinations, working on the NRI, working on GIS/SSURGO/compilation, developing interpretations, setting up and testing NASIS, providing basic soil services and meeting with the public in a variety of settings, from schools to planning commissions.

Most offices report that the NRCS reorganization has not affected them too much. Changes noted by some offices were "negative." for example, having a delay in filling a vacancy, a freeze in updates to official series descriptions and interpretations, or delays in purchases requested.

Eleven offices have two MLRA's in their survey area, two offices have three MLRA's, and one has 4 MLRA's. (Only one office has 1 MLRA in the county.) So nearly all offices have a stake and an interest in seeing that the administration of the "MLRA concept" in soil survey is successful. Judging by the 100% response to the questionaire sent out to the project offices in order to prepare this report, the rest of the soil survey staff should have no doubt that they have the full cooperation of those in the project offices.

NCSS ACTIVITIES IN CONNECTICUT

The NCSS program participant in Connecticut consists of the USDA, Natural Resources Conservation Service, the Connecticut Department of Environmental Protection(CT DEP), University of Connecticut Agriculture Experiment station, and the Connecticut Agriculture Experiment station.

- This has been a year of major transitions.
- Lost 2 soils staff to promotions to other states.
- Barbara Alexander served as a member of the National Task Force to explore digitizing acceleration options.
- NRCS in Connecticut went through a major reorganization with statewide teams. The Soils staff is on the Inventory team with responsibility for soil survey and georeferencing data for other inventories, This will assure that we will have a landscape perspective on all programs.

We have continued great progress in accelerating our five-year project of remapping, recorrelation, compilation, digitizing, and product development of a statewide soil survey. The following are some of our accomplishments to date:

- We began phase 4 of the project. We will complete 10.5 quads this year. This will complete 90% of the state.
- We have 40+ quads of digital data being used by the public, with another 40 available by late summer.
- We have purchased ARC- Info software in hopes of accelerating SSURGO certification of our subsets.
- There is great excitement by the public about digital soils data, but few are prepared to use it. Our SSURGO dataset needs to be made more user friendly.

OTHER ACTIVITIES INCLUDE:

- MO staff assisted us on database management and resolving Frigid/Mesic and Spodosol/Inceptisol issues on the Massachusetts/Connecticut state line.
- We began a Global Climate Change Study with Dr. Dan Vogt and the Yale School of Forestry and Environmental studies. This study will develop a model for predicting organic Carbon sequestration in forested landscapes in southern New England.
- The Connecticut DEP is evaluating the use of STATSGO soils data to correlations with Radon levels.
- The digital soils data is being used in the EPA Resources Priority Protection Project to identify critical resource areas.

Representatives of the Storm Agriculture Experiment Station and the Connecticut Agricultural Experiment station could not attend this meeting, so I respectfully present abstracts of their current research.

Reports attached

Report of Soil Related Research of the University of Connecticut
Storrs Agricultural Experiment Station
Harvey D. Luce

Research related to the calibration of the presidedress nitrate test (a.k.a. June nitrate test) continues under the direction of Dr. Thomas Morris. The current databases well documents the concentration of soil nitrate above which there is no response to N fertilization (critical level). Less well documented is the relationship between the soil nitrate concentration and the amount of sidedress nitrogen that is needed among those soils with nitrate levels below the critical level. Efforts are underway to determine economic optimum N fertilization rates for this latter group of soils, The presidedress soil nitrate test (PSNT) is also being evaluated for use with sweet corn, pumpkins, and is being planned for fall cabbage starting in 1996. Results from the first year of tests indicate that the *test is* useful *in* determining where additional N fertilization is not needed in both sweet corn and pumpkins. The critical soil nitrate concentration for sweet corn is similar to field corn. Results from a single experiment in 1995 suggest that pumpkins require about one-half the N that is currently recommended and excessive N levels can reduce yields.

Efforts are underway to quantify the water quality benefits of using the PSNT test as a basis for determining rates of N fertilization needs for silage corn. Preliminary results indicate a significant reduction in nitrate leaching from corn plots fertilized according to the PSNT test in comparision with plots fertilized according *to* traditional *practices.*

A study is being conducted on the effect of land spreading the residual or sludge from water treatment plants (WTR). WTR has the capacity to adsorb large amounts of soil P resulting in a reduction of plant available P and its contains heavy metals. A study is planned of the effect of WTR that has been amended with P on plant available soil P. The potential of heavy metals to leach from soils treated with WTR will be evaluated by leaching undisturbed soil columns.

Under the direction of C.P. Schulthess, research is being conducted on a number of topics related to the sorption phenomenon occurring on soil and mineral surfaces. Topics include the kinetics of carbon dioxide adsorption and desorption on Ti-oxide surfaces, the effects of aqueous carbon dioxide on the adsorption of protons by Al and Ti oxides, and the production of fulvic acid products by humic acids in alkaline solutions.

In collaboration with Gifford Fogle, a Ph.D. candidate in archeology, Harvey Luce has found that soils hypothesized to have been cultivated in the 18th century by Mashatucket Pequots using traditional tillage techniques could be statistical differentiated
from soil hypothesized to have never been cultivated on the basis

of differences in the depth distribution of organic matter, clay, P, Munsell color Value, and Munsell color chroma.

I

Record of the Year

19944995

An account of the activities and accomplishments of the staff of The Connecticut Agricultural Experiment Station during the year, for the use and advantage of the citizens of Connecticut.

plates containing distilled water and then examined after 7 days. The infection rates have ranged from 16% to 63%. These experiments suggest that the source of inoculum, presumably another spore, is directly associated with the larval mosquito host. The involvement of epizoic protozoa such as *Vorticella* spp. that colonize the cuticle of larval mosquitoes are suspected.

Biological control of hemlock looper: In a cooperative study with Dr. Chris T .Maier and Carol Lemmon (Department of Entomology), Dr. Andreadis has discovered and described a new microsporidian parasite from larvae of the spring hemlock looper, *Lambdina athasaria* (Lepidoptera: Geometridae). The parasite has been named, *Orthosomella lambdinae* n. sp. (Microsporida: Unikaryonidae). The principal site of infection is the midgut epithelium. The microsporidium develops within the cytoplasm of the host cell and has unpaired nuclei in all stages of development. Schizonts are rounded to irregular in shape with a variable number of nuclei (2-29, median=6). They are limited by a simple plasmalemma and divide by plasmotomy. Sporogonial plasmodia are elongate and sausage-shaped with a variable number (2-18, median=6) of linearly arranged nuclei. They are surrounded by an electron dense surface coat and give rise to moniliform chains of uninucleated sporoblasts with a corresponding number of nuclei. Sporoblasts concurrently undergo sporogenesis prior to cytoplasmic cleavage into free spores. Mature spores are uninucleate and oblong to slightly reniform. They measure 2.8 X 1.5 mm (live) and have 7-8 turns of the polar filament. The natural prevalence of *O. Iambdinae* in larval populations of *L. athasaria* at Devil's Hopyard in East Haddam was found to range from 2.0-18.4% (6.8% overall).

Maynard compared yields of field tomatoes grown in soils amended for 3 years with MSW compost (25 and 50 T/A) with yields from unamended soils. All plots were fertilized. To determine the liming effect of the compost, there were two unamended controls: one with lime, one without lime. Average yields (lbs/plant) from plots amended with 50 T/A MSW compost were 33% greater when compared to the unlimed control and 28% higher compared to the limed control. Yields from plots amended with 25 T/A MSW compost increased 7%. These increases in yield from the compost-amended plots are similar to increases seen after one application of compost. The average number of tomatoes per plant and the average weight of each tomato were also greater from the compost-amended plots. The addition of 50 T/A MSW compost for 3 years raised the pH unamended control plots (0.7 lbs/plant). The fall applied leafplots averaged 0.6 lb/plant. With fall cauliflower, plots amended with undecomposed leaves in the spring had yields of 2.0 lbs/plant compared to plots amended with leaves in the spring or amended with leaf compost (1.7 lbs/plant). The unamended control plots averaged 1.3 lbs/plant. Yields at Windsor followed the same trends.

There is **some question as** to the differences in rates of decomposition between maple and oak leaves. In 1995, a sheet composting experiment will be conducted in plots amended with either all oak or all maple leaves and a variety of vegetables will he grown.

Fertilizer/compost and ***organic trials***: Earlier research at the Experiment Station has shown that long-time use of compost can reduce the amount of fertilizer needed to obtain optimum yields for many vegetables. In 1995, this research has been expanded to include many different compost/fertilizer combinations so that the best conditions to grow a variety of vegetables can be determined. In addition, organic methods are being utilized on some plots so that comparisons between organic and conventional methods can be made. This 3-year experiment is being conducted at both Lockwood Farm and the Valley Laboratory.

Degradation of chemical wastes: Drs. Joseph J. Pignatello and Patrick Huston (assisted by M. Day) have continued investigations into oxidative degradation of pesticides in waste materials as indicated below:

Aqueous wastes; the photo-assisted Fenton reaction ($Fe^{3+}/H_2O_2/uv$).

1. Pesticides. Destruction of a variety of pesticides has been studied. These include the following:

alachlor	dicamba
aldicarb	disulfoton
azinphos-methyl	malathion
captan	methoxychlor
carbaryl	picloram
carbofuran	simazine

Complete loss of pesticide generally occurred in less than 30 minutes at: 5 x 10^{-5} M Fe^{3+}, 0.01 M H_2O_2, and *300400* nm *uv* radiation. High yields of inorganic ions such as Cl^-, NO_3^-, PO_4^{3-}, and SO_4^{2-} and loss of total organic carbon from solution indicated substantial mineralization in many cases. Intermediate oxidation products were observed, including formate, aetate, and oxalate. The initial rates varied over only a small range due to the non-selectivity of the hydroxyl radical (HO'), the active oxidant. Carbaryl forms a complex with Fe^{3+} that is photolabile. In the dark H_2O_2 transforms it to a second complex. This further supports the idea that Fe plays a direct role in degradation.

2. ***Chlorinated Hydrocarbons.***

Kinetics andproducts of three compounds in relation to reaction mechanism: The products and rate constants of tetrachloroethene (PCE), trichloroethene (TCE), and 1,1,2-trichloroethane (TCA) under $Fe^{3+}/H_2O_2/uv$ conditions vs. H_2O_2/uv conditions in which HO' is the only oxidant. These experiments were conducted to determine whether reactive hypervalent iron-oxo (ferryl, $Fe^{IV\ or\ V}{=}O$) species are involved in the oxidation in addition to the HO' under photo-Fenton conditions.

The products included mono-, di-, and tri-chloroacetic acids (MCAA, DCAA, and TCAA, respectively) and dichloroacetaldehyde (DCAAD). Several other plausible ones were absent., including mono- and tri-chloroacetaldehydes, oxalate, glyoxalate, and formate.

The products were identical under the two conditions, but their yields were very different. For example, under $Fe^{3+}/H_2O_2/uv$ conditions, PCE produced 30-fold more TCAA, TCE produced 20-

fold more DCAA, and TCA produced 13-fold more DCAA compared to H_2O_2/uv conditions. This suggests involvement of iron in product formation, but does not prove the specific involvement of ferryl. In the case of TCE and PCE the higher yields of the chlorinated acetic acids could conceivably arise from epoxidation of the double bond by ferryl.

Competitive kinetics suggests the involvement of iron in the rate-limiting step, but confirming evidence is needed. The rate constant ratio k_{TCA}/k_{TCE} decreased progressively from 3.9 to 2.8 as the product [Fe”] $[H_2O_2]$ increased. This suggests that a species other than HO’ that is dependent on both iron and peroxide concentrations (possibly ferryl) was participating. The ratio k_{PCE}/k_{TCE} was identical at 0 and very dilute (1 x 10^{-5} M) Fe^{3+}; the ratio at higher [Fe”] is pending.

Degradation of fully chlorinated hydrocarbons by addition of a ***co-substrate:*** Fully halogenated compounds like carbon tetrachloride (CT), hexachloroethane (HCA), and TCAA, are resistant to Fe^{3+}/H_2O_2/uv due to their poor reactivity with HO’. However, we found that CT and HCA are rapidly degraded when a co-substrate such as oxalic acid or isopropanol is added. The initial steps are reductive and the reduced products are susceptible to oxidization by HO’ at a later stage.

In the presence of oxalate (ox), CT degradation is catalytic in iron(III). Dioxygen is only slightly inhibitory, but clearly assists in regeneration of catalyst and conversion of intermediates. The reactive species was shown to be $ox^{\bullet -}$ or $CO_2^{\bullet -}$, or both, formed by photolysis of $Fe(III)(ox)_n$ complexes. These radical anions reduce CT to the $CCl_3^{\bullet}$

literature, sorption to glassy polymers is ***dual-mode,*** in that both partitioning and *ad*sorption occur simultaneously. Adsorption occurs at internal "voids" or sites inside the polymer matrix.

Sorption to soils, peat treated or untreated with HF/HCl, and HA all show dual mode sorption behavior, including nonlinear isotherms and competitive effects for polar and nonpolar compounds alike. The isotherms become increasingly nonlinear with time, indicating that the "adsorption" sites are internal to the SOM. Competition seems to depend on the degree of similarity in stereo-electronic properties between the competing molecules. The concept of SOM as a dual-mode sorbent is new to the literature. Future research will attempt to determine whether the internal adsorption sites in SOM play a role in slow desorption.

Leachability *of arsenic from* municipal ***compost Dr.*** Btij L. Sawhney, in collaboration with Dr. David E. Stilwell and Gregory J. Bugbee, began investigations into potential leachability of arsenic (As) from compost used in growth medium for container-grown plants. These investigators previously determined leachability of heavy metals, Cd, Cr, Cu, Ni, Pb, and Zn from plant growth medium containing different proportions of compost. They found that concentrations of Cd and Pb in the leachates from the growth media remained below the detection limits throughout the six-month period and those of Cu, Ni, Pb, and Zn remained below the drinking water standards at near neutral pH values of the media. Leachability of As was not investigated, however. While As content of most composts lies below the Environmental Protection Agency (EPA) guidelines of 41 ppm, the Connecticut Department of Environmental Protection (DEP) has recently promulgated a more stringent limit of 15 ppm. Analysis of a recent batch of compost produced by the Metropolitan District Commission (MDC) in Hartford, showed 20 ppm As. Potential leachability of As from this compost is being determined by analyzing the water percolating through the potted plant containers filled with growth medium mixes containing 0, 25, 50, and 100% compost by volume. Each treatment is replicated two times and rainfall is supplemented with overhead irrigation to supply a centimeter of water per day. The leachates are collected quantitatively in receptacles attached at the container bottom. The leachates are removed biweekly and aliquot of each leachate (125 mL) is being refrigerated until analyzed for As.

Sorption ***and desorption of organic*** contaminants ***by clays:*** Dr. Sawhney determined both vapor-phase and aqueous phase sorption and desorption of trichloroethylene (TCE) and ethylene dibromide (EDB) by common soil clay minerals smectite (Sm), illite (11) and kaolinite (Kl), a modified organo-smectite and a silica gel (a well-characterized model sorbent). Vapor-phase sorption by the sorbents were rapid initially and then continued at a slow rate. Sorptions were related to surface areas of the clays; Sm>Il>Kl. Also, the amounts sorbed were greater under dry conditions and decreased as the relative humidity (RH) was increased. For example, Kl sorbed about 25 mg/g EDB under dry conditions, 15 mg/g at 5% RH and only 8 mg/g at 80% RH. Desorption was also rapid initially. However, subsequent desorption occurred at much slower rates than the corresponding slow sorption in all sorbents. The desorption isotherm profiles were different in different sorbents. The slow desorption is thought to result from restricted diffusion of the contaminant from the intraaggregate micropores in sorbent particles. The relationship between sorbent porosity and desorption characteristics is as yet unclear. Porosity of the various sorbents is being obtained using "mercury intrusion technique" and will be used to interpret the slow desorption of contaminants from the sorbents.

While vapor-phase sorption of organic contaminants above has been observed to be related to surface areas of the clays, role of surfaces in aqueous phase sorption, predominant in natural systems, remains to be determined. Dr. Sawhney has prepared smectite clays with different layer charge by reducing the charge on Wyoming smectite by Li and heat treatments. Sorptions of organic contaminants by these clay preparations are being carried out to determine the role of clay surfaces, which mainly consist of hydrophobic siloxane groups, in sorption/desorption reactions.

Utilization of municipal and industrial compost for container grown plants: #en municipal wastes are composted and used as a soil amendment, the materials reaching dumpsites are reduced. The nursery industry could benefit from using compost in potting media if no adverse environmental effects are demonstrated. Gregory Bugbee effectiveness of each type. Gregory Bugbee in cooperation with Nardella's Turf Care Inc. set up an experiment in November 1992 to study limestone used on lawns. Each limestone was applied at the rate of 50 and 100 lbs. per 1000 sq. ft. plots at Meadowbrook Golf Course in Hamden. Soil is being tested at the 0.5-3 and 3-6 inch depth each year to determine how effective each limestone is at raising the soil pH. Prior to applying the limestone, the soil pH for all plots and depths were found to be about 5.5. In 1994, the pelletized limestone raised the soil pH to near 6.0 at the 0.5-3 inch depth, the pulverized limestone elevated the pH to about 5.8 and the granulated limestone raised the soil pH to near 5.7. None of the limestones affected the soil pH at the 3-6 inch depth. Soil pH's for all plots will be monitored for another 2 years.

Soil testing: Testing soil samples for available plant nutrients is a continuing service for citizens of Connecticut. At the laboratory in New Haven, Mr. Bugbee tested 7,825 samples and ***answered*** 1951 inquiries.

VALLEY LABORATORY

Hemlock woolly adelgid: Eastern hemlock, ***Tsuga canadensis*** (L.) Carriere, is an important tree species in the forests of eastern North America. It is also among the most widely grown evergreens in ornamental landscapes. The hemlock woolly adelgid, ***Adelges tsugae*** Annand, native to Japan, is a destructive pest of eastern hemlock in at least 10 eastern states from West Virginia to southern New England. This insect is expanding its distribution at the rate of about 30 km each year and threatens to eventually eliminate hemlock throughout much of its natural range in eastern North America. Dr.
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introduction into the field; (3) by designing standard protocols to sample adelgid and enemy populations; and (4) by determining how natural enemies can be used in conjunction with chemical control methods in an integrated approach to managing adelgid populations. Biological control agents developed during this project will be shared with other states in a cooperative effort to combat hemlock woolly adelgid and other important adelgid pests.

Research on the biological control of the hemlock woolly adelgid has focused on understanding the biology and behavior of the predatory ladybird beetle, ***Pseudoscymnus*** new sp. (Coleoptera:Coccinellidae). There are four larval stages and one adult stage which actively predate on all stages of the adelgid. Dr. Cheah has determined that development in the laboratory from egg hatch to adult emergence is 28 to 32 days at 20C, and that a single larva consumes an average of 500 eggs or 50-100 adelgid nymphs (mainly instars 2-4) during that time. Adult predation is not as easily quantifiable, but experiments have shown that an adult consumes an average of 48 adelgids a week, although this predation is likely to be modified by oviposition trends.

Dr. Cheah has determined that the life cycle of ***Pseudoscymnus*** is very well synchronized with that of its prey. Spring egg hatch is timed to coincide with peak adelgid oviposition and continues in mid-spring to coincide with adelgid hatch. Most importantly, a second generation of the coccinellid is produced when adult beetles of the first (spring) generation begin oviposition at the very same time that adult adelgids of the summer generation do. Adult beetles are able to survive the summer aestivation of the adelgid, a period of about 14 weeks, by feeding on the dormant first instar nymphs. As adelgid dormancy is broken in October, oviposition is resumed by the two generations of adult beetles produced in the spring and summer. Larvae produced in the fall are able to complete development by feeding on adelgid nymphs.

Dr. Cheah has found that adult beetles can have a life span of a year, with females generally outliving males. Oviposition occurs over several generations of adelgids with some females surviving to oviposit on two successive spring generations of the adelgid. Fecundity is maintained by repeated matings, and a maximum of 325 eggs has been recorded in a lifetime. Adult beetles have been found to produce up to 50 eggs in a week, but eggs are typically laid singly or in small clusters (2-4 eggs) in protected sites such as in curled bud scales, within cones, under bark flaps, or on adelgid wool.

Efforts since January 1995 have concentrated on the mass rearing of ***Pseudoscymnus*** for spring and summer field experiments. From a starting population of about 300 adults, approximately 3,000 adults have been successfully reared. Field experiments have included the release of 2,025 adults (1,037 female and 988 male beetles) to date on a select group of adelgid infested trees in a natural forest environment in Windsor. Other ongoing studies to determine the impact of adults and larvae on the adelgid involve sleeve cage experiments at Lockwood Farm in Hamden. A recent shipment of natural enemies from Japan has yielded more eggs, larvae and adults to augment genetic diversity in the mass rearing procedure.

Dr. McClure answered a total of 945 inquiries on the hemlock woolly adelgid from the public during the past year. In addition he visited 21 hemlock sites by request to appraise adelgid infestations first hand, conducted 49 diagnostic tests for arborists and property owners to evaluate the effectiveness of chemical pesticides, was interviewed about the progress of his research by the media on 5 1 occasions, and gave 25 talks to scientists, reporters, arborists, foresters, nurserygrowers, and citizens on the ecology and control of hemlock woolly adelgid.

Weed Control: Dr. Todd L. Mervosh, assisted by Daniel Pilver, conducted weed control research in a variety of crops including ornamental trees, tobacco, fiber flax and perennials In cooperation with Dr. John F. Ahrens, Dr. Mervosh conducted experiments at Imperial Nurseries in Granby to compare sprayable herbicide combinations containing isoxaben with standard granular herbicides for efficacy and safety to container-grown rhododendron, euonymus, and spirea. First-year results indicate that isoxaben sprays can provide effective, economical, and convenient preemergence weed control for these crops. In experiments conducted by Drs. Mervosh and Ahrens at Casertano's Nursery in Cheshire, a number of herbicide combinations provided excellent weed control and crop safety in daylily, iris, and astilbe. Dr. Mervosh has initiated a study at the Valley Laboratory to evaluate two new herbicides, sulfentrazone and halosulfuron, for possible registration in field-grown omamentals such as yew, hemlock, arborvitae, and juniper.

Dr. Mervosh has also begun research in Windsor to evaluate the experimental herbicide sulfentrazone for use in broadleaf tobacco. Sulfentrazone is being compared to pendimethalin and napropamide, herbicides currently registered for use in tobacco, for crop tolerance, weed control, and effects on establishment of a fall-planted rye cover crop.

Dr. Mervosh is continuing weed control studies in fiber flax. Most of the soil-applied herbicides he has evaluated have caused unacceptable injury to the emerging flax. Postemergence herbicide combinations of MCPA or bentazon with sethoxydim have provided broad spectrum weed control and good crop safety. Dr. Mervosh has observed that when flax is planted early (before May), a canopy develops in time to help suppress weed growth and competition. He is also examining nitrogen fertility levels for effects on flax growth and weed competition.

In cooperation with Drs. James A. LaMondia, Richard Cowles, and Wade H. Elmer, Dr. Metvosh will begin a project in 1995 to study the use of cover crops and companion crops for pest management in strawberry plantings. His work will focus on weed populations in different crop rotations.

Using taxane extracts provided by Gerri MacEachem-Keith of Analytical Chemistry, Dr. Mervosh is evaluating taxanes for herbicidal properties. In preliminary studies, he has observed inhibition of root development in germinating monocotyledon seeds (rye, oats, perennial ryegrass) exposed to a taxane solution containing 1 ppm paclitaxel (taxol). Roots of dicotyledon seedlings showed no visible effects.

Dr. John F. Ahrens, Scientist Emeritus, provided 339 consultations for Connecticut growers and municipalities on weed identification and management, and on control of other pests. He also cooperated with Dr. Mervosh in research in the control of weeds in ornamental plantings and Christmas tree plantations and the evaluation of hairy vetch as an alternative cover crop for Connecticut nurseries. Much of Dr. Ahrens' research was directed towards obtaining new herbicide registrations for ornamental plants through the national IR-4 program. Dr. Ahrens organized and participated in several meetings of Christmas tree growers to educate them on improved cultural and weed management practices. He is in demand by nursery, Christmas tree and landscape organizations for presentations on weed management in these fields.

Fertilizers on Christmas Trees, Nursery Plants and Turf: Christmas tree production is perhaps the only commodity that is evaluated for appearance at a time of year different from when it is actively growing. Cold weather initiates the transport of some elements from needles to woody portions. If the tree does not have a sufficient reserve of nutrients, enough may be lost from the needles to cause them to yellow. The effect is usually temporary, with yellow needles becoming green again and, along with the new growth, appearing entirely normal in the spring. For forest and landscape trees, this is not a concern, but yellow needles can give Christmas trees an overall yellow appearance, making them unsaleable in December. Analyses of trees with poor winter color from plantations around the state have revealed potassium and magnesium deficiencies and growers have reported improved color with additional applications of K and Mg fertilizers. In a planting of blue spruce

established at the Valley Laboratory in 1988, Thomas M. Rathier has been applying luxurious amounts of potassium, magnesium, nitrogen or minor elements fertilizers to observe the effects on winter color of needles. Thus far, differences in growth have been observed along with some *color* differences, but the trees are entering the first year of salablity now and evaluations should be revealing.

Many Christmas tree growers and field nurseries use slow release sources of nitrogen (N) in their fertilizer blends. However, little is known about their release patterns, especially when they are applied in late winter or early spring. Mr. Rathier is conducting a long term study evaluating 5 N sources (urea, Poly S coated urea, methylene urea, urea treated with nitritication inhibitors, and Polyon coated urea) for their N availability characteristics and longevity. Application dates evaluated are early spring and winter dormant. Each of the N sources are applied to turf plots to visually monitor availability.

Insect pests of Christmas trees: The development of a new class of insecticide compounds known as chloronicotinyls has resulted in the release of imidacloprid (Merit and Marathon for omamentals and turf, Admire and Provado for agricultural crops). Imidacloprid is effective at low application rates, has very low mammalian toxicity and is a soil applied systemic product, making it very attractive to growers who find it hard to spray at appropriate intervals. The effectiveness of imidacloprid on pests of true fir Christmas tree pests such as balsam twig aphid and elongate hemlock scale is not known. Mr. Rathier and Dr. Richard Cowles are conducting an evaluation of imidacloprid applied as a soil injected soluble, topdressed granular, or soil incorporated granular.

Fertilizers on tobacco: Historically, Connecticut tobacco is a crop that receives luxurious levels of organic nitrogen fertilizers in order to grow high quality, high value cigar wrapper leaves. Since the organic nitrogen must be mineralized to ammonia (hence nitrate) before the crop can take it up, it is usually applied well in advance. Such a practice on continuously cropped fields, however, can result in a large potential for loss of nitrate to ground water. Two broadleaf tobacco growers with fields in a small sensitive aquifer that has a well with nitrate in excess of the drinking water standard of 10 ppm N are cooperating with Mr. Rathier on trials to evaluate the efficacy of delayed applications of N and reduced N totals. Mr. Rathier is sampling soils at strategically important times and testing them for nitrate to determine N availability as a way to predict the potential for N loss to ground water. For the past 3 years, the crop receiving 35% of its N as preplant and 65% as sidedressings has a delay in availability by about IO days compared to the crop receiving the standard of 50% preplant and 50% as sidedressings. This delay better suits the N uptake pattern of Connecticut tobacco. Both crops had similar leaf **quality.** In the other trial, crops received ***200,250*** or 300 Ibs N per acre with 50% applied preplant and 50% applied as sidedressings. Each treatment has had N become available at the same time in proportion to the applied rates in each of the last ***3 years.*** Leaf quality was observed in the same proportions. These data have been used by officials of the Department of Environmental protection and the Hartford County Soil and Water Conservation District to formulate best management practices guidelines for management of N in aquifer protection areas. The studies are continuing in order to evaluate the effects of such practices on long term N availability.

The concept of area or whole aquifer management rather than single field management is proving to be a more common sense approach to the problem of ground water pollution and is beginning to be considered by regulatory agencies as a means to deal with contaminated wells. Accordingly, in the same sensitive aquifer mentioned above, Mr. Rathier is evaluating the N availability of all the major land uses within the zone of immediate recharge for the contaminated well. Tobacco occupied 12% of the aquifer acreage and had the greatest amount of N available and potentially leachable of all the land uses (other crops are: corn, rye, legumes, and unfertilized turf and brush areas). In fact, if tobacco occupies more than 25% of the acreage, the potential loss of nitrate will be greater than the amount needed annually to contaminate ground water. The other land uses, which lose less nitrate to ground water are, in effect, diluting the effect of the tobacco and are keeping the total nitrate lost under the maximum. However, there is usually a delay of up to several years before implemented practices result in wells in compliance. While nitrate concentration in the well in question is slowly dropping, it is still in excess of 10 ppm N as nitrate. The study will continue to see when the changes finally do bring the well to compliance.

Aphid ***control*** on ***tobacco:*** In 1994 a second trial evaluating imidacloprid (Admire) for aphid control in tobacco was conducted by Mr. Rathier and Dr. James A. LaMondia. Admire, which will likely have a tobacco label for 1996, was applied in transplant water at the rate of O.Olg active ingredient per plant (approx 0.25 lbs/acre). Treated plants had virtually no aphids after 30 days and only minor infestations after 70 days, while untreated plants were moderately infested after 30 days and heavily infested after 70 days. A more detailed study is underway in 1995, evaluating different rates and application methods along with other insecticides.

Nematodes and plant pathogens: Dr. James A. LaMondia, assisted by Jane Canepa-Morrison. Mary Klepacki and Jenifer Monoson, investigated the relationships between nematodes and/or plant pathogenic fungi on tobacco, strawberries, potatoes, asparagus, and omamentals. A detailed report of his research accomplishments is included in the Department of Plant Pathology and Ecology.

Insect pests in nurseries and turf: Dr. Richard Cowles began studies in October 1994 on the insect pests of nurseries and turf, focusing on the soil-dwelling Coleoptera. A detailed report of his research is included under the Department of Entomology.

Requests for Information: A total of 7,741 inquiries were answered at the Valley Laboratory during the past year. This represents a 6% increase in the number of citizen inquiries from the previous 12-month period. About 60% of the requests for information were from the public; the remainder were from commercial growers, pest control operators, and municipalities. Most of the queries were answered by Mr. Thomas Rathier (58%) and Mr. John Winiarski (18%) who oversee the inquiry offtce. Beth Beebe and Jane Canepa-Morrison capably ran the offtce whenever Mr. Rathier and Mr. Winiarski were away.

Inquiries by subject category were as follows: insect pests (36%); general horticultural information (16%); fertilizers, soils and water issues (16%); plant diseases (14%); weed control (10%); pesticide use (3%); birds, mammals and reptiles (2%); and others (3%).

Hemlock woolly adelgid was the single most often asked about problem again this year. Dr. McClure, Mr. Rathier and Mr. Winiarski answered 1,228 inquiries (16% of the total) on this destructive insect pest. In addition to the hemlock woolly adelgid many hemlocks have been infested by hemlock eriophyid mites this spring. This mite causes the previous year's needles to bronze and eventually fall off. An unusually high number of spittlebugs has also been reported on hemlock, as well as on pine, this spring.

Perennial indoor pests, such as Indian meal moth and carpenter ants were common complaints. This past year saw a rise in carpet beetle calls along with inquiries about ticks. Mosquitoes were common problems in 1994 but have not been reported heavy as yet in 1995. An interesting problem that has been noticed in annually increasing numbers are parasitic wasps that are attached to Christmas trees as pupae and subsequently emerge as adult wasps when the trees are brought indoors at holiday time. The wasps are harmless in the home but homeowners become alarmed. Efforts are being made this year to see if the wasps parasitze any of the common Christmas tree insect pests.

Drought stress has accounted for much of the problems observed in home landscapes. Many trees showed sparse growth this spring reflecting low water availability last summer. Plants that were not regularly irrigated have shown many disease symptoms and insect pests along with overall reduced vigor. Golf courses found that increased traffic along with warm temperatures reduced the vigor and increased disease susceptibility on their greens. Injuries by white grubs was heavy in all turf areas.

Honeylocusts have been devastated by the honeylocust plant bug this spring and birch leaf miner has been heavy. Arborvitae leaf miner has been building for a few years now and appears to have peaked this spring. Two spotted spider mites were heavy in 1994 and are appearing earlier than normal in 1995. Eastern tent caterpillar was heavy this spring and gypsy moth has been reported over an exceptionally wide area but in low total numbers.

Leaf spots, summer patch and brown patch were common turf diseases diagnosed in summer 1994 and red thread has been the common disease this spring. More azalea leaf gall has been observed this year than in recent years. Tip blight of junipers and arborvitae has been frequently observed this spring. Most stress related plant diseases have been observed.

Ground ivy, violets, annual bluegrass and annual Veronica have been the most frequent weed problem in turf this past year. Poison ivy responded favorably to the drought conditions of 1994 and many callers are looking for solutions. Moles in lawns and turf are frequent complaints. Chipmunks have been reported in record numbers this spring.

Interest in home gardens has remained high this past year with many people requesting soil analysis and basic information. More and more people each year are seeking information on organic or natural pest controls and fertilization.

Field Visits: Six scientists at the Valley Laboratory visited 152 commercial fields, greenhouses, golf courses, Christmas tree farms, residential properties, parks and forests during the past year to diagnose the more complex problems first hand. Some problems were solved during these visits, but many required taking plant and soil samples for laboratory analyses with subsequent reports to the growers by letter or phone call.

Mr. Thomas Rathier made 25 such visits to the field and made the following observations. As in 1993-94, basically droughty conditions made the establishment of woody plants in production fields very difficult. Many growers had to replant fields. Established trees and shrubs also fared poorly with reduced water availability. Tobacco required frequent irrigations which probably reduced N availability which, in turn reduced leaf quality.

The comparatively mild fall and winter of 1994-1995 has had a serious effect on most crops. Despite the lack of snow cover, more insects than usual overwintered successfully. Tobacco saw aphids 3-4 weeks ahead of schedule. Spruce spider mites and eriophyid mites have been reported in record numbers by Christmas tree growers and nurseries as well as other pests such as balsam twig aphids. More Rhizosphaera needle cast has been observed on blue spruce in more plantations than ever. Cultural problems related to excessive irrigation were observed in many container nurseries.

Diagnostic tests: A total of 633 non-routine diagnostic tests were performed by various scientists during the year. These included 3 17 by Dr. LaMondia on nematodes and plant diseases; 224 by Mr. Rathier on an array of pest problems; 49 by Dr. McClure to assess the effectiveness of chemical controls for hemlock woolly adelgid; and 40 by Dr. Cowles to identify beetle grubs in soil samples.

Soil ***tests:*** A total of 5,008 soil tests were expertly performed by John Winiarski during the past year. Of these, 3,678 (73%) were performed for the commercial sector, 1,279 (26%) for homeowners, and 5 1 (1%) to assist Station scientists in their research. Soil samples submitted by the commercial sector included: nurserygrowers (1,328); landscapers (1,073); tobacco growers (567); golf course superintendents (277); vegetable growers (216); fistmas [illegible] growers (76); floricultural&s (32) and municipal groundskeepers (26). Soil samples received from homeowners were from lawns (652); vegetable gardens (393) and ornamental gardens (234). Neville Taitt assisted Mr. Winiarski by preparing hundreds of soil samples for analysis during the "spring crunch", which helped to keep the soil testing laboratory running smoothly during the busiest time of the year.

Research on the farm: There were a total of 37 experimental plots during the past year at the Windsor farm. Nineteen of these were being used by six New Haven-based scientists; the remainder were being used by six Windsor-based scientists. Richard Horvath, Research Farm Manager, with the help of William Johnson, maintained the many field plots and met the specific needs of each scientist. Valley Laboratory scientists also conducted experiments on 33 plots off site, such as in forests and in growers' fields. Mr. Horvath and Dr. LaMondia coordinated the Valley Laboratory effort to comply with EPA Worker Protection Standards for Agricultural Pesticides and organized and conducted training sessions for the staff.

Research facilities: Renovations of Dr. McClure's new laboratory on the upper level of the main building are nearly complete. The completion of this laboratory is the final phase of an g-year revitalization of the Valley Laboratory which included construction of a conference room, a fire escape tower and a pesticide storage shed, and renovation of all offices and laboratories. Neville Taitt has kept the new offices and laboratories, conference room, and the grounds clean and attractive and has received numerous, unsolicited compliments from the public for his efforts.

Gordon S. Taylor Conference Room: A growing number of agricultural organizations are using the conference room at the Valley Laboratory regularly for their meetings. During the past year the room was used on 51 occasions by 28 different groups. Our most frequent "tenants" were The Department of Agriculture, The Connecticut Greenhouse Growers Association, The Connecticut Christmas Tree Growers Association, The Connecticut Agricultural Information Council, The Connecticut Rhododendron Society, The Maple Syrup Producers Association of Connecticut, The Connecticut Beekeepers' Association, Farm Fresh, The Department of Environmental Protection, The Hartford County Soil and Water Conservation District, and The Connecticut Chapter of the National Association of Organic Farmers. Mr. Taitt has done a great job preparing the room for meetings, as has Mr. Horvath for ensuring that the room is available after hours and on weekends.

Valley Laboratory crop donations support community services: The Valley Laboratory continued its tradition of contributing fresh fruits and vegetables, Christmas trees and ornamental plants to area service organizations. More than 4 tons of asparagus, broccoli, cauliflower, eggplant, lettuce, peaches, peppers, potatoes, strawberries and tomatoes were donated to Foodshare of Hartford, The State Department of Children and Youth Services, The Laurel Street Mental Health Unit, and The South Park Inn Homeless Shelter. Drs. John Ahrens, David Hill, James LaMondia, and Abigail Maynard generated the fresh produce and Dr. Mark McClure organized the distribution effort. In addition to fresh produce, the Valley Laboratory donated hundreds of ornamental plants and Christmas trees to more than a dozen different area groups including The Greater Hartford Easter Seal Rehabilitation Center, The Connecticut Department of Corrections, and The State Department of Children Youth Services. Dr. Ahrens grew these plants and he and Mr. Horvath organized in their distribution.

State of Maine
Report to the
Northern Cooperative Soil Survey Conference

Norman R. Kalloch, Jr.
State Soil Scientist

Maine NRCS currently has an in-house digitizing staff for SSURGO development. There are two soil scientists dedicated to production digitizing. This year approximately 2.0 million acres are under contract to meet SSURGO standards. At the end of calender year 1996 nearly 40% of the state will have digital soil data.

Currently Maine soil scientists are working on cooperative agreements for three large landowners. These areas are in the remote areas of Maine. These agreements provide the vehicle to complete the once over soil survey in these areas.

A new soil scientist has been hired to fill a position created by a reassignment of a former soil survey project leader. This person will have responsibility for completing an active soil survey plus initiating an update soil survey.

A project office is being established in Dover-Foxcroft, Maine. Six soil scientists including Maine's Database Manager, Correlator and three Project Leaders will be assigned to this office. The remainder of Maine's 3.7 million acres will be mapped by soil scientists headquartered at this office

A new General Soil Map has been developed for the State of Maine. The map is based on STATSGO but with fewer map units. The map will be part of a University of Maine Bulletin that will describe the major soils in the state. Kenneth LaFlamme and John Ferwerda, former Assistant State Soil Scientist and State Soil Scientist, respectively, were instrumental in writing the text for the map.

Maine Agricultural Experiment Station Report

Professor Susan Eric is working to develop a mechanistic understanding of how water-soluble soil organic matter interacts with ions in soil solution and with soil surfaces. A specific research focus is on the ability of these naturally-derived organic ligands to alter rates of such important soil chemical reactions as the precipitation or dissolution of the essential plant nutrient phosphorus. Research projects are underway with the following objectives: 1) to determine the effects of added organic matter on phosphorus sorption and 2) to use the results of the above studies to develop a conceptual model of how naturally-derived soluble soil organic matter interacts with soil surfaces to affect phosphorus solubility. In addition an on-farm project in its second year is examining response of potatoes growing on soils relatively high in residual phosphorus to additional phosphorus fertilizer.

Professor Ivan Fernandes is working on forest soils to examine the effects of atmospheric pollution on the biogeochemistry of forested ecosystems, focusing on nitrogen enrichment, base cation depletion, and climatic warming phenomena. In addition, he is carrying out several studies looking at utilization of paper-making residuals (i.e. sludge and ash) in land applications and for manufactured soil possibilities.

Professor Larry Zibiliski is conducting research to determine the controlling effects of soluble carbohydrates on nutrient transformation in soil. Origins of soluble carbohydrates are from native organic matter decomposition and plant root-derived materials, Interactions of climatic factors and the quality and quantity of organic materials in the soil system are being investigated. New work will center on the plant root-derived materials, namely their effect on decomposition of native soil organic matter and that of added organic residues. Information in sought to elucidate the mechanisms of nutrient transformation controls and structural stabilization in agricultural and forested systems.

Senior Soil Scientist Robert Rourke is in the second year of a study of four transects across Maine each consisting of three lines on which five sites are located at which three samples are removed from the upper four inches of the B horizon (usually consider as spodic). Additional information at these sites includes: percent of albic present, vegetative cover, longitude and latitude, and color of B. The samples of B are sieved and analyzed for percent organic carbon. A method of separation of Humods from Orthods is sought in this study as is an appreciation of the relationship of Humods to landscape position in Maine.

TRAINING AND SITE EVALUATIONS

6 hydric soils training sessions with reg 4 approval

100 Site evaluations completed

RESEARCH

Global change soil climatic station established in Ellicott City on University of Maryland forage farm site

Establishment of climatic station on Smithsonian Institute property to monitor hydric soils (May 1996)

Computer Assisted Mapping
A Proposal for the Maryland/Delaware Soil Survey

Recent advances in GIS and computer technology now offer the opportunity to combine field mapping and digitization into a one-step process. At present, field mapping and updating entails a series of steps. This method requires the field soil scientist to perform remapping on black and white photos, transfer the new lines to a mylar overlay of the orthophotoquad and then send the overlays to a scanning facility for digitization. Utilizing new technology, the possibility exists to reduce this time consuming process substantially. Products are available which would allow the field soil scientist to bring an orthophoto up on a portable laptop computer, adjust existing linework or create new lines, and create a digital file of the survey linework for downloading to a GIS. In other words, the soil scientist can create a digitized soil survey in the field. This would reduce map compilation time, the expenses related to scanning and off-site digitization, and allow the incorporation of GPS data to create some to the most accurately geo-referenced soil surveys we have ever performed. This technology will assist many other EBA activities.

Therefore, the soil survey staff in Maryland and Delaware recommend testing of the technology on the Delmarva Peninsula Project and in the Anne Arundel County Soil Survey Update to develop guidelines for equipment, software, and methods related to soil survey updating.

Impact of Sea Level Rise on Soil Quality in Coastal Areas

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University of Maryland at College Park

The purpose of this project is to help better understand the impact of sea level rise and periodic tidal inundation on upland soils adjacent to coastal marshlands and how the rates of these processes may be altered in the future as a result of faster rates of sea level rise associated with global warming. In transgressive coastal areas, rising sea level causes submergence of marginal upland soils which spawns the development of organic-rich marsh soils over formerly upland soils. At slightly higher elevations the upland soils are periodically inundated by storm tides at frequencies related to their elevations. The extent of these transformations is postulated to be related to both the rate of sea level rise and the nature of the geomorphic surface. The joining of topographic and elevational data with past rates of sea level rise allows translation of the continuous land surface into a chronological continuum or "chrono-continuum." This approach permits time-sequence analysis of the changes occurring in the soils which become inundated with increasing frequency over time.

The objectives of this study are: 1. To evaluate the impact of occasional tidal inundation on soil properties in upland soils along coastal fringe areas; 2. To determine the effects of inundation ***frequency on*** selected soil properties; 3. To develop chronofunctions which describe the changes in soil properties ***over time,*** in relation to rates of sea level rise

Two sites in Dorchester County, MD were selected for study and have been evaluated with regard to the stated objectives. Soils at each site were analyzed by horizon and then weighted means were calculated for the upper 50cm and the upper lm. Soils subject to greater frequency of tidal inundation exhibited higher weighted mean values for electrical conductivity (EC) of saturated paste extracts, and also higher values for exchangeable sodium percentage (ESP). Application of the "chrono-continuum" concept at the sites permitted time sequence analysis and projections. Testing of five different types of equations demonstrated that changes in EC and ESP over time are best described by an exponential function. Using past rates of sea level rise, mathematical descriptions of soil changes with time (chronofunctions) showed exponential increase until ceiling values were reached, where ceiling values were based upon observed maxima within the vicinity of the research sites. Because possible global warming may cause more rapid rates of sea level rise, projected chronofnnctions were calculated using alternate sea level rise scenarios. These models demonstrate the possible impact of sea level rise and tidal inundation on low lying areas surrounding Chesapeake Bay.

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Soils Developed in Freshwater Marl Sediments in The Hagerstown (Great) Limestone Valley

Joey N. Shaw[3]
Martin C. Rabenhorst[1]

Certain calcareous soils **occupying** alluvial landscape positions in the Hagerstown (Great) limestone valley of western Maryland have developed from highly calcareous (60-100g/100g) marl sediments of Holocene age which range in depth from .5m to over 8m. These marl-derived soils have a high pH (7.5-8.5), low bulk density, and high porosity (0.5 to 0.6). The carbonate in the marl was developed from inorganic and biogenic processes. The marl was formed in ponds which are now extinct, but had inundated alluvial landscape positions during parts of the Holocene period. Certain algae capable of accumulating carbonate internally and externally developed the majority of the marl.

Pedogenic processes have transformed the marl sediments into highly calcareous Mollisols. The presence of buried surface horizons and coarse (> fine sand) carbonate forms render classification of these soils problematic. The coarse carbonate forms were mainly biogenic deposits, but these carbonates have been altered sufficiently by coating with pedogenic carbonate to identify calcic horizons. The drainage class is difficult to interpret as a result of the gleyed appearance of the marl sediments (chroma <3) and the high pH of these soils which inhibits Fe oxide reduction. Most of the marl-derived soils (70%) are better drained than the previous classification indicates. These soils have been mapped in the Great Valley in units named for the Warners series (fine-silty, carbonatic, mesic Fluvaquentic Haplaquolls) and the Massenetta series (fine-loamy, carbonatic, mesic, Fluvaquentic Hapludolls). However, proper classification may place these soils in the Typic Calciudolls subgroup. Some soils originally mapped in the very poorly drained Dunning units are very poorly drained marl-derived soils.

Mineralogical Determination for Family Placement Our Experience on the Maryland Coastal Plain

Martin C. Rabenhorst'
Diane Shields'

The coarse-loamy and fine-loamy soils mapped in the Maryland portion of the Mid-Atlantic Coastal Plain, have for the last couple of decades, been the focus of considerable debate regarding their proper placement into mineralogical families. The soils under consideration are those of the Sassafras and Downer series, and their more poorly drained catenary associates. At

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present, both the Sassafras and the Downer soil series have been correlated into siliceous families of Typic **Hapludults,** with Sassafras being fine-loamy and Downer being coarse-loamy.

According to Soil *Taxonomy,* differentiation between siliceous and mixed families of loamy soils is based upon the weight percentage of weatherable and resistant minerals in the 0.02-2mm fraction. The objectives of this study therefore, were: 1) to compare the results of mineralogical determinations of the 0.02-2mm fraction (as prescribed in Soil *Taxonomy) with the* more rapid approach of grain counting; and 2) to determine the proper mineralogical placement 'of the fine loamy and coarse loamy soils in the Maryland portion of the Mid-Atlantic Coastal Plain.

Based upon the XRD/chemical analyses, and using estimates from grain counts of the medium sand fraction, 16 of 18 pedons examined would be classified into families with siliceous mineralogy, and thus these soils would be best correlated in siliceous families. Therefore, the Sassafras and Downer soils and their catenary associates should remain in siliceous taxa. It is likely that other reports suggesting that these soils be classified into families with mixed mineralogy, were drawing upon data based on grain counts of finer sand fractions, which may have caused an overestimation of the weatherable minerals in these soils.

For loamy soils of the central Delmarva Peninsula, mineral estimates for use in the family placement (0.02-2mm fraction) can be better estimated by conducting grain counts of the medium sand fraction than of the fine sand fraction. We would assume that this approach would not be valid in other regions. The segregation of minerals according to particle size is a commonly observed phenomenon. Therefore, in order to obtain reasonable estimates of mineral assemblages for the purposes of soil classification from grain counting, one should ensure that the fraction being counted reflects the mineral composition of the 0.02-2mm fraction.

Pedo-Geomorphic Assessment Of Sulfidic Materials In Anne Arundel County Landscapes

Terry Valladares[5]]
Martin C. Rabenhorst'
MS Project

Serious problems associated with the disturbance of sulfide-bearing soil materials have been identified in Anne Arundel County. While we possess some knowledge of the areal extent of the problem, we do not presently have sufficient ability to predict the likelihood of encountering problems at a specific location. This information is related to the depth at which sultidic

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materials[6] occur and the geographic distribution of these materials. With the impending update of the Soil Survey of Anne Arundel County there is an excellent opportunity to conduct synergistic work, by joining the conventional soil survey activities, with studies emphasizing observations of the soil-regolith, deeper than is traditionally done. This approach should lead to the development of landscape models useful for a better assessment of potential soil problems tied to acid sulfate conditions. The objectives of this project are: 1) to study the character and distribution of sulfidic materials within the soil/regolith column derived from unconsolidated Tertiary and Cretaceous sediments in Anne Arundel County; and 2) to develop a pedo-geomorphic model for predicting the location, depth and distribution of sulfidic materials within landscapes underlain by unconsolidated Coastal Plain

Submerged Soils in Shallow Water Habitats

George P. Demas[7]
Martin C. Rabenhorst[1]
J. Court Stevenson'

Science-based management of shallow water habitats is limited by information on the spatial distribution of properties of sediments. This limitation in part stems from the lack of an adequate model or system to classify and delineate subaqueous soil types (sediments). Present classification systems are inadequate because the existing paradigm does not actually consider them as "soils" at all, but merely as "sediments". Field observations suggest that these sediments could be better understood as "soils", and the present paradigm could be modified to incorporate a new one - a pedological paradigm. We propose the application of a pedological paradigm for subaqueous soils of subtidal habitats to develop ecological interpretations of subaqueous soil types and apply an inventory of subaqueous soil resources for management of estuarine shallow water habitats. The objectives of this project are: 1) to examine and characterize submerged soils in order to evaluate the usefulness of a pedological approach in relating submerged soils to the geomorphology of subaqueous landscapes; 2) to develop soil series concepts and soil mapping units suitable for the mapping of soils in shallow water habitats, and to develop a protocol which could be used for the future mapping of submerged soils in shallow water habitats; and 3) to identify interpretive relationships between the characteristics of submerged soils or soil mapping units and SAV characteristics, such as establishment, vitality and survival.

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[6]Sulfidic Materials have been defined in ***Soil Taxonomy. There*** have been basically two definitions (before and after the 1992 edition) and are both reproduced in Appendix A.

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Comparison of Chemical Properties of Soils Under Forest and Agricultural Land Management: Or the case for cultural Alfisols

Martin Rabenhorst[1]
Diane Shields'
George Demas[7]

The purpose of this project was to evaluate the impact of agricultural activities upon soil chemical properties deeper in the soil profile. In Soil Taxonomy, soil properties have been selected as differentiating characteristics which are thought to be little affected by normal farming activities. One property often utilized in classifying soils in the eastern US is the base saturation. For example, in differentiating between Alfisols and Ultisols, the % base saturation at a depth of 125cm below the top of the argillic horizon is used. While it has been assumed that soil chemical properties are affected at such depths, this project was initiated to test this assumption. In collaboration with the Soil Survey updates in Queen Annes and Worcester counties, approximately ten sites were located in each of the two counties. At each site, two pedons were located in reasonably close proximity to each other (usually within 25 to 100 yards), with the major difference between the two being that one was located in a mature woodland (>40years) and the other was located in the adjacent agricultural field. Across a broad variety of soils (particle size family and drainage class) the impact of adding agricultural amendments was observed even at depths of 1 to 2 meters below the surface.

Carbon Storage in Submerged Upland Tidal Marsh Soils of the Chesapeake Bay, Maryland

Melvin L. Tucker'
Martin C. Rabenhorst'
Elissa Levine[10]

Covering only about 12% of the land area, wetland soils have dominated soil carbon storage since the late Holocene (Harden et al., 1992). A significant component of wetlands is the tidal marsh. Located in low energy coastal environments, these systems are susceptible to rising sea level. In these marshes, massive quantities of peat accumulation and carbon sequestration is attributed to frequent tidal inundation, predominantly anaerobic environments, and high carbon inputs by marsh vegetation.

This study was an attempt to observe and document past marsh dynamics in hopes of gaining a comprehensive understanding of the future role of these marshes in the global carbon cycle. Detailed surveys of transects in two Submerged Upland Tidal Marshes in Dorchester County,

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[10]National Aeronautic and Space Administration - Goddard Space Flight Center

Maryland were run to acquire elevations for the marsh surface as well as the old submerged mineral soil surface. Dates for transect points were assessed using 14C and 210Pb dating methods. The result was a chrono-continuum which established a relationship between points along the marsh transect with their specific time of submergence, which is a function of past rates of sea level rise. Soil carbon was quantified at various depths for points along the transects. Joined with the tidal marsh chrono-continuum, this information was used to develop a mathematical function relating soil carbon storage to past rates of sea level rise. This model is referred to as the carbon chrono-function and provides the means to make limited assessments of the future carbon storage abilities of these soils based of predicted rates of sea level rise.

Because these soils form gradually in response to rising sea level, a transition zone exist between the marsh and the forested upland. Vegetated by a thin stand of pines with an understory of marsh grass, the width of this transition zone is a function of topography and the tidal range. An attempt was made to detect this zone using Thematic Mapper and SPOT imagery. Mapping these transition zones in this manner provides some idea as to the future lateral extent of these **marshes.**

Agronomic and Environmental Implications of Broiler Litter Amendments to Soybeans

Lenore Matula[11]
MS Project

The Delmarva Peninsula produces over 300 million broiler chickens annually. The close proximity of extensive gram (corn, wheat, soybeans) production to poultry houses economically facilitates the transport and application of broiler litter **(BL),** a mixture of manure and sawdust, to the fields. Nitrate contamination of groundwater in areas around Delmarva's highly concentrated poultry industry is inherently linked to N losses from BL-amended soils. Although not recommended by University of Delaware personnel, much of the BL is applied to land cropped to soybeans, the dominant crop in the region. Little is known about the agronomic and environmental implications of applying BL to soybeans. Therefore, two field experiments were conducted to determine the impact of this practice on crop productivity and N fixation, and to estimate the contribution of BL derived N to plant N, soil N, and groundwater N. One experiment utilized a rate of BL application variable and the other experiment utilized a time of BL application variable.

"Soil Scientist, USDA-NRCS

Registration Form

Name(s) of
Participants: ______________________________

____

Organization ______________________________

Street Address ______________________________

City ____________ State ______ Zip ______

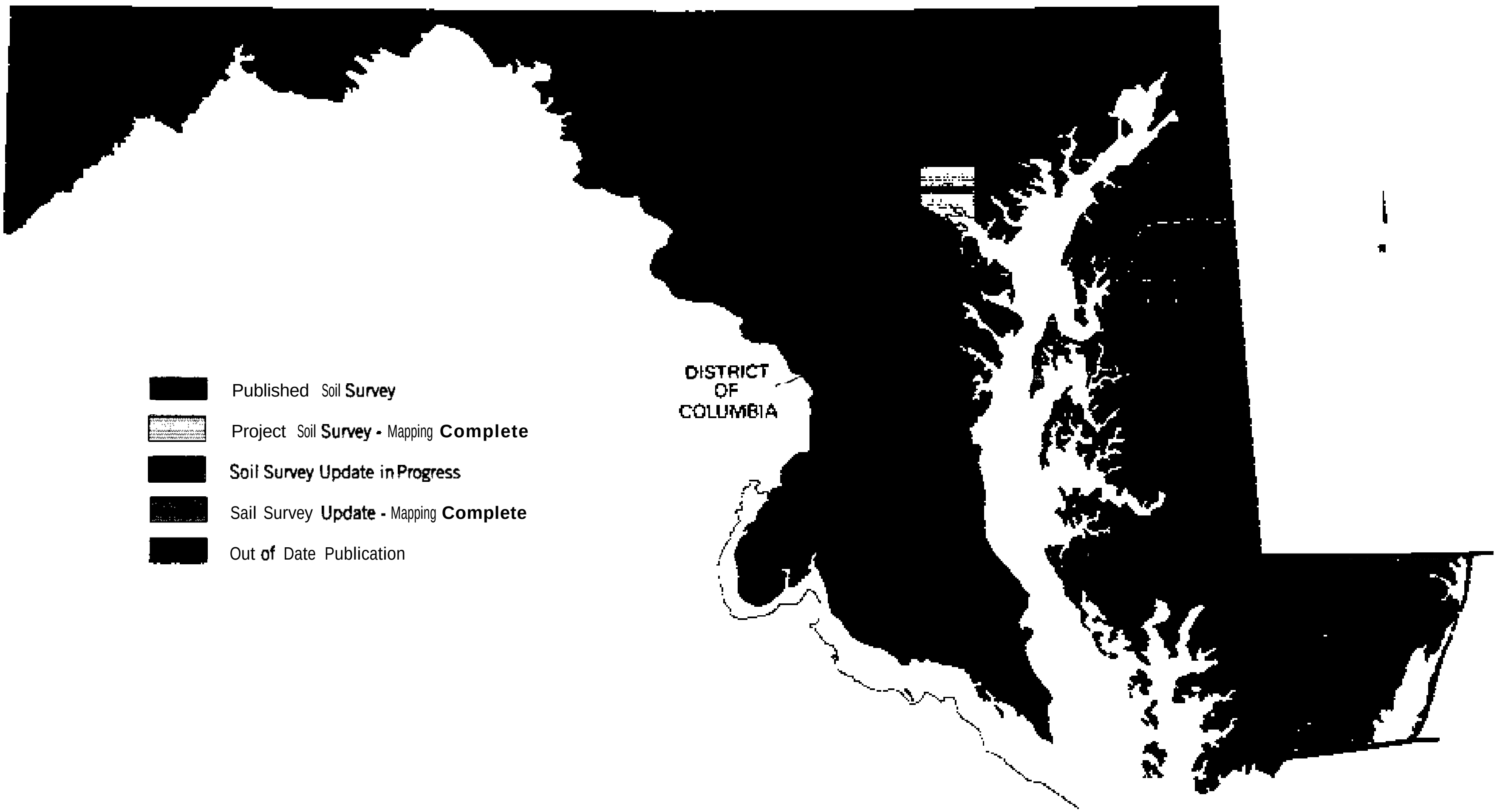
Checks payable to: Maine Chapter ACHCA
Forward Registration
& Payment to:

Darby I. Northway, Admin.
The Renaissance
355 Pool Street
Biddeford, ME 04005-9714

DIRECTIONS TO EMBASSY SUITES HOTEL:
From the North and South via I-95:
Travel I-95 (Maine Turnpike) to

U.S. DEPARTMENT OF AGRICULTURE

NATURAL RESOURCES CONSERVATION SERVICE



STATUS OF SOIL SURVEYS

MARYLAND

JANUARY 1996

MILES

SOURCE
Status data element from Soil Survey Schedule database 7/95
Illustrated using Digital Soil Survey Areas 10/92 revised 7/95
Albers Equal Area Projection.

Revised January 1996 100580

USDA NRCS NATIONAL CARTOGRAPHY & GEOSPATIAL CENTER FORT WORTH TX 1996

MASSACHUSETTS EXPERIMENT STATION REPORT

Peter Veneman
Department of Plant and Soil Sciences
Amherst, MA 01003

The College of Food and Natural Resources is undergoing a reorganization and will refocus its mission on biotechnology. The Department of Plant and Soil Sciences is slated for a reduction in faculty although the administration has not indicated which areas are targeted for reduction. On a positive note, Dr. Baoshan Xing joint our faculty as a soil chemist. Dr. Xing was on a post-doctoral appointment at the Connecticut Experiment Station for one year prior to his arrival in Amherst. Dr. Xing is an expert in the area of heavy metal-organic colloid interaction. Dr. Craker's second 3-year term as Department Head expired and he was succeeded by Dr. William Bramlage. The new Head is a post-harvest physiologist with a specific interest in the physiology of apples. Judy Bartos, upon graduation, obtained a position with Stone and Webster and is presently delineating wetlands in Vermont. She was replaced by Mickey Spokas. Several other students completed their M.S. degree requirements including Ken Deshais, David Gorden, and Rich Bizzozero. The former two found employment in the private sector, while the later was already employed by the Massachusetts Executive Office of Environmental Affairs. Eric Winkler completed his Ph.D. and is presently working in the lab on a post-doctoral position researching the performance of alternative onsite sewage treatment and disposal techniques.

Massachusetts changed its onsite sewage disposal code in 1995, and now requires that the suitability of each proposed sewage disposal facility be evaluated by certified soil evaluators. Our laboratory, with strong NRCS support, did the bulk of the training of these individuals. By last December, we trained over 1,000 individuals in groups of 35 each for one week class and field periods. We are continuing this effort but on a much reduced scale. Our off-campus M.S. program is still going strong with a steady enrollment in most of our courses. At the present we have 11 students enrolled in this program, accounting for a fourth of the total number of graduate students. These students generally do not complete a thesis but instead partake in a 6-credit independent study. Our courses in hydric soils and wetland delineation still prove to be quite popular. A commitment to these kind of outreach activities have given our program a strong visibility within the state.

We still are continuing research in the area of plant-soil-water relationships. The long-overdue report for the Corps of Engineers study is almost completed. Several papers are in preparation and should be available for review this summer. The use of a growing season based on seasonal measurements at 20-inch depths is unsuited because of slow cooling during the fall. Most of our wetlands have a growing season starting the middle of April and ending by the end of December using the Soil Taxonomic definition of growing season. Growing seasons based on average killing frost dates reported in soil survey reports (usually Table 2 or 3), gives us a growing season from April IS, to October 12, which is more reflective of actual conditions. Our recommendation is to add 2 weeks to the beginning of the growing season date reported in soil survey reports and to use the soil survey termination date. Soils with low chroma colors obviously are much wetter than pedons with higher chromas, however, that may not be true in sandy soils. This issue will be addressed in our new Hatch project evaluating iron cycling in sandy soils in several small watersheds. This project will be a cooperative effort between Geosciences and Plant and Soil Sciences. We are also looking at the role of iron in the establishment of hydrophytic plants. It is thought that this type of vegetation survives long-term saturation because these plants are able to neutralize the toxic effects of reduced iron by precipitating the iron as pore linings or oxidized rhizosphres. As part of this project we are looking at one calcareous and an acidic wetland to evaluate the role of reduced iron in plant survival. This project also involves measurements of wetland seedling growth under laboratory conditions in which the iron content and speciation is controlled. It is hoped that the research results may lead to a higher success rate in mitigated and created wetland systems.

MASSACHUSETTS REPORT
Bruce W. Thompson

The reorganization within the Natural Resources Conservation Service has changed the personnel associated with the soil survey operations in Massachusetts. Dick Scanu, formerly State Soil Scientist is now the Assistant State Conservationist for Operations. The new State Soil Scientist is Bruce W. Thompson. He transferred from the State Soil Scientist position (14 years) in Missourri. He is also the M.O. Team Leader for MO-12, the New England Region.

Massachusetts currently has 3 field soil scientist conducting update soil surveys.

- a project leader in Franklin County
- a project leader and a term soil scientist in Plymouth County

The term employee will be converted to a career employee on July 7, 1996. A new soil scientist position has been allotted to Massachusetts by the Regional Conservationist to be tilled before October.

Bill Taylor is still the Assistant State Soil Scientist. He handles basic services for the central part of the state and is responsible for project soil survey activities such as, technical reviews of manuscripts, map compilation, training, participation in field reviews, the state legend and STATSGO updates.

Massachusetts was a test site for NASIS version 1.0. The data for 2 counties was loader on the computer and converted from 3SD to NASIS. At this time all Massachusetts counties 3SD data tiles have been verified and are ready to be converted to NASIS 2.0. The conversion will be completed by September.

Technical edits have been completed for 4 area soil survey publications. Hampshire and Harnpden Counties West was published earlier this year. This leaves 3 area soil survey publications remaining to be published. Worcester County South is scheduled for english edit later this fiscal year. Middlesex County is ready for english edit but is waiting for completion of the map finishing. Worcester County Northwest has the technical edit completed and is at the state office.

We have two counties, that are part of the national initiative, to be digitized for SSURGO. Norfolk and Suffolk Counties has been sent to NCG for a quality check and Barnstable County has 4 quads remaining that need to be labeled and checked for a quality join. Massachusetts has entered into a M.O.U. with MASS/GIS and Mass Food and Agriculture to scan and digitize soil surveys that are published on orthophoto quads. They have completed Hampshire and Hampden Counties East, and the initial quality check is excellent. The scanning of Berkshire County has been completed by Mass/GIS and the data has been forwarded to Mass Food and Agriculture for labeling, etc. The state initiative is a two year project. Their ability to complete the work may be limited by our ability to provide them with products to digitize.

The Memorandum of Understanding for MLRA-144A Southern New England has been developed/reviewed and approved by National Headquarters. Bill Taylor is developing an initial MLRA legend proposal that we will present to the steering committee at a later date for their consideration.

We have been extremely busy with numerous investigations, site work and training functions. The following are a sampling:

(a) We have conducted a study relative to soil temperature to identify the frigid/Mesic line in Massachusetts and New Hampshire. This proposal has been sent out for review.

(b) Studies are being conducted on the presence of frigid Inceptisols.

(c) The GPR unit has been used to study Cranberry bogs in order to determine the depth of organic deposits and the depth to underlying deposits (bog iron).

(d) Water table studies have been started cooperatively with partners.

(e) We have been testing hydric soil field indicators with the Mass. Dept. of Environmental Protection.

(f) We continue to provide training in the identification of hydric soils to the the Dept. of Environmental Protection, so members of Conservation Commission will be able to identify wetlands.

(g) We are also conducting workshops on soil identification. It is for a the state program called title-s-the septic tank law. These workshops are for soil evaluators.

(h) We have been recompiling 1/3 quads to full quads for our soils data so the quads can be scanned for special watershed studies by U.S. Fish & Wildlife on small watersheds and by town agencies for special projects.

As a state we are greatly concerned about proposed activities that may impact our abilities to conduct production soil surveys next fiscal year. The National Resource Inventory is scheduled to start in October. Traditionally soil scientists have been used to collect the data because of our remote sensing capabilities. The 1996 Farm Bill will require that wetlands be certified. Since hydric soils play such a large roll in the identification of wetlands, what will the impact be on soil scientists time? A third potential workload, that the digitizing/DOQ initiative may cause, is the need to provide perfect joins between county soil survey publications. If SSURGO requires perfect joins, time will need to be scheduled to conduct this workload. Soil Scientists have the skills to do each of the activities listed above. The question we need answered is are we going to conduct product soil survey activities, the MLRA reorganization concept, or are we going to be conducting activities related to basic services.

MLRA OFFICE REPORT
NEW ENGLAND REGION
Bruce W. Thompson

The MLRA soils staff reported to the Amherst office during late October 1995 through the first week in January 1996. The last member to join the staff was Drew Adam, NRI Specialist, who transferred to the MO staff on March 17, 1996. The staff is comprised of 7 persons:

NAME	POSITION	PRIOR LOCATION
Darlene Monds	GIS	Chester, PA
Jim Giuliano	Editor/Writer	Chester, PA
Shawn Finn	Database Manager	Somerset, NJ
Andrew Williams	Correlator/Interp.	Pensacola, FL
Steve Fischer	Correlator/Interp.	Topalo, MS
Drew Adam	NRI Specialist	Barttleboro, VT
Bruce Thompson	MO Team Leader	Columbia, MO
Vacant	Secretary	

I'll use a series of overheads to demonstrate our area of responsibility and the workloads that we will be expected to complete. MLRA-12, the New England Region, is comprised of the 6 New England states, New York state, 15 counties in Ohio, 14 counties in Pennsylvania and 7 counties in New Jersey (see Fig. 1).

There are 17 operational soil surveys in the region which comprises a total of 34 counties (see Fig. 2).

CT - Update, the whole state

New Jersey which are updates nearing completion (see Fig. 4). Andrew has responsibility for MLRA's 146, 143, and 144B. These are the frigid soils of Maine, New Hampshire, Vermont and the Adirondack Mountains of New York (see Fig. 5). In addition to the 6 counties just mentioned, Andrew will also have responsibility for Franklin County in Massachusetts (see Fig. 6).

Steve has the largest area and potentiallythe most diverse. He covers MLRA's 139, 140, 141, 142, 100, and 101 (see Fig. 7). Five of the projects are located in New York and two in Ohio (see Fig. 8).

The manuscript backlog is a-major concern nationally as well for the New England Region, there are several reasons why completed soil surveys have not been published. Chief among these are (1) correlation documents have not been prepared because of recent changes in taxonomic definitions (2) map compilation has not been completed (3) former scribing procedures are no longer being used to create soil delineation overlays as part of the SSURGO certification program and (4) manuscripts are still at state offices awaiting some sort of adjustment prior to technical edit. The acceleration of manuscript preparation will be one of the MLRA major concerns but it must run concurrent with map preparation.

At the present time there are 8 soil survey manuscripts at the state offices. The technical review of these manuscripts will be assigned to the correlators on the MO staff when they are forwarded. The map should be compiled and map finishing in progress (see Fig. 9).

There are five soil survey manuscripts presently in state offices and the technical review is complete. However, questions raised during the technical review have not been addressed by states. The maps have not been submitted to NCGSC for carto preparation. These manuscripts will be forwarded to the MO for English edit when the review questions have been addressed and the maps submitted to carto (see Fig 10).

An additional 3 soil survey manuscripts have had the technical review completed. The english edit will not be performed until the maps are submitted to NCGSC for carto preparation (see Fig. 11).

There are 3 soil survey projects where the technical review of the manuscripts and the maps are complete. The manuscripts are at the MO and the english edit will be performed by the MO editor (see Fig. 12). Jim Giuliano has been completing 2 soil surveys for Oregon which were assignments he had while in Chester. These english edits are complete and the manuscripts are being type set at the MO-13 office prior to being sent to GPO.

Darlene Monds has completed quality checks on three SSURGO digitizing projects. Generally speaking the work looks excellent and only minor suggestions on technique and some line placement have been returned to the states.

At this time funding to set up the MO office is not available. This will slow progress but any requests for assistance will be provided for the staff. We will complete the template and purchase order for the computers we need to service the MO and NRI but inform Fort Collins to set on the request until we notify them we have funding available.

A board of directors meeting has been held and organizational items, such as, supervision, program responsibility, and budget responsibility were discussed.

NEW HAMPSHIRE/VERMONT
COOPERATIVE SOIL SURVEY

LONG RANGE PLAN
OF SOIL SURVEY OPERATIONS
1996 - 2000

INTRODUCTION

This report and long range plan of soil survey operations documents the advancement into a new and exciting era of soil survey operations in Vermont and New Hampshire. It also poignantly describes the continued decline in federal funding levels, declining soils survey staff, and the importance of outside financial support necessary to continue providing up-to-date soil resource data and interpretations to communities and citizens of Vermont and New Hampshire in a timely manner. The changes in funding level and recent restructuring of the National Cooperative Soil Survey has mandated changes in the soil survey infrastructure; it has placed great emphasis on the importance of listening closely to specific customer needs, and has caused a re-evaluation in program priorities in order to maintain efficiency within the soil survey with fewer resources. Although decline in funding and staffing levels are rarely viewed as a positive change, it has, in fact, created opportunities to reorganize on a broad regional scale, to utilize staff resources more effectively between the two states, and re-focus program efforts that will allow the soil survey program to continue to meet customer needs in the midst of declining resources. The most significant, and exciting change in the soil survey infrastructure was the landmark decision, made in January of 1995, to establish a staff-share arrangement between the soil survey programs in Vermont and in New Hampshire. The second most significant change, which we have not yet fully benefited from, is the regionalization of the National Cooperative Soil Survey to funetion on an MLRA basis with Vermont and New Hampshire technical assistance being provided from the newly established MLRA Region Office located in Amherst, Massachusetts.

CURRENT VERMONT-NEW HAMPSHIRE STAFF SHARE ARRANGEMENT

During the Spring of 1995, it was decided and agreed upon that two soil scientists from the Coos County, New Hampshire, soil survey crew, would be detailed to Essex County, Vermont to carry out soils mapping on 3,000 acres. This has proven to be a very efficient use of soil scientists time as the Essex County soil survey area is only five minutes from the Lancaster, NH soil survey office and the field season opens up earlier in the season in Essex County than where soil survey operations are currently being conducted in Coos County, NH. The long range plan is to continue having soil survey mapping in Essex County, VT during the early Spring, until the field season opens up in Northern Coos County.

In a reciprocal arrangement, New Hampshire was receiving technical soil services from the Soil Resource Specialist located in Brattleboro, Vermont. This arrangement worked out very well for both states as New Hampshire does not have a soil scientist located in the southwestern portion of the state, and the existing technical soil services workload in Vermont allowed for time to be allocated to New Hampshire with little difficulty. This position, however, became vacant during the Winter of 1995-96 and there arc no current plans to till this position.

To take greatest advantage of the technical expertise of individuals, and utilize their specialty to greatest advantage, it was decided and agreed upon to expand the position description of the Soil Survey Data Set Manager, located in Concord, New Hampshire, to have two-state responsibility, and to expand the position description of the Soil Technology Coordinator, located in Winooski, Vermont, also to have two-state responsibility. Official change in position descriptions and position responsibilities took place effective October 1, 1995.

The GS-9 soil scientist position located in Woodstock, Vermont, has expanded position responsibilities to provide technical assistance to the Soil Survey Data Set Manager on issues pertaining to the soils database for both states. Most of the database work carried out by this individual is supporting the Vermont soils database, however, there are other database functions and maintenance activities that is carried out that benefit both states.

PROJECT SOIL SURVEY
WINDSOR COUNTY, VERMONT

This project soil survey was started in 1984 and has continued on a more-or-less uniform track of completing 50 to 60 thousand acres each season. Completion of this survey is scheduled for the Fall of 1997, however, with the transfer of the Vermont Soil Resource Specialist, this survey has the potential of delaying completion for another year without the help from mapping details. At the present time, it does not seem likely that funding will be available to fill the vacancy of the Soil Resource Specialist. This not only reduces projects mapping goals for the survey area, but it also places additional workload on the Project Leader, who has taken over many of the technical soil services that was previously provided by the Soil Resource Specialist. In addition, current funding levels in Vermont may not allow for detailing soil scientists on per diem from other locations to assist in the mapping progress in order to meet the originally projected completion date of Fall 1997. Under the current and projected staffing plans for the survey area, soils mapping will be completed in November, 1998. The completion date could be delayed further of demands on technical soil services in the area increases.

It may be possible to make the originally scheduled completion date of November, 1997 through the use of mapping details from the Merrimack/Belknap County Soil Survey, headquartered in Concord, New Hampshire. By detailing one soil scientist from Concord, NH, to the Windsor County Soil Survey during F/Y96, FN97 and for first quarter FN98, it would be possible to complete the Windsor County Soil Survey by November 1997 (see attached spreadsheet and graph).

This proposal allows for a reduced acreage goal for the Soil Survey Project Leader to enable the handling of technical soil services left behind by the Soil Resource Specialist. It also allows for reduced mapping goals for the soil survey party member who also serves as a database assistance in support of NASIS development in both Vermont and New Hampshire.

This staff share **proposal** would only be possible if the **Merrimack/Belknap** Soil Survey receives reciprocal mapping assistance from Vermont after the completion of the Windsor County Soil Survey. The reciprocal arrangement would require the Windsor County project leader and the soil survey party member to be detailed to Merrimack County, New Hampshire for 3rd and 4th quarters of F/Y98 and for all of **F/Y99.** This will allow for the timely completion of the **Merrimack/Belknap** Soil Survey but obviously delays the start of any new surveys in Vermont or preempts **any assistance** to the on-going Vermont surveys. Never-the-less, without this reciprocal arrangement, the completion of the Windsor County **survey** would be delayed for at least one year and new starts or assistance to ongoing surveys would not be practical.

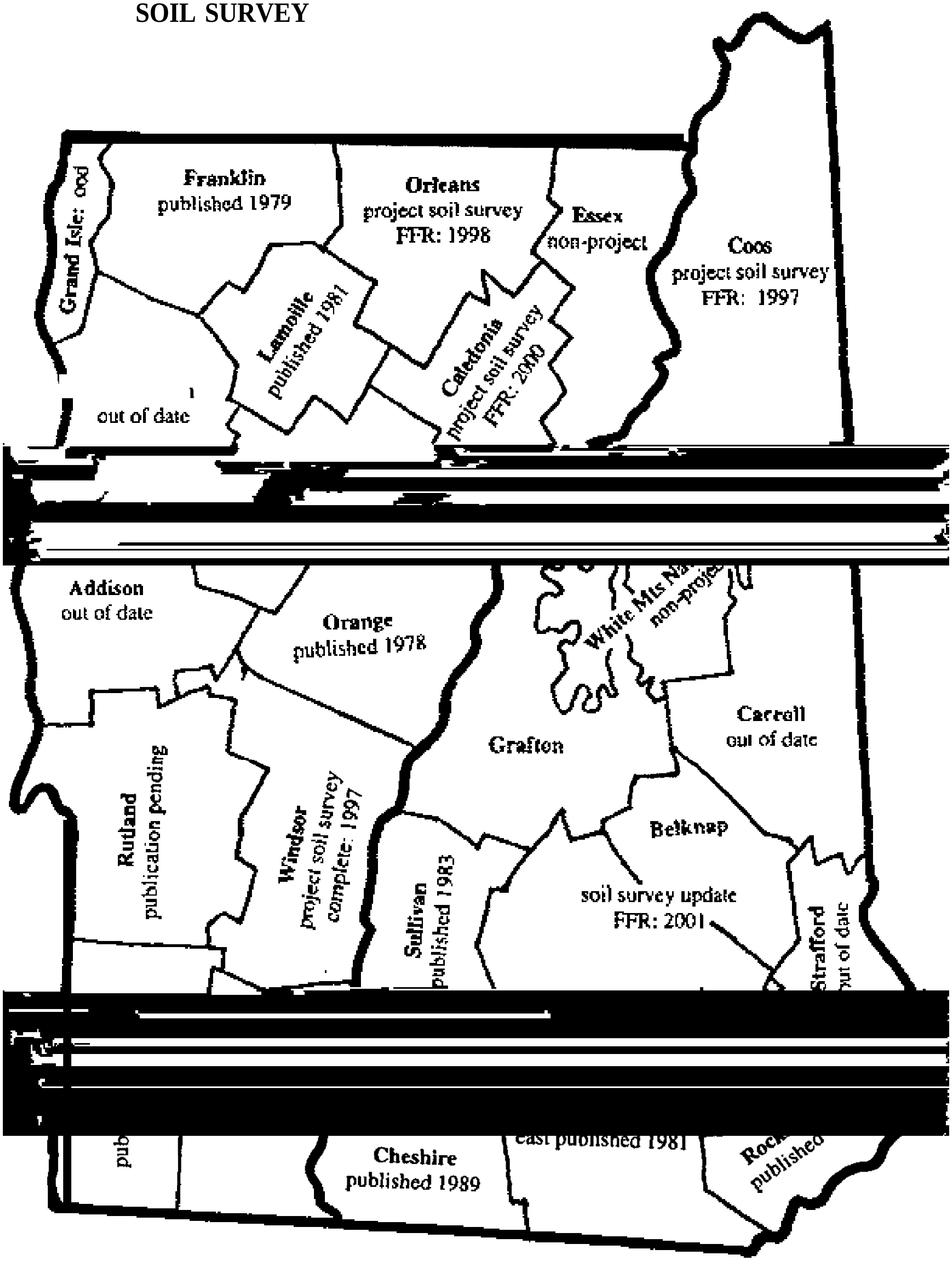
SOIL SURVEY UPDATE
MERRIMACK AND BELKNAP COUNTIES, NEW HAMPSHIRE

The soil survey update of Merrimack and Belkuap County in New Hampshire started in 1987 and has experienced sporadic progress due to soil survey party members being detailed to other part of the country to assist in the cropland mapping effort, loosing soils staff, and assigning Co-lateral duties to the Soil Survey Project Leader and some of the party members.

Based on current projections of funding and staffing, the soil survey update is not due to be completed until Fall of 2000. Entering into a staff-share arrangement with the soil survey staff in Windsor County, Vermont, this completion date could be moved up to the Spring of 2000. The arrangement would also the Project Leader to commence coordinating soil survey activities in Strafford County, New Hampshire as early as 1999.

This staff share arrangement would slow mapping progress in Merrimack County for F/Y96, F/Y97 and for 1st quarter of F/Y98 as one soil scientist would be detailed to Windsor County, Vermont during these years to help complete this survey on schedule. Upon completion of Windsor County, however, Merrimack County would receive the benefit of two additional soil scientists for the second half of F/Y98 and for all of FN99. The resulting progress would allow for the completion of the survey nearly a full field season ahead of what would othenvise be possible with current staff and funds.

SOIL SURVEY


Franklin
published 1979
Orleans
project soil survey
FFR: 1998
Essex
non-project
Coos
project soil survey
FFR: 1997
Lamoille
published 1981
Caledonia
project soil survey
FFR: 2000
out of date
Addison
out of date
Orange
published 1978
Grafton
Carroll
out of date
Rutland
publication pending
Windsor
project soil survey
complete: 1997
Sullivan
published 1983
Belknap
soil survey update
FFR: 2001
Strafford
Cheshire
published 1989

New Hampshire - Vermont Cooperative Soil Survey Program

Significant Lines of Program Direction

CO-02 F/Y97

Northeast Area Board Of Directors

MLRA Steering Teams
MLRA 142 - Tyrone Goddard, NY
MLRA 143 - Norm Kalloch, ME
MLRA 144A - Bruce Thompson, MA
MLRA 144B - Steve Hundley, NH/VT
MLRA 145 - Kip Kolesinskas, CT/RI

MO 12 Regional Office Amherst, MA
Bruce Thompson - Team Leader
Andrew Williams, Correlator
Darlean Manda, GIS Specialist
Shawn Finn, Database Manager

State Offices: New Hampshire and Vermont
Steve Hundley, State Soil Scientist, NH/VT
Durham, NH
Pauline Pare, State Resource Conservationist, VT/NH
Winooski, VT

Global Change Initiative
Steve Hundley, Project Leader
Joe Homer, Soil Scientist
Karen Dudley, Soil Scientist

MLRA Project Team
Steve Gourley, Soil Technology Coordinator, Winooski, VT
Kathy Swain, Soils Specialist (Database) Concord, NH
Martha Stuart, Soil Scientist (Pt.Tm. Database) Woodstock, VT
Caroline Alves, Soils Specialist (GIS) Williston, VT
Bob Long, Soil Scientist (Pt.Tm. GIS) Newport, VT
Pete Whitcomb, Soil Scientist (Pt.Tm. GIS) Concord, NH

Windsor Co. VT MLRA Subset
Thom Villars, Soil Survey Project Leader
Martha Stuart, Soil Scientist

Orleans Co. VT MLRA Subset
Bob Long, Soil Survey Project Leader (P/T)
Carinthia Grayson, Soil Scientist (P/T)

Coos Co. NH MLRA Subset
Joe Homer, Soil Survey Project Leader (P/T)
Mary Ellen Cannon, Soil Scientist (P/T)
Tom Burke, Soil Scientist (P/T)

MLRA Subset
Peter Whitcomb, Soil Survey Project leader (P/T)
Karen Dudley, Soil Scientist (P/T)
Phil Meyer, Soil Scientist

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	NEW HAMPSHIRE COOPERATIVE SOIL SURVEY PROGRAM					
	Soil Survey Area:	3S-D Total Survey Land Area	3S-D Total Survey Census Water	3S-D Total Federal Land	Total Surface Area in Survey	Total County Surface Area
1	Belknap County	(1)	(1)	(1)	(1)	301,491
2	Carroll County (2)	443,433	36,928	153,406	633,767	633,767
3	Cheshire County	452,736	12,160	2,208	467,104	467,104
4	Grafton Co. Area	760,385	14,684	231	775,300	1,119,833
5	Merrimack County	(1)	(1)	(1)	(1)	611,117
6	Rockingham County	443,073	17,536	4,357	464,966	464,966
7	Strafford County	237,031	8,256		245,287	245,287
8	Sullivan County	345,268	7,744	293	353,305	353,305
9	Hillsborough East	261,391	3,047	2,778	267,216	570,253
10	Hillsborough West	294,165	4,514	4,358	303,037	
11	Coos Co. Area	930,323	7,210		937,533	1,171,187
12	Wt.Mt.Nat.Forest	567,094	11,093		578,187	(3)
	(Graf. & Coos only)				0	
13	Merbel Survey	845,271	54,976	12,361	912,608	

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eage included as part of.

NEW HAMPSHIRE SUMMARY OF SOIL SURVEY STATUS

SOIL SURVEY AREA	Corr. Date	Publication Date	Mapping Scale	Mapping Order	Photo Base	Area Digitized	SSURGO Schedule
Belknap County	7/65	11/68	15,840	2	Mosiac	No	None
Carroll County	1/74	12/77	24,000	2/3	Mosiac	Yes	None
Cheshire County	9/85	6/89	20,000	2	Ortho	Yes	1997
Coos County	1997	1999	24,000	2/3	Ortho	Partial	2000
Grafton Co. Area	10/86	1997	20,000	2/3	Ortho	Yes	1995
Hillsborough Co. Eastern Part	2/80	10/81	20,000	2	Ortho	Yes	1997
Hillsborough Co. Western Part	5/83	10/85	20,000	2	Ortho	Yes	1997
Merrimack County	3/63	6/65	20,000	2	Mosiac	No	None
Rockingham County	4/86	10/94	20,000	2	Ortho	Yes	1997
Strafford County	unk	3/73	20,000	2	Mosiac	Yes	None
Sullivan county	3/81	12/83	20,000	2/3	Mosiac 1/	Yes	1996
White Mountains National Forest							
Merrimack/Belknap County Update	2000	2002	24,000	2	Ortho	Partial	2003

1/ Recompiled into orthophoto quad base prior to digitization.

STATUS AND AVAILABILITY OF SOIL SURVEY PUBLICATIONS
NEW HAMPSHIRE

COUNTY	YEAR OF PUBLICATION	SURVEY DIGITIZED?	COMMENTS
Belknap	1968	Partial	Publication is out-of-print and out-of-date soil survey currently being updated .
Carroll	1977	Yes	Survey and digital data does not meet current-day standards. Update of communities done on a cost-share basis.
Cheshire	1989	Yes	Modem, published soil survey, available in hard copy or digital format.
coos	Scheduled 1999	Partial	Soil survey mapping currently underway. County is 85% complete. Mapping scheduled for completion 1997.
Grafton	Scheduled 1997	Yes	Modem survey, publication pending, survey is currently available in digital format.
Hillsborough	1981&85	Yes	Published in two parts. Survey is available in hard copy or digital format.
Merrimack	1965	Partial	Publication is out-of-print and out-of-date. Soil survey currently being updated.
Rockingham	1993	Yes	Modem published soil survey, available in hard copy or digital format.
Strafford	1973	Yes	Survey and digital data does not meet current-day standards. Update of communities done on a cost-share basis. The publication is out-of-print.
Sullivan	1983	Yes	Modem published soil survey, available in hard copy or digital format.

stssaid	soil survey subset	land area	correlation date	pub. date	survey status	compition date (1)
NEW HAMPSHIRE						
NH003	Carroll Co.	294,200	01/74	12/77	Outofdate	
NH005	Cheshire Co.	373,700	09/85	09/89	Published	
NH009	Grafton Co.	387,600	10/86	1996	Progress	1986
NH017	Strafford Co.	80,900	unk	03/73	Outofdate	
NH019	Sullivan Co.	264,978	03/81	12/83	Published	
NH601	Hillsborough	303,037	05/83	10/85	Published	
NH609	Merrimack -	305,000			Update	2002
NH609	Belknap	270,900			Update	2002
NH607	Coos Co.	187,500	1997	1999	Project	1997
MASSACHUSETTS						
MA003	Berkshire Co		05/84	02/88	Published	
MA011	Franklin Co.				Update	
MA614	Worcester		1989		Project	1997
MAINE						
ME005	Cumberland	563,840	06/69	1974	Published	
ME011	Kennebec	553,600	02/74	1978	Published	
ME606	Androscogin	470,400	02/66	1970	Published	
ME606	Sagadahoc	inc.	02/66	1970	Published	
ME602	Somerset	535,120	01/67	09/72	Published	
ME031	York Co.	640,000	03/78	06/82	Published	
ME601	Knox Co -	524,160	01/83	1987	Published	
ME601	Lincoln Co.	inc	01/83	1987	Published	
ME027	Waldo Co.	469,760	12/79	07/84	Published	
ME613	Oxford Co.	408,377	09/87	1995		
ME611	Hancock Co.	589,329	07/88	1997		

From MLRA 143 work Plan

TABLE 2

STATUS AND STAFF YEAR NEEDS
MLRA143
MARCH 1995

REV. 3/24/95

SURVEY AREA	SSAID	CORRELATION DATE	PUBLICATION DATE	PUBLICATION SCALE	SURVEY STATUS	COMPLETION DATE	STAFF NOW	PRIORITY	LAND AREA *	STAFF YEAR NEEDS	START DATE
MAINE											
Oxford County Area	ME613	09/87	1995	1:20,000	PUBLISHED	------	------	2	499,127	-----	-----
Franklin County Area and parts of Somerset County	ME610	05/92	1999-est.	1:20,000	COMPLETE	------	------	1	463,887	-----	-----
Somerset County, Southern Part	ME602	01/67	1972	1:20,000	PUBLISHED	------	------	3	133,780	5.0	-----
Piscataquis County, Southern Part	ME615	04/94	1999-est.	1:24,000	COMPLETE	------	------	1	528,000	-----	1995
Penobscot County	ME614	12/60	1963	1:62,500	OUT OF DATE	------	------	5	1,250,452	25.0	-----
Hancock County, Area	ME611	07/88	1997-est.	1:20,000	COMPLETE	------	------	1	64,057	-----	-----
Washington County, Area	ME617	-----	-----	1:24,000	PROJECT	1997	2	5	579,862	2.0	1987
Northern Piscataquis and Northern Somerset County Area	ME620	-----	-----	1:62,500	NON-PROJECT	------	------	5	2,435,158	40.0	1997
Northern Hancock and Western Washington County Area	ME622	-----	-----	1:62,500	NON-PROJECT	------	------	5	1,031,738	23.0	-----
Western Aroostook County Area	ME621	-----	-----	1:62,500	NON-PROJECT	------	------	5	1,790,974	39.0	-----
Somerset County Area nd parts of Franklin and Oxford Counties	ME619	-----	-----	1:62,500	PROJECT	1997	2	5	2,008,410	7.0	1985
Aroostook County, Southern Part	ME608	03/62	1964	1:20,000	PUBLISHED	------	------	3	745,011	13.5	-----
Aroostook County, Northern Part	ME607	12/60	1964	1:20,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
* Acreage reflects the area of the survey within MLRA 143											
NEW HAMPSHIRE											
Carroll County	NH003	01/74	12/77	1:20,000	OUT OF DATE	------	------	5	29,027	2.0	-----
Grafton County Area	NH009	01/86	1996	1:20,000	COMPLETE	------	------	1	228,185	-----	-----
White Mountains National Forest	NH605	------	-----	1:24,000	NON-PROJECT	------	------	5	709,407	30.0	-----
Coos County Area	NH607	------	1999-est	1:24,000	PROJECT	1997	2	5	930,323	7.0	1960
VERMONT											
Addison County	VT001	05/67	11/71	1:15,840	OUT OF DATE	------	------	4	200,300	8.0	-----
Bennington County	VT003	1992	1997	1:20,000	COMPLETE	------	------	5	231,300	1.0	-----
Caledonia County	VT005	-----	-----	1:20,000	PROJECT	2,000	2	5	39,400	1.0	1988

TABLE 2 CONT.

STATUS AND STAFF YEAR NEEDS
MLRA143
MARCH 1995

REV. 3/24/95

SURVEY AREA	SSAID	CORRELATION DATE	PUBLICATION DATE	PUBLICATION SCALE	SURVEY STATUS [1]	COMPLETION DATE [2]	STAFF NOW [3]	PRIORITY [4]	LAND AREA [5]	STAFF YEAR NEEDS [6]	START DATE
VERMONT											
Chittenden County	VT007	1969	1974	1:15,840	OUT OF DATE	-----	-----	4	238,400	10.0	-----
Essex County	VT009	-----	-----	1:20,000	PROJECT	NOT SET	1.5	5	303,400	24.0	1988
Franklin County	VT011	1976	1979	1:20,000	PUBLISHED	-----	-----	3	298,900	14.0	-----
Lamoille County	VT015	1979	1981	1:20,000	PUBLISHED	-----	-----	3	296,600	15.0	-----
Orange County	VT017	1975	1978	1:20,000	PUBLISHED	-----	-----	3	9,500	1.0	-----
Orleans County	VT019	-----	2001-est.	1:20,000	PROJECT	1999	1.0	5	96,500	2.0	1987
Rutland County	VT021	1985	1996	1:20,000	COMPLETE	-----	-----	2	210,000	-----	-----
Washington County	VT023	1995	1998-est.	1:20,000	COMPLETE	-----	1.0	5	251,600	1.5	-----
Windham County	VT025	1983	1987	1:20,000	PUBLISHED	-----	-----	2	126,900	-----	-----
Windsor County	VT027	-----	1999-est.	1:20,000	PROJECT	1996	2.0	5	187,600	2.0	1985
MASSACHUSETTS											
Berkshire County	MA003	05/84	02/88	1:25,000	PUBLISHED	-----	-----	3	361,540	13.0	-----
Franklin County	MA011	-----	-----	1:12,000	PROJECT (UPDATE)	-----	.20	5	162,295	7.8	-----
Hampden and Hampshire Counties (Western Part)	MA608	1989	NOT-SET	1:25,000	MAPPING COMPLETE	-----	-----	3	263,126	10.0	-----
NEW YORK											
Clinton County	NY019	4/94	-----	1:24,000	COMPLETE	-----	0.6	2	203,950	0.5	-----
Essex County	NY031	EST. 1998	-----	1:24,000	PROJECT	-----	2.5	5	921,366	10.0	-----
Franklin County (Southern Part)	NY603	-----	-----	1:20,000	PROJECT (UPDATE)	-----	0	5	774,800	20.0	-----
Fulton County	NY035	EST. 11/97	-----	1:24,000	PROJECT	-----	2.0	5	239,000	8.0	-----
Hamilton County	NY041	02/94	-----	1:62,500	COMPLETE	-----	0	2	1,157,400	.5	-----
Herkimer County	NY606	1969	-----	1:24,000	NON-PROJECT	-----	0	5	571,500	21.0	-----
Lewis County (Eastern Part)	NY616 NY614	-----	-----	1:24,000	PROJECT (UPDATE)	-----	0	5	434,390	19.0	-----

REV. 3/24/9

TABLE 2 CONT.

STATUS AND STAFF YEAR NEEDS
MLRA143
MARCH 1995

SURVEY AREA	SSAID	CORRELATION DATE	PUBLICATION DATE	PUBLICATION SCALE	SURVEY STATUS[1]	COMPLETION DATE[2]	STAFF NOW[3]	PRIORITY[4]	LAND AREA[5]	STAFF YEAR NEEDS[6]	STAR DATE
ntinued) NEW YORK											
eida County	NY065	1991	-----	1:24,000	COMPLETE	-----	0	1	132,923	.5	----
Lawrence County	NY089	1990	-----	1:24,000 1:62,500	COMPLETE	-----	0	1	807,704	2.0	----
ratoga County	NY091	1994	-----	1:24,000	COMPLETE	-----	0	1	177,000	.1	----
arren County	NY113	1983	1989	1:15,840	PUBLISHED	-----	0	2	369,558	.5	----
ashington County	NY115	1973	1975	1:20,000	PUBLISHED	-----	0	2	27,077	1.7	----

FOOTNOTES:

1 *published = published soil survey report available*
complete = final work complete, awaiting publication
project = field work currently underway
non-project = no project field work underway, no or little mapping available
out of date = publication no longer available
(update) = soil survey update in progress

[redacted]

3, 5, 6 *figures reflect acreage and staff only for that part of the survey in MLRA143*

4 *categories identifying resources required to bring each soil survey to a uniform standard by MLRA*

1= very low (little work required to meet uniform standard)
2 = low
3 = moderate
4= high
5= very high (unsurveyed acres requiring new mapping)

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NEW HAMPSHIRE/VERMONT COOPERATIVE SOIL SURVEY
LONG RANGE PLAN OF OPERATIONS
1996-2000

Highlights of the Plan:

April 10, 1996

vermont/hilites1.lrp

Cooperating Arrangement between the VT/NH State Soil Scientist and the VT/NH State Resource Conservationist

The position responsibilities for the State Soil Scientist and the State Resource Conservationist are carried out through a cooperative arrangement whereby consensus is achieved before actions are carried out. This pertains to the New Hampshire soils program as well as the Vermont soils program and is particularly important when changes in one program will effect the other.

As it pertains specifically to the Vermont Soils Program, the State Soil Scientist is responsible for the technical aspects of running the program (plan of operation, quality control, data collection needs, etc.) and the State Resource Conservationist is responsible for the administrative aspects of running the program (supervision, budgets, staffing plans, allocation of resources, etc.) Obviously these two positions cannot function independently and considerable cooperative support and communication is essential. Many activities and program changes will be made through suggestions and recommendations made by both individuals. Final approval on any aspect of the Vermont Soil Survey program rests with the State Resource Conservationist and the Vermont State Conservationist.

Under the terms of this Long Range Plan, the State Soil Scientist located in Durham, New Hampshire, will have soil survey program responsibilities for both New Hampshire and Vermont. This position works with the VT/NH State Resource Conservationist in developing and maintaining a soil survey plan of operations, ensuring activities are being carried out within the standards of the National Cooperative Soil Survey, and providing approval authority for action items designated as requiring the approval of the State Soil Scientist as identified in the National Soils Handbook. Exercising approval authority on activities pertaining to the Vermont Soil Survey Program will be done through consultation with the State Resource Conservationist and/or the Soil Technology Coordinator.

The State Resource Conservationist, located in Winooski, Vermont, provides administrative oversight and handles supervisory responsibilities for the Vermont Soil Survey Program. This individual works with the State Soil Scientist in preparing and managing budgets, staffing plans and the deployment of staff to meet priority mapping objectives. The SRC also provides leadership and coordination for administering technical soil services and serves as liaison with soil survey cooperators, including units of government, VCGI, etc.

VT/NH Soil Technolow Coordinator

This position is supervised by the VT/NH State Resource Conservationist. Primary responsibilities include all soil classification and correlation activities in both states. The incumbent will schedule and coordinate all field reviews, determine research needs, and coordinate field activities. Additional responsibilities include, but are not limited to coordinating manuscript development, soil map compilation, reviewing, updating and enhancing soil interpretations, liaison activities with cooperators including VCGI, and handling technical soil services where appropriate. All activities are coordinated through the Amherst MO Office.

VT/NH Soil Dataset Manager

This position is supervised by the VT/NH State Soil Scientist. Primary responsibility is to manage and maintain the official copy of the 3S-D and NASIS for all Vermont and New Hampshire soil surveys. NASIS training is provided as appropriate. State option tables are added, populated and maintained as needed. The incumbent provides FOCS support in New Hampshire and assists the Soil Technology Coordinator in providing FOCS support in Vermont. The Dataset manager is also responsible for maintaining Section II of the FOTG as per the individual state's needs and requests from the State Offices and field offices.

Soil Survey Party Member, Woodstock, Vermont

This position is supervised by the Windor County Soil Survey Project Leader. The incumbent serves on the soil survey staff to carry out project soil survey mapping in Windsor County, and to carry out supporting soil survey activities. The incumbent also serves as a technical assistant to the VT/NH Soil Dataset Manager. Responsibilities include 3S-D and NASIS support activities, particularly as it pertains to the Vermont soil surveys, however assistance is provided in all phases of 3S-D and NASIS operations. Carrying out database support activities requires commuting to Concord, New Hampshire on a regular basis. Although every effort will be made to schedule the bulk of the database workload during the winter season, there is need to carry out database activities during the field mapping season as well. This will impact on individual mapping goals, and should be taken into consideration.

Technical Soil services

This is a separate program to the project soil survey activities, but is part of the staff-share arrangement between Vermont and New Hampshire and affects the soil science staff in both states.

With the loss of the Soil Resource Specialist, located in Brattleboro, Vermont, there have been no reciprocal arrangements for carrying out technical soil services across state lines. There is a definite work load and staffing need to fill a Soil Resource Specialist position in Southern Vermont, that could also serve Southwestern New Hampshire. The filling of this position will be looked into further as budgets and staffing plans permit.

project Soil Survey: Windsor County, Vermont

With the loss of the Soil Resource Specialist Position, the Windsor County Soil Survey would need to postpone the completion date by one year; from Fall of 1997 to the Fall of 1998. This Long Range Plan suggests one soil scientist from Merrimack Co. New Hampshire, be detailed to Windsor County for the 1996 and 1997 field season. A mapping goal of 12,000 acres per season for the 1996 and 1997 season, will facilitate the completion of this soil survey on schedule in the Fall of 1997.

Upon completion of the mapping, it is suggested the Soil Survey Project Leader and Party member be detailed to Merrimack County, NH for the 1998 and 1999 field seasons, to assist in the completion of that survey. Merrimack County is a soil survey update, with average daily mapping goals of 500 acres. Total mapping goals for the two-party detail is 36,000 acres per season. These goals should allow time for the Project Leader to carry out technical soil services and tie up loose ends with the Windsor County Soil Survey. These goals should also allow the party member, who also serves as soil survey database assistant, to allocate time for database management during the field season.

Neil Survey Update: Merrimack-Belknap County, w Hampshire

Based on current projections of funding and staffing, this soil survey update is not due to be completed until the Fall of 2000 or into the mapping season of 2001. The suggested detail from Merrimack County, NH to Windsor County, VT will have significant impacts on mapping progress for the 1996 and 1997 field seasons. Although progress will be substantially reduced during these years, the suggested Long Range Plan calls for assistance from the Windsor County soil survey crew to complete a total of 72,000 acres during the 1998 and 1999 field seasons. The results of this reciprocal arrangement will allow for the Merrimack-Belknap Soil Survey Update to be completed nearly a full year ahead of schedule, in Spring of 2000 with the Project Leader coordinating soil survey activities in Strafford County, New Hampshire as early as 1999.

The National Soil Survey Division and the National Progress Reporting System will need to be informed of this arrangement so as not to cause any adjustments in State CO-02 funding allocation due to short-term increased or decreased progress resulting from this arrangement. The East Regional Office and Amherst MO Office will also be informed of this staff-share arrangement.

Essex County, VT and Coos County, NH

Currently there is no official MOU to conduct a soil survey in this County, with the exception of the MLRA 143 MOU signed in Fall of 1995. Vermont has an unofficial mapping goal of 8,000 acres per year in this county. In the past, this mapping effort has been carried out by the Project Leader of the Caledonia Soil Survey and through assistance from Vermont mapping details. This effort has taken away from Caledonia mapping progress, and the

NEW HAMPSHIRE/VERMONT COOPERATIVE SOIL SURVEY
LONG-RANGE STAFFING PLAN
APRIL 1996

soils/stfpln1.lrp

Note: Duties and responsibilities are subject to change and revision as the Amherst MO Office becomes functional in carrying out regional soil survey management responsibilities.

Status:

GS-13 State Soil **Scientist, NH/VT** — **Filled**
Durham, NH

a) Soil Survey Program Management in NH
b) Develops/maintains NH/VT soil survey plan of operations
c) Liaison with NH State Agencies/Programs
d) Technical Soil Services in Strafford, Rockingham and Hillsborough County
e) **NRI** Operations Management in NH
f) Represents NH at MLRA Steering Committee meetings
g) Manages Global Change projects in NH

GS-13 State **Resource Conservationist; VT/NH** — **Filled**
Winooski, VT

a) VT Soil Survey administrative oversight
b) Leadership for VT Technical **Soil Services**
c) VT Soil Survey budget and staffing
d) Liaison between VT S/C and SSS
e) Liaison with VT soil survey cooperators
f) Assists SSS in development of soil survey plan
g) Other SRC responsibilities, outside soil survey

GS-12 **Soil Technology Coordinator; VT/NH** — **Filled**
Winooski, VT

a) Maintain, update OSDs
b) Handles Correlation/Classification
c) Coordinates soil interpretations
d) Soil Survey Manuscripts
e) Leadership for all field reviews
f) Coordinates field investigations/studies
g) Provides 3S-D for FOCS to VT field offices
h) Represents VT at MLRA Steering Committee meetings
i) Handles Technical Soil Services requests in VT

GS-12 **Soil Dataset Manager; VT/NH** **Filled (w/GS-11)**
Concord, NH

a) Maintains official copy of 3S-D & NASIS
b) Updates and upgrades NASIS per NHQ dir.
c) Provides 3S-D for FOCs to NH field offices
d) Provides NASIS Training
e) Maintains Sec.II, FOTG to NH/VT as needed
f) Maintains NH State and MLRA 144B soils legend
g) Coordinates population of State Option Tables
h) Database support for NH GIS initiative.

GS-12 Soil Resource Specialist **Vacant**
Brattleboro, VT

a) Technical soil services in Bennington, Windham, Rutland, Addison, Cheshire, Sullivan and Hillsborough Counties.
b) Liaison with USFS, Green Mts. National Forest

GS-11 GIS Specialist **Filled**
Williston, VT

a) Coordinates VT soil data automation
b) Liaison with VCGI, & local units of governments
c) Technical support for map compilation/map finishing
d) Database support for VT GIS initiative
e) GIS training
f) Technical soil services in Chittenden County

GS-11 Soil Survey Project Leader **Filled**
Woodstock, VT

a) Manages the Windsor County Project Soil Survey
b) Technical Soil Services in Windsor and Orange County
c) Assistance to USFS Green Mts. National Forest

GS-9 **Soil Scientist** **Filled**
Woodstock, VT

a) Project soil survey mapping in Windsor County
b) Technical Soil Services in Windsor County
c) Technical assistance in NASIS database
d) Maintains VT State Option Tables in NASIS
e) Soil Survey supporting activities.

GS-11 Soil Survey Project Leader **Filled**
St. Johnsbury, VT

a) Manages the Caledonia County Project Soil Survey
b) Oversight for soils mapping in Essex County
c) Technical Soil Services in Caledonia, Washington, Lamoille and Essex County.

GS-9 **Soil Scientist** **Vacant**
St. Johnbury, VT

a) Project soil survey mapping in Caledonia and Essex County
b) Technical Soil Services in Caledonia County
c) Soil Survey supporting activities.

GS-11 Soil Survey Project Leader **Filled**
Newport, VT

a) Manages the Orleans County Project Soil Survey
b) Technical Soil Services in Orleans, Grand Isle and Franklin County

GS-9 **Soil Scientist** **Filled**
Newport, VT

a)Project soil survey mapping in Orleans County
b)Technical Soil Services in Orleans County
c) Soil Survey supporting activities.

GS-11 Soil Survey Project Leader **Filled**
Lancaster, NH

a) Manages Coos County Project Soil survey
b) Technical Soil Services in Coos, Grafton and Carroll County
c) Coordinates Global Change projects in Grafton and Coos County
d) Liaison activities with USFS: WMNF and Hubbard Brook

GS-9 **Soil Scientist** **Filled**
Lancaster, NH **(2 1/2-time positions)**

a) Project soil survey mapping in Coos County
b) Technical Soil Services in Coos County
c) Project soil survey mapping in Essex County, VT
c) Soil Survey supporting activities.

GS-11 Soil Survey Project Leader **Filled**
Concord, NH

a) Manages the Project Soil Survey Update for Merrimack and Belknap County.
b) Technical Soil services in Merrimack and Belknap County
c) Oversight for NH map compilation and GIS activities
d) Liaison with OSP/UNH Complex Systems

GS-9 **Soil Scientist** **Filled**
Concord, NH

a) Project soil survey mapping in Merrimack and Belknap County
b) Project soil survey mapping in Windsor Co. VT
b) Technical Soil Services in Merrimack/Belknap County
c) Soil Survey supporting activities.

GS-9 **Soil Scientist** **Filled**
Concord, NH

a) Project soil survey mapping in Merrimack and Belknap County
b) Technical Soil Services in Merrimack/Belknap County
c) Soil Survey supporting activities.
d) Coordinates S-NH Wet Soil Monitoring program

JOINT MEETING OF THE VERMONT AND NEW HAMPSHIRE SOIL SURVEY STAFFS

QUECHEE, VERMONT
April 16, 1996

On Tuesday, April 16, 1996, the soil survey staffs in Vermont and New Hampshire met in Quechee, Vermont. The purpose of the meeting was to discuss issues and concerns surrounding the development and implementation of a joint soil survey plan of operations whereby staff and resources are shared in order to carry out program operations in the most effective and efficient way possible. This includes the Soil Survey Annual Plan of Operations, the Five-Year Long Range Plan of Soil Survey Operations, the Long Range Staffing Plan, and the handling of technical soil services.

Those present at the meeting:

Steve Hundley, State Soil Scientist, VT/NH
Pauline Pare, State Resource conservationist, VT/NH
Steve Gourley, Soil Technology Coordinator, VT/NH
Kathy Swain, Soil Dataset Manager, VT/NH
Caroline Alves, GIS Specialist, Williston, VT
Peter Whitcomb, Project Leader, Concord, NH
Phil Meyer, Soil Scientist, Concord, NH
Thorn Villers, Project Leader, Woodstock, VT
Martha Stuart, Soil Scientist, Woodstock, VT
Joe Homer, Project Leader, Lancaster, NH
Roger DeKett, Project Leader, St.Johnsbury, VT
Bob Long, Project Leader, Newport, VT
Carinthia Grayson, Soil Scientist, Newport, VT

This first item of business was the Annual Plan of Operations. The Vermont soils staff indicated over the past several years they have successfully developed annual plans of operations as a self-directed work team. They would like to continue this approach to address soil survey needs and workload in Vermont. It was unanimously agreed that this team will remain intact to address Vermont needs.

The existing plans of operations, for both states, for F/Y96, will remain in effect until January 1, 1997. (Vermont has a state APO in effect, and New Hampshire has a joint VT/NH APO currently in effect. NH does not plan on pulling out a NH plan from the already existing joint APO and will continue to maintain the joint APO for F/Y96. Steve Hundley will request quarterly updates from Bob Long, Team Leader assigned to maintain the VT soils APO.) All individuals at this meeting agreed we should work toward a single, joint APO for both state programs which we will have in place by January 1, 1997, to cover F/Y97. The Vermont self-directed work team and the New Hampshire soils staff will start work on their respective state APO for F/Y97 toward the end of the 1996 mapping season with the intent to meld the two APOs into a single document by January 1, 1997. After this date, the APO for both Vermont and New Hampshire will be represented in this single document that will be maintained by the VT/NH State Soil Scientist with copies provided to the MO12 Team Leader.

It is the responsibility of the State Soil Scientist to coordinate the Joint Annual Plan of Operations (and land range plan) with the MO12 Staff so that soil survey operations in Vermont and New Hampshire support the Region 12 Program Plan and the MLRA Work Plans.

The VT self-directed work team will continue to meet and address items in the Joint APO that affect Vermont operations. The NH soils staff will do the same for the New Hampshire program. When ever adjustments or revisions are needed in the joint APO, the staffing and resource needs in both states will be taken into consideration.

The second item of business pertained to the drafting of a two-state long range plan of soil survey operations. Questions were raised as to whether this long range plan will address staff-sharing only whereby each state program provides assistance and details to the other state as needed, or will the long range plan address combining of staffs whereby the potential could exist to relocate or reassign soil scientists anywhere within the two-state region.

Steve Hundley indicated both options (and perhaps others) must be allowable in the long range plan. We must look at all potential opportunities to make our operations more efficient. The potentials for staff-sharing can be implemented immediately. The potential for combining staffs and reassigning soil scientists across state lines is probably four years away, if not more. And with all decisions involving reassignment and relocation, all factors will be considered including, personal needs and desires, funding, program benefits and agency benefits, before an actual decision is made.

Steve Hundley mentioned, and it was agreed, we should have a long range program plan and long range staffing plan in place fairly quickly. Steve suggested we work on finalizing a joint long range plan by the end of June 1996.

It was agreed that the VT self-directed work Team and the NH Soils Staff will work on their respective long range plans with the intent of melding these plans into a single long range plan for both states at a meeting in White River Junction on Tuesday, June 25, 1996. Each state will draft their plan taking the needs of the other state into consideration and suggesting operations that reflect the most efficient way to carry out program operations. This long range plan will include compilation and digitizing needs, special projects with cooperators, and technical soil services.

Steve Hundley will suggest a format for both the Annual Plan and the Long Range Plan for both states to follow to facilitate the melding of both plans.

When the VT/NH staff-sharing was initiated, in the Spring of 1995, it was deemed appropriate to keep track of staff hours spent by soil scientists in the adjoining state. There was discussion at this meeting that perhaps keeping track of hours is a form of micro-management and may not be needed. There was consensus from the group that if the State Offices don't want the information, then we do not wish to maintain a record of staff hours shared. It was agreed Pauline will discuss this matter with John Titchner and Steve Hundley will discuss the matter with Dawn Genes, and we will let the State Conservationists decide.

The meeting adjourned with everyone present agreeing it is a good idea to maintain a staff-sharing program and to combine the plan of operations into a single joint document. We all agree there are still hurdles to jump and issues to resolve, however, all agree we should move forward with this concept and work to make it a success.

These minutes were reviewed and approved by all participants.

Steve Hundley

CURRENT SOIL SCIENCE RESEARCH
DEPARTMENT OF ENVIRONMENTAL SCIENCES
COOK COLLEGE AT RUTGERS, THE STATE UNIVERSITY OF NEW JERSEY

Dr. Harry Motto heads the soil chemistry program at Rutgers. The primary research interest of the soil chemistry group is heavy metal solubility. Studies in this area employ both batch and column systems. A recent column study examined the relationship between the breakthrough point of various heavy metals and soil properties. Results of this study are being compared to computer models of heavy metal behavior in soil. A batch study on the solubility of Cd, Cu, Pb, and Zn with time at various pH levels is also in progress. Results have been obtained for samples equilibrated for three and six month intervals, and analyses of eighteen month equilibration samples are forthcoming. Another batch study, in preliminary stages, will examine the effects of amorphous and crystalline oxides of iron and manganese on the immobilization of Pb and Cd in soil.

Dr. Robert Tate III leads the soil microbiology group. One project is studying the effects of zinc contamination on soil microbial ecology, particularly the recovery of the microbial community as affected by management. The relationship of diversity of soil microorganisms to soil quality is of particular interest. A portion of these studies involve evaluation of the relationship of the microbial community with the physical indications of soil quality. Other activities include elucidating the effects of soil aggregation on sequestering of organic matter and/or xenobiotics and movement of bacteria in soil. A joint project with researchers in Florida on the interaction of management practices on subsidence of organic soils is also being initiated.

Dr. Stephanie Murphy , soil biophysics, is working with Dr. Tate in studying bacterial movement in soil columns. Her other major research project involves determination of optimum specifications for golf green rooting zone construction. In addition, Dr. Murphy is participating in research studies concerning leaf mulch effects on soil aggregation and physical properties of soil related to drainage and *Phytophthera* root rot in a cranberry bog.

Use Dependent Database Update
June 6, 1996
R.K. Shaw

Lab data for 4 more matched pairs has been received from Lincoln, bringing the total to 19.

1. This data has been added to the Excel database, from which the following analyses were determined:

a) statistically significant differences (t-test) in 14 different soil properties at three soil depths

A Horizons

Db, Kf, pH(H2O), %BS, CEC, %OC significantly different @.001 level

B Horizons

%BS and pH significantly different @.001 level

100cm

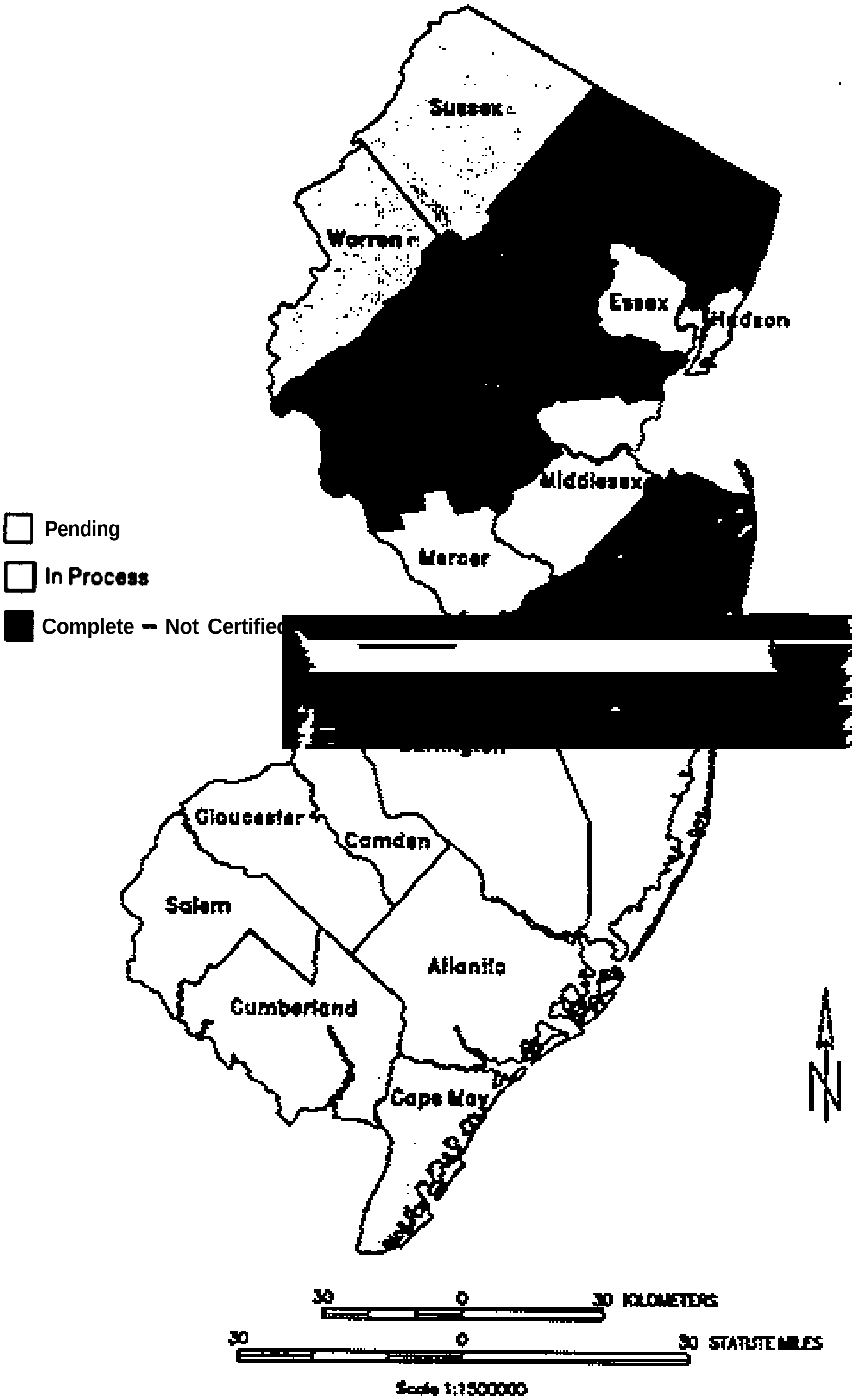
%BS significantly different @.001 level

b) correlation coefficients among these 14 soil properties at three depths
Good correlation of both Db and OC with 1/3 and 15 Bar H20, CEC, total pore space and air-filled pores (at 1/3 Bar water content) make these two properties good indicators of change in the A horizon.

c) regression and dataplots for wooded vs cultivated OC and Db to investigate the reliability of making predictions on rates of changeà€€4 -14 2 Tm (air1)Tj 0.0232 Tc 0.Tw -95.D (In general, bass c correlatio

Digital Soil Survey Projects

New Jersey



lass Mop: 1:250000 DLG USGS, 1990

Report to The Northeast Soil Survey Conference of Research in Progress.

June 7, 1996
Joseph R. Heckman

Presidedress Soil Nitrate Test for Fall Cabbage

Fall cabbage is often planted after harvest of spring vegetable crops such as sweet corn, snapbean, and lettuce. These crops leave carryover N in the soil. The presidedress Soil nitrate test (PSNT) may be useful to improve N management with fall cabbage (or other cole crops) grown as a "catch crop" to utilize residual N. Our research is designed to evaluate the PSNT for use with fall cabbage and to determine the effectiveness of cabbage for utilization of carryover N from spring crops. The findings with cabbage should complement current Extension programs on use of PSNT 'with sweet corn and tield corn. Implementation is expected to improve N recommendations and reduce nitrate leaching losses.
Investigator - J.R. Heckman

At-harvest Stalk Nitrate Testing for Sweet Corn

A tissue test, referred to as "end-of-season stalk nitrate," has already been developed for this purpose in field corn. It indicates whether an inadequate, optimal or excessive amount of N fertilizer was applied to field corn. The development of a comparable test for sweet corn, an "at-harvest corn stalk nitrate test," will provide feedback information to sweet corn growers.

Those who learn that their crops usually test in the optimal range will be able to validate their N management program. Growers who learn they usually apply too much N will profit by adjusting' their N rates in subsequent seasons. Implementation is expected to improve N fertilizer recommendations for sweet corn. Investigator - J.R. Heckman.

Evaluation of liming Practice and Ammonium Sulfate for control of Summer Patch of Kentucky Bluegrass Caused by Magnoporthe Poae

As a consequence of research conducted at Rutgers showing that the use of ammonium sulfate significantly reduces summer patch disease, the turfgrass industry is showing increasing interest in the use of ammonium sulfate as a turf fertilizer. - However. because ammonium sulfate 'is 'strongly acidifying N fertilizer, its widespread long term use without an effective liming program could potentially jeopardize turfgrass quality. Additional field research is needed. therefore, to develop appropriate liming recommendations to accompany the use of ammonium sulfate as a turf fertilizer. More specifically, research is needed to determine the optimum soil pH that should be maintained to achieve the greatest suppression of summer patch disease from the use of ammonium sulfate fertilizer while also 'maintaining acceptable turfgrsss quality,

Investigator - J.R. He&man.

Correction of Manganese Deficiency in Soybean

Manganese deficiency often occurs in soybean grown on slightly acid to alkaline sandy soils of the Atlantic Coastal Plain. Although Mn deficiency can be readily corrected with foliar applications of MnS04, information is needed to help producers make decisions about when economic responses to foliar treatment may be expected and if MnS04, can be safely applied along with post-emergence herbicides (Basagran, Blazer, Classic, and Pursuit). Field experiments conducted a: 13 locations compared an untreated check and one (V3 growth stage) or two (V3 and RI growth stage) sprayings of Mn. At five of the locations the efficiency of co-application of Mn (0.56 and 2.24 kg Mn/ ha rate) with herbicides was also evaluated. Soybean yield increases observed at 9 of the 13 locations ranged from 94 to 712 kg /ha for a single spraying of Mn and from 74 to 705 for an additional spraying of Mn. Results indicate that a Mn deficient soybean crop usually responds profitably to two sprayings of Mn. Co-application of MnS04 with herbicides did not affect the performance of any of the herbicides tested and is a more economical approach for soybean producers to apply Mn.

Investigators - J.R. Heckman and B. A. Majek

Microwave Digestion of Forest Soils and Foliage: Total Al, Ca, Fe, K, Mg, Mn, P and N.

R.A. Hallett*, J.E. Hislop, J.W. Hombeck
USDA Forest Service
Northeastern Forest Experiment Station
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Abstract

Microwave digestion techniques were evaluated for their effectiveness at determining Al, Ca, Fe, K, Mg, Mn, P and N in forest soils and foliage. A microwave oveu was used to digest standard reference materials (SRM) which included CANMET, SO-2 and SO-4 (mineral soil samples); NIST, Pine 1575 (foliar sample); and an uncertified forest floor standard (NA1 7). Milestone's recommended methods did not result in 100% recovery of elements for SRM's; consequently we modified variables in digest protocols, including digest time and power, sample weight, and amounts and types of acids used to arrive at more satisfactory recovery rates. We consistently digested up to 60 samples per day and achieved recovery rates of Al, Ca, Fe, K, Mg, Mn, and P from SD-2 and SO-4 soils of 87% to 1 14% with CV's of less than 10%. Recovery rates of greater than 90% were achieved for Ca, K, Mg, Mn, and P for Pine 1575. Recovery rates for Al and Fe from foliage were not acceptable. Total nitrogen recovery was 99.3% (CV 9.2%) for SO-2. We were not able to achieve acceptable recovery of N from any other sample type due to temperature limitations of the microwave digestion vessels. Al in the digestate of NA1 7 moved in and out of solution over the course of 52 days, indicating that the timing of digestate analysis is critical. Microwave digestion was found to be more efficient and safer for the total digestion of forest soils but conventional block digestion methods are deemed more efficient for total elemeut analysis of foliage.

NRCS - NEW YORK
PROGRESS REPORT, 1996

Following is a summary of our soil survey activities and accomplishments during fiscal year 1996.

I. Progress Reviews & Technical Visits

1. Delaware County	Final Field Review	Complete 7/96
4. Essex County	Progrees Field Review	Complete 8/96
5. Cattaraugus County	Progress Field Review	Complete 9/96

In addition to the surveys above, a technical visit was conducted for the Allegany County soil survey during the Cattaraugus County field review. Technical visits or reviews were cancelled for New York City and Fulton County. All reviews were conducted by the MLRA Region 12 Office.

II. Soil Survey Mapping Progrese

During last fiscal year, we mapped a total of 275,757 acres and updated 77,014 acres. There were mapping contracts for Cattaraugus, and Delaware County, in addition to our mapping.

III. Soil Survey Reports

Following is the status of our soil survey manuscripts:
1. St. Lawrence County, Dutchess County, and Saratoga County - These manuscripts have completed a technical review and are awaiting an English edit.
2. Hamilton County and Oneida County - These manuscript8 are in the process of being edited for submission for technical edits.
3. Clinton County - Paul Puglia has been completing the state edit for this manuscript.
4. Otsego County - This manuscript has been recently completed. The state edit will be completed under contract to Lee McDowell.
5. Delaware County - This manuscript is currently being prepared by Steve Seifried.

Map compilation/digitizing:
1. St. Lawrence County and Dutchess County - These surveys are being digitized as part of the soil survey publication process. Digitizing was completed under contract through NCG. The QA and associated work leading to SURGGO Certification is being completed in state.
2. Saratoga County and Hamilton County - The compilation and QA have been completed. They have been submitted to NCG for evaluation.
3. Oneida County - This survey has been compiled and submitted to NCG for evaluation. It is being digitized jointly by NRCS as part of the 1996 earmarks.
4. Clinton County and Otsego County - Map compilation has been completed. QA was completed under contract.
5. Delaware County - Compilation is underway. It is projected for completion by 12/97.

IV. Soil Survey Digitizing.

Completed digitizing of 1,178,090 acres last year. Even more significant, we have soil surveys of Dutchess County, Seneca county, the Seneca Nation of Indians, and St. Regis Indian Reservation that are awaiting SURGGO certification.

Next year, our priorities for digitizing are as follows:
1. Complete digitizing for Oneida, Putnam, and Rockland Counties under agreement from 1996 earmarks. These projects are in various stages of completion (see attachments).
2. NRCS-NY and Cornell University has also submitted a proposal to establish a digitizing center for the northeast at Cornell University. We are awaiting a response.

V. Soil Databaees

1. Steve Indrick has completed the validations required for conversion of our SSSD county databaeee to NASIS.
2. 486 computers have been placed at the New York City, Essex County, Allegany County, and Cooperstown soil survey offices. These computers have the complete SSSD database loaded, including the pedon program. In addition, the SSSD software has been loaded at Ellicottville and Ballston Spa, so that all of our offices have access to SSSD and can input or retrieve soils data.

VI. Other Items

1. Farmbill programs - we are committed to carrying out our responsibilities under this program. We have huge responsibilities under WRP. Unfortunately, the workload is not evenly distributed among administrative areas. Neither are our soil scientists. I previously put forth a proposal for accomplishing this workload that involved assisting outside of administrative areas and extended involvement to all soil scientist, including myself. Please keep me informed of your workload in this program and your accomplishments.
2. Soil classification and Correlation - We can not longer correlate dual phases of a given soil series in a given county into the same map unit. In fact it is recommended that we not have dual drainage phases. This is a process that must be accomplished over a period of time. I need your recommendations on how we should proceed with this.
3. NRI - This is a priority program, set to begin in January. We are currently preparing a plan. Some or all of us will be involved. This program will effect our mapping and other goals.

TYRONE M. GODDARD
State Soil Scientist

CORNELL UNIVERSITY AGRICULTURAL EXPERIMENT STATION REPORT

Dr. Ray Bryant
Department of Soil, Crop and Atmospheric Sciences
Room 709 Bradfield Hall
Cornell University
Ithaca, NY 14853-1901

There have been major changes in administrative personnel at Cornell over the last two years. Cornell President Frank Rhodes retired and Hunter Rawlings is the new university president. Dean David Call retired and was replaced by Darryl Lund. John Duxbury replaced Jeff Wagenet as Department Chairman. From among the soils faculty, Armand van Wambeke, Tom Scott, and Dave Bouldin retired. Dr. Erick Femandez, a graduate of North Carolina State University, was hired in the area of soil and crop management in the tropics. These changes are expected to have major impacts on the Cornell program in future years.

Marcel Hoosbeek completed his Ph.D. program. The work on quantitative modeling of soil forming processes (pedodynamics) culminated in an assessment of the dynamics of organic carbon in a Spodosol and related implications for global change. The results of a joint faculty project to map pesticide leaching potential with integrated databases and simulation models was completed. The project is an excellent example of the usefulness of the STATSGO database.

Internationally, statistical methods were used to extrapolate limited data to make a map of the rainfall erosivity in Honduras. A previously unreported. inverse relationship between erosivity and elevation was discovered and used to improve the extrapolation. A means of assessing the ecological sustainability of slash-and-burn agriculture using soil fertility indicators was developed and applied to soils surrounding a long established community of the Dyack tribe on the island of Borneo in Indonesia. Investigations am continuing with a focus on phosphorus as the limiting nutrient in the system.

Since 1994, I have been working in collaboration with Dr. Ray Knighton, Associate Professor at North Dakota State University, on the development of computer-based soil science tutorials. Examples on the subjects of soil genesis, soil mineralogy and the chemistry of liming may he viewed at my faculty web site:
http://wwwscas.cit.cornell.edu/rbb1/

Recent Publications:

Kleinman, P. J. A., Bryant, R. B., and Pimentel, D. 1996. Assessing ecological sustainability of slash-and-burn agriculture through soil fertility indicators. Agron. J. 88:(In press)

Mikhailova, E. A., Bryant, R. B., Schwager, S. J., and Smith, S. D. 1996. Predicting rainfall erosivity in Honduras. SSSAJ (In press).

Hoosbeek, M. R. and Bryant, R. B. 1995. Modeling the dynamics of organic carbon in a Typic Haplorthod. p. 415-431. In R. Lal, J. Kimble, E. Levine, and B.A. Stewart (ed.) Soils and global change. Advances in Soil Science, CRC Press, Inc., Boca Raton, FL.

Bleeker, M., DeGloria, S. D., Hutson, J. L., Bryant, R. B. and Wagenet, R. J. 1995. Mapping pesticide leaching potential with integrated environmental databases and simulation models. J. Soil and Water Conservation 50:388-394.

PENN STATE REPORT

by

Edward J. Ciolkosz and Rick L. Day

Teaching

The undergraduate teaching program in the Penn State Agronomy Department has 150 turf majors, 20 crops majors, and 20 soils majors. We are in the process of revising the soils major. The revision will include a core of soils courses and a number of options within the major such as: Production Ag, Environmental Soils, Basis Soils, Graduate School Prep, Information Management (GIS, etc.). The thrust in GIS is new in the department and it will emphasize GIS as well as other advanced information system technologies. In the GIS thrust, two new courses are being planned that will emphasize the availability and accessibility of NRCS soil databases, both spatial and tabular, within GIS applications. An allied undergraduate program in the College of Agricultural Sciences is the Environmental Resource Management (ERM) program which has 640 students of which about 25 specialize in the soils technical area. The department's graduate program has the following number of students: Turf (5), Crops (4), Soils (17 full time, 7 part time). All of our undergraduate courses are operating at capacity or near capacity. Thus, our teaching program is dominantly a service program to other departments within the College of Agricultural Sciences and other departments in the University.

Research

Research items and products are listed below:

1. The department has an internet World Wide Web (WWW) home page that can be entered through the Penn State Home Page: http://www.psu.edu and down through the College of Agricultural Sciences to the Agronomy Department home page. The department's home page is very complete and includes a newsletter that is updated weekly during the school year and every two weeks during the summer.

2. Publications on fragipans, argillic, and cambic horizons in Pennsylvania soils have been produced (list provided upon request). The next one in the series will be out in late fall on epipedons in Pennsylvania soils.

3. A Pennsylvania Ag Experiment Station Bulletin on soil climates of Pennsylvania is being prepared. We hope it will be out in late fall.

4. A study of soil temperature with depth is being carried out. Data is being gathered which extends to a depth of two meters or greater and a model will be produced which predicts and quantifies the change in soil temperature with depth and latitude for North, Central, and South America.

5. Saturated hydraulic conductivity data for Pennsylvania is being collected from various sources. These data will be published in our Agronomy publication series.

6. We are attempting to obtain the pedon soils data that was collected by the EPA as a part of their acid rain studies in Pennsylvania. When we obtain these data they will be integrated into our soil characterization database. With these data we will have about 925 pedons of Pennsylvania data in the database.

7. A publication on the "Genesis of Pennsylvania's Limestone Soils" has been completed and one on the "Genesis of Pennsylvania's Shale Soils" is being planned.

8. A publication on the Pedogeomorphology of the Pennsylvania Piedmont (GSA Bull.) and a chapter on soils (in a book on Pennsylvania Geology--PA Geol. Survey) are in press.

9. A list of Ed Ciolkosz's publications for 1994 and 95 am available on the WWW Agronomy Department's home page. This listing will be updated each January.

10. Doug Miller (Agronomy Dept. grad) is working with a group of meteorologists who are running very large global computer circulation models. Doug is using STATSGO to create a soil interface to the atmospheric circulation models and has created some very useful products (map of U.S. soil surface textures; U.S. soil available moist to 2.5 meters). These products can be downloaded from a Penn State WWW home page (http://eoswww.essc.psu.edu/soils.html).

11. A paper on the genesis of prairie soils in Pennsylvania has just been published in the journal Soil Science.

12. A study is underway in the Laurel Ridge area of southwestern PA that will evaluate the renovation of atmospheric acid deposition by soils formed in differing geologies, specifically the Mauch Chunk (Leck Kill soil) and Pottsville formations (Rayne-Gilpin soil complex). Keith Goyne. an M.S. student in Soil Science, will be conducting much of the research as part of his thesis work. Throughfall under mature forest canopy and soil leachate chemistry from multiple horizons will be analyzed. Sampling will be conducted during periods of "leaf-on" and "leaf-off." Soil pits will be instrumented with pan and wick lysimeters.

13. A study is underway in northeastern PA to study hydrodynamics of fragipan soils formed in glacial till materials with perched water tables. The study is part of the Ph.D. work of Miguel Calmon. A hillslope has been instrumented with rainfall gages, water level monitors, thermocouples, redox electrodes and water samplers for a year. Correlations between redoximorphic features and measured properties will be determined. Early data shows a high frequency of saturated soil conditions of short duration at levels significantly above redoximorphic features. Another part of thii study (also part of Miguel Calmon's thesis work) is a block study to determine water flow rates and patterns above, within and through a fragipan. An excavated block will be irrigated and water will be collected at various levels within the block to determine a mass balance. Hydraulic conductivities will be calculated and compared with Guelph permeameter readings.

14. We am evaluating a software product called SoilView, produced by Tom D'Avello et al. (Illinois State Office) for use in PA. The software simulates a Soil Survey on a computer using ArcView, a popular GIS module. We may work with Illinois to improve or modify the software so that we can distribute it with digital soils data in PA. Currently, GIS users at county levels often have difficulty working with the data due to the complexity of the databases.

DATE: June 18, 1996

TO: Steve Hundley

FROM: John Hudak

SUSJECT: NECSS Conference - Pennsylvania Report

The fallowing points were noted in the National Cooperative Soil Survey - Pennsylvania Report:

Pennsylvania currently has nine soil scientists employed. Three are located at the state office, five are located at project offices and one is located at a map compilation facility.

Pennsylvania field soil scientists are currently working on updates of the following soil surveys: Wostmoreland, Potter and Chester Counties.

Pennsylvania maintains a Hap Compilation Center (MCC) on site at Penn state University which is currently working on digitizing and SSURGO certification. To date 15 surveys are digitized and seven are currently in some stage of the digitizing process.

The Pennsylvania Department of Environmental Protection (DEP) is interested in digital soils data for the entire state and NRCS ha6 submitted a proposal to DEP to provide this data layer.

OPTIONAL FORM 99 (7-90)

FAX TRANSMITTAL # of pages ▶ 1

To STEVE HUNDLEY	From JOHN HUDAK
Dept./Agency NH/USDA-NRCS	Phone # 717-782-3439
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NSN 7540-01-317-7368 5099-101 GENERAL SERVICES ADMINISTRATION

Northeast Cooperative Soil Survey Conference

Rhode island Agricultural Experiment Station
William R Wright
Department of Natural Resources Science
University of Rhode Island
Kingston, Rhode Island 02881

1996

Heavy Metal Concentrations

Heavy metal concentrations in soils are a product of parent material mineralogy, climate, and pedogenesis, but may also reflect inputs from anthroprogenic sources. With concerns for environmental quality and particularly background levels of pollutants relative to possible contamination of sites, information of "natural" levels of metals in soils is of utmost importance. To address this issue, eighty sites, representative of four of the dominant soil associations in Rhode Island were selected and sampled for analyses. Soil samples were obtain from A, B, and C horizons of these soils which represent 68% of the area of the State. As would be expected, surface soils contained the highest concentrations of heavy metals with their abundance generally following in decreasing order Fe, Mn, Pb, Zn, Cu, Ni, Cr, and Cd.

Spatial coordinates of each site were obtained with a GPS unit and input into our Geographic Information System- Spatial statistics are currently being done to determine any correlations with soil properties or land use elements.

On-Site Waste Water Training Program

The Rhode Island on-site waste water training program has been up and running for over one year. Numerous workshops have been held for contractors, engineers, town officials, homeowners, etc. to view and discuss various alternative and/or innovative methods of waste disposal. This has become au important program not only in Rhode Island, but throughout New England as we develop new on-site waste water disposal regulations to address critical and/or unique environmental areas of our landscape.

Riparian Buffer Zones

Studies are continuing on the importance of ripariau buffer zones in attenuating pollutants, primarily nitrogen, in our landscape. Previous studies have indicated relatively high removal rates in these areas, primarily associated with denitrification. Current studies are addressing the importance of "organic patches" which are fairly common iu poorly drained, coarse-textured soils. Studies are addressing both forested as well as non-forested (ie. lawns, pastures, etc.) areas of the landscape.

New Faculty Position

The Department of Natural Resources Science is pleased to announce that Dr. Jana Compton has beeu hired as our new Soil Biogeochemist. Jaua graduated from the University of Washington and has been a post-dot at the Harvard Forest for the past year or so. She will be joining us some time in late July or early August.

Bill Wright Promoted

As of January 1, 1996, Bill has assumed the position of Associate Dean of the College of Resource Development. A replacement for Bills position of Soil Morphologist is currently in progress and a new faculty member is anticipated to be on board by September of 1996. This individual will most likely be the new RI Agricultural Experiment Station representative to the National Cooperative Soil Survey Program.

Northeast cooperative Soil Survey Conference
Burlington, VT
June 10-13, 1996

Vermont Report

Reorganization hae brought major changer in the etruoture of the soil survey program in Vermont. The • tato • oil scientist poeition was eliminated in January, 1995. Program management were aeeigned to the State Reeource Coneervationiet and technical reeponeibilitiee were assigned to the state Soil Soientiet for New Hampshire.

The soil survey etaffe in Nev Hampshire and Vermont are vorking together to utilize ehrinking etaffe in both states to overcome the loss of several key personnel and to improve the soil survey program in both state6 through staff sharing and other cooperative arrangements. The states currently share a State Soil Scientist, Soil Correlator, Soil Database Manager, and Soil Resource specialist. The staffs *in* both state6 are vorking together on a eingle long range plan and annual plan of operations(APO) to implement by January, 1997.

The Vermont 6oil 6urvey etaff has successfully reorganized as a self directed work team to develop many new idea6 to decrease paper vork, improve productivity, and meet the need8 of their cuetomere. The Vermont Soil Team coneiet6 of the following members:

Pauline Pare'	State Resource Coneervationiet	Winooski, VT
Steve Hundley	State Soil Scientist	Durham, NH
Stephen Gourley	Soil Technology Coordinator	Winooski, VT
Caroline Alves	GIS Specialist/Soil Scientist	williston, VT
Heather short	GIS Technician/WAE	Williston, VT
Roger DeKett	Soil Survey Project Leader	St. Johnsbury, VT
Thom Villars	Soil Survey Project Leader	Woodstock, VT
Martha Stuart	Soil Scientist	Woodstock, VT
Bob Long	Soil Survey Project Leader	Newport, VT
Carinthia Grayson	Soil Scientist	Newport, VT
Vacant	Soil Reeource Specialist	Southern, NH/VT

To date, 86 percent of Vermont has been mapped. There are 3 progress soil surveys: Caledonia, Orleans, and Windsor Counties. In addition mapping is also underway in Essex County, *a* nonprogress survey supported by outside funding sources.

The eoile team uses vork groups to meet many of the goals of the APO. Work groups *are* working on APO and long range plan development, 6oil database development and implementation, technical soil • ervice6, soil survey geographic databaee development and certification (SSURGO), wetland determinations, and soils training using the field office computer system (FOCS).

The soils *team* ha6 developed innovative programs in geographic information system (GIS) data development, map Compilation and map finishing to meet the neede of local users and to provide the National Cartographic and GIS *center* with a digital survey that meets SSDRW certification etandarde.

Vermont Report **Continued**

The soils team has been very successful1 in utilizing **ARCINFO** GIS technology in digital data development and map finishing. SSURGO certification for **Rutland** and **Windham** Counties and map finishing of **Rutland** County have been completed.

The soils team worked with the **soil** database manager for NH/VT to insure that all of the **surveys** were converted from SSSD to **NASIS. FOCS** databases have been installed in all field offices.

The **soils** team developed and tested a soil eurvey database that meets the needs of local GIS user8 **saving** them considerable time in data development. **Most** users found the official database confusing and impossible to use and **were** hand typing in their own information.

The soils team developed a eet of ancillary soil interpretations for **onsite sewage** disposal to meet customer6 needs that were not being met by standard soil interpretations. The ancillary interpretations were generated electronically from the soil survey database using criteria developed from customer input and local ordinances.

The soils team is currently working with many local customers to develop guidelines for mountain bike **trails.** They are also working with local foresters to develop more useful voodland soil interpretations.

The soils team ha6 developed working relationships **with** the US Forest Service and the Army Corps of Engineers to complete a number of soil mapping and **soil** interpretation projects.

Despite shrinking staffs and budgets the Soil Survey Program is alive and vell and thriving in Vermont.

WEST VIRGINIA AGRICULTURAL AND FORESTRY EXPERIMENT STATION

John C. Sencindiver
West Virginia University
Division of Plant and Soil Sciences
P.O. Box 6108
Morgantown, WV 26506-6108

Faculty

Dr. Robert F. Keefer, Professor of Soil Fertility and Chemistry, retired in 1995.
Dr. Rabindar N. Singh, Professor of Soil Chemistry and Mineralogy, announced his retirement for December 3 1, 1996.
Dr. Devinder K. Bhumbla, Assistant Professor and Extension Specialist in Soil and Water Quality, was hired in 1996.

Research Projects Completed Since 1994 Conference

1. Characterization and Classification of Acid Sulfate Mine Soils in Northern West Virginia and Western Maryland - D. V. McCloy and J. C. Sencindiver.

Twelve pedons of extremely/ultra acid mine soils were described and sampled for chemical, physical, and mineralogical analyses. Properties related to sulfuricization and development of sulfuric horizons were evaluated. Sulfuric horizons were identified in eleven of the twelve pedons. These eleven pedons were classified as Typic Sulfochrepts and the remaining pedon was classified as a Typic Udorthent.

2. Physical Properties and Erodibility of Fly Ash used as a Topsoil Substitute in Mine Land Reclamation - J. M. Gorman, J. C. Sencindiver, R. N. Singh, R. F. Keefer.

Fly ash used as a topsoil substitute is highly erodible until vegetation has been established. Initial erosion values were up to five times greater for fly ash than for the minesoil. After three years, development of water stable aggregates and a vegetative cover stabilized the fly ash.

3. Treatment of Wastewater by Minesoils in Southern West Virginia - K. L. Owens, S. L. Hoover, J. G. Skousen, J. C. Sencindiver.

Morphological, physical and chemical properties of two minesoil series were evaluated for wastewater treatment potential. Saturated hydraulic conductivity (Ksat) studies indicated that water would move too slowly for proper treatment through one series (Sewell), whereas Ksat values for the other series (Kaymine) were adequate for treatment. Actual studies with spray irrigation of wastewater on these soils confirmed the predictions. Water ponded on the

Sewell but infiltrated the Kaymine immediately. Spray irrigation was discontinued on the Sewell site and this soil was removed from the study. Final results indicated that Kaymine provided only partial renovation of the surface applied wastewater. Metals, exchangeable cations, phosphate, and total suspended solids, were removed by passing wastewater through the minesoil. Eighty to 90 percent of BOD was removed from wastewater, but fecal coliforms were not removed.

Research Projects Initiated Since 1994 Conference

1. Minesoil Genesis Fourteen Years after Mining - W. J. Noll, J. C. Sencindiver.

Prior to mining in 1980, transects were established across a site in central West Virginia and the soils were described, sampled and analyzed. Immediately after mining and regrading but before seeding in 1982, the transects were reestablished and the very young minesoils were described, sampled and analyzed. In 1996, the minesoils will again be described, sampled and analyzed. Genesis of the minesoils will be evaluated.

2. Characterization and Carbon Distribution of Frigid Soils of West Virginia - A. B. Jenkins, J. C. Sencindiver.

With the cooperation of the Natural Resources Conservation Service and the U. S. Forest Service, 18 pedons were described and sampled and total biomass was estimated at each site in the Monongahela National Forest above 3500 feet elevation. The soils are currently being analyzed.

3. Properties of Soils in Natural and Mitigated Wetlands - J. C. Sencindiver.

The West Division of Highways has funded a project to evaluate mitigated wetlands in the state. Vegetation, wildlife, hydrology, and soils are being considered in separate studies. Several transects have been established across three natural and three constructed wetlands. Soils along each transect will be described and sampled for laboratory analyses in 1996.

Publications

A list of publications of the soils group from 1962 - 1995 is available on request.

Committee 1 --Revise By-Laws of the Northeast Cooperative Soil Survey Conference

Backnround

The By-Laws of the Northeast Cooperative Soil Survey Conference set the framework for how the Conference will function. There have been a couple of events this past year that effect parts of the by-laws. Consequently a change in the by-laws are needed.

In the reorganization of the NRCS, the NTC's have been closed and the position of Head, Soils Staff has been eliminated. The Head, Soils Staff was also the Steering Committee Chair. The Committee will need to determine who the steering committee chair will be, what position the chair will be linked to, or if the chair is not linked to a position how it will be filled.

The reorganization changed the boundaries of the NRCS region. The SCS Northeast region contained 13 states and the NRCS East region contains 12 states. Virginia is now in the south region. The National Cooperative Soil

Committee #1 - Revise By-Laws of the East Region Cooperative Soil survey Conference

Chair: Kip Kolesinskas, NRCS, Storrs, CT
Vice Chair: Bob Rourke, U of M, Orono, ME

Committee members:

Dr. Ed Ciolkosz, Penn State, University Park, PA
Dr. Ted Andreadis, CT Ag.Exp.Sta., New Haven, CT
Ed White, NRCS, Harrisburg, PA
Marty Rabenhorst, UofM, College Park, MD
Dr. Chris Evans, UNH, Durham, NH
Nancy Burt, USFS, Rutland, VT
Bruce Thompson, NRCS, Amherst, MA
Bill Taylor, NRCS, Amherst, MA
Ev Stuart, NRCS. Kingston, RI
Charlie Parker, NRCS. Dover, DE
-Dr. Bob Rourke, UofM, Orono, ME
Tyrone Goddard, NRCS, Syracuse, NY
Edward Stein, NRCS, Utica, NY
Maxine Levin, NRCS, Beltsville, MD
Edwin White, College of Env. Science, Syracuse, NY
Bill Moriarity, USFS, Warren, PA

COMMITTEE 1

BY LAWS OF THE NORTHEAST NCSS WORK PLANNING CONFERENCE

JUNE 10-11, 1996

PARTICIPANTS:

COMMITTEE MEMBERS: Kipen Kolesinskas (Chair), Bob Rourke (Vice Chair), Tyrone Goddard, Bii Taylor, Everett Stuart, Ed Ciolkosz, Marty Rabenhorst, Maxine Levin

COMMITTEE OBSERVERS: Tommy Calhoun, and Loyal Quandt

We convened on the afternoon of June 10, 1996, and reviewed the By Laws that were last amended in 1994. The NRCS reorganization caused a need for several recommendations for changes. The recommendations for changes are as follows:

ARTICLE III

1.1 Change SCS to NRCS; remove Virginia from list
Does Virginia want to stay with the South or go with the Northeast?
--Virginia made a request to go to the South. We will respect that request.

1.3 & 1.4 Regional Soil Scientist and MO Leaders will be added to the participants of the NCSS work planning conference.

2.0 Take out "of any federal or state agency" to include all possible participants.

ARTICLE IV

1.1 Steering Committee Chair - Change to NRCS East Region Soil Scientist

1.3.4 Liaison 2. Change to The East Region Conservationists, NRCS

1.4.3 Change to NRCS

2.0 Change to NRCS
Past chair adds continuity

4.0 Change to NRCS Regional Conservationist, East Region
--Add Director of Soil Survey Center or designated representative

ARTICLE VI

4.2 Change to NRCS

4.3 Change to NRCS

4.5 Two copies to the NRCS East Regional Office

4.6 Send one copy to MLRA Office 12, 13, and 14

4.7 Two copies to the Region 8 and 9 Forest Service Regional Directors

4.8 Send one copy to the National Canadian Agricultural Office

ARTICLE VII

2.0 One NRCS lead soil scientist from the East Region will be designated to attend the National conference in addition to the NRCS member of the National Conference Steering Team.

ARTICLE IX

1.0

Drop 2. Head Soils Staff, NNTC, SCS

Change 3. to 2.

Change 4. to 3.

2.0 Lead Scientist is responsible for selecting three federal representatives

The following new article which will add a new standing committee to the NE Conference to fulfill the National NCSS Work Planning Conference requests:

Article X -- Northeast Research Needs Committee

Section 1 .0 Accept section 1.0 purpose and charge except add at the end "issues related to soil survey". Remove work permanent. It is redundant.

Section 2.0 Reviewed standing members recommendation from the research needs committee:

(Field soil scientists are not part of the work planning conference as permanent members. There should be some perspective from the field however the information could be sought through the State Soil Scientists and MO Leader.)

2.1 East Region soil scientist (permanent:) (Chair - facilitator)

2.2 One MO Leader as designated by the Steering Committee (rotate **MO12 & MO13** every four years)

2.3 One State Soil Scientist that is not an MO Leader (rotate every two years through all the state soil scientists)

2.4 Two experiment station members

2.5 Keep USFS as part of committee; one member selected by the leader in FS

2.6 As per Article III Section 1.5 -- member from the NSSC -- NSSL liaison to the NE (permanent member)

Section 3.0 (MO Leader rotate between MO 12 and MO 13 every four years; rotate the State Soil Scientists on the committee every two years (do not include MO Leaders) among all the member State Soil Scientists in the East Region.

Section 4.0 drop

Change section 5.0 to 4.0 - One of the two Experiment Station/University members will be nominated and selected every two years to serve a four-year term.

ARTICLE XI - SILVER SPADE AWARD
Section 1 .O - No changes

The committee chair conferred with Committee 3 Research Needs to find a compromise with the suggestions that Committee 3 made to change Article **X**. Changes were presented to all members of the 1996 Work Planning Conference for concurrence, and have been incorporated into the revised by-laws.

PENNSTATE

(814) 865-6541
FAX: (814) 863-7043

Department of Agronomy
College of Agricultural Sciences

The Pennsylvania State University
116 Agricultural Sciences and Industries Building
University Park, PA 16802-3504

June 24, 1996

Thomas E. Calhoun
USDA-NRCS
Soils Division
PO Box 2890
Washington, DC 20013

Dear Tom:

The Natural Resources Conservation Service (NRCS) reorganization has caused many adjustments in the National Cooperative Soil Survey (NCSS) program. Although many adjustments were made within the NRCS, the four Regional Cooperative Soil Survey Conference structure was retained except Virginia was not included in the Northeast Conference. My records indicate that Virginia, at least back to 1966 (this is as far as my records go back), was a participant in the Northeast Conference. [redacted] contributor and partner in the [redacted] they were no longer permanent participants (as defined by our by-laws) of the Conference. I do not believe this is in the best interest of the Northeast Cooperative Soil Survey program and is not in keeping with the spirit of partnership in the Cooperative Soil Survey.

The NEC-50 (Northeast Experiment Station Soil Survey Committee) unanimously passed a resolution at their recent meeting in Burlington, Vermont to pursue an action that would again make Virginia (both NRCS and Virginia Tech) a permanent member of the Northeast Cooperative Soil Survey Conference (NECSSC).

I understand that this can be accomplished by presenting a supported proposal that Virginia be included in the NECSSC to the Steering Committe of the National Cooperative Soil Sumy Conference. Therefore, I submit the following proposal:

Virginia (NRCS and Virginia Tech) be made a permanent member of the Northeast ... e 1998 conference.

Edward J. Ciolkosz for the NEC-50 Committee	James Baker Virginia Tech Ag Experiment Station	Denise Doetzer NRCS Virginia State Conservationist

Sincerely,

Edward J. Ciolkosz
Professor of Soil Genesis
and Morphology

EJC/sc

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1996 NORTHEAST COOPERATIVE SOIL SURVEY CONFERENCE

Committee 2 -- GIS-SSURGO

Background

GIS and SSURGO development will increase in importance in the Northeast. During the 1994 Conference a GIS-SSURGO committee addressed various aspects of this subject. Bruce Stoneman, soil scientist in Virginia, was chair of the 1994 committee. That committee did not have time to complete all charges, plus the committee recommended that it be continued to address progress and new changes in technology.

MLRA offices were established as part of the NRCS reorganization. A GIS specialist position will be part of the MLRA office staff. The committee should look at the duties of this position to determine what role the MLRA office will have in SSURGO development.

There is still concern about digitized material meeting SSURGO standards and being certified. The committee should look at what progress has been made in the past two years towards SSURGO certification.

This year NASIS will replace 3SD as the mechanism for managing soil survey attribute data. It is important to understand how attribute data in NASIS will be linked with the spatial data to develop SSURGG.

Committee Charges

1. Review the committee report from the 1994 Conference and determine what progress or accomplishments have been made. It is recommended that the previous chair, Bruce Stoneman, be contacted to determine if he has any background material or comments from committee members.

2. How will SSURGO be developed in the new reorganization? What is the role of the MLRA?

3. Address the SSURGO certification process. With a dynamic database what are we certifying?

4. What is the official copy of the soil survey?

5. How will spatial data be linked to NASIS attribute data?

Committee #2 GIS and SSURGO

Chair: **Darlean Monds,** NRCS, Amherst, NA
Vice Chair: Connie Carpenter, **USFS,** Durham, NH

Committee members:

- Dr. David **Vogt,** Yale Univ., New Haven, CT
- John Hudak, NRCS, Harrisburg, PA
- Dr. Rick Day, Penn State, University Park, PA
- Caroline **Alves,** NRCS, VT
- Steve Fischer, NRCS, Amherst, NA
- Fred **Magdoff, UVM,** Burlington, VT
- Steve Carpenter, NRCS, **Morgantown,** WV
- Wayne Hoar, NRCS, Orono, **ME**
- John Kick, NRCS, Syracuse, NY
- James Brown, NRCS, Annapolis, ND
- Matt **Sweisburg, USEPA,** Boston, NA
- Paul **Craul,** College of **Env.Science,** Syracuse, NY
- James Patterson, Nat. Park Service, Washington, DC
- Alex Topalanchik, **NRCS, Morgantown,** WV

Committee 2 - GIS -SSURGO

Northeast Cooperative Soil Survey Conference
Burlington, Vermont
June 9-13, 1996

Charges and Discussion

1. Accomplishments made since the 1994 conference.?

- Approximately 33 surveys have been SSURGO certified; 50 at NCG for review.
- States are more familiar with the certification process having been through it.
- States have a better understanding of how long certain tasks take.
- NCG has developed an excellent error checking system and recently released AMLs.

2. How will SSURGO be developed under the new reorganization? What is the role of the MO?

Presently, SSURGO is still being developed by states, in cooperation with NRCS partners, and through contractors. A national Quality Improvement Team is evaluating the present system and will be making recommendations to top management as to how SSURGO should be developed in the future. A combination of methods, including digitizing teams, will probably be recommended.

To get the enormous task of digitizing and certifying soils done in a reasonable time frame we need to use the best tools for the job. ARC/Info is the logical choice since that is the software that NC&G Center is using to do QA and most of our partners use this software as well. However, data capture software such as LT4X should be used if the SSURGO developers are most comfortable with that. The error checking could still be done in ARC/Info.

The MO is now responsible for performing a 10% check on map compilation. The state soil scientist is responsible for a 100% edit. It is projected that about 2000 soil surveys will need to digitized within the next five years. Most of these surveys will require recompilation and subsequent 10% check by the MO.

MO Region 12 has about 100 surveys that will be digitized as part of this digitizing initiative. The Northest has some of the most complex landscapes in terms of high polygon densities of 2000 - 3500 per quadrangle. This recompilation workload is huge! It will require some correlation, quality joining, and error checking. The MO will provide guidance so that consistency can be established within the region.

NCG has been overloaded with the job of certifying data and does not have time to provide support or training for producing SSURGO data to all 50 states. The MO can provide answers, can organize. GIS user groups to foster information sharing, can clarify policy, procedures, and standards, and provide guidance for correlation and quality joins in addition to QA for soil map compilation. Consistency between MOs across the country will be challenge.

3. Address the SSURGO certification process. With a dynamic database what are we certifying?

We are certifying that the soils information is the best information that we have and is what the field offices are utilizing. We are certifying the reliability/accuracy of the soil lines, soil symbols, data elements, interpretations, etc. The most recent data is what should be certified. The metadata needs to include explanations and disclaimers notifying the public that there will be periodic updates to the database.

4. What is the official copy of the soil survey?

Where SSURGO data exists, that is unquestionably the official copy. Where there is only the published survey, that is the only choice. Where there is both a digital version (uncertified) and a published survey, the State Soil Scientist needs to determine which data source is most accurate. The version determined to be the "official" should be used at the field office.

When author errors are discovered in the digitization, these corrections should be recorded and maintained on an office copy of the published survey.

5. How will spatial data be linked to NASIS attribute data?

This link is not developed yet. It is projected for the 4.0 release in October '97.

Some suggestions for the download include:

- Provide an easy to use interface so that the public can understand the soils data. Currently, you need to be a soil scientist to figure out how to use the data.
- Provide a "top twenty" soil attribute table which includes the most frequently requested soil attributes. Currently, users are overwhelmed and buried under mountains of data they do not understand. Also, they have difficulty linking the tables.
- Provide clear, concise documentation with graphics to explain the meaning of mapunit, inclusions, and component.

Committee 2 (SSURGO/GIS) Recommendations

1. An "update" process needs to be established for maintenance of SSURGO certified data.

2. NCG, Soils Support Branch, could provide a more detailed checklist of tasks that must be performed prior to submittal of digital data for review by NCG.

3. Minimize changes in SSURGO standards; when they are needed, do it on an annual basis if possible.

4. It should be recognized that Metadata is to be developed by the state soils staff for previously published soil surveys. Field survey staff should develop the metadata throughout the survey for progressive and update surveys. The National Soils Handbook should be edited to reflect this task. In addition, MO and SO staffs should receive training in this area so as to provide this training to field staff.

5. The State Soil Scientists, under reorganization, are to take the lead in providing technical soil services (TSS). With the increasing demand for services related to digital soils information, tools need to be available to assist those soil scientists providing TSS and the GIS user community. Specifically, an "ARC/SSURGO Interface" is needed and should be developed ASAP. (ARC is the most widely used GIS.) The interface should include but not limited to:
   - "customized" interpretations capability
   - definitions and descriptions of soil attributes/properties that a non-soil scientist can understand
   - "top 20" list of soil attributes that are most widely used with examples of their use
   - must be easy to use
   - should be recognized as a "marketing strategy" for soil survey.

6. Suggests that "agency-focused" ARC/INFO courses targeted for different skill levels be coordinated through the NCG.

7. As part of the National Digitizing Initiative, consistency with regards to "quality joining" is important. Guidance is needed from NHQ. Will the surveys be digitized as is? Will a "quality join" be expected? If so, what defines a quality join for these published surveys? (Current NSH definition is not realistic.)

8. The Northeast region proposes the following definition for a quality join for published surveys: Strive to have perfect line and interpretation joins, recognizing that map unit names may not be exactly the same.

9. The perception is that "quality joining" is a SSURGO/GIS issue. Everyone needs to understand that it is a correlation issue. All NCSS members should assist in eliminating this perception.

10. Due to the increased soils digitizing initiative planned for the next five years, it is recommended that this committee be continued. The charges should be adjusted to the situation as the next NECSS conference approaches.

1996 NORTHEAST COOPERATIVE SOIL SURVEY CONFERENCE

Committee 3 -- Electronic Distribution and Access of Soil Survey Data

Background

This past year NRCS, universities, and many others have developed "home" pages accessible through the intemet. These home pages are a link to information an intemet user could be looking for.

Through the NRCS home page, a user can access soils information such as official series descriptions, NASIS, STATSGO, SSURGO, pictures relating to soil survey, etc. Universities also have information relating to soil survey that is accessible through the intemet. It is difficult for many intemet users to find the soils information because they do not know the intemet address. It is recommended that the committee develop a list of locations on the intemet where soils information can be found and the addresses of those locations.

There is some soils information that is in electronic form, such as STATSGO, SSURGO and MUR data, that is not assessable through the intemet. The committee should determine what information is available and develop a list of the information and where it can be obtained.

As these lists are being developed it may become apparent that there is some information that should be assessable on the intemet. This information should also be noted and develop recommendations as to how the information could be made available to users.

Committee Charges

1. Provide information about soil survey data on the Internet.

   a. Provide a list of home pages currently on the intemet that contain or locate soil survey information. Include their addresses on the list.

   b. Provide a method, or instructions, on how to use the intemet to access home pages and soil survey information.

   c. What other electronic soils data should be on the intemet? Who should have responsibility for this information and where should it be located?

2. Develop a list of soils information that is available in electronic form which is not on the intemet. (Example is SSURGO

3.

Committee #3 Electronic Distribution and Access of Soil Survey Data

Chair: Dr. Ray Bryant, Cornell University, Ithaca, NY
Vice Chair: Chris Smith, NRCS, Somerset, NJ

Committee members:

John Gailbraith, Cornell Univ., Ithaca, NY
Dr. Harvey Luce, UConn, Storrs, CT
Panola Rivers, NRCS, Harrisburg, PA
Kathy Swain, NRCS, Concord, NH
Shawn Finn, NRCS. Amherst, MA
Jim Guliano, NRCS, Amherst, HA
Paul Hues, NRCS, Orono, ME
Steve Indrick, NRCS, Syracuse, NY
Leander Brown, USACOE, Baltimore, MD
W. Dean Cowherd, NRCS. Annapolis, MD
Larry Day, Delaware Water Dist., Walton, NY
Roxanne Palone, USFS, Morgantown, WV
Gary Peterson, Penn State, University Park, PA
Richard Weismiller, UofM, College Park, MD
Linton Wright, Jr., USFS, Elkins, WV
Mike Sheehan, USACOE, Waltham, MA
Margie Faber, NRCS, Storrs, CT

1996 NECSSC Committee 3

Electronic Distribution and Access of Soil Survey Data

Committee members:

John Galbraith, Cornell Univ., Ithaca, NY
Dr. Harvey Luce, U. Conn, Storm, CT
Panola Rivers, NRCS, Harrisburg, PA
Kathy Swain, NRCS, Concord, NH
Shawn Finn, NRCS, Amherst, MA
Jim Guliano,NRCS, Amherst, MA
Paul Hue, NRCS, Orono, ME
Steve Indrick, NRCS, Syracuse, NY
Leander Brown, USACOE, Baltimore, MD
W. Dean Cowherd, NRCS, Annapolis, MD
Larry Day, Delaware Water Dist.,

Committee Charges:

I. Provide information about soil survey data on the Internet.

a. Provide a list of home pages currently on the intemet that contain or locate soil survey information. Include their addresses on the list.

The committee compiled a list of **86** soil survey related sites of which 17 were directly related to soil survey data. A new web page was developed for the Soil Information Systems Laboratory **(SISL),** a joint facility of the NRCS and the Cornell Agricultural Experiment **Station, located** at Cornell University. The 86 **soil** survey related sites were listed as links on the SISL home page. A printout of this page follows the text of this report. The URL addresses of individual links are not listed because addresses are subject to change. The **SISL**

3. How do we handle freedom of information requests for soil survey data that is in electronic form.

The committee developed the following policy statement:

Members of NECSS committee 3 assert that soil data that is currently being reviewed and edited in the SSSD and/ or NASIS is not public information. When a version of soils data are downloaded to NRCS field offices for use in FOCS the data are considered to be in the Field Office Technical Guide and are subject to requests under the Freedom of Information Act as public information. We strongly support the procedure of versioning of data releases to facilitate tracking of data edits. Further, we support the efforts of the Ft. Collins NASIS team to coordinate development of national policies and procedures governing the distribution of electronic data.

Recommendations:

- The Soil Information Systems Laboratory should maintain the list of soil data links to keep it current and should add a quest and response mechanism for new sites to be suggested by users.

- University cooperators should give immediate priority to referencing their soil databases on the WEB. Both NRCS and university cooperators should adopt a long-term goal of making soil data directly available on-line through a database manager program to process queries from remote sites and download results to the user.

- The policy statement regarding versioning of electronic data as it relates to requests for soil data under the freedom of information act should be forwarded to the Information Resource Management Division staff at Ft. Collins, CO for their consideration during the course of developing an agency-wide policy.

- Committee 3, Electronic Distribution and Access of Soil Survey Data, should be discontinued.

- Soils Data
- Organizations
- Programs and Projects
- University Curricula, Programs, and

applications; compiled from FAO soil map of the workf.

- Maine Office of GIS Digital soils data for selected Maine quads available at 1:24000 scale.
-

- Soil Science Courses at U. of MN

- Soil and Water Sciences. State Univ.: Administration and programs.

- Plants, Soils and biometeorology Dept., Utah State Univ. Prorams, faculty, research, seminars,

- Plant and Soil Sciences, U. of Vermont Programs, Activities and Facilities, Personnel, jobs and internships.

- Dept. of Crop and Soil Sciences, Washington State Univ.

- Dept. of Soil Science, U. of Wisconsin-Madison: Faculty, Courses, Links.

- Crop and Soil Enviornmental Sciences Virginia Tech. Dept. program description, faculty, courses.

- U. of Wyoming, Dept. of Plant, Soil and Insect Sci Intro to dept. program.

- Univ. of Reading Postgraduate Prospectus Description of graduate study programs in soil science at Univ. of Reading, UK. LInks to research centers, university departments, other soil sites.

- Soil Information Systems Laboratory A collaborative project between Cornell University and the Natural Resources Conservation Service to digitize soil surveys in New York State.
- Cornell University Soil, Crop, and Atmospheric Science Department Information about the department, courses offered, faculty pages.

Journals

- J o u r n a l

- Clays and Clay Minerals - the Journal Description of journal contents.

Publications

- Soils and Water Quality, NCSU Cooperative Extension Publication, How soils influence water quality, Importance of good soil management, photos.

- Soil facts - NCSU A list of extension publications related to soils and water quality.

- US Dep. of Health Analysis paper Impact of leadcontaminated soils on Public Health.

- Glossary Definition of terms. see pgs. ST for soils terms.

Photos

- National Soil Photo Gallery (soil profiles) Seven soil profile photos (gif) no documentation, preview size only.

- Soil profiles of Europe 25 pictures with previews of soil profiles of Europe. Some with horizonation and brief morphological descriptions. How's your Duetsche?

- National Soil Photo Gallery (landscapes) Forty landscape photos (gif) no documentation, preview size only, long loading time.

- National Soil Photo Gallery (landuse) Six land use photos (gif) no documentation, preview size only.

- Soils and Water Quality NCSU Cooperative Extension. Publication, How soils influence water quality, Importance of good soil management, photos.

- **The Special Collections Program** Ag-related photos

Committee 4 -- Northeast Cooperative Soil Survey Conference Research Needs Committee

Background

The Steering Committee at the 1995 National Cooperative Soil Survey Conference agreed to establish a Standing Committee on NCSS Research Agenda. The purpose of this committee is to establish a formal **mechanism within the National Cooperative Soil Survey Conference to identify, document,** prioritize and address the critical research and development issues within the NCSS; to identify opportunities for partnering; to identify opportunities for funding; to increase credibility; to increase visibility and to insure the technical excellence of the National Cooperative Soil Survey.

The National Steering Committee suggested that each Regional Conference establish parallel committees to develop regional research agenda that can be merged into a national agenda. The Northeast Steering Committee agrees with this suggestion and recommends that a standing committee be develop for the Northeast Cooperative Soil Survey Conference. It is also recommended that the standing committee be added **to the** Conference By-Laws and that this committee work with the committee that is developing revisions to the By-Laws.

Committee Charees

1. Work in cooperation with Committee 1-- Revise By-Laws of the Northeast Cooperative Soil Survev Conference to develop an article for the by-laws that will establish a permanent research committee

2. Develop guidelines and a protocol as to how this permanent committee will function in the future? How often will the committee meet? What products will it deliver? Examples could be: A literature search of existing research, and a method of queering existing databases to determine missing information.

3. Identify, document and prioritize the critical research for soil survey in the Northeast. This list will be forwarded to the National Research Committee. Some research needs could be obtained from MLRA steering committees, MLRA offices, Universities, and project offices.

4. Develop a proposal for accomplishing the research.

Committee #4: East Region Cooperative Soil Survey Conference Research Needs Committee

Chair: Dr. Peter Veneman, UMass, Amherst, MA
Vice Chair: Norm Kalloch, NRCS, Orono, ME

Committee members:

✓Margret Thomas, CT DEP, Hartford, CT
Steve Gourley, NRCS, Winooski, VT
✓Dr. Richard Bartlett, UVM, Burlington, VT
Andrew Williams, NRCS, Amherst, MA
✓Steve Carlisle, NRCS, Ithaca, NY
✓Paul Puglia, NRCS, Ellicottville, NY
Dr. Del Fanning, UofM, College Park, MD
✓Dr. John Sencindiver, WVU, Morgantown, WV
-William Clapman, UofM, Orono, ME
✓Steve Fay, USFS, Laconia, NH
✓Herb Gardner, UofM, Orono, ME
✓David Hill, CT Ag. Exp. Sta., New Haven, CT
✓W. Shaw Reid, Cornell Univ., Ithaca, NY
Wendy Mahaney, USF&W, Old Town, ME
-John Short, Nat. Park Service, Washington, DC
✓Thom Villars, NRCS, Woodstock, VT

Minutes of the Research Needs Subcommittee

June 10, 1996

Vice Chair: Norm Kalloch, NRCS, ME

Participants:

Robert Dobos	NRCS, WV
Thorn Villars	NRCS, VT
Steve Gourley	NRCS, VT
Russell Briggs	SUNY ESF, NY
Ron Yeck	NRCS, NE
John Sencindiver	WV University, WV
Andrew Williams	NRCS, MA

The meeting began with a brief discussion and affirmation of the need to follow the committee charges as listed (attachment 1). Discussion shifted to "suggested additions" to the bylaws (attachment 2). There was much discussion of section 2.0 "Membership of the standing committee". It was agreed that the East Regional Soil Scientist did not have to be on the committee. We discussed the membership list and decided to rework it as follows:

1 representative from NSSC (Phil Schonenburg)
2 field soil scientists
2 MO representatives or their designees
2 state soil scientists
4 Exp. Stn./Univ. representatives
1 Forest Service representative
12 TOTAL MEMBERS

Committee membership was later changed (reflected later in the minutes).

Discussion next focused on the need for a permanent chair and who that should be. After much discussion, the group decided that this would be the job of the regional soil scientist, who would act as a facilitator for committee meetings. This brought the total membership to 13. We then discussed sections 3.0 - 5.0 of suggested additions to the bylaws and amended them as follows:

#3.0 ... is 4 years with 1 state soil scientist, 2 Experiment Station/University representatives and 1 field scientist representative being replaced every two years

#4.0 - add field soil scientist (change geographical to geographic)

#5.0 - add and/or University after Experiment Station.

We then discussed how the Forest Service representative should be selected. It was decided that we would contact the East Regional Forest Service Soil Scientist and invite him/her or a designee to participate. This concluded discussion of charge #1.

We decided that charge #2 should be handled by the committee once it was established. We decided to set an initial meeting date for the committee, which would in turn (1) develop a national research agenda that would be forwarded to the national committee (which has the National scope), and (2) develop a list of needs for regional research.

June 11, 1996

Chair: Norm Kalloch, NRCS, ME
Participants:

Robert Dobos	NRCS, WV
Thorn Villars	NRCS, VT
Steve Gourley	NRCS, VT
Russell Briggs	SUNY ESF, NY
Ron Yeck	NRCS, NE
John Sencindiver	WV University, WV
Andrew Williams	NRCS, MA
Lenore Matula	NRCS, Baltimore, MD
Gail Roane	NRCS, Washington, DC
Maury Mausbach	NRCS, Ames, IA

Norm opened the meeting and asked for input from Dr. Mausbach, who suggested that we keep the focus REGIONAL and not worry about national efforts. Membership on the research needs committee was reviewed following comments from Kip K. representing the bylaws committee. He noted concerns that the committee was too large and suggested keeping the variety of interests while reducing the numbers. There was some discussion regarding the need to include field soil scientists and that input could be solicited by the state soil scientist. Finally, the group agreed that field representation was important from the point of view of a "reality check", as well as to provide an opportunity for field soil scientists. The final committee list was agreed to as follows:

1 East Region Soil Scientist (permanent as facilitator/coordinator), i.e. Maxine
1 Forest Service (permanent) Selected from research by Robert Lewis, NEFS Exp. Stn
Res. Director, Radnor PA.
1 Center Position (permanent)
1 MO leader 4-yr rotation (rotate 10 and 14)
1 SSS-rotate every 2 yrs (rotate among the states)
2 Exp Stn/Univ, rotate every 2 yrs
1 Field Person (rotate among states every 2-yrs)
8 TOTAL members

The discussion returned to charge two, at the point where we left off from the previous day. The following issues were decided upon:

(1) The initial meeting date for the Research Needs Committee would be on or before December 3 1, 1996;

(2) The committee will identify, document, and prioritize research needs for the region. The committee will facilitate this task by exploring opportunities for partnerships and for funding. The committee will work to increase visibility of the research needs and to insure technical excellence

(3) The committee will seek input from: MLRA steering committee, MLRA Offices, State Offices, Soil Scientist Project Offices, and University/Experiment Stations.

A suggestion was made that the committee should function as a clearinghouse for existing research information. It was further suggested that the committee work closely with the Electronic Data Distribution Committee to make this information available over the intemet for anyone desiring access to it. Bylaws should identify this and direct the committee to develop protocol and procedures to implement this suggestion.

Distribution of the product of the Research Needs Committee (prioritized research needs) was discussed. The information should be routed to: state soil scientists for distribution to field people; Experiment Stations/Universities; NE Soil Survey Conference chair; National conference chair, and NRCS Institutes. In addition, the information should be posted on the NRCS homepage (or other server).

Charge three was then discussed, opening with examination of the materials submitted to Dr. Veneman and culminating with a list of suggested research needs (below) which will be forwarded to the committee.

Research Needs: Genera1 Topics Compiled by Committee:

1. Assess appropriate loading rates of organic wastes on various map units (mineralized N, P, K, etc.)

2. Develop large scale (i.e. 1:24,000) maps of soil and temperature regimes to use for refinement of soil boundaries within and between MLRAs.

3. Refine hydric soil indicators (National vs. Regional list). Determine if one list can cover all situations in the field.

4. Improve understanding of the movement and partitioning of water into, through and out of the soil system.

5. Resolve fragipan and densic material-basal till controversy

6. Determine background levels of heavy metals associated with various map units.

7. Assessing BMP effectiveness on minimizing the movement of soils and attached materials.

8. Assess the impact of forest management practices on long-term soil productivity

9. Collect basic soil data to substantiate and improve soil interpretations

10. Identify key soil properties that can be used to assess the potential for erosion. The resulting hazard matrix can be used to prioritize areas where BMPs should be implemented.

11. Refine soil-vegetation relationships.

12. Characterization, mapping and classification of disturbed soils.

13. Investigate deep weathering process of rock and saprolite.

14. Need interpretations for reclamation strategies to improve soil quality.

15. Develop predictive tools for determining acid mine drainage potential from sulfate soils.

16. Develop tehnologies to differentiate present redox features from relic redox features. Determine how human disturbance affects processes and morphology --both for soils made less wet (drained wet soils) and for soils made more wet (constructed wetland, etc.)

17. Need improved model of soil genesis.

18. Need more consideration of soil/biological relationships.

19. Develop list of soil quality indicators and an inventory and monitoring procedure to help determine the "health" of the soil.

20. Study the effects of riparian buffers on water quality-using buffers for pollutant removel from both surface and subsurface flow.

21. Identify user needs/wants and taylor soil survey information accordingly. More urban interpretations will be needed in the Northeast.

22. Utilize geophysical tools (GPR, EM) to a greater degree to more accuractely characterize map unit composition/variability.

23. Develop methods to more accurately quantify carbon sesquestration in the soils of the region - and the effect of temperature. This is a national focus and we need to take the lead in the Northeast.

24. Assess what the south region is doing with water table studies and see if it is applicable to the Northeast.

25. Develop a consistant water table monitoring procedure. We need more data to back up our interpretations.

26. Utilize the relationship between universities and soil survey projects to alleviate the workload at the Lincoln Lab.

27. Develop regional soil tempreture studies as needed to help clarify the frigid/mesic/cryic breaks. This will help us to adjust MLRA boundaries as we update the soil surveys in the region,

NRCS BREAK-OUT SESSION
Thursday, June 13, 1996

Agenda

I. **Selection of Permanent Chair, Conference Steering Committee**
With the restructuring of the National Cooperative Soil Survey, the Northeast Cooperative Soil Survey Conference does not have an individual identified as the Permanent Chair of the Conference Steering Committee. Under Article IV, Section 1.1 of the Conference by-laws, this selection needs to be made. (Coordinate with Technical Committee addressing by-laws.)

II. **Northeast Soil Taxonomy Committee**
As of June 9, 1994, the following individuals were serving as members of the Taxonomy Committee:

	Term of Office:
Bob Ahrens	Permanent Chair
Karl Langlois	permanent member
Scott Anderson	1992-1994
Shawn Finn	1993-1995
Marge Faber	1994-1996
Alex Topalanchik	1995-1997
Gerry Rosenberg	1996-1998

According to the by-laws, we need to select replacements for: Karl Langlois, to serve as permanent member for the Northeast Region, Scott Anderson, Marge Faber to replace her when her term of office expires, and Gerry Rosenberg.

III. **Selection of representatives to the National Conference**
Discuss method of selecting NRCS representatives from the Northeast to attend the National and Regional Soil Survey Conferences. (Article VII, Section 2.0). Coordinate with Technical Committee addressing by-laws.

IV. **Conference boundary**
The current Northeast Cooperative Soil Survey Conference boundary encompasses the 12 Northeastern States, and coincides with the Northeast Experiment Station boundary. This boundary, however, may not adapt well to soil survey program initiatives according to the boundaries served by MO12 and M013. (ie: MO13 services Land Resource Region N which is more closely associated with program initiatives in the South Region). Does this topic warrant discussion? Coordinate with Technical Committee addressing by-laws.

V. **Host for 1998 conference**
Volunteer to host the 1998 Northeast Cooperative Soil Survey Conference. Final selection to be made during the NECSSC business meeting, Thursday afternoon.

VI. Other topics

Northeast Cooperative Soil Survey Conference
NRCS Break Out Session
8:00 am Thursday, June **13, 1996**
Steve Hundley, Moderator

The minutes of the June 9. 1994 NCSSC break out session were read.

I. ***Selection*** of ***permanent chair,*** conference ***steering committee.***

After a brief discussion on the composition of the conference steering committee it was decided to delay a decision until the afternoon business meeting so all conference participants could be included in the discussion.

II. Northeast Soil Taxonomy Committee

After a discussion on the pros and cons of having permanent members on the taxonomy committee, the group moved to have the 2 MO Leaders serve as co-permanent members.

The following 3 people were nominated as Soil Taxonomy Committee Members to replace Scott Anderson. Marge Faber, and Gary Rosenberg:

George Demus	1996-1998 term
Steve Gourley	1997-1999 term
Wayne Hoax	1998-2000 term

III. Selection ***of representatives*** to the National Conference.

It was decided that the attendees for the next National Conference would be:

-- The host state representative for the next Northeast Cooperative Soil Survey Conference

-- An attendee selected by the East Regional State Conservationist.

IV. Conference Boundary

After some discussion it was recommended to leave the boundary of the Northeast Cooperative Soil Survey Conference as it now exists.

V. ***Host* of 1996 *Conference***

Maine was nominated and selected for the 1998 **NCSSC**.

Additional Topics Of Discussion:

MLRA. MOWS need to be amended to reflect the MO structure relative to state responsibilities for correlation and databases etc. It was recommended that the steering committee be reconvened to discuss amending MOWS to reflect MO leadership.

The role of the Board of Directors was discussed now that the MO structure is in place The importance of the steering committee was reaffirmed within the MO structure.

It was pointed out the soil survey reimbursable should be used to accelerate the soil survey and not for base operations.

It was suggested that soil survey costs are different among the regions. and that their must be equity in how the basic allocation of funds are distributed. These regional differences need to be accounted for.

Respectively Submitted,

Norman Kalloch Jr

Norman R. Kalloch, Jr.
State Soil Scientist. Maine

NEC - 50 REPORT

EXPERIMENT STATION REPRESENTATIVES

Members Present

Ray Bryant - New York
Ed Ciolkosz - Pennsylvania
Bill Jokela - Vermont
Marty Rabenhorst - Maryland
Bob Rourke - Maine
John Sencindiver - West Virginia
Several visitors

1. Since NEC-SO no longer exists as a officially recognized experiment station committee, the pros and cons of having a recognized committee were discussed. We decided to wait until we had progressed on the northeast soils bulletin before seeking reinstatement as an official committee. It was decided that we would continue to meet and call ourselves NBC-50 since that name is recognized and understood by most representatives of the NECSSC.

2. Soil Taxonomy Committee

   1994 - 1996 John Galbraith
   1995 - 1997 Chris Evans
   1996 - 1998 Marty Rabenhorst
   1997 - 1999 John Sencindiver
   1998 - 2000 Peter Veneman

3. Soil Genesis Field Trip - A trip was not held in 1996, but will be held again in 1997 and every two years thereafter. Marty Rabenhorst agreed to study the history of the trip and determine who should host the 1997 trip.

4. Soils Map and Bulletin - It was agreed that we will work toward the completion of a new edition of the soils map and bulletin, Marty Rabenhorst, in cooperation with NRCS, will continue to work on the map. Chapters and authors for the bulletin will be determined after the map has been completed.

5. Representatives to the 1997 National Conference - John Sencindiver and Ed Ciolkosz

6. Representative to the National Soil Survey Center Advisory Committee - Ray Bryant

7 . Report submitted by John Sencindiver

PENNSTATE

(814) 865-6541
FAX: (814) 863-7043

Department of Agronomy
College of Agricultural Sciences

The Pennsylvania State University
116 Agricultural Sciences and Industries Building
University Park, PA 16802-3504

Date: August 23.1996

From: Ed Ciolkosz *Ed*

To: NECJO Committee Members

Subj: Virginia's Assignment as a Permanent Participant of the Northeast Cooperative Soil Survey Conference

As you recall at our last meeting in **Burlington,** we passed a unanimous motion to attempt to reinstate Virginia as a permanent member of the NE Cooperative Soil Survey Conference. Attached is my letter to Tom Calhoun in which we are requesting this action. I feel very confident that the reinstatement action will take place.

EJC/se

Attachment

Date: January 2, 1997

From: Ed Ciolkosz *Ed*

To: NBC-50 Committee Members, NRCS State Soil Scientists, MO Soil Leaders and Regional Soil Scientist of the Northeast

Subj: Virginia's Assignment as a Permanent Participant of the Northeast Cooperative Soil Survey Conference

We have been successful in our efforts tore-acquire Virginia as a permanent member of the Northeast Cooperative Soil Survey Conference (see attached copy of the request and the NCSS Steering Committee **meeting minutes). Thus,** NRCS and Virginia Tech. soil scientists will be a part of the 1998 Conference in Orono, Maine. Also, we must again modify our by-laws to again make Virginia a permanent member of the conference.

Have a good year.

EJC/se

cc: T. Calhoun

USDA United States Department of Agriculture

Natural Resources Conservation Service

Soil Survey Division
PO Box 2890
Washington DC 20013
202-720-1858

SUBJECT: NCSS Steering Committee Meeting Minutes

December 2. 1996

TO: Steering Committee (see attached list)

File Code: 430-14

The Steering Committee for the National Cooperative Soil Survey Conference met on November 8, 1996 at the Days Inn Downtown Conference Room in Indianapolis, Indiana. All the members were present except for Bill Volk of the Bureau of Land Management. Mark [illegible]

ote
JC

The Steering Committee meeting was adjourned at 3:30 PM

Respectfully Submitted,

THOMAS E. CALHOUN
Program Manager

Enclosure

cc:
Horace Smith, Director, SSD, NRCS. Washington, D.C.
Carol Jett, Deputy Chief, SSRA, NRCS. Washington, D.C.
Ed Ciolkosz, Professor of Soil Genesis, Penn State Univ. University Park, PA

Final:TEC:12/2/96
USDA:NRCS:SSRA:SSD:TCalhoun:720-1824

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(814) 865-6541
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Department of Agronomy
College of Agricultural Sciences

The Pennsylvania State University
116 Agricultural Sciences and Industries Building
University Park, PA 16802-3504

June 24, 1996

Thomas E. Calhoun
USDA-NRCS
Soils Division
PO Box 2890
Washington, DC 20013

Dear Tom:

The Natural Resources Conservation Service (NRCS) reorganization has caused many adjustments in the National Cooperative Soil Survey (NCSS) program. Although many adjustments were made within the NRCS, the four Regional Cooperative Soil Survey Conference structure was retained except Virginia was not included in the Northeast Conference. My records indicate that Virginia, at least back to 1966 (this is as far as my records go back), was a participant in the Northeast Conference. Virginia (both NRCS and Virginia Tech) has been such a strong contributor and partner in the Northeast Conference that 1 was somewhat shocked when informed they were no longer permanent participants (as defined by our by-laws) of the Conference. I do not believe this is in the best interest of the Northeast Cooperative Soil Survey program and is not in keeping with the spirit of partnership in the Cooperative Soil Survey.

The NEC-50 (Northeast Experiment Station Soil Survey Committee) unanimously passed a resolution at their recent meeting in Burlington, Vermont to pursue an action that would again make Virginia (both NRCS and Virginia Tech) a permanent member of the Northeast Cooperative Soil Survey Conference (NECSSC).

I understand that this can be accomplished by presenting a supported proposal that Virginia be included in the NECSSC to the Steering Committe of the National Cooperative Soil Survey Conference. Therefore, I submit the following proposal:

Virginia (NRCS and Virginia Tech) be made a permanent member of the Northeast Cooperative Soil Survey Conference, beginning with the 1998 conference.

Support for this proposal comes from the following:

Edward J. Ciolkosz for the NEC-50 Committee *Ed Ciolkosz*	James Baker Virginia Tech Ag Experiment Station *James C. Baker*	Denise Doetzer NRCS Virginia State Conservationist *Denise Doetzer*

Sincerely,

Ed Ciolkosz

Edward J. Ciolkosz
Professor of Soil Genesis
and Morphology

EJC/se

NORTBEAST COOPERATIVE SOIL SURVEY CONFERENCE
BUSINESS MEETING

Thursday, June 13.1996

DRAFT AGENDA

I. Review and approve minutes of last meeting: **June 10, 1994**

II. Old Business

1. Location of the 1998 Northeast Cooperative Soil Survey Conference

2. Soil Taxonomy Committee appointments

ID. New Business

1. Review and discuss recommendations for change in the NECSSC by-laws as presented by the By-Laws Technical Committee and Research Needs Technical Committee.
   - A. Selection of Permanent Chair
   - B. Selection process for representatives to attend tbe National Conf.
   - C. Establish Northeast Research Needs Committee.

2. Action, if any, on recommendations of the GIS-SSURGG Technical Committee.

3. Action, if any, on recommendations of the Data Access Technical Committee.

4. Other new business

1996 North East Cooperative Soil Survey Conference
Business Meeting Minutes
June 13, 1996

- Meeting called to order at 3:25 p.m. by Steve Hundley.
- Steve Hundley reviewed the minutes of the 1994 NECSSC meeting. Bob Engel motioned that the minutes be approved, the motion was seconded and passed.
- Maine has volunteered to host the 1998 NECSSC. There were no other volunteers. Ron Taylor motioned to have Maine host the 1998 NECSSC, seconded by Bruce Thompson, and passed
- Discussion about who would attend the NCSSC in Baton Rouge, LA on June 14-20, 1997 and the appointments to the Soil Taxonomy committee. A motion to accept revisions of by-laws as presented by committee 1 (Revised By-Laws of the NECSSC) and committee 4 (Research Needs Committee) was made by Kip Kolesinskas, seconded and passed.
- A motion recommending that the GIS-SSURGO committee (committee 2) be continued was made by Ron Taylor, seconded by Leander Brown, and passed.
- A motion to discontinue committee 3 (Electronic Distribution and Access of Soil Survey Data) was made by Ray Bryant and seconded by Ron Taylor. Maxine Levin commented that some people wanted this committee. to continue, ex. the Research Committee suggested interacting with this committee in the future. Ray Bryant explained that SISL at Cornell University will maintain the site for accessing soil survey data, add new sites and have a mechanism such as a Bulletin Board for discussion that would allow the Research Committee to communicate electronically. John Galbraith amended the motion to read that committee 3 will be discontinued and SISL will be on the agenda at the 1998 NECSSC to report on progress over the next two years regarding the web site. Seconded by Ray Bryant and passed.
- Discussion on format of conference. The format of this meeting, 4 days instead of 4 1/2 and state reports scattered throughout worked well and there was good attendance at the business meeting. Other comments were that its not good to have the conference go into Fridays and travel on Monday might be better that travel on Sunday. These comments will be forwarded to Norm Kalloch and Bob Rourke by Steve Hundley to aid in planning the 1998 conference.
- Steve Hundley requested hard copies of all the speakers reports and 100 copies of color maps so the proceedings will be sent out in a timely manner.
- Special thanks go to the local arrangements committee-Bill Jokela and Marilyn and Dave Van Houten.
- The meeting was adjourned at 3:45 p.m.

Respectfully submitted,
Katherine Swain

BY-LAWS OF THE NORTHEAST COOPERATIVE SOIL SURVEY CONFERENCE

ARTICLE I -- NAME

Section 1.0 The name of the Conference shall be the Northeast Cooperative Soil Survey Conference.

ARTICLE II -- PURPOSE

Section 1.0 lhe purpose of the Northeast Cooperatii Soil Survey Conference is to bring together representatives of the National Cooperative Soil Survey In the northeastern states for discussion of technical and scientific questions. Through the actions of committees and conference discussions, experience is

ARTICLE IV -- ORGANIZATION AND MANAGEMENT

Section 1.0 Steedng Committee

A Steering Committee assists in the planning and management of biennial meetings, including the formulation of committee memberships and selection of the committee chair and vice-chair.

Section 1.1 Membershlp

The Steering CommHtee consists of the following four members:

1. NRCS East Regbn Soil Scientist [Steering Commtttee chair]
2. The conference chair
3. THe conference vice-chair
4. The past conference chair

The Steering Committee may designate a conference chair and vtce-chair If the persons are unable to fulfill their obligations.

section 1.2 Meetings and Communications

A planning meeting is to be held about one Year prior to the conference. Additional meetings may be scheduled by the chair 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 chair.

***Section* 1.3** Authority and Responsibilities

Section 1.3. I Conference Participants

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

The Steering Committee makes recommendatbns to the conference for extra and specbl participants In speck conferences.

***Sect/on* 1.3.2** Conference Committees and Commlttee Chair

Tne Steering Commtttee formulates the conference committee membershlp and selects the committee chair and vice-chair.

The Steering Committee is responsible for the formulation of committee charges.

Section *1.3.3* Conference Policies

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

Section 1.3.4 Liaison

The Steerlng Commtttee is responsible for maintaining liaison between the regional conference and
1. The Northeastern Experiment Station Directors,
2. The East Regbn State Conservationists, NRCS,
3. Director, Soil Survey Division of the Natural Resources Conservation Service,

4. Regional and national offices of the U.S. Forest Service and other cooperating and participating agencies, and
5. The National Cooperative Soil Survey Conference.

Section 1.4 Responsibilities of the Steering Committee Chair are:

section 1.4.1 Call a planning meeting of the Steering Committee about one Year In advance of, and if possible at the place of. the conference to plan the agenda.

Section 1.4.2 Develop with the Steering Commtftee the first and final drafts of the conference's committees and their charges.

Section 1.4.3 Send committee assignments to committee members, The committee assignments will be determined by the Steering Committee at the planning meeting. The proposed chair and vice-chair of each commmee will be contacted personally by the conference chair

Section 1.4.4

Section 1.4.5

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ARTICLE V -- TIME AND PLACE OF MEETINGS

Section 1.0 The conference convenes every two years. In even-numbered years. The date and bcatlon will be determined by the Steering Committee.

ARTICLE VI -- CONFERENCE COMMITTEES

Section 4.0 Most of the work of the conference ls accomplished by duly constituted commttfees.

Section 2.0 Each committee has a chair and vice-chalr. A secretary or recorder may be selected by the chair, if necessary. The committee chair and vice-chalr are selected by the Steering Commlftee.

Section 3.0 The kinds of committees and their members ore determined by the Steering Committee. In making their selections, the Steering Committee makes use of expressions of Interest filed by the conference participants.

Section 4.0 Each committee shall make an official report at the designated time at each biennial conference. Chair of committees are responsible for submitting the required number of committee reports promptly to the vice-chalr of the conference. The conference vice-chair is responsible for assembling and distributing the conference proceedings. Suggested distribution is:

Section 4.1 One copy to each parficlpant on the malting list.

Section 4.2 One copy to each State Conservationist, NRCS, and Experiment Station Director of the Northeast.

Section 4.3 Five copies to the Dlrector of Soil Survey, NRCS, for distribution to National Off ice staff.

Section 4.4 Ten copies to the National Soil Survey Center [NSSC) for distribution to staff In the center.

section 4.5 Two copies to the NRCS East Region.

Section 4.4 One copy to each MO 12, 13, and 14 offiie.

Section 4.7 Two copies to the Region B and 9 Forest Service Regional Directors.

Section 4.8 One copy to Agriculture, and Agri-Food Canada office.

Section 4.9 Much of the work of committees will of necessity be conducted by correspondence between the times of biennial conferences, Commfftee chairs are charged with the responsibility for initiating and carrying forward this work

ARTICLE VII -- REPRESENTATIVES TO THE NATIONAL AND REGIONAL SOIL SURVEY CONFERENCES

Section 4.0 *The* Experiment Station chair or vfce-chalr will attend the national conference the year prior to the regional conference for which they were selected. A second Experiment Station representative also will attend the conference. The second representative is to be selected by the Experiment Station representatives at the regional conference.

Section 2.0 One NRCS lead soil scientist from the East Region will be designated to attend the National Conference In addition to the NRCS member of the National Conference Steering Team.

section 3.0 One member of the Steering Committee will represent the Northeast Region at the South, Midwest, and West Regional Soil Survey Conference. If none of the members of the Steering Commtttee can attend a particular conference. a member of the conference will be selected by the Steering Commtttee for this duty.

ARTICLE VIII -- NORTHEAST COOPERATIVE SOIL SURVEY JOURNAL

Section 1.0 lhe Northeast Cooperative Soil Survey Conference will publish a journal on soil survey and related topics at least once between conferences. 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 chair. Their responsibility will be to assist In gatherlng Information for the journal, as well as prlnting and distributing the journal.

representatives.

Section 1.0 This is a standing committee, the purpose of which is to maintain a formal mechanism within the Northeast Region todentify, d

year term)
2.5 One NRCS fielct soil scientist (two-year term)
2.6 The National Soil Survey Center Liaison (permanent)
2.7 U.S. Forest Service Representative (permanent)

Section 3.0 The state soil sclentlst and field soil sclentist will be selected from a different state every two years alternating between each MO. The state soil sclentist and field soil scientist will be from different states and different MOs.

Section 4.0 The regional soil scientist will be responsible for selecting the state soil scientist and NRCS field soil sclentlst.

Section 5.0 The Experiment Station Conference chair, or vice-chair Is **responsible for overseeing the selection of the experiment station/university representatives as described** In Section 2.4 above.

Section 6.0 The Northeast Forest Service Experlment Station Research Director will select the appropriate U.S. Forest Service representative.

ARTICLE XI -- SILVER SPADE AWARD

Sect/on 4.0 **The award will be presented every two years ot 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 wlth the last award reciplent acting as chair of the selection committee. If multiple awards were given at the previous meeting, the chair of the selected committee will be elected by the committee. The recipients of the award will become members of the Silver Spade Club.**

ARTICLE XII -- AMENDMENTS

Section 1.0 **Any part of this statement for purposes, policy and procedures may be amended any time by majority agreement of the conference partiiipants.**

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
By-Laws Amended June 10, 1994
By-Laws Amended June 13, 1996

NATIONAL COOPERATIVE SOIL SURVEY

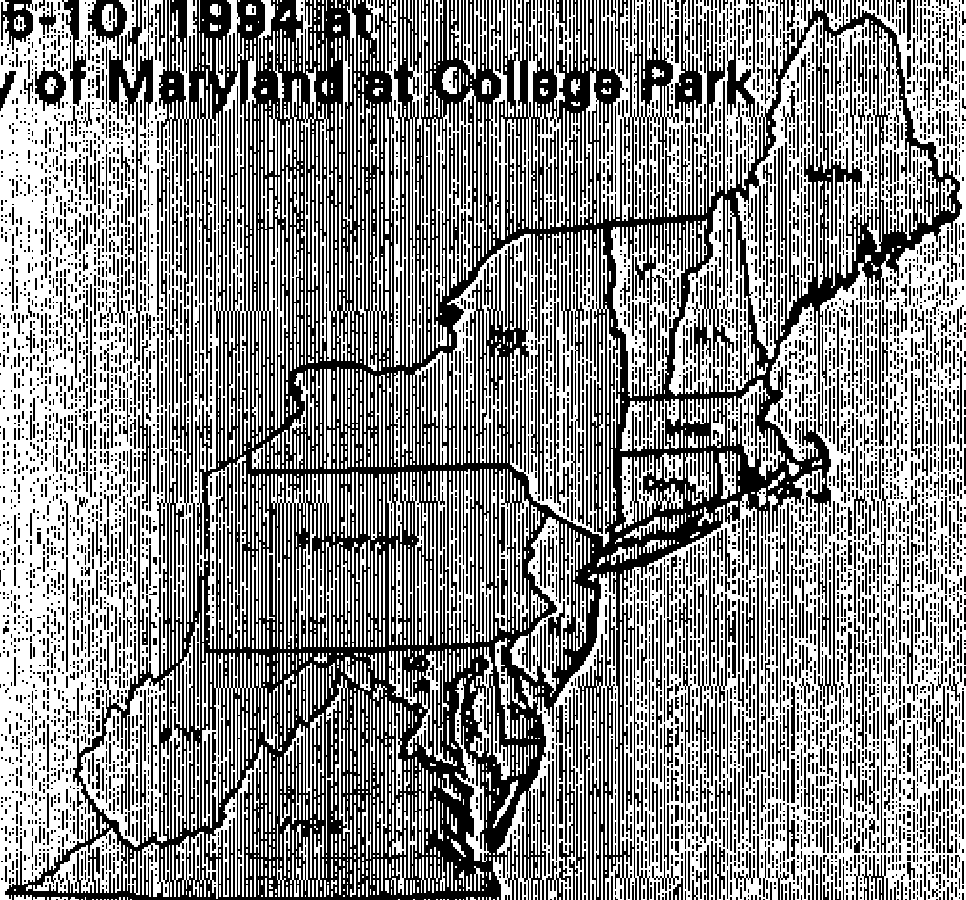
Northeast Regional Conference Proceedings

College Park, Maryland
June 5-10, 1994

PROCEEDINGS OF THE 1994

Northeast Cooperative Soil Survey Conference

Held on June 5-10, 1994 at
The University of Maryland at College Park



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Maryland Agicultural Experiment Station
USDA-SCS

Assembled by

Martin C. Rabenhorst, University of Maryland, College Park, MD
James H. Brown, State Soil Scientist, USDA-SCS, Annapolis, MD

Proceedings of the

1994 NORTHEAST COOPERATIVE SOIL SURVEY CONFERENCE

held on June 5-10, 1994 at

The University of Maryland at College Park

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NORTHEAST COOPERATIVE SOIL SURVEY CONFERENCE
College Park, Maryland
June 5-10, 1994

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AGENDA
NORTBBAST COOPERATIVE SOIL SURVEY CONFERENCE
College Park, Maryland
June 5-10, 1994

Sunday	-	**June 5**	
5:00	-	7:00 p.m.	Registration - Annapolis Hall
5:00	-	7:30 p.m.	social - Hospitality Suite; Room 2104 Kent Ball
Monday	-	**June 6**	Grand Ballroom Lounge, Stamp Union
			Morning Moderator - Leander Brown
8:00	-	8:15 a.m.	Remarks - Nartin Rabenhorst, Vice Chairman
8:15	-	8:30 a.m.	Welcome to Maryland - Robert Klumpe - SCS, Maryland State Conservationist
8:30	-	a:45 a.m.	Welcome to UMD - Craig Oliver, Dean, College of Agriculture, UMCP
8:45	-	9:15 a.m.	National Cooperative Soil Survey - Dick Arnold
9:15	-	9:45 a.m.	National Soil Survey Center Activities - Jim Culver
9:45	-	10:15 a.m.	COFFEE BREAK
10:15	-	10:45 a.m.	Northeast Soil Survey Activities - Karl Langlois
10:45	-	11:15 a.m.	U.S. Forest Service Activities - Connie Carpenter
11:15	-	11:45 a.m.	NE SCS Activities - Ray Brown
11:45	-	12:00 p.m.	Silver Spade Award - Del Fanning
12:00	-	1:30 p.m.	LUNCH
			Afternoon Moderator - Margie Faber
1:30	-	2:00 p.m.	How changes in NCG will affect the States - Dick Folsche
2:00	-	2:30 p.m.	Strategic Plan for Soil Survey program - Tommy Calhoun
2:30	-	3:00 p.m.	Project Soil Survey by NLRA - Loyal Quandt
3:00	-	3:30 p.m.	COFFEE BREAK
3:30	-	5:00 p.m.	Committee Meetings: 1. order 1 Soil Surveys - Room 1102, Stamp Union 2. Disturbed Soils - Room 1139, Stamp Union 5. Who are cur customers? - Room 1104, Stamp Union
5:00	-	6:30 p.m.	Social - Bospitality Suite; Room 2104 Kent Hall
8:00	-	9:30 p.m.	NEC-50 Meeting - Room 2136, Stamp Union

Tuesday - June 7

8:00 - 9:45 a.m.

9:45 - 10:15 a.m.
10:15 - 10:45 a.m.
10:45 - 11:05 a.m.
11:05 - 11:25 a.m.
11:25 - 11:45
11:45 -
12:00 -
1:30 -

3:00 -

3:30 -
3:50 -
4:20 -
4:40 -
5:00 -
5:10 -
5:30 -
Wednesday -
7:30 -
6:00 -

a.m.

Thursday	-	June 9	General Sessions Grand Ballroom Lounge, Stamp Union
8:00	-	9:30 a.m.	Breakout NEC-50 Rm 2136, Stamp Union SCS Rm 2146, Stamp Union
9:30	-	9:50 a.m.	BREAK
			Morning Moderator - Tyrone Goddard
9:50	-	10:10 a.m.	Maine Report
10:10	-	10:30 a.m.	Rhode Island Report
10:30	-	11:00 a.m.	COFFEE BREAK
11:00	-	11:20 a.m.	NASIS - Karl Langlois
11:20	-	11:40 a.m.	Soil Inputs to Models - Bob Nielsen
11:40	-	12:00 p.m.	New Hampshire Report
12:00	-	1:30 p.m.	LUNCH
			Afternoon Moderator - Dick Scanu
1:30	-	1:50 p.m.	Pennsylvania Report
1:50	-	2:10 p.m.	Vermont Report
2:10	-	2:30 p.m.	Virginia Report
2:30	-	2:50 p.m.	west Virginia Report
2:50	-	3:10 p.m.	Maryland Report
3:10	-	3:25 p.m.	Submerged Soils in Shallow Water Habitats - George Demas
3:25	-	3:45 p.m.	COFFEE BREAK
3:45	-	5:00 p.m.	Committee Meetings: 1. Order 1 Soil Surveys - Room 1102, Stamp Union 2. Disturbed Soils - Room 1139, Stamp union 3. MLRA/Physiographic Areas - Roan 2136, Stamp Union 4. GIS -SSURGO - Room 2146, Stamp Union 5. who are our customers? - Room 1104, Stamp Union
5:00	-	6:30 p.m.	Social - Bospitality Suite; Room 2104 Kent Ball

Riday	-	June 10	Grand Ballroom Lounge, Stamp Union
			Morning Moderator - Ed White
8:00	-	8:15 a.m.	NEC-50 Report - Ray Bryant
8:15	-	8:30 a.m.	NE-SCS Report - Karl Langlois
8:30	-	a:45 a.m.	Committee 1 Report
8:45	-	9:oo a.m.	committee 2 Report
9:oo	-	9:15 a.m.	Committee 3 Report
9:15	-	9:30 a.m.	Committee 4 Report
9:30	-	9:45 a.m.	Committee 5 Report
9:45	-	ll:oo a.m.	Business Meeting

A CENTURY MINUS FIVE --- AND COUNTING

Northeast Soil Survey Conference
College Park, MD June 1994

Dick Arnold, Director, Soil Survey
USDA-SCS, Washington, DC

1. Have you heard the rumors? Soil surveys are almost completed. The once-over is going to happen. The Soil Survey is obviously on a one way track and will pass over the far horizon into oblivion.

2. Others have rumored that we have passed our zenith and are really over the hill. The glory days were in the 1960s and 1970s they say, certainly not in the 1990s.

3. Rut if we look all around us we see nothing but change. Everywhere there is change, beautiful, wonderful, exciting, and to some extent predictable.

4. Let me tell you something, ladies and gentlemen, the world is changing and your soil survey will be changing with it. Take heart and get on with life. It is far too short to waste.

5. There will be no ruins perched high on the slopes waiting the return of unknown ghosts of yesteryear.

6. There will not be any reason to dredge for gold again with a fever that consumes reason and caution. We don't need rusting buckets to remind us of what might have been.

7. The sky is gray and ominous. The forest closes /in around us. But look, there ahead in the bend in the road is a golden promise of a bright new day. A ray of hope that pushes aside the gathering storm clouds.

8. It is not a new beginning. It is not a rebirth. It is not the smoke and mirrors of magicians. It is the adherence to the reality of living in a world which continues to evolve and grow and recycle the goodness thereof.

9. Remember when outsiders used to tell us that the only thing we knew to do was look at "holes in the ground"?

10. What some folks have never understood is that we learned the value of teamwork. From the smallest to the strongest we set our minds to the task at hand and pulled, and pulled, and pulled together.

11. We stretched that little hole in the ground into a trench reaching across the landscape as far as we needed it to go. We saw new relationships, and learned how the underground world was put together. We created the Pedosphere.

12, The U.S., like much of the rest of the world, has recognized the significance of clean water - for man and beast, for land and feast. It is crucial for a sustainable, productive nation.

13. The quality of water is more than the sediment load swirling by on its way to degrade other parts of the environment. It is also the way water travels through the landscape. Gently, peacefully, meaningfully - or in a destructive rush to engulf all that lies ahead.

14. The quality of animal habitat is receiving deserved attention as we search for an appropriate balance of what will remain as the biodiversity of plant and animal life.

15. Ecosystem-based assistance for integrated total resource management. It is far more than a catchy phrase. It is cognizance of the relevance of sustainable "humanized" ecosystems.

16. When you no longer can see the forest because of the trees, it just might be those majestic redwoods that hold each of us spellbound at the grandeur of Nature.

17. Resilience is the ability or capacity to return to a former state when disturbed. But perhaps more interesting is the concept of adaptability - that ability or capacity to change with changing conditions. This is north central California, not the Andes mountains of Peru.

18. Like and amoeba - stretching, groping, encircling and digesting its own environment. The social system is as important as the ecosystem in making this a "one world". There are so many potential customers for soil information.

19. No matter what we do, or say, or think, it is other people who make the major decisions about land use, farming systems, and managing resources. But we can promote stewardship. Stewardship of all resources. Stewardship. Consider this, "Stewardship is the social acceptance of sustainability".

20. From space one can glance across the Hawaiian islands to the farthest horizon and see the curvature of the earth. what goes around, comes around. What comes around is surely connected to that which was before and that which is yet to come.

21. There are many acres of public land and land of Native Americans that would benefit from detailed inventories as plans are prepared the changing conditions in the decades ahead.

22. With a policy of "no net loss of wetland", there likely will be more and more "reconstructed" wetlands such as these vernal pools. Getting it right the first time is not at all easy.

23. Monitor the status, condition and trend of natural resources. Conduct sophisticated research. Delineate special features. But for goodness sake, get the geographic coordinates - because it is a world of cadastral accuracy and geographic information systems.

24. Caring for renewable resources means knowing which species of seedlings to plant on which sites. Rotations, once started, are not so easy to change. The margins for error are small when you tinker with the risks of sustainable ecosystems that are in concert with the rest of the environment.

25. Efficient, thrifty farmers: effective, thrifty farming systems: integrated, thrifty ecosystems. Beaded for a productive nation in harmony with a quality environment.

26. Do we really understand soils like this? Will we ever know the story of their genesis? Was it dry once? Has it always been wet? So much yet to learn about that which we have made maps of.

27. Use dependent properties can be measured. Techniques have been developed. NASIS will likely be able to store and manage such information. How far and how fast will we move toward measuring the quality of soils?

28. Soil Taxonomy has led us *into* strange new ventures, helped us meet new friends, and lt us search for improved understanding together. It is a stimulus, not an answer. It is a thermometer, not a climate. It is the most comprehensive system devised - and yet it's flaws will eventually destroy it.

29. Teamwork. Shoveling together. Filling in something. Teams change the way we do things and help us find better ways.

30. And after the filling in, there is often a brief moment of silence, the bowing of heads. Collectively there is recognition of the passing of a friend whose time had come.

31. Yes, a team - maybe two teams - or more, have worked long and hard to bury the concept that the only way to present soil information is the paper bound standard soil survey report. There is light at the end of the tunnel. There is sunshine at the bend in the road ahead.

32. Soil survey is a global science. It is helping others who want help. It is teaching, reaching, and preaching. The opportunities that exist today have never presented themselves before in our lifetime. If this is possible, what next?

33. Well, for one thing, equality for those who see a place for themselves in the scheme of things. Equality in training, in job opportunities, and in being the best we can make each other be.

34. Another thing is equality of ecosystems as they are integrated into an interactive wholeness not before perceived as necessary, nor particularly desirable as implemented.

35. And still there is the challenge to obtain food from healthy, uncontaminated soils. Clean environments now - and far, far into the future. Where? For how long? Who will protect all of this?

36. Diversity means different things to different people. Uniformity is not diversity. Standards appear to be essential for meaningful feedback, yet conformity is not diversity. Concepts, ideas, theories, laws, incentives, regulations, lawmakers, governance for the good of the many and not the few - these are a few of diversity things. Diversity is what made us strong and it will keep us strong if we once again embrace the value of such a reality.

37. There will be some unexpected events in the years ahead. Things aren't always predictable or the same as before. Chaos is ordered, it is simple, and it has a charm of its own.

38. Weather vanes patterned after pigs or rabbits? Possibly, but not a good choice. This is the silhouette of reversible plows. Some things are a one way trip.

39. Protected in the cornfields of the Midwest from the harvest of sawlogs in the West, I had no perception of what a sheared stump might look like. Awesome.

40. A century minus five. Not much time left is there? You can get us there by leading. You can't push wet noodles, but you can pull them. How does Nature lead a river? Change a baselevel and you change the playing field.

41. Be delighted when beauty graces beauty. Enjoy the unusual, the unexpected.

42. Be sensitive to the little things that disturb the environment around you. Great care will have rewarding results.

43. Shake up those things that cling too tightly to the past, to tradition for tradition's sake. There are new ways. There are times to try and times to fail. Progress is a process, not a place.

44. Turn a corner and there may be another illusion beckoning you to venture further. False starts are acceptable but not blindly following the wrong signs. Illusions are a challenge, an opportunity to re-evaluate where we are.

45. A century will come and go, yet our mission of helping others will still be there in shining golden letters.

46. Always read the landscapes before you. They are witnesses to the behavior of society. They have clues that can help unravel the pieces of the puzzle about how mankind has fared on his journey through space and time.

47. Yes, you can read stewardship. In the eye of the beholder is the reflection of a value system.

48. Social acceptance of conservation is dependent on cultural aspects, economic impacts, and available technology. Social acceptance of sustainability is what we call stewardship.

49. There it is. Right before your eyes. The beauty of the countryside is a measure of man's love for the land and his diligence in caring for its resources.

50. A few of the marvels of the world are not of man's doing. Icebergs beneath the mist shrouded hills of Glacier Bay National Monument are one of those marvels.

51. Another are the oblique dunes in the Oregon Dunes Natural Resource Area.

52. A century minus five. Ninety-five years of marvelous beauty and still looking great. Changes are a part of our history, vital to our traditions, and hold forth promise of success. Success, as we have learned, is a journey, it is not a destination.

THANK YOU.

NATIONAL SOIL SURVEY CENTER ACTIVITIES[1]

Northeast Cooperative Soil Survey Conference
Collage Park, Maryland
June 5-10, 1994

I compliment the Northeast Regional Cooperative Soil Survey Conference Planning Committee for developing a timely and informative agenda for this workshop. Your New England Society of Soil Scientists newsletter does a nice job of keeping us in the National Soil Survey Center informed of soil survey activity in the Federal and private sector for the northeastern part of the country. I am always curious about what the Ed Sautter "saying" will be in each issue. It is interesting to note that Ed also has two brothers who had careers with the Soil Conservation Service in Nebraska: Howard, a soil scientist, completed several soil surveys in southeastern Nebraska, and John was a district conservationist in the heart of the Nebraska Sandhills.

There are three major areas of National Soil Survey Center (NSSC) activities I would like to share with you this morning. These are:

1) Our new look in terms of restructuring and increased opportunities to provide services to our customers,

2) Current end planned proactive National Soil Survey Center end Soil Survey Division issues, end

3) National Soil Survey Center activities end products.

Our New Look In Terms of Restructuring.

The Soil Survey Division now has a new internal process for how we do business and provide services to our customers. This process has been underway for about two and one-half years. The first phase began implementation in January of this year.

A brief overview of the responsibilities of the old staffs and the lines of supervision is provided as en attachment, Many of us have a good appreciation and understanding of the functions of the older staffs.

The Soil Survey Division is now managed by a Steering Team under the technical direction of Dick Arnold, Director, Soil Survey Division, SCS-USDA. The new organizetion centers around the team concept, improved customer service, and elimination of traditional structured staffs. The accompanying illustrations provide an overview of our new mode of conducting business.

Increased Awareness of Soil Survey

The National Soil Survey Center has taken on a more proactive role within the agency and in outreach to our customers. These activities are beginning to have a positive impact on how other people view the importance of the wide variety of soil survey products we produce. Some examples are:

---

[1] Jim Culver, Assistant Director, Soil Survey Division

-- Steering Team meetings with State Conservationists in the four NTC regions in the United States (Midwest in Wisconsin, in June 1993; Northeast in Washington, DC, in November 1993; South in Texas, in November 1993; and West in New Mexico, in December 1993). I was very pleased with the session in the Northeast, which included all of the State Soil Scientists. One full day was spent discussing soil survey issues, with emphasis by Richard Duesterhaus, Assistant Chief for Northeast, SCS National Office, on doing soil survey by geographic areas.

-- The National Leaders/Steering Team have scheduled time to visit with each of the Assistant Chiefs and Deputies in the National Office for the past two years to discuss mutual soil survey opportunities, concerns, and strategic issues for the future.

-- A National Soil Survey Center State Conservationist Advisory Committee, consisting of four State Conservationists from each NTC region, has been very helpful in providing management and technical advice in providing quality, timely assistance to states. State Conservationists currently serving on this committee are Niles Glasgow, Florida; Duane Johnson, Colorado; Dawn Genes, New Hampshire; and Earl Cosby, Wisconsin.

-- A National Soil Survey Center Technical Advisory Committee, made up of our National Cooperative Soil Survey members, has representatives from each region. Current members are Dave Lewis, University of Nebraska; Bob Rourke, University of Maine; Mary Collins, University of Florida; Gene Kelly, Colorado State University; Pete Avers, U.S. Forest Service; Glen Besieger, U.S. Department of the Interior; Gus Dornbusch, Jr., Director, Midwest NTC; Dick Arnold, Director, Soil Survey Division; and Maurice Mausbach, Bill Roth, Tom Calhoun, Jim Culver, Steve Holzhey, and Dennis Lytle, Assistant Directors, Soil Survey Division.

These groups have provided excellent advice and counsel on the direction of several soil survey issues which are key to our strategic program plan. This July, both Advisory Committees will be meeting in the National Soil Survey Center and will meet jointly for one day.

-- Steering Team meeting with National Employee Development Committee to discuss the short and long-term soils training needs for soil scientists and other disciplines.

-- Current initiative to have input into the forums directed toward the structure of SCS or the Natural Resources Conservation Agency, the needs of its customers, critical priorities, etc. A number of issue papers have been prepared and provided to State Soil Scientists for their use in working with NCSS cooperators. I would encourage each of you to take advantage of this opportunity to share your input to this process. Our recent personnel discussion with Pearlie Reed, Associate Chief, SCS, encouraged us in soil survey to express our recommendations and concerns during these scheduled reinvention forums.

-- Critical issues in keeping with the Soil Survey Program Plan are being addressed by teams within the National Soil Survey Center. Currently, 13 teams are working on an excellent cross-section of issues (briefing of teams included in attachments). Our initial plans are for our employees to spend about one-third of their time participating on team assignments.

Current National Soil Survey Center Activities and Recent Products.

-- Soil Survey Manual!!! A product of nearly a quarter century of work.

-- National Soil Survey Handbook. Currently being printed by GPO, states have copies.

-- Guide to Authors of Soil Survey Manuscripts.

-- Guide for Soil Survey by Geographic Areas.

-- Global Climate products (i.e., Taxonomy National Soil Moisture and Temperature Maps).

-- Keys end Amendments to Soil Taxonomy.

Training

-- Currently three approved courses; Basic Soil Survey and Lab; Soil Correlation; and Soil Science Institute.

-- Two new training courses being developed. They are Soil Technology - Measurement and Data Evaluation and Soil Technology - Programs and Application.

-- Working with National Employee Development Committee to develop a core curriculum for soils training needs for employees.

-- Recently completed a series of 5 one-week workshops on soil map compilation and digitizing.

-- Training on new format and improved application of our databases in preparation of soil survey manuscripts.

National Soil Survey Information System -NASIS

-- A high priority item within the NSSC. Staff currently working on several NASIS teams. Collectively, within the National Cooperative Soil Survey, we are using about 17,000 soil series and have laboratory data for about the same number; have about 37,000 SOI-5's and about 240,500 data sets in our Map Unit Use File (MUUF).

Major Land Resource Area - MLRA

-- Excellent progress has been made during the past few years to conduct all future soil surveys on a physiographic area basis. Activity has been initiated in 60 MLRA's throughout the United Stetes, and 12 have been approved by the Director, Soil Survey Division. Each operational MLRA is directed by a Steering Committee of the involved states. In most instances, the Steering Team is chaired by the State Soil Scientist having the largest area of the MLRA. The Steering Teams also include active membership from the University NCSS cooperators, NSSC soil scientists, and other disciplines.

There has been an initial effort to fund, update, and maintain soil surveys by MLRA. Currently, several of you are members of a Northeast work group or team chaired by Dawn Genes, State Conservationist, in New Hampshire, to look at options in funding soil survey activities on a MLRA basis. Also, there has been a 1006 budget proposal to fund MLRA 105, which includes Wisconsin, Iowa, Minnesota, and Illinois.

This year, we plan to organize our service to states for field reviews. soil correlation, soil investigations, soil sampling, and other services on a regional basis. Tentative plans are to have six teams on a MLRA basis to work with the states to service the request for NSSC assistance.

Personally, I feel the National Cooperative Soil Survey will coma through tha reinvention process with a strong recognition for the quality of the products we produce. This need will be supported by resources to maintain a strong national soil survey program. We feel our new organization of the national soil survey will provide an improved atmosphere and vehicle to deliver improved service to all our customers, of which you are number one.

NATIONAL SOIL SURVEY CENTER

C. Steven Holzhey
Assistant Director
Soil Survey Division

Gary B. Muckel
Soil Scientist

Donna R. Zabel
Secretary

James R. Culver
National Leader
Quality Assurance

H. Raymond Sinclair, Jr.
National Leader
Interpretations

Robert J. Ahrens
Acting National Leader
Classification

Ellis G. Knox
National Leader
Investigations

Dennis J. Lytle
National Leader
Geography & Information Systems

6/23/93

Why Restructure the Soil Survey Division?

Create an Organizational Structure That:

- Is Customer-Focused
- Receptive to New Ideas and Concerns
- Is Flexible and Proactive
- Can Quickly and Effectively Identify Opportunities
- Establishes and Empowers Teams According to Priorities to Obtain Improved Results

Why Restructure the Soil Survey Division?

Create an Organizational Structure That:

- Provides Focused Leadership Based on a
  - Mission
  - Vision
  - Strategic Plan
- Identifies and Sets Unified Priorities for the Division

Soil Survey Division Restructuring

- Employee Input (NSSC Climate Survey)
- Customer Input
  - State Soil Scientist Meetings
  - Agricultural Experiment Stations Advisory Committee
  - State Conservationists Advisory Committee
  - Regional SCS Meetings
  - Regional and National NCSS Meetings
  - SCS Top Staff

Soil Survey Division Restructuring

- Richard Arnold, Director Program Direction
- August Dornbusch, NTC Director - Admin.
- Steering Team
  - C. Steven Holzhey, Assistant Director
  - Maurice Mausbach, Assistant Director
  - Dennis Lytle, Assistant Director
  - William Roth, Assistant Director
  - Jim Culver, Assistant Director
  - Tom Calhoun, Assistant Director

Soil Survey Division Steering Team

- Supervision and Guidance Responsibilities
- Supervise Ail Employees Except for Those in Production Units, i.e., Editors, Laboratory Staff
- Sponsor Teams
- Informal Guidance, i.e., Natural Work Groups

Steering Team Responsibilities

- Strategic Planning/Program Mgmt. - 35%
  - Sponsor
  - Coach
  - Priority Setting
  - Policy
- Supervisory - 15%
- Outreach (Liaison) - 25%
- Communicating with Customers - 25%

a

Soil Survey Division Restructuring

- **Technical Leaders**
  - Hari Esnaran, Natl. Leader, World Soil Resources
  - Ellis Knox, Natl. Leader, Soil Survey Research
  - Carolyn Olson, Lead Scientist, Soil Landscapes
  - Rob Ahrens, Lead Scientist, Soil Taxonomy
  - Larry Ratliff, Lead Scientist, Quality
  - H. Raymond Sinclair, Lead Scientist, Applications

Soil Quality Team: An Example

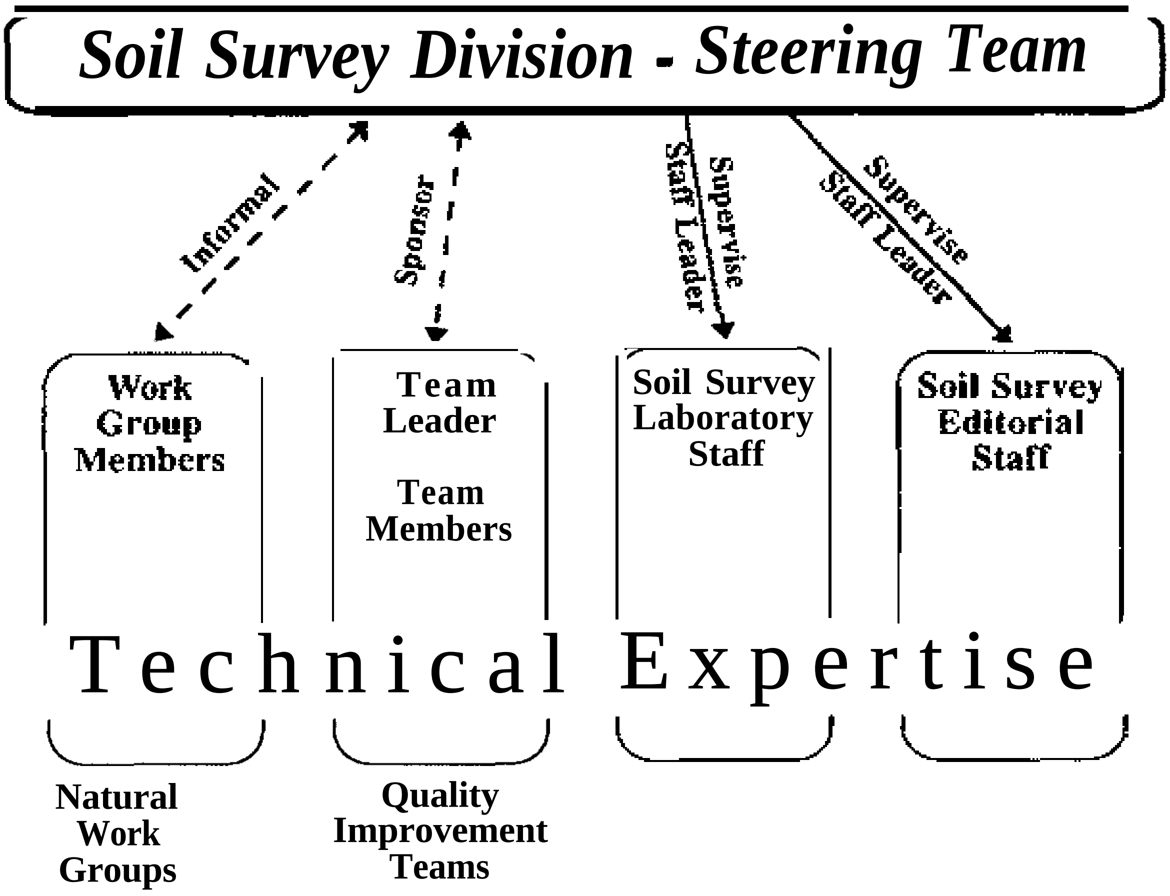
Team Charges

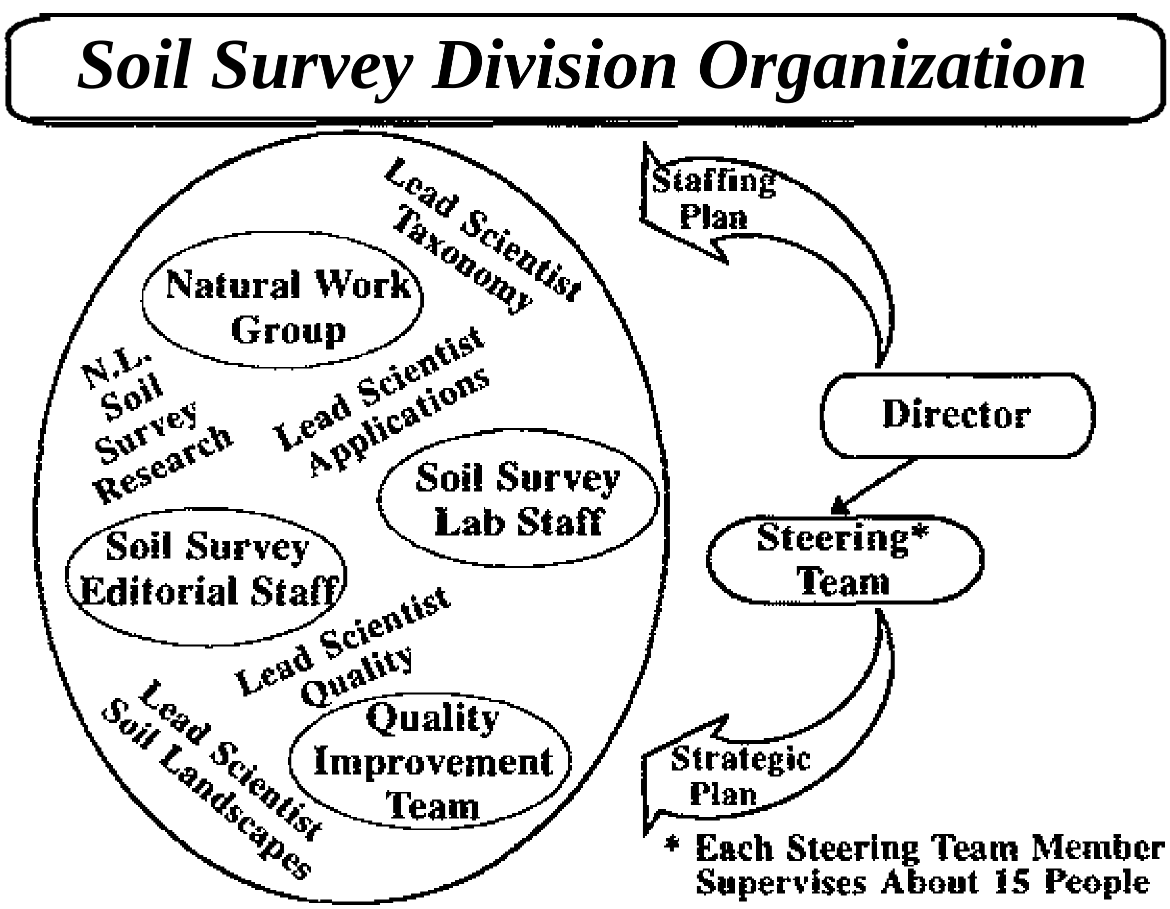
1. Develop a strategy to address soil quality issues
2. Identify and develop indicators and criteria for evaluating and monitoring soil quality
3. Develop a final draft of indicators and criteria for the Natl. Soil Survey Handbook

Gary Muckel, Ldr.

Robert Grossman
Carl Clocker
Betty McQuaid
Berman Hudson
Ronald Bauer

Maurice Mausbach
Team Sponsor


Soil Survey Division - Steering Team
Informal
Sponsor
Supervise
Staff Leader
Supervise
Staff Leader
Work Group Members
Team Leader
Team Members
Soil Survey Laboratory Staff
Soil Survey Editorial Staff
Technical Expertise
Natural Work Groups
Quality Improvement Teams


Soil Survey Division Organization
Lead Scientist Taxonomy
Natural Work Group
N.L. Soil Survey Research
Lead Scientist Applications
Soil Survey Lab Staff
Soil Survey Editorial Staff
Lead Scientist Quality
Lead Scientist Soil Landscapes
Quality Improvement Team
Staffing Plan
Director
Steering* Team
Strategic Plan
* Each Steering Team Member Supervises About 15 People

Soil Survey in the Northeast

Karl H. Langlois, Jr.
Head, Soils Staff
Northeast National Technical Center
Soil Conservation Service
Chester, Pennsylvania

Two years ago we had a very successful joint Conference with the South region in Ashville, North Carolina. Besides being an excellent Conference it gave us an opportunity to interact with soil scientists in another region.

In the next few minutes I am going to talk about some of the changes in the soil survey program in the Northeast. I plan to cover program emphasis, Northeast Cooperative Soil Survey program activities, and staffing changes.

Activities and Program Emphasis in the Northeast

Wetlands

Wetlands are getting more attention each year. Recently SCS, EPA, FWS, and the Corps signed a Memorandum of Agreement Concerning the Delineation of Wetlands for Purposes of Section 404 of the Clean Water Act and Subtitle B of the Food Security Act. The purpose of the MOA is to specify the manner in which wetland delineation's and certain other determinations of waters of the United States made by SCS under the FSA will be relied upon for purposes of Clean Water Act Section 404. This MOA will help promote consistency between CWA and FSA.

Without getting further into the MOA, we are anticipating an increased workload for soil scientists. The majority of the workload will be on-site identification and delineation of hydric soils. This type of activity is Technical Soil Services and the on-site investigations should be conducted by resource soil scientists.

Hydric Soil Mica *tors*

Hydric soil indicators have been developed and are being field tested this year. Chris Smith and others have been working on this for many months and will give a report later in the week. This has been a huge effort and the indicators are still being refined. Chris has reviewed reams of documents and letters and is looking at new ways to make the indicators better.

Water Quality

Water quality continues to be an important issue in the country and especially in the Northeast. Soil data is 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. There are many water quality questions that need complex answers. Water quality poses a challenge to all soil scientists for years to come.

Water quality efforts in SCS are currently centered around modeling such as EPIC SWERB and others. Again, the soils information is an important factor for the use of these models. SCS is also integrating the models with GIS using SSURGO data.

MLRA's

Major Land Resource Areas (MLRA) are becoming increasingly important in the soil survey program. They will be used for the management of soil surveys and soil survey legends. State Conservationists in the Northeast have agreed to start the development of a Memorandum of Understanding in all MLRA's in the Northeast. This will allow us to better manage the surveys and assure better map unit design and joining between political boundaries.

GPR

Several years ago I talked about Ground Penetrating Radar and the potential it had in the Northeast. This tool can be very useful for gathering data while we are doing transects for modernizing and maintaining our soil surveys. I encourage you to take another look at GPR and how it can help with the collection of data and map unit design. 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 used for interpretations.

Training

Perhaps one of the most important items we need to place program emphasis on is training of soil scientists. Changes continue to take place that affect all soil scientists. As we finish the mapping phase of soil survey in the Northeast, soil scientists will spend more time on the use of soil surveys. Soil interpretations will be their number one workload. Computers are playing a big role in the daily activities of soil scientists. We must be sure they are fully trained to meet these challenges, We must identify all training needs of soil scientists and make sure they receive the best training we can provide.

Last December a pilot course relating to soil interpretations was given in Fort Worth. Soil Scientists from all regions attended and provided excellent comments about the course. These comments will be used to strengthen the course. An effort is underway in the National Soil Survey Center to review the content of all soil survey courses taught by SCS. This should lead to better courses that will address todays needs.

NASIS

NASIS is well underway. I will be talking about some of the technical aspects of NASIS later in the week but now I would like to touch a little on some of the general aspects.

The software is being developed for use in the state office and the project office. This means that all soil scientists will use it. NASIS is a tool to help soil scientists conduct soil surveys. It is more comprehensive than 3SD which was more of a data management tool. 3SD has been great for soil survey because it has forced us to look at our data and to revise it to the point where it is much more accurate than before we used 3SD.

The NASIS beta test will start this month and the first state in the Northeast to use it is Virginia. It will be installed during the week of June 20th. The first general release will be October 1994.

I have been very impressed with the development of the NASIS software. It has been built from the ground up rather than using pre-existing software and trying to restructure it. Analysis and development have been done before programming has started. The programming has been done using the most advance technology available to SCS such as Informix and X-Windows,

One thing I would like SCS soil scientists to do is spread the word about the soils software. 3SD has been released and revised many times. Updates to 3SD have occurred many times without fanfare and these generally have gone unnoticed because the software has worked so well. I am confident you will find the same quality in the NASIS software.

Soil Maps

This year a map compilation and finishing course was conducted in each region. The course covered procedures, policy, and standards for development of a map from the field to publication. During the course, digitizing of soil survey maps was also covered. Each state needs to develop an efficient way of completing this job.

InfoShare is a USDA program that is currently studying the combination of offices and equipment of USDA agencies. If InfoShare moves forward there will be better equipment and a great need for digitized soil survey maps in the future. We should keep this in mind and develop a compilation, finishing and digitizing program that can be expanded in the future.

Field Office Technical Guide

During the past several years SCS has placed emphasis on revising and updating the Field Office Technical Guide. This important document is the basic source of information for all field office technical assistance. SCS soil scientists have spend many hours checking and updating Field Office Technical Guides. The majority of the updating was in Section II. This information was derived from the State Soil Survey Database and transferred to the Field Office through CAMPS.

Working With Others

Soil scientists at the NTC, are spending more time working with other disciplines than we have in the past. We are trying to more fully integrate soil survey into as many disciplines as we can. This had been done by establishing teams to address certain issues. There is also a strong need for interdisciplinary involvement in water quality, RUSLE, and Ecosystem Based Assistance.

There is still a strong need for technology transfer among the Universities, NTC, NSSC, and states. This is one of the areas we plan to develop in the next couple of years.

Personnel Changes in SCS in the Northeast

SCS has recently had a reduction in force of over 1000 employees through an effort to down-size government by implementing a monetary buy-out program. This has left most NTC's and state offices, and many field offices with an imbalance of technical specialists. It will be a challenge to adjust this imbalance so we can effectively do our jobs of conducting soil surveys and providing technical soil services.

For several months SCS has been using terms such as Reinventing Government, Total Quality Management, Teams, Empowerment, and Flattening the Organization. However our offices organize or reorganize, our goal has to be that we are more efficient, and that we provide service to our customers,

Many changes have occurred on soils staffs in SCS state offtces in the past two years. The following people retired in the recent SCS reduction in force:
Bill Hatfield, State Soil Scientist, West Virginia,

Dale Childs, assistant State Soil Scientist. West Virginia,
Dick Hall, state Soil Scientist, Delaware,
Garland Lipscomb, state Soil Scientist, Pennsylvania,
Will Hanna, State Soil Scientist, New York, and
Ken LaFlamme, Assistant State Soil Scientist, Maine

During the past two years Russ Kelsea, Assistant State Soil Scientist in New Hampshire was promoted to soil scientist in the Technical Information Systems Division in Fort Collins, CO.

Scott Anderson from Pennsylvania, was promoted to Assistant State Soil Scientist in New York.

Maxine Levin, Assistant State Soil Scientist in New Jersey transferred to California as an Assistant State Soil Scientist. Shawn Finn was promoted to Assistant State Soil Scientist in New Jersey and is in charge of soil databases.

Bruce Dubee transferred from Puerto Rico to Virginia as an Assistant State Soil Scientist in charge of soil databases.

These changes affected 9 positions in 8 states. There are currently many positions that are vacant.

In the past two years there have been no changes on the Soils Staff at the Northeast NTC.

NNTC-NSSC Soils Staff

The National Soil Survey Center (NSSC) and the National Technical Center (NTC) have different roles in the soil survey program. In general the NSSC works with the states in the development of soil survey from start to finish. It is the production part of soil survey. The NTC works with the state in the use of soil surveys and soil survey information. This is referred to as Technical Soil Services, which is providing technical services to our customers.

The Soils Staff in the Northeast assists the National Soil Survey Center with the development of new interpretations and is responsible for the development of regional interpretations.

Closing

The Steering Committee and Committee Chairpersons and others have put many hours of time into this conference. I hope you enjoy the week and will fully participate in the Committee meetings scheduled throughout the week.

SILVER SPADE AWARD

The Silver Spade Award is presented to a member of the Conference who has contributed outstanding regional and/or national service to soil survey. Recipients of the Silver Spade Award are:

1984 Edward J. Ciolkosz, Pennsylvania State University
1986 Edward H. Sautter, State Soil Scientist, CT
1988 Sidney A.L. Pilgrim, State Soil Scientist, NH
1990 William R. Wright, University of Rhode Island
1992 Delvin S. Fanning, University of Maryland
1994 Robert V Rourke, University of Maine

PROJECT SOIL SURVEYS
BY MAJOR LAND RESOURCE AREAS

By
LOYAL A. QUANDT
NATIONAL SOIL SURVEY CENTER
LINCOLN, NEBRASKA

The federal soil survey activities in the United States began almost one hundred years ago. Most of the earlier surveys were small scale and general in nature, or were single purpose surveys made for conservation planning. In 1952, the Soil Conservation Service was given leadership responsibility for soil surveys of private lands and ier sur.96'es beganr sumodeme

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EVALUATIONS

All Major Land Resource Areas for project soil surveys are required to have a quality evaluation made for each area to determine the overall needs. This quality evaluation will be completed before the projects are approved. The items that should be evaluated include attribute data, soil laboratory data, map unit line placement, map unit composition, soil interpretations and soil research needs.

MEMORANDUM OF UNDERSTANDING

The Memorandum of Understanding (MOU) records the intent of Soil Conservation Service and one or more cooperators to join in making a soil survey of the MLRA or specific area or in performing related soil survey work.

*PROJECT **WORK** PLAN*

The Project Work Plan, a companion document to the Memorandum of Understanding, contains the specifications to complete the work and products produced during the project.

*NORTHEAST MLRA **WORK** GROUP*

In the fall of 1993, the Assistant Chief for the Northeast presented the charge that a MLRA Work Group be formed to recommend implementing procedures for managing and developing the update/maintenance of soil surveys by the MLRA process in the Northeast Region. The chair for this Workgroup is Dawn Genes, State Conservationist - New Hampshire. The Work Group report recommendations are to have 100 percent of the MLRAs assigned to the Northeast states by May 1995. This report was presented to all the Northeast State Conservationists at their May 12, 1994 meeting in Windsor, Connecticut. All the states agreed to meet the goal. Some of the information from this Work Group meeting is included with this report.

*Assignment criteria for states responsible for **Major** Lund Resource **Areas:***

The state assigned the responsibility for the MLRA was based on which state had the dominant area or most acreage. The list of MLRA assigned to each state is shown Exhibit 649-l of the National Soils Handbook for all the MLRA's shown in USDA Agricultural Handbook No. 296.

This only means that the State Soil Scientist is responsible for maintaining the boundary, description and documentation for each MLRA assigned to that state. The development of the Memorandum of Understanding, Project Plans and oversight of updating soils surveys can be performed by any person sharing the MLRA responsibilities by mutual consent of MLRA participants.

The National Soil Survey Center is responsible for keeping current the LRR and MLRA maps and descriptions.

Land Resource Region and Major Land Resource Area analog maps have traditionally been reasonably stable. However, a reevaluation of Land Resource Reglon and Major Land Resource Area map unit concepts are in process. This is due to updating soil surveys by MLRA and the introduction of a new digital map product (state soil geographic database) as the Major Land Resource Area building block. As a result, there may be a need to defme new Major Land Resource Areas or revise previously accepted MLRA delineations and some associated Land Resource Regions.

***Impact Analysis* of *assigned MLRA's to states in the* Northeast:**

The following is a listing of Major **Land** Resource Areas assigned to each state in the Northeastern States;

State	Assigned Major Land Resource Areas
Connecticut	145
Delaware	**153C**
Maine	143, 146
Maryland	**153D (proposed)**
Massachusetts	144A
New Hampshire	144B
New Jersey	149A
New York	101, 140, 141, 142, 149B
Pennsylvania	**127, 147**
Rhode Island	**none**
Vermont	**none**
Virginia	148
West Virginia	**126**

It is quite apparent from this list that the state of New York will have a much greater workload for preparing Memorandum of Understandings and Project Plan for five **MLRA's,** whereas, Maryland, Rhode Island, and Vermont have none.

If a state desires to change the existing Major **Land** Resource Area map (NSH-649) the state soil scientist **coordinates** the suggested changes in existing MLRA with the National Soil Survey cooperators at the State level and other appropriate Federal and State agencies.

By mutual agreement the states involved with a MLRA may want to recommend boundary changes or have another state responsible for that **MLRA.** There are procedures now in progress for a boundary change between **MLRA** 139, 140, 100, and 101. The states of New York, Pennsylvania and Ohio have agreed to recommend these changes.

The staff in the state of Maryland have proposed a revision of the **boundaries** for **MLRA** 153B and 149A and recognition of the proposed **MLRA** 153D - Northern Tidewater Area.

There are 13 states in the Northeastern states which have responsibiity for 17 Major Land Resource Areas. They are involved with 8 additional **MLRA's** for which they would participate on Steering Committees but do not have responsibility.

Management of Project Soil Surveys

The present staffing for a state soil survey staff is a line staff structure. Exhibit 12. consisting of a State Soil Scientist and Assistant State Soil Scientists responsible to the State Conservationist. The Soil Scientists within these states are administratively or technically responsible to the State Soil Scientist. Most of these Soil Scientists work within the boundaries of their state. They gain broader experience through being detailed for work projects in other states and by attending training sessions, workshops, and meetings.

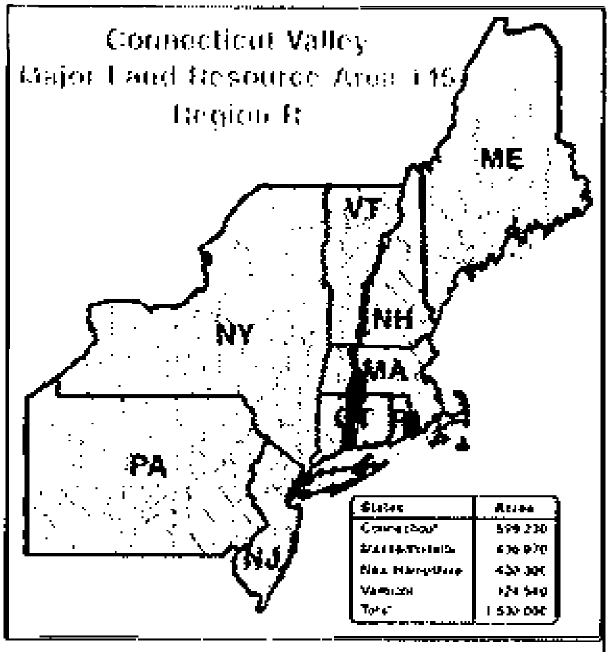
An example of a structure for conducting a Project Soil Survey update by Major Land Resource Area, Exhibit 11, was developed to illustrate the team approach for a more effective and efficient procedure in updating soil surveys. This structure is flexible and can be adapted for each MLRA. It provides a framework by which the resources from each state can be applied to complete the project soil survey.

This structure enables the states to apply financial and staffing resources to subsets of the MLRA. The responsible State Soil Scientists. Project Coordinators, and the Steering Committee provides the leadership and coordination for each of the states involved to have input to manage the updating process. This process will result in high quality soil surveys, a coordinated legend, and the sharing of data and expertise.

In some cases, Soil Scientists assigned to the MLRA Project will be technically responsible to the Project Coordinator but will still reside in their respective states and will still remain administratively responsible to their particular State Staff. However. they will still have the flexibility to work throughout the entire MLRA.

The Project Coordinator will also work closely with other disciplines and incorporate their technical knowledge, skills, and expertise into the overall soil survey product. When the project is completed, members of the Project Soil Survey in that MLRA can be reassigned to other prioritized projects.

Exhibit 11: Structure of Project Soil Survey



Soil Survey Project
Major Land Resource Area 145
Connecticut Valley

[illegible]
State Soil Scientist, CT (Chair)
Asst. State Soil Scientist, MA
State Soil Scientist, VT
State Soil Scientist, NH
Project Coordinator
Technical Advisor - NSSC
Cooperators
Resource Conservationist
State Conservationist (Sponsor)

Communications - Maintenance
Coordinate Activities
Evaluations - User's Needs
Cooperating Agencies
Prepare MOU & Work Plan

Project Coordinator

Soil Scientist

[redacted]

University Soil Scientist

[redacted]

[redacted]

NSSC Staff

Subcommittee
Coordinates
Legends

Investigations
Data Sharing
Manuscripts

Database Specialist
NTC & NSSC Staff

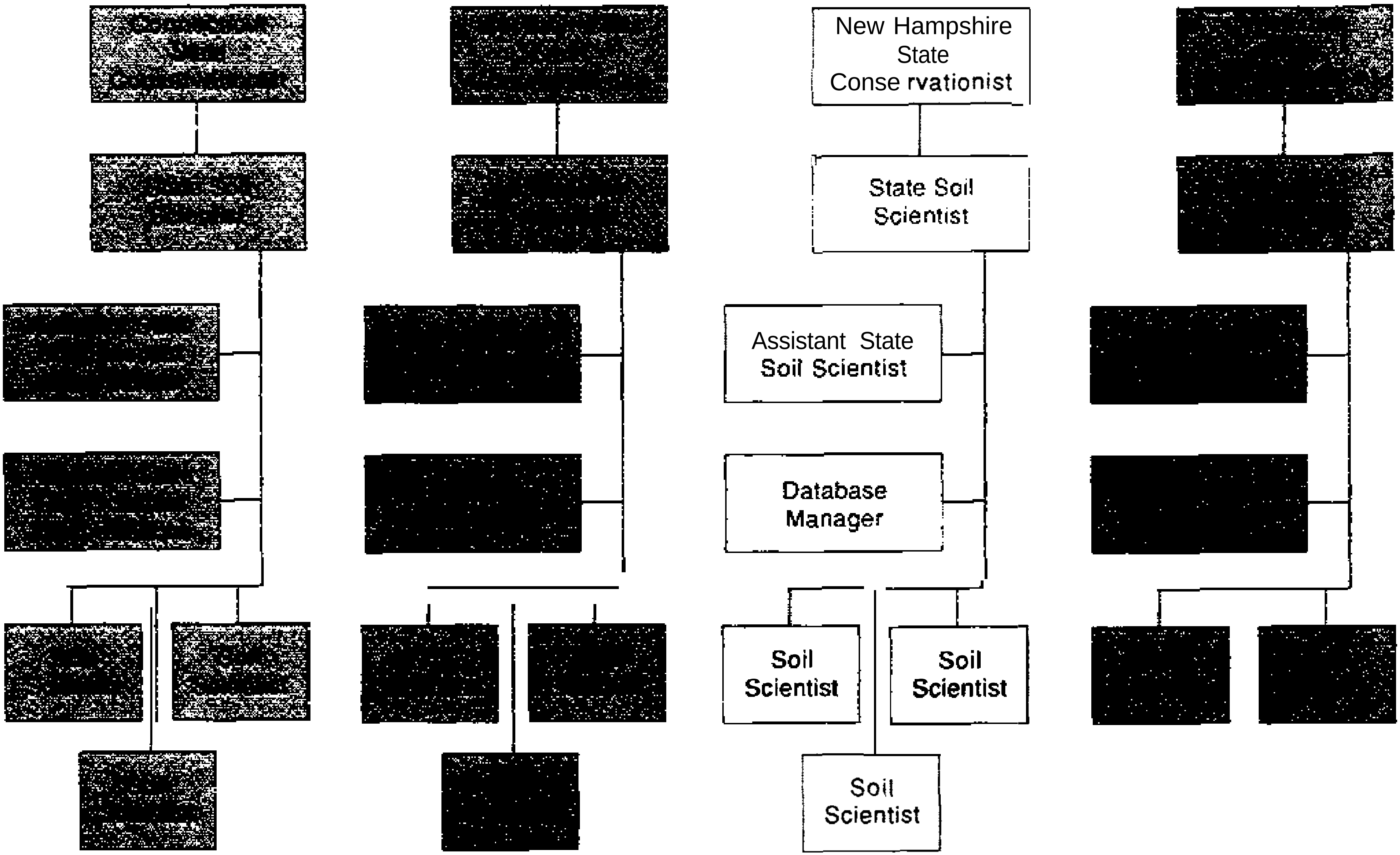
Interpretive
Maps Attribute
Data

Map
Compilation
Digitizing

30

5

Exhibit 12: Soil Survey Operations Line Staff



SOIL TAXONOMY

Peter L.M. Veneman
Massachusetts Agricultural Experiment Station
19 Stockbridge Hall
Amherst, MA 01003

Change for the sake of changing doesn't always result in improvements. Soil Taxonomy in its current pattern of coming out with new "Keys" every two to three years, appears to be subject to contineous and sometimes radical changes. If we compare the thickness of the first "Keys to Soil Taxonomy" to the current issue, which is about 2.5cm thick, we must conclude that our soils are rapidly aging indeed. Fortunately it is not the change in soil development rate, but rather a change in how we look and interpret our soils. I do think, however, that the rate as well as the magnitude of some of these changes can be slowed down somewhat. I realize that the present changes are the result of a number of international committees finishing their tasks, nevertheless, I do think that it is an unhealthy practice to make major changes every 2 or 3 years. Students who have taken a course in Soil Taxonomy are already outdated by the time they finish their college career. In particular, rapid changes are not very agreeable with people who use Soil Taxonomy only occasionnelly such as geologists, geomorphologists and engineers. I therefore would like to propose a moratorium on major changes in Soil Taxonomy. New "Keys" are not allowed to be produced at intervals any shorter than 5 years.

Having made these general comments, I would like to address some specific issues pertaining to the 1992 edition of the "Keys." In that edition the aquic moisture regime was expanded to 4 moisture conditions, namely: Epiaquic, Endoaquic, Anthroaquic, and Oxyaquic. While these separations in theory make sense, in practice their use does not provide us with too much additional information, in fact they contribute to a violation of one of Soil Taxonomy's basic rules. Guy Smith, in his series of interviews entitled "Rationale for Concepts in Soil Taxonomy" comments that the "philosophy of Soil Taxonomy is that a soil should be classified on its own properties, and not on those that are presumed to have existed at some time in the past, end not on the properties of adjacent soils." Let me illustrate my point by the following example. In the northern tier of the United States most soils have been glaciated and are underlain by dense glacial till. Based on my experience, these soils are saturated from the bottom up early in the growing season, while the substratum remains virtually unsaturated later on in the growing season. In other words, these soils have endosaturation in the early part of the growing season and episaturation during the summer. Apparently the decision has been made to classify these soils as having an epiaquic condition, even though this is not entirely based on actual conditions. In the past these situations were handled at the series level and that perhaps was a more appropriate way to assess seasonal changes in soil conditions. Soil Taxonomy is supposed to be a field-based system, yet the 1992 changes have resulted in a need for regional meetings to decide how to classify the soils in principle. This was followed at the state level by a substantial effort to reclassify all soils. This procedure does not install confidence in our classification system. Although in theory providing more detail, it de *facto* has resulted in a more interpretive system. One of the things that soil scientists in general like is the notion of an aquic condition applicable to 2 meters, rather than a strict limitation to the upper 50 cm of the soil profile.

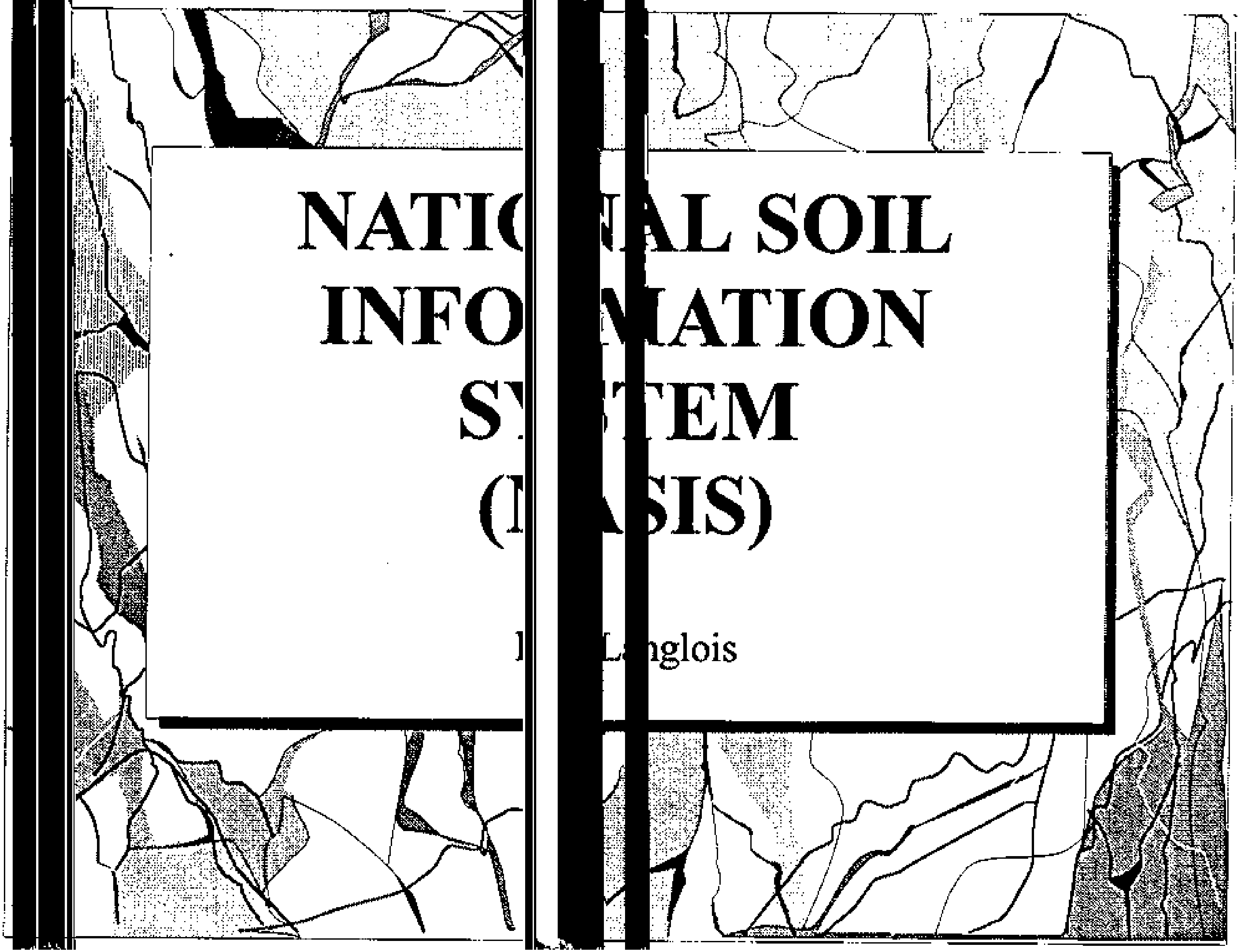
One of the changes that has a large impact is the requirement in the Entisol order that aquic conditions be evident in a layer between 40 and 50 cm from the mineral soil surface. Previous editions of the Keys merely required evidence in a layer within 50 cm of the surface. Although this change, I am told, was needed to properly classify rice paddy soils, it results in an aquic subgroup designation even when soils are clearly poorly drained. A number of soils in the Northeast located in the lower landscape positions have stratified sediments resulting from the combined effects of gravity and water. Some of these deposits are sandy between 40 and 50 cm and have chromas of 4 despite being poorly or sometimes very poorly drained. In future editions of the *Keys*, that is after my moratorium has expired, we may want to change the *aquent* requirements back to its original wording.

Based on our experience in southern New England, the basic idea that low chroma colors due to redox depletions represent long term saturation, proved quite valid. Perhaps in the future, we may want to expand the sandy aquic Entisols to include chromas of 4 with significant (>10%) redox depletions with a chroma of 1. In my experience, the utility of a,a-dipyridyl is greatly overstated. It requires observations during the wet season. A negative test during the summer still does not exclude the presence of an aquic condition. This test may have some use in disturbed soils, however, under natural conditions the moisture condition generally is indicated by the morphology.

The use of the *Oxyaquic* condition at the subgroup level only has limited applicability. How does one know that a soil that does not have a morphology indicating wetness, is saturated for 1 month per year in six or more out of the 10 years? A number of soils that have redox concentrations in the subsoil are now going to be classed at the oxyaquic subgroup, yet this morphology generally is due to moist <u>not</u> saturated conditions! Again, this designation sounds great in theory, however, it lacks a scientific basis and practical applicability.

The definition of *Aquods* should be rewritten to include more morphological parameters. In its current form it requires either a histic epipedon or mottles within the albic or spodic horizons. The new criteria should be much more specific, including more detailed data such as organic coatings in the albic, and color and thickness requirements for the spodic horizon, in particular the Bh part of the spodic.

In closing, I would like to observe that Soil Taxonomy truly is a remarkable document. Despite its shortcomings, and everything has shortcomings, it works thanks to the attention to detail by its many creators. Thanks to the efforts of many soil scientists from Guy Smith down to the current "keeper of the flame," we have a publication reflecting a wealth of knowledge about a remarkable resource: our soils.The definition of



NATIONAL SOIL INFORMATION SYSTEM (NASIS)

[illegible] Langlois

NASIS

- Why NASIS?
- New Data Elements
- Transition from SSSD to NASIS
- Implementation Timeline
- Workload
- Hardware and Software

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Why NASIS?

- The SCS-Sol-5 is outdated.
  - It is too difficult to add data elements.
  - It contains layers consisting of multiple horizons.
  - The ranges of data are too wide for map unit components.
- NASIS Map Unit Record (MUR) will accommodate as many components as is necessary to document map unit composition.
- NASIS MUR will easily allow the addition of data elements.

Why NASIS? - cont.

- NASIS will include spatial and attribute data.
- Horizons will be used to store data for map unit components.
- NASIS will provide more and better data for users. There will be approximately 40 data elements added for map units, components, and component layers.
- Representative Values can be recorded where appropriate.

Why NASIS? - cont.

- Move to a full featured RDBMS.
- Generate interpretations locally.
- Improve management and reliability of soil data & information.

NASIS - New Data Elements

- Cover
- Landform
- Flooding - additional information
- Ponding - additional information
- Map Unit - additional information
- Horizons
- Rock fragments
- Particle size - sand, silt, clay
- Surface rocks
- Soil moisture & temperature

Representative Values (RV)

- A RV is a single value that can be used by modelers.
- Data that has a range of values will also have a RV.

RV

Transition From SSSD to NASIS.

- Data Conversion
  - SSSD to NASIS MUR
  - Populate the National Standard
- Develop New Criteria for Interpretations
- Update National Policy and Guidelines
  - Change Soil Handbook and Manual
  - Change Existing Soil Courses

NASIS Imdementation Timeline

NASIS 1.0 Beta Test	Jun. -Aug. 1994
Release 1.0	October 1994
Release 2.0	October 1995
Release 3.0	October 1996

Release 1.0 Features

- Conversion of SSSD to NASIS
- Security System & Controls
- Operational Data Dictionary
- Database Interactions
- NASIS Editors (Legend & Mapunit)
- Configurable Edit Screen Setup
- On-line Help System
- Q & A Functions
- Reports (primarily for DSM)

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Release 1.x Features

- Cut/Copy and Paste Function
- Query Generator (Select)
- Global edit function
- Communication Support
- Calculation & Validation

Release 2.0 Features

- Interpretation Criteria Maintenance
- Interpretation Generation
- Data Accumulation
- Generalized Data Comparison
- Export to FOCS, external users
- Aggregate Pedon & Lab Data
- Exchange Data between NASIS Sites

Release 3.0 Features

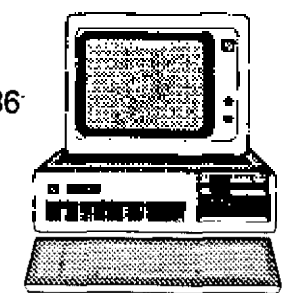
- Add GIS capabilities to NASIS
- Manage SSURGO. STATSGO, NATSGO
- True Survey Area Editor

Workload

- Validation of Current Data
- Change Layers in SSSD to Horizons in NASIS
- Change Official Series Descriptions in Text, to a Relational Database called a National Standard

Hardware and Software

- Hardware
  - NASIS with GIS - Workstation
    - State Offices
    - MLRA Offices
  - NASIS without GIS - 386/486
    - Small Project Offices
- Software
  - UNIX
  - Informix



Hydric Soil Indicators
by
Chris Smith, Soil Scientist, NNTC
Presented to the
1994 Northeast Soil Survey Work Planning Conference
College Park, MD

Hydric soil Indicators are separate but closely related to both the Hydric Soil Definition and the Hydric Soil Criteria

First consider the definition. " A hydric soil is a soil that is saturated, flooded or ponded long enough during the growing season to develop anaerobic conditions in the upper part." The primary requirements are saturation, reduction, and the development of redoximorphic features.

When lists of hydric soils were first developed, assignment of a soil was based on the subjective evaluation of soil properties by people through collective discussion of what soils would be included within the definition. Not only was this time consuming, but it was not linked to the soil survey map unit nor was it necessarily correlated from state to state.

As the Wetland Inventory carried out by the Fish and Wildlife Service came into operation, soil scientists were able to convince wetland scientists that soils were an important parameter in identifying wetlands. However, there was a need to link the soil survey to the inventory process to be useful. It was decided to produce a list based on the information contained on the Soils Interpretation Record. This had many advantages because the search was carried out by computer, making it completely objective and fast. The problem was how to write a computer selection criteria that would query the SIRs and identify the hydric soils. The Criteria are those properties and limits in the computer program that produce a list that would not miss any hydric soil. This approach allows the user to go to the field knowing there is some likelihood that a hydric soil may exist. The list does not remove the need to independently confirm the presence of the hydric soil since the permitted range of some soils would be less anaerobic than required by the definition of a hydric soil

Each of the criteria do not need to be necessarily scientific, but rather the criteria need to produce a list on which people can agree. Each criteria has its own limitations. Water tables in the database are precise to only the nearest 0.5 foot. The program uses the highest soil water depth from the range of depths. Drainage classes are not defined by morphology and are interpreted slightly differently from state to state. Soil Taxonomy does not have the necessary class limits to be completely useful nor are all the orders defined with the same depth limits in the aquic suborder. Therefore, while criteria may be useful in producing a hydric soils list, they are not reliable when confirming the presence of a hydric soil in the field. They may be correct or sometimes but they may also be wrong, Verifying a soil as hydric because it meets the requirements of the definition has proved to be difficult. Many soil scientists have been applying the criteria to field situations. This practice is not producing consistent determinations. Early technical information referred to morphologic properties broadly listed as chroma of I and no mottles or chroma of 2 and mottles. This was helpful; however, the problem is more complex. Soil scientists and the general public have a desire to know how to identify a hydric soil in the field. The definition itself is not very precise. Because there is no accepted standard of comparison, delineators may be confused with soils occurring in the wetland transition zone as to whether the soil is hydric. Each soil scientist is having to defend their hydric soils call on experience and data collection. Thus, the need for Hydric Soil Indicators grows from a desire to reduce the number of costly and inefficient independent determinations.

Indicators **are a sign** or property that is so strictly associated with a particular environmental condition that its presence points out the existence of these conditions or that those conditions may be logically deduced as occurring. In developing Indicators, verifying that a particular property is strictly associated with the definition is very important. Once an indicator is confirmed, the Indicator can be used indefinitely. The indicators as currently detailed list those properties that can be agreed to by most soil scientists without the submission of any data designed specifically for this purpose. Since this definition is relatively new, very little data has been collected specifically to determine the limits of the hydric soil definition. Thus some people feel that the indicators don't go far enough.

The hydric soil definition itself is not very precise. The "upper" part is not clearly defined. The term anaerobic is not very specific in terms of intensify nor volume of soil. Is it the whole soil or some part of the soil? The term anaerobic is confusing since what we are looking for in soil morphology are features that a from a reducing environment rather than an anaerobic environment.

In spite of these limitations, it is possible to document what properties are commonly being used to determine that the requirements of the definition are meet. As mentioned earlier, the current indicators are those that can be agreed to with minimal new data collection. Each Indicator must never be wrong. Thus, it must include only those soils properties that we know to be true in a particular geographical area. New Indicators can be added at any time in the future. Currently the indicators are divided into sub regions based on the six soil temperature regimes.

The indicators are in no way meant to replace the soil scientist's option to determine that a soil is hydric by any means that is currently available by showing that the requirements of the definition are meet. Hopefully, the Indicators will remove the burden of having to prove and repeatedly defend the techniques that are commonly recognized as accepted knowledge about how to identify a hydric soil. This should make the soil scientist's job function more efficiently and consistently from site to site and state to state.

Submerged Soils In Shallow Water Habitats

G.P. Demas

ABSTRACT

Recently, special emphasis has been placed on shallow water habitats due to their crucial role in estuarine ecosystems. One vital function of these habitats is their support of submerged aquatic vegetation (SAV). Scientific studies have produced a wealth of data concerning shallow water habitat characteristics and the relationship between individual habitat components and aquatic plants and animals. One important element of shallow water environments that has received little or no attention is the substrate, or soil.

Historically, submerged soils have generally been neglected in the field of soil science. One of the few maps of submerged soils known of in the United States was developed in Florida by the USDA-Soil Conservation Service in an early 1900's soil survey. In 1965, a tentative classification scheme for subaqueous soils was proposed in Germany, but the work was not continued. When *Soil Taxonomy* was developed in the 1970's, the formal definition of soils appeared to exclude submerged soils from the realm of pedology. *Soil Taxonomy* defines soil as " The collection of natural bodies...supporting, or capable of supporting plants out-of-doors." In the SCS *Soil Survey Manual* the definition is presented again. It states that "Bodies of water that support floating plants, such as algae, are not soil, but the sediment below shallow water is soil if it can support bottom-rooted plants...". Although the SAV are not emergent plants, they are bottom-rooted plants. This inclusion of vegetation as a key element in the definition of soil offers the opportunity to study submerged soils in shallow water areas of lakes, rivers, and bays where SAV presently or potentially exist.

The proposed study will focus on submerged soils from a pedologic perspective to determine if the approach of soil science including characterization, classification, interpretation, and mapping techniques are applicable. The results could make a significant contribution to the understanding and management of shallow water habitats.

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NCSS ACTIVITIES IN CONNECTICUT

The NCSS program participants in Connecticut consist of the USDA, Soil Conservation Service, the Connecticut Department of Environmental Protection (CT DEP), the Storrs, University of Connecticut Agricultural Experiment Station. and the Connecticut Agricultural Experiment Station. National Cooperative Soil Surveys were accelerated and published for all eight counties in Connecticut; Hartford County in 1962 through New London County in 1983. To better meet users needs for a seamless soil survey, a single legend for the whole state, and a flexible digital project that could be used in a GIS system, in 1983 we began to modernize our eight surveys into a single digital statewide survey.

ln cooperation with CT DEP, we have successfully pursued funding for our modernization through Environmental Protection Agency (EPA) grants and matching funds from the Connecticut Department of Transportation. We have established this effort as a five-year project of remapping, recorrelation, compilation, digitizing, and product development. The following are some of our accomplishments to date:

* Established a statewide legend for the entire state
* Phase 1

Activities related to classification, morphology, and genesis have been limited, but Connecticut SCS and University Staff did host a portion of the New York-Connecticut-Massachusetts Dense Till-Fragipan Tour. to examine dense till and fragipan soils/landscapes and test the proposed criteria.

In addition. we are currently in the process of updating many of the series we are responsible for. to accomodate changes in taxonomy and how we describe redoximorphic features.

Representatives of the Storrs Agricultural Experiment Station and the Connecticut Agricultural Experiment could not attend this meeting. so I respectfully presented abstracts of their current research.

Storrs, University of Connecticut Agricultural Experiment Station
- Report attached

Connecticut Agricultural Experiment Station
- Report attached

[redacted]

lower

[redacted]

Intensively Managed Pastures:

[redacted]

to pasture had little influence on soil

N%-N concentrations: there were few differences detected when

Atrazine Leaching Losses in Banded and Broadcast Treatments in Corn: Atrazine is generally applied to corn fields in a broadcast spray. Application of the herbicide in a band directly over the maize row, however, reduces the loading rate to a field and may reduce the potential for losses to groundwater. Zero-tension pan lysimeters were used to collect percolate from banded and broadcast atrasine-treated maize plots in 1993. Samples were analyzed for atrazine using immunoassay. Wean concentrations of atrazine in collected percolate were greater in the broadcast treatment (1.0 $\mu g\ L^{-1}$) compared with concentrations in the banded treatment (0.3 $\mu g\ L^{-1}$). Cumulative losses of atrazine in the soil water for the broadcast and banded treatments were 1891 and 204 mg ha^{-1}, respectively. LOSS of atrasine in both treatment5 was associated with increased percolation. Banded application has the potential to reduce soil water losses of atrazine compared with broadcast application. Personnel: K. Guillard, G. S. Warner, K. K. Hatfield, and J. Stake.

Effect of dissolved carbonates on the adsorption of protons by oxides: A back-titration technique for measuring the adsorption of aqueous protons on the surface of oxides was initiated in our new laboratory. The necessary automation of the titration equipment was completed, and the installation of the basic laboratory equipment needed for this research has progressed significantly (e.g., installation of a clean, pure-water source). The two oxides studied were aluminum and titanium oxides. To slurries of these oxides, a known guantity of acid or base was added, equilibrated overnight, and analyzed by titration methods for amount of protons remaining in solution. Known quantities of Na-bicarbonate were also added to various samples of the Al-oxide, and this modification resulted in an enhanced adsorption of protons. Using automatic inorganic carbon analyzer, it was also confirmed that Tioxide displays a bicarbonate adsorption envelope (a pH-dependent adsorption pattern) with an adsorption maximum at pH 5. These data suggest that the presence of inorganic-c in soil environments may significantly increase the apparent surface charge of oxides in soil. Personnel: C. P. Schulthess, J. Belek, K. Swanson.

The suspension effect: the Donnan potential vs. the Liquid Junction potential: The term "suspension effect" refers to the variation in measured pH of a slurry as a function of the physical placement of the electrodes (e.g., in the slurry versus in the supernatant). An earlier study in Japan showed that the measured pH of resin had a unique time-dependent response when both electrodes (glass and reference) were in the supernatant; this type of response was not present when the underlying resin was absent. In theory, identical response patterns were expected, We attempted, unsuccessfully, to reproduce these extraordinary results. The cause for our failure to reproduce these results is not clear at this time. Personnel: C. P. Schulthess, J. Belek, S. Tokunaga.

THE CONNECTICUT

AGRICULTURAL EXPERIMENT STATION

Record of the Year

1992-1993

The Connecticut Agricultural Experiment **Station,** founded in 1875, **was the first** *experiment station in the United States.* The Station has **laboratories, offices, and greenhouses** at 123 Huntington Street, New Haven **06504. Lockwood** Farm for experiments on Evergreen Avenue in **Hamden, and the Valley Laboratory and farm on Cook** Hill Road, **Windsor 06095. Station research** is conducted by **the** following departments: **Analytical Chemistry, Biochemistry** and **Genetics, Entomology,** Forestry and **Horticulture, Plant Pathology and Ecology,** Soil **and** Water. The Station **is chartered by the Connecticut General** Statutes to experiment with **plants and their pests, insects, soil and water and to perform analyses.**

DEPARTMENT OF SOIL AND WATER

Chemical treatment of pesticide wastes: Dr. Joseph Pignatello (assisted by M. Day) continued his investigations into the use of [redacted] hydrogen peroxide for treatment of water or soil contaminated with pesticides and other hazardous organic compounds. The proposed method for water involves reaction with hydrogen peroxide and a ferric salt under slightly acidic conditions (pH ~3) and irradiating the reaction mixture with visible or 350 nm UV light (hereafter, $Fe^{3+}/H_2O_2/UV$). The proposed method for soil involves treatment in the dark at its natural pH with hydrogen peroxide and a ferric complex of a carboxylate or phenolate ligand L (hereafter, FeL/H_2O_2).

Progress has been made toward identification of the organic degradation products of 2,4-D and metolachlor resulting from $Fe^{3+}/H_2O_2/UV$ oxidation. Previous experiments showed complete oxidation of 2,4-D to CO_2 and HCl. Reactions interrupted before completion showed 2,4-dichlorophenol, 2,4-dichlorophenyl formate, 2,4-dichloro-1-(chloromethoxy)benzene, 6,8-dichloro-2H-1,4-benzodioxan-3-one, formic acid, and oxalic acid as the major products. Oxalic acid accumulates to ~60% yield in the dark but is completely oxidized in light. Experiment and numerical simulation suggest that oxalate is stable in the dark it complexes with ferric ion, whereas in the light this complex photolyzes to CO_2 and ferrous ion.

Metolachlor (0.1 mM) is completely degraded by $Fe^{3+}/H_2O_2/UV$ to CO_2, HCl, and inorganic N (9:1 NH_3:NO_3^-) in 6 hours at 10 mM H_2O_2 and 1 mM Fe(III). Experiments with ring-^{14}C-metolachlor indicate that the ring is oxidized more rapidly than the side chains. Several organic intermediates were tentatively identified on the basis of their mass spectra. Their identities are consistent with attack of the oxidant (presumably hydroxyl radical) at most positions on the molecule. Chloroacetic acid was one of the more persistent chlorinated products.

A commercial polychiorobiphcnyl (PCB), Aroclor 1242. was also extensively degraded by $Fe^{3+}/H_2O_2/UV$. Aroclor 1242 is a mixture of tri-. tetra-, and pentachlorobiphenyls. with smaller amounts of mono-, di-. and hexachlorobiphenyls. The reaction conditions employed a 1 g/L two-phase mixture in acidified water at 66C. Up to 88% PCB removal and 83% dechlorination occurred over a 21 hour period. The production of chloride is consistent with deep oxidation of the PCBs. Much less degradation occurred at room temperature or in the absence of light. The order of reactivity was di- > tri- > tetra- ~= penta or higher Cl congeners. but the selectivity was weak. Perfluorinated surfactants added to increase PCB solubility in water (or rate of dissolution from the oil phase) had a detrimental effect on degradation.

Previous experiments showed that 2,4-D in soil (0.01 mole/kg, 2000 ppm) could be degraded leaching to ground water observed here likely resulted from a much higher nitrogen content of the compost than anticipated at the tune of application.

Compost stockpile: Ground water samples from three test wells installed up-gradient and three down-gradient along the perimeter of the 50yd^3 compost stockpile were collected monthly and analyzed for the heavy metals and nitrate as described above for the field plot. As in the field plot, concentrations of heavy metals in the up-gradient and down-gradient wells around the stockpile did not differ significantly and also remained below the drinking waler standards throughout the 18 month period. Clearly, leaching of heavy metals from the compost pile also did not contaminate the ground water. Mean contribution of nitrate from compost pile over the 18 months was 4.9 mg L^{-1}, which is slightly lower than in the field plot.

Leachability of heavy metals from source-separated municipal solid waste

Utilization of municipal solid waste compost for nursery stock: As composting becomes more and more popular as a waste disposal alternative, finding uses for the finished product becomes important. In a three year study at Windsor and Mt. Carmel, Dr. Abigail A. Maynard is determining the suitability of municipal solid waste (MSW) compost as a mulch or soii amendment in field-grown nursery stock. In addition the potential for nitrate leaching from MSW compost-amended soils is also being determined. Plants studied include red and sugar maple, pin oak, and white pine. Weed counts were made in October to determine the effectiveness of the compost in controlling weeds when used as a mulch While herbicides provided the best control. there were 6-8 times fewer weeds in mulched plots compared to untreated plots. In Winter 92-93. initial measurements including height, crown volume, number of shoots, color, and caliper of the plants were made. The nutrient status and organic content of the compost-amended soil were also determined. Organic matter percentage and pH increased on the compost-amended plots as well as other plant nutrients. Nitrate analysis of the ground water throughout the year showed concentrations well below the 10 ppm drinking water standard with virtually no differences between the treatments.

Utilization *of municipal* solid *waste compost for vegetable production:* In Spring 1991. source-separated municipal solid waste from Fairfield and Greenwich was composted in Fairfield's composting facility in a trial run. To determine the potential benefits of this MSW compost, Dr. Maynard compared yields of field-grown tomatoes grown in compost-amended soils (applied at 25 and 50 T/A) with yields from unamended roils. AU plots were fertilized. Average yields (lbs/plant) from plots amended with 50 T/A MSW compost were 38% greater when compared to the unamended control. Yields from plots amended with 25 T/A MS W compost increased 23%. The average number of tomatoes per plant and the average weight of each tomato were also greater from the compost-amended plots. The addition of 50 T/A MSW compost raised the pH of the soil from 5.4 to 62 and increased the organic matter 38%. MSW compost was reapplied at the same rates in Spring 1993 and replanted with tomatoes to determine the cumulative effects.

Utilization *of* municipal ond *industrial compost for* container grown *plants:* Municipal and industrial composts were tested as replacements for the peat, sand and perlite used in potting media *by Gregory* Bugbee. Composts from four Connecticut facilities were evaluated: 1) coffee and food processing residue compost from Nestle Inc., New Milford, 2) MSW compost from Fairfield, 3) wood chip and sewage sludge compost from Hartford and 4) wood chip, sewage sludge, leaves and wood ash from Bristol. Physical and chemical properties of all media components were determined. A conventional potting media containing 0%/vol. compost, 50% peat, 30% perlite and 20 % sand was amended to contain 0, 10, 25, 37.50.80 and 100% of each compost. Rudbeckia cv. "Goldilocks" were grown for four months in two-l pots containing each medium. Leachate was collected at two week intervals and analyzed for nitrate and ammonia nitrogen. The dry weight of plants grown in media containing up to 25 %/vol. of all the composts was equal or greater than the plants grown in unamended media. Higher percentages of the Hartford and Fairfield

Raw leaves as a soil *amendment:* Many municipalities in Connecticut with leaf collection programs in the fall are turning to farmers to dispose of their leaves. However. nor al! farmers have extra land to set aside for a standard composting operation. Instead. they layer undccomposcd leaves on their fields and simply plow them under. This is called sheer composting. Niuogm deficiency can be a problem in these soils because the microorganisms involved in leaf decomposition use nitrogen more efficiently than plants. To determine whether sheer composting leads to decreased yields, Dr. Maynard is conducting experiments at both the Valley Laboratory and Lockwood Farm. Undecomposed leaves were layered about six inches thick on one set of plots in November 1991 and another set in April 1992. The leaves were incorporated into the soil by rototilling in two directions, perpendicular to one another. Yields from these plots were compared to yields in plots amended in April 1992 with one inch of finished leaf

Leaf compost in container media: An experiment has been initiated by Gregory Bugbee, at Casertano Farms in Cheshire, to determine how leaf compost can best be used to grow containerized plants. Five species of perennial flowers have are being grown in media containing 0, 25, 40, 60 and 80% leaf compost. The remainder of each media is perlite and a costly compost from Maine. Casterno Farms is a leaf collection site for the town of Cheshire and this study is funded by The Northeast Region Sustainable Agriculture Research and Education Program.

Cumulative effects of compost: Chicken manure compost was applied for three consecutive years to the same plots in a previous experiment. This study continued on a limited basis in 1992 to determine if, after three years of compost additions, enough nutrients have accumulated in the soil to sustain the growth of a variety of vegetables without additional inorganic fertilizer or compost. At Mt. Carmel, yields of lettuce from the compost-amended plots averaged 1.1 lbs/plant compared to 1.0 lb/plant on the fertilized control. This was the only crop in which the compost-amended plots had yields which equaled or exceeded the fertilized control plots. spring broccoli had yields of 1.0 lb/plant on the fertilized control compared to 0.8 lb/plant on the compost-amended plots. The highest yields of spring cauliflower were from the control plots (1.9 lb/plant) with the compost-amended plots averaging 1.0 lb/plant. Tomato yields from the fertilized control were 17 lbs/plant compared to 11 lbs/plant from the compost-amended plots. The control plots also had

Delaware Soil Survey Report
Richard Hall, Retired
SCS, Dover, Delaware

Soils Team: Elesa Cottrell, Acting State Soil Scientist
Charles Parker, Asst. State Soil Scientist and Soil Survey Data Base Manager
Christine Coffin, Soil Scientist, Georgetown
Mary Ann Levan, Soil Scientist, Newark

The cooperators in the Delaware Soil Survey Program are the Delaware Department of Natural Resources, the University of Delaware Department of Plant and Soil Sciences, and the Delaware Association of Conservation Districts.

Delaware has only one full-time field soil scientist and is updating the soil survey in Sussex and New Castle counties. Mrs. Levan is updating the survey in New Castle County and works three days a week. The entire state will be published as one report. To date 36 percent, about 446,000 acres, are updated and about 300,000 acres are digitized. Updating is being done at the uniformscale of 1:24000 on ortho-photography.

NASIS is about 45 percent complete.

A new Major Land Resource Area (MLRA), 153D (4,218 square miles), is developed for Delaware, Maryland, and New Jersey. Four MLRA's are found in the state (148, 149A, 153C, and now 153D). 153D is called Northern Tidewater and covers about 50 percent of Delaware, which is all of Sussex County (946 square miles).

The State has a new series of 7.5 minute topographic quad sheets. These were developed on the 81 and 82 photography and are at a contour interval of five feet except in the Upper Coastal Plain and Piedmont.

Studies in Delaware:

1. Base Saturation of Coastal Plain Soils: A study of the impact of material from the Piedmont on soils below the fall line has begun. Four sites are selected that have old growth timber forest and a cultivated field side by side. The soil profile is sampled at three depths for analysis.

2. Redoximorphic Features: Another study of red sands in the area of the divide between the Chesapeake Bay and Delaware Bay watersheds has begun. A few redoximorphic features have been

noted in soil descriptions indicating seasonal high water tables, but because of color, high water inferences are questioned. A series of wells for observation are being installed.

Maine Agricultural and Forest Experiment Station Report

Robert V. Rourke

In the past two years several members of the College of Natural Resources, Forestry and Agricultures have been engaged in pedologically related research activities.

Cooperative Forestry Research Unit.

R. D. Briggs

Soils research of Cooperative Forestry Research Unit centers on site productivity. Following six years of research, a field guide for classification of soils according to expected conifer productivity is in press. Site classification research continues as the emphasis but has shifted from conifers to deciduous species. During the past two years we have been conducting field studies to evaluate the species composition as a function of soil and topographic characteristics in western Maine. Building on those results, current efforts are directed towards evaluation of sugar maple productivity within and among the habitat types that have been identified.

The 1994 field season marks the completion of the research project examining impacts of precommercial thinning and fertilization of spruce-fir stands on surface water chemistry and tree growth across soil drainage classes. The project is being conducted on paired watersheds at Weymouth Point. In addition to advancing our understanding of precommercial thinning impacts on stand growth and development, this project provides us with the opportunity to extend the record (initiated in 1979) of solution chemistry response to clearcut harvesting and subsequent control of vegetation competing with conifer crop trees.

The Maine climate gradient study, undertaken in cooperation with Ivan Fernandez, takes advantage of the existing gradient across Maine to study climatic impacts on rates or nutrient cycling in forest soil. Forty eight plots were strategically located along four transects spanning four climate zones. Temperature and precipitation are continuously recorded at each of the transect endpoints. Rates of organic matter decomposition, N mineralization, CO_2 evolution from and partial pressures in the soil are being measured. Preliminary analysis showed that mean air temperature and soil moisture content explained 44% of the variation in N mineralization across the study area.

Soil Microbiology Studies.

L. M. Zibilske

Current work in the Soil Microbiology program is concentrated on the roles of soluble organic matter in determining the viability and productivity of soil microbial biomass. Of particular- interest are the interactions of soluble, available carbon and nitrogen in forested and agricultural systems. These investigations are examining whether the types and amounts of soluble carbon in a soil system affect the survival and subsequent mineralization activity of soil microbes during the plant growing periods of the year.

Soil Characterization Studies.

Robert V. Rourke

Soil characterization efforts in recent years have been completed and published on the Chesuncook, Telos, Colonel, and Dixfield soil mapping units. Work is continuing through fiscal 1994 on the cryic, shallow, Saddleback and deep Sisk soil mapping units.

A study of water tables, soil temperatures and morphological soil characteristics on selected Maine soils has been completed and published. This study was conducted over several years by soil scientists of the USDA in the various regions of the state that had active soil survey parties. The data was compiled and edited by Paul Hughes a soil scientist with the SCS USDA. The report present information concerning the relationship between water table heights, duration, and morphological characteristics of the soils.

Soil Chemistry Research.

Tsutomu Ohno and M. Susan Erich

The research goals of this program are to develop a mechanistic understanding of how water-soluble soil organic matter interacts with ions in soil solution and with soil surfaces. A specific research focus is on the ability of these naturally-derived organic ligands to alter rates of such important soil chemical reactions as the precipitation or dissolution of the essential plant nutrient phosphorus. Several research projects are underway with the following objectives: 1) to chemically characterize water soluble organic ligands extracted from crop residues, manures, and mineral and organic soil horizons; 2) to investigate the effects of ionic composition on the physical conformation of water-soluble organic matter; 3) to determine the effects of this organic matter on the kinetics of phosphorus precipitation and dissolution; and 4) to use the results of the above studies to develop a conceptual model of how naturally-derived soluble soil organic matter interacts with soil surfaces to affect phosphorus solubility.

Forest Soils Research.

Ivan J. Fernandez

The forest soils program is involved in several major ecosystem level programs of research investigating the effects of nitrogen and sulfur deposition (air pollution), temperature and moisture (climate change), and residuals (sludge and ash) effects on soil processes and ecosystem health. A whole watershed manipulation at the Bear Brook Watershed in Maine has included catchment-scale treatments of N and S by helicopter since the fall of 1989. This study has included intensive work on soil processes controlling the retention and release of these elements, and the role of specific biological and chemical processes in ecosystem response. At the Howland Integrated Forest Study site there is a suite of research projects determining the effects of temperature and moisture on biogeochemical cycling in forested ecosystems with emphasis on soil processes. This includes long-term monitoring of soil solutions with intensive quantitative soil pit research, experimental soil warming studies in the field using underground heat cables, and a study of the relationship between climate and soils based on a network of 16 sites located throughout Maine across the four distinct climatic regions of the state. In addition, a clearcut watershed in western Maine is the site of a study of the effects of forest harvesting, herbicides, and papermill sludge-ash land application on forest soil response and recovery. All of this research is founded on the goal of quantifying biogeochemical cycling in key forested ecosystems, and defining the soil processes most critical in controlling the response of these ecosystems to environmental perturbations.

MARYLAND PROGRESS REPORT

National Cooperative Soil Survey
current Staffing In Maryland

Name/Position	Location	Grade
James H. Brown, State Soil Scientist	Annapolis	GM-13
William Dean Cowherd, Asst. State Soil Scientist	Annapolis	GS-12
Lydia Schlosser, Soil Scientist (Part-time)	Annapolis	GS-11
Rebecca Jeffries, Secretary	Annapolis	GS-06
Carl Robinette, Soil Scientist	Cumberland	GS-11
James Brewer, Soil Scientist	Cambridge	GS-11
George Demas, Soil Scientist	Snow Hill	GS-11
David Verdone, Soil Scientist	Frederick	GS-09
Phillip King, Soil Scientist	Hagerstown	GS-09
Joseph Kraft, Soil Scientist	Hagerstown	GS-11
Diane Sheild, Soil Scientist	Centerville	GS-11
Leander Brown, Soil Scientist COE/	Baltimore	GS-12
John Burns, Soil Scientist	Snow Hill	GS-09
Melvin Tucker, Volunteer	Annapolis	

Current University of Maryland Staff
College Park and Eastern Shore

Dr. Martin Robenhorst,	Asst. Prof. of Pedology,	(301) 405-1343
Dr. Delvin Fanning,	Prof. of Soil Science,	(301) 405-1344
Dr. Richard Weismiller,	Prof. of Soil Science, Acting Chairman for Dept. of Agronomy	(301) 405-1312
Jim Jordon,	Asst. Researcher Plants and Soil Science	(301) 651-2200 Ext. 634

Soil Survey
Updates In *Progress*

Anne Arundel
Baltimore City
Frederick
Queen Anne's
Washington
Worcester

Number of acreage last year - 360,000 acres.

Five new soil series have been proposed.

Funding Support

Anne Arundel
Corps of Engineers
Frederick
National Park Service
Queen Anne's
Washington
Worcester

Maryland Agricultural Experiment Station
1994 Report
Martin C. Rabenhorst

Ongoing Research Projects in Pedology

1. Sulfidic Materials - Evaluation and Testing of Definition
   Graduate Students Steve Burch and Ahmed Hussein

2. Development of Soil Chronofunctions in Tidal Marsh Soils - (NASA)
   Sulfide Accumulation - Graduate Student Ahmed Hussein
   Carbon Storage - Graduate Student Melvin Tucker

3. Impact of Sea Level Rise on Soil Quality in Coastal Areas (SCS-Global Warming)
   Graduate Student Ahmed Hussein

4. Soils, Hydrology, and Vegetation in Dunal Landscapes of the Lower Delmarva Peninsula
   Graduate Student Sara Tangren

5. Quantitative Relationships Among Groundwater, Plant Community, and Soil Morphology in a Palustrine Wetland (EPA)
   Graduate Student Sara Tangren

6. Water Tables and Soil Morphology: Quantification Using Simulated Hydrographs (EPA)
   Graduate Student L. Peter Galusky

7. Mineralogical Placement of Loamy Soils (Coop. with SCS)
   with Soil Scientist Diane Shields

8. Impact of Agricultural Activity on the Base Saturation (Coop. with SCS)
   with Soil Scientists Diane Shields and George Demas

9. Pedo-Geomorphic Assessment of Sulfidic Materials (Coop. with SCS)

10. Submerged Soils in Shallow Water Habitats (proposed - Coop. with SCS)
    Soil Scientist George Demas

11. Constructed Wetlands for Treating AMD
    Graduate Student Mark Magness

Present Soils Faculty in the Department of Agronomy

Scott Angle - Soil Microbiology
Frank Coale - Soil Fertility/Nutrient Mgmt.
Del Fanning - Soil Genesis and Mineralogy
Bob Hill - Soil Physics
Bruce James - Soil Chemistry
Raymond Miller - Soil Chemistry and GIS
Martin Rabenhorst - Pedology
Ray Weil - Soil Fertility
Richard Weismiller - Soil &Water Resources

New Courses Developed

AGRO 499A (Now AGRO 461) - Hydric and Hydromorphic Soils
AGRO 4998 (Now AGRO 425) - Terrestrial Bioremediation

Other Cooperative Efforts

General Soil Map of Maryland
1994 National Soil Judging Contest - Queen Annes County, MD

MASSACHUSETTS AGRICULTURAL EXPERIMENT STATION

Peter L.H. **Veneman**
Department of Plant **and** Soil **Sciences**
University of **Massachusetts** at **Amherst**

The past years have bee" marked by budget Cuts and retrenchment et most academic **institutions** in the United States. The University of **Massachusetts** is no exception, **in** fact we now have the distinction of being the second most expensive public university in the country. Not bed for **a** state that has the fourth **largest** per capita income. **More** and **more** we **see** the **mission** of the university being changed from **a** primary **focus** on education to one that **values** funded research and **paid services.** Outside dollars become the primary reason for program **expansion,** never mind that **some** programs may provide **essential** services to the **state** and the general public. Even though the state budget hae **seen a** healthy boost over the last few **years, a** likewise increase in academic **budgets is** still lacking. This phenomenon probably is quite familiar to most of you gathered et **this** meeting.

During the past two **years, Drs.** John Baker end Daniel Hillel, soil chemist and soil **physicist** respectively, retired. Due to **a** hieing freeze, both **positions** are still vacant and probably will remain **so** until at least 1996. Dr. Rohde, long-term **MAES** director, will retire next month. The **position was** slated to be merged with that of the office of extension Dean, however, that idea has been shelved and **a** search will commence within the next few months.

Despite the lack of support from the administration, **our** regional off-campus program **is** doing very well. Presently **some** 45 students are enrolled in the program that allows working **professionals** to ear" at least 15 **credits** in **soil** science courses. **Our** students are engineers, geologists, **biologists,** and environmental **specialists** who are currently working and seek to gain additional soils training. The **courses** generally are held on Saturday6 in **a** central location. All **courses are** identical to **our on-campus courses** and generally have the same instructors. upon completion of the 15 credits the students receive **a** certificate on behalf of the presidents of the New England landgrant **institutions.** A "umber of these **students** have expressed en interest in cue off-campus Master of Science program. Unfortunately, due to the lack of active faculty, we had to limit the "umber of students in that program. We expect **a** significant enrollment in the off-campus H.S. program once existing faculty vacancies are filled.

Judy **Bartos** is finishing her work on the **distribution** of heavy metals in relation to different parent materials including **outwash,** till, **glaciolacustrine,** and floodplain sediments. Significant amounts of Cd, Cu, Ho, Ni, Pb, and **Zn** are occluded in soil minerals, generally not in **a bio-available** form. Accordingly, she reported very low **amounts** of TCLP extractable heavy metals. **Regression** with commonly determined soil **properties** did indicate trends (e.g. **more** heavy metals with increasing clay content) but low **correlation coefficients** generally indicated a poor correlation. Spatial variability due to regional differences in parent material appeared **significant.**

Ken **Deshais** and David **Gorden** completed their thesis work on the New England Soil Monitoring project. This study involved long-term monitoring of water table levels and **soil** temperatures at almost 50 **sites** throughout southern New England. At a number of sites additional measurements of soil **matric** potential, **redox** potential, dissolved oxygen levels, and **concentrations** of ferrous iron are performed. A strong spatial correlation at the regional level was evident, indicating the need for regional indicators of wetness rather than more general national parameters. We also found that growing seasons based on soil temperatures in excess of 5 **°C** resulted in very long growing periods. For example, in **southern** New England the growing season based on Soil Taxonomy was from April 15 to the beginning of December. The actual growing season (based on vegetational observations) runs from early April to the beginning of October. Use of climatic data as provided in soil survey reports (generally Table 2) provided much more realistic estimates of the growing season.

In loamy soils, low chroma colors tend to be useful indicators of the seasonal water table. Color criteria for sandy soils, however, may need to be revised. **For** example, a sandy loam to **sandy** textured soil displayed saturation within 30 cm for at least 3 weeks during the growing season, yet had a dominant color of 4 and about **20% redox** depletions with a chroma of 1. A comparison of hydrophytic vegetation, **hydric** soils and wetland hydrology indicated that the soils and hydrology agreed more often than did the vegetation which generally expanded beyond the wetland boundary.

Research in iron **cycling** in wetlands in southern New England is continuing, in part because a number of poorly and very poorly drained soils have much higher chroma colors than one would expect based on the landscape position. This work also may prove interesting in respect to **mechanisms** developed by wetland plants to cops with iron toxicity. The latter may have implications in wetland restoration and mitigation projects.

State Report: New Hampshire
Steve Hundley and Chris Evans

Part One--Soil Survey Program Activities

There are currently two soil survey mapping efforts continuing in New Hampshire. The Coos County Survey will complete the once-over for New Hampshire and the survey of Merrimack and Belknap Counties is being handled as a single soil survey update. The anticipated completion date for Coos is 1997, with the completion date for Merrimack-Belknap extending until 2002. This extension reflects continued reductions in soil survey budgets, anticipated reduction in field soil scientists, and increasing priorities elsewhere in the program.

There is currently a staff of nine soil scientists in the soil survey program, including a husband-wife team filling a single position in a staff-share arrangement. This husband-wife team was on a three-month mapping detail to Virginia this past winter. The soil survey staff includes the State Soil Scientist, Assistant State Soil Scientist, Soil Dataset Manager, two project leaders and four soil scientists carrying out production soil mapping.
Through cooperative efforts with the University and the Office of State Planning, we now have the soil survey in six counties digitized. The seventh county, Sullivan, is currently being recompiled onto an orthophoto base in preparation for digitization this winter. The three remaining counties to be digitized are Coos, Belknap and Merrimack, in which soil quads are being digitized as mapping is completed.

The only "hole" in thestate, as far as mapplng is concerned, is the White Mountains National Forest. There is centinulng communication between SCS and the USFS in establishing a soil survey program In the National Forest, but at this time sufficient funding seems to be the major deterrent. New Hampshire is currently in the third year of a wet soil monitoring program, being funded through the National Global Change Initiative. This is a cooperative effort between SCS and the NHAES. Fourteen sites have been established in the stnte, primarily in Aquods and Aquepts, to assess wetness morphology with actual data on saturated and unsaturated conditions. Data collected include water table depths, redox potential, soil temperature and unsaturated soil moisture. A presentation of interim results was given at the National Wet Soil Monitoring Conference in Fargo, North Dakota, in June 1994, and a poster session will he presented at the ASA Meetings in Washington this Fall.

New Hampshire has recently received endorsement from the SCS National Office to adopt Order 1 mapping standards for the State and to enter into a cooperative agreement with the New Hampshire Board of Certification of Natural Scientists to carry out the Order 1 mapping standards by the private sector. This MOU provides the vehicle by which quality control and quality assurance will be carried out on map products produced by private soil consultants. We believe New Hampshire is the first state in the Nation to have uniform mapping standards for use by both the private and public sector, supported by State regulatory agencies and referenced in state statutes, model ordinances and other land-use policies.

The SCS in New Hampshire is worklng with the SCS in Massachusetts to establish a soil survey of the Merrimack River Basin. This effort is a **result** of trying to meet our customer's needs by developing a seamless soil survey and one soil survey legend for the **3,200,000** acres covering **15** soil survey areas within the Merrimack River Basin. This effort **will** be in support of the Merrimack River Initiative, funded through EPA and the Northeast Interstate Water Pollution Control Commission to address water quality concerns and issues within the watershed. New Hampshire will be **taking** the leadership role in this effort as all of the River Basin that occurs in Massachusetts has complete, up-to-date soils mapping. The MOU for the Soil Survey of the Merrimack **River** Basin **is** expected to be signed this Fall and will include the update mapping currently underway in Merrimack and Belknap Counties. It will also include update needs in portions of Carroll and Strafford Counties In New Hampshire.

We are also developing an MOU for the soil survey management area of MLRA 1448. This area covers portions of the frigid temperature regime in Eastern Maine, portions of New Hampshire, Massachusetts, Vermont, and New York. This effort is in support of National Strategic Planning to establish MLRA **soil** survey management **areas.**

Other activities these past two years Include responsibilities in carrying out the 1992 National Resource Inventory in New Hampshire, preliminary studies in Organic Carbon sampling, **pre-**conversion editing of the State Soil Survey Database in preparation for the National Soil Information System, and reclassification of **official** series descriptions to recent revisions in soil taxonomy.

Part Two-Agricultural Experiment Station

In addition to the soil-water monitoring detailed above, the pedology program personnel are involved in two other major initiatives. First, a Hatch project dealing with map unit development for anthropogenic soils. This program builds on earlier work completed in Mitchel Strain's M.S. thesis, and will consist of identifying and characterizing different types of anthropogenic soils in New Hampshire. Objectives of the program are to characterize **soil** properties-and their variability--within a variety of contexts, and to develop a data base which can be used to generate nppropriate choices for defining map unit characteristics and interpretations.

The second initiative is a series of studies of the naturally radioactive granites and soils **that** are abundant in New Hampshire. Projects have been designed to exnmine weathering rates and rates of radionuclide release during initial alteration, effects of **podzolization processes** on redistribution of released radionuclides, and bioavaiinhilitylndices which will tie pedogenic processes to forms of **nuclides** most likely to be absorbed by plants. Work has also been nearly completed on two studies relating **areal** and spatial distribution of **soil** radioactivity to individual soil series and to map unit composition.

CORNELL UNIVERSITY AGRICULTURAL EXPERIMENT STATION

Dr. Ray B. Bryant
Department of Soil, Crop and Atmospheric Sciences
Room 709 Bradfield Hall
Cornell University
Ithaca, NY 14853-1901

The beginning of a new emphasis in soil genesis research was marked by the organization of a special symposium on quantitative modeling of soil genesis at the 1992 Annual Meetings of the Soil Science Society of America. A special publication of the presentations, authored by R.B. Bryant and R.W. Arnold, should he available by the end of 1994. A similar symposium was organized by R.B. Bryant and E. Pena Cervantes for the 15th World Congress of Soil Science in Acapulco, Mexico (July, 1994). Quantitative modeling of soil forming processes is basic research needed for addressing questions related to acid deposition, global climate change, and for the development of new soil interpretations. We believe that this kind of research should he an integral part of soil survey updates by MLRA. A basic review of modeling pedogenesis by M.R. Hoosbeek and R.B. Bryant was published in Geoderma, 55 (1992) 183-210. Marcel Hoosbeek completed his PhD in August, 1993 and is currently doing post-doctoral study at Syracuse University. .In September, 1994, Dr. Hoosbeek will join the staff at Wageningen University, Holland.

John Galbraith is near completion of a study to assess the feasibility of developing an expert system for Soil Taxonomy. A prototype of the program was demonstrated al the ISSS Congress in Mexico and will be presented also at the ASA-SSSA annual meetings in Seattle (Nov. 1994). Elena Mikhailova is nearing completion of a Master's study. Her work will result in a provisional erosivity map for Honduras as part of a larger interdisciplinary project on sustainable agriculture. Saiping Tso is beginning soil survey activities in the Dominican Republic. She is trying to develop a methodology for using indigenous knowledge of soils to interpret medium scale soil surveys (1:50,000) for use by farmers managing fields of less than I hectare. Freddy Sancho has completed his course work and returned to Costa Rica to conduct the field research component of his PhD program.

Although the results are not statistically valid, carbon sequestration studies in the Tughill region of New York show interesting trends. Carbon estimates are biased by small scale maps. When map scale requires generalization beyond the ahility to report small areas of Histosols, the amount of carbon sequestered in these landscaped in grossly under estimated. Work will be continued for the purpose of gathering data on carbon in soils at higher elevations and for gathering additional data for achieving statistical validation of earlier results.

RHODE ISLAND AGRICULTURAL EXPERIMENT STATION
William R. Wright
Department of Natural Resources Science
University of Rhode Island
Kingston, RI 02881

1. Comparison of Natural and Constructed Wetlands

C. Duncan and P. Groffman

Microbial biomass C, soil respiration, denitrification enzyme activity (DEA), and potential net N mineralization and nitrification were compared in two constructed and three natural wetlands. The constructed wetlands studied had marsh and wet meadow vegetation and received storm water discharge directly from a large shopping mall and its associated parking lots. The natural sites encompassed three soil drainage classes (moderately well drained, poorly drained, and very poorly drained) across an upland to wetland transition zone with red maple (Acer rubrum L.) swamps and mixed oak (Quercus sp.) forests in the transition zone. Our objective was to determine if microbial biomass and activity were similar in the constructed wetlands and the most common type of natural wetland in our area. Microbial biomass C, DEA, and potential net N mineralization and nitrification were similar among the constructed and natural wetland sites. In all cases, levels of these parameters in the constructed wetlands fell within the range of variability observed in the natural wetlands. Denitrification enzyme activity was higher ($p < 0.05$) in the constructed wetlands than in the moderately well drained soils at the natural sites. Soil respiration was generally lower ($p < 0.05$) in the constructed wetlands than in the natural wetlands. The results suggest that the constructed wetlands have a significant and active microbial community that facilitates nutrient cycling and water quality maintenance functions similar to natural wetlands. The successful development of the microbial community in these wetlands was likely due to the use of organic substrates and aggressive establishment of the plant community during wetland construction.

2. Nitrate Removal in Wetland Transition Zones

W. Nelson and A. Gold

The objective of this study was to examine groundwater nitrate removal rates within a soil toposequence with respect to soil drainage class, time of year, and depth below groundwater table. Experimental units consisting of a groundwater nutrient application well and a set of sampling wells were instrumented along three soil drainage class transects at two depths (six treatments). A solution containing nitrate and a conservative tracer (bromide) were added continuously and monitored during March, June, September, and November. Nitrate removal rates (ug NO_3-N per kg soil per day) were determined by coupling results of the Na:Bromide analyses with groundwater flux estimates from the experimental unit. Significant differences by soil drainage transect were observed with the highest rates occurring in the poorly drained transect and the lowest rates occurring in the somewhat poorly drained transect. Significant differences were found between sampling periods with the highest rates in September and November and the lowest rates in March and June. Microbial activity rather than plant activity appeared to be the dominant process responsible for the nitrate removal.

3. Prediction of vegetative Cover With the Aid of Remotely Sensed Spectral Data. Digital Terrain Data and Soil Drainage Classes

R. Duhaime and P. August

Near-infrared digital orthophotography and three collateral datasets were used to model ecological communities on Block Island, Rhode Island. Aerial photography of the island was taken on May 19, 1992 at a nominal scale of 1:40,000. The photography was scanned and differentially rectified. The resulting dataset was comprised of three spectral bands and had a pixel dimension of 1.27m. The three bands of data were used as independent variables in the model. The terrain model that was used to create the orthoimagery of Block Island were also used to derive SLOPE and ASPECT data. Soil Survey data was used to create a DRAINAGE CLASS dataset and this was used to distinguish wetland from upland vegetation. Overall there were 9 independent variables and one dependent variable (vegetation class) in the model. Linear discriminent analysis was used to classify 14 vegetation types within 6 discrete land cover classes. Overall Classification Accuracy was 77.1 percent for training data and 56.6 percent for validation data. The ecological variable DRAINAGE CLASS dominated the model and explained the most variation in vegetation class.

4. Spatial Variability of Heaw Metals in Rhode Island Soils

M. Wood and W. Wright

Eighty soil profiles representing the four dominant parent materials/soil series in Rhode Island were sampled for analyses. These well-drained, agricultural soils, represent approximately 27 percent of the soils in the state. A, B. and C horizon were sampled for each pedon and analyzed for available (DTPA), extractable (0.1 N HCl)

Septic System Regulations are being revised to include more emphasis on a soil-based site suitability criteria for on-site sewage treatment.

To assist RIDEM and the private sector to understand the current science of hydric soils and soil-based septic system siting, the University of Rhode Island Department of Natural Resources Science is developing a Hydric Soils Identification and Septic System Siting Short Course. The course will offer training in wetland identification, description and documentation and site evaluation for on-site sewage disposal. This 30-hour long course will be offered through as a URI College of Continuing Education course. All courses will be strongly field oriented. The first short course will be offered in the Fall 1994.

6. Morphological Properties as Predictors of Seasonal High Water Tables

B. Lesinski and W. Wright

Ground water levels were measured in 19 wells over a 23-month period (1991 to 1993) at four seasonally wet soil hydrosequences ranging from moderately-well drained to very poorly drained in the Narragansett Basin of eastern Rhode Island. Soils were formed in low chroma (gray) Carboniferous, parent materials that exhibit a lodgement till densipan approximately 1.0 m from the surface. Recorded water levels at all sites were within 31 cm of the surface for some time during the monitoring period, even in moderately-well drained positions with no redoximorphic features within 40 cm of the soil surface.

Yearly and growing season single-event and mean maximum water levels were statistically related to 27 soil morphological properties to determine those properties significantly related to high water levels. Soil properties were based on color, depth, and thickness of horizons and layers documented in standard field soil description procedures. Numerical color ratios and indices were also evaluated for significant relationships to high water levels. A series of predictive equations were developed for use in estimating high ground water levels for soils in this geographic region. Models accounted for 76-85% of the variability in predicting high water levels using these properties.

The soil properties selected in stepwise regression equations for the prediction of annual high water tables were quite variable; however, the mean of the five highest water tables were most highly correlated with depth to B horizon with a matrix chroma of 2 or less; depth to hue of 2.5Y, 5Y, or N; depth to common to many prominent redoximorphic features; and chroma index. On the other hand, the same three soil properties were selected for the prediction of single-event or mean high water tables during the growing season (soil temperature >5°C). The properties selected were depth to redoximorphic features from bottom of A horizon; value plus chroma of B horizon; and value plus chroma of A horizon.

Virginia Agricultural Experiment Station Report

James C. Baker

This report will consist of three parts: 1) Status of the Virginia Tech Soil Survey and Interpretations Program, 2) Research Efforts in Soil Genesis, Survey, and Land Utilization, and 3) An update on the Crop and Soil Environmental Sciences Graduate and Undergraduate Program. This report is for the period 1992/94.

Virginia Tech personnel in Soil Genesis, Morphology, and Soil Survey are as follows:

J.C. Baker - Project Leader and Soil Survey Coordinator
W.J. Edmonds - Soil Survey Field Coordinator
W.L. Daniels - Resident Instruction, Reclamation - Soil and Land Use
P.J. Thomas - Soil Scientist, Computer Applications Specialist

and 11 Field Soil Scientists:
2 Interpretative Soil Scientists - County
4 Interpretative Soil Scientists - Virginia Department of Health
3 Laboratory personnel

I. Virginia Tech Soil Survey Operations 1992/94.

technologies utilized and proposed for Virginia are appropriate to local soil conditions.

II. Research Efforts.

There have been several collaborative field studies conducted (VA Tech, SCS, USFS) with laboratory data directly in support of soil survey activities.

A. Work continues on a study of Mollisols set in alluvial/terrace landscapes in the Ridge and Valley Province extending into the western Piedmont Regions. Several new soil series have been approved as a result of these studies.(Staff)

B. An evaluation of high altitude (> 1170 meters) forested soils continues. This study correlates measured chemical and physical features, climatic data, and site features to tree growth and site index. The most significant correlations with site index are with basil area, elevation, root restricting depth, landscape position, and mean organic matter of the upper 20 cm. (M. Corrigan, M.S research)

C. A study has been initiated to relate shrink-swell capacity of soils to easily measured features such as soil texture, mineralogy, cation exchange capacity and atterburg limits.1 P.J. Thomas, Ph D. Dissertation)

D. The study of "Red Soils" in the Piedmont and Blue Ridge provinces in Virginia is complete. This study of Ultisols and Alfisols formed from residual parent material was designed to see if there was excessive "overlap" in series concepts and to reevaluate the number of series actually needed to describe and define the soils in these landscapes. (Staff)

E. A soil genesis study of upland soils form in transported materials overlying the Virginia Piedmont using trend surface analyses has been completed and will be published. **Two** major grouping of soils were studied: those with predominantly red colors in the B horizons and those with predominantly strong brown B horizons. Age estimates of some of the oldest landscapes suggest much longer times for soil formation than once thought. (H.T. Saxton, Ill, M.S. 1994)

F. A collaborative field/lab study in the Pole Cat Creek Watershed, involving all Virginia Tech, and Soil Conservation Service Soil Scientists was initiated in the Autumn of 1993. This study focused on training **in the latest field techniques for making measurements and observations of soil properties in the field. Several field investigative procedures and instrumentation were employed. The compact constant head permeameter (Amoozemeter), EMC 31, global positioning system, G.P.R., Script Writer, and the Pedon Data Entry package** were all employed in this study which resulted in mapping of 9,000 acres, 147 pedon descriptions taken and 16 pedons sampled for complete laboratory characterization. The field portion of this study was accomplished in 6 days. (State SCS Office and Field Staff)

Other soil genesis/land use related research projects include:

G. The Virginia Agronomic Land Utilization Evaluation System (VALUES) has been developed at Virginia Tech. VALUES restructures and reorients soil test fertilizer recommendations to include the best currently available technology on water quality oriented nutrient management. The system is soil series based with each of the 550 soils in Virginia rated according to soil characteristics and yield potential. (Donohue, Simpson, Baker, Monnett, & Hawkins)

H. A soil genesis study is nearly completed on soils formed totally or in part from transported colluvial materials in the Ridge and Valley Province. Land use in these landscapes, particularly those uses relating to downward water movement, may be severely restricted. Fragipans, paleosols, and other discontinuities are common.(C. Ogg, Ph D. Dissertation)

I. An on-going study of the impact of increasing soil temperature on soil morphology and weathering should provide important information on the potential effects of global warming on soils. (S.B. Feldman, Ph D. Dissertation)

J. Wetlands Preservation: There are several on-going research projects in our department that are concerned with wetlands preservation and restoration. The fundamental relationships among site hydrology, soil morphology, and the vegetative community are being studied at a number of undisturbed sites statewide.

In addition, a similar study of soil/hydrology/vegetation relationships in wetland mitigation sites, constructed in the recent past by Virginia Department of Transportation, **has also been initiated. The functional relationships on the mitigation sites are being directly compared to their nearest available natural comparison wetland. (Daniels, Genthner, Stolt, Groover, & Nagle)**

K. Disturbed Lands Restoration: The CSES department has a large land restoration research program with the overall goal of developing the most appropriate technologies and strategies for returning disturbed landscapes to their intended productive use. Currently, research programs are being carried out in the coal fields of SW Virginia, the upper Coastal Plain, and at a variety of non-tidal wetland sites associated with highway disturbances statewide. (Daniels, Baker, Stolt, Zipper, & Zelazny)

L. Whole Regolith Pedology: Considerable attention **has been devoted, in the** past few years, to the study of soils and associated landscapes on well-developed soils in the Blue Ridge and Piedmont Provinces. These studies have emphasized soil reconstruction techniques which attempt to quantify gains and losses of various soil constituents relative to those of the parent materials. Variability within the soils, detailed studies of the transition zone between soil and saprolite, and characterization of saprolites were used to examine the genesis of these materials and the soils formed from them. (Stolt & Baker)

III. Department of Crop and Soil Environmental Sciences.

Effective 1 June 1994, Dr. R.Q. Cannell, formerly head of CSES, was named Director of the Virginia Agricultural Experiment Station. The interim head for CSES is Dr. Jack Hall.

State funding for Virginia Tech resulting in cuts in the College of Agriculture and Life Sciences over the past four years have been significant (approximately 28%). At the same time, our department has grown in undergraduate enrollment putting increased pressure on physical facilities and faculty teaching loads.

The undergraduate enrollment projections for fall 1994 is between 430-450 majors. This includes 130 majors in 6 options (128 hr., Soils, Environmental Science, Turf, Crops, Bio Tech, and International Programs) in Crop and Soil Environmental Sciences, and 300 plus majors in 3 options in Environmental Science (134 hr, Aquatic Resources, Land Resources, and Waste Management). Graduate enrollment is 52.

Soil Genesis/Survey/Land Use, Teaching efforts in CSES.

CSES 2124 Soil Evaluation (Edmonds) 20-25 students per year.
CSES 31 14, 3124 Soils, Soils Lab (Daniels/ Baker) approximately 350 per year.
CSES 4120 Soil Survey and Taxonomy (Edmonds) 35 per year.
CSES 4130 Soil Genesis and Classification (Daniels) 15 alt. years.
CSES 4834 Soil Characterization and Interpretation (Edmonds) 25 + per year.
CSES 5134 Soil Genesis and Geomorphology (Baker) 8-10 alt. years.
CSES 5124 Topics in Soil Genesis (Daniels/Baker) 4 - 6 per year.

Undergraduate Soil Science Scholarship Program (Full Fees for three students/yr.)

West Viiginia Agricultural and Forestry Experiment Station Report

John C. Sencindiver

Staff

On June 30, 1993 Dr. Robert Maxwell resigned his Bean and Experiment Station Director position to return to teaching. Dr. Barton Baker, Director of the Division of Plant and Soil Sciences, became Interim Dean and Interim Experiment Station Director on July 1, 1993. On that same date, I became the Interim Division Director, a position I will hold through August 15.1994. Because of the increased administrative duties, I nave decreased my involvement in teaching and research during

Students and Courses

Research Projects

duties76

2 . <u>Mineralogy of Minesoils in Southern and Central West Virginia</u> D. Kingsbury and J. Sencindiver

Mineralogy of **Kaymine** and Fiveblock **minesoils** (both loamy-skeletal, mixed, **nonacid,** mesic Typic Udorthents) from southern West Viiginia and **Janelew** minesoils (loamy-skeletal, **mixed (calcareous) mesic** Typic Udorthents) **from** central West Viiginia was examined by XRD, XRF, optical techniques, and chemical analyses. **Kaolinite** and hydrous mica were the dominant minerals in the clay **fractions**. AU minesoils contained **small** amounts of vermiculite, but Janelew had more than **Kaymine** or Fiveblock. Mica and kaolinite dominated the silt fractions of **Kaymine** and Fiveblock. Quartz, hydrous mica and kaolinite dominated the **Janelew** silt **fraction**. The most common minerals in the sand fractions of **all** three minesoils were quartz, **kaolinite** (from **mudstone** fragments), and mica.

3 . <u>Physical Properties of Two Minesoil Series Relating to Wastewater Treatment Potential</u> **- S**. Hoover, J. **Sencindiver,** and **J. Skousen**

Seven **minesoil** series have been correlated and mapped **in** West Viiginia. Detailed chemical characterization of those **minesoils** has been completed but physical property data, particularly water relations, are tacking. This study was designed to evaluate the saturated hydraulic conductivity **(Ksat)** and other physical properties of southern West Viiginia minesoils. These properties are very important for evaluating land use potential.

Most land development in southern West Viiginia has **occurred** in the **valleys** because of steep and very steep topography. **Since** the most desirable building sites are currently occupied, little suitable land is available for community expansion. Surface mining of coal by the mountain-top removal method has created large areas of nearly level to gently rolling land. Some of this land is being used for housing developments, schools, and tight industry, **emphasizing** the need for better soils data.

Saturated hydraulic conductivity was **evaluated** for two **minesoil** series, **Kaymine** (loamy-skeletal, mixed, **nonacid** mesic Typic Udorthents) and **Sewell** (loamy-skeletal, mixed, acid, mesic Typic Udorthents). Soil blocks were **used** for both field and laboratory **determinations**. **Sewell minesoils,** although sandier textured than **Kaymine,** had lower **Ksat values** for both the field and laboratory evaluations. **Ksat** decreased with depth for both soils, but field **Ksat** was generally lower than laboratory **Ksat** on the same block.

The following studies are continuing:

1. Land Application of Municipal Wastewater Sludges - **R. Bricker and J. Skousen**

2. Mineralogy, Genesis and Classification of Extremely Acid Minesoils - **D. McCloy** and J. **Sencindiver**

3. A Model for Revegetating Abandoned Mine Land Using Industrial Wastes - **R.** Keefer, R **Singh**, J. **Gorman**, D. **Bhumbla**, J. **Sencindiver**, D. Patterson, and D. Horvath.

4. Treatment of Acid Mine Drainage with Constructed Wetlands and Anoxic Drains - A **Sexstone**, J. **Skousen**, and P. **Sterner**

5. Effects of Siderite in the Determination of Neutralization Potential for the Acid-Base Account - **P. Evans, J. Skousen, and J. Sencindiver**

6. Nutrient Enrichment to Enhance the Biodegradation of a West Virginia Crude Oil - **J. Winger and A. Sexstone**

Publications

A list of publications of the soils group is available upon request.

NEC 50 Report
Members Present

James C. Baker, Va. Tech, Chair
Ray Bryant, Cornell U
Chris Evans, U New Hampshire
Delvin Fanning, U MD
Peter Veneman, U Mass.
Robert Rourke, U ME , Sec.
Ed Ciolkosz, Penn. State U
Martin Rabenhorst,U MD
John Sencindiver, W V U

The meeting was called to order by chairman James Baker.
The following issues were discussed:

Soil Map and Bulletin for the Northeast United States;

William Wright, RI is chair of this project and could not attend this meeting.
The sub committees appointed are as follows:

Map: Rabenhorst, Ciolkosz, Baker
Text: Evans, Veneman, Bryant

The map decisions will be made first and then with this information in hand the text committee will assign authors for the various chapters.

The decision was made that a map of approximately 1:1,600,000, on a single sheet would be the best size to accompany the report. The level of detail varies significantly from state to state using the STATSGO based map. Several map "approximations" will be proposed for review, that will show various combinations of consolidation of some of the suborder units. These will be distributed to the map subcommittee, including Rourke, to review, provide editorial comments, and returned to NNTC by Oct. 1994. It is hoped a final revised map will be in hand such that further decisions concerning the publication can be addressed at the annual ASA meetings in Seattle in November.

Hvdric Soils Indicators

There was considerable discussion on the proposed use and testing of Hydric Soil Indicators for wetland delineations. There was widespread discontent with the process by which the Hydric indicators were being used with the feeling that the University community was being left out of the decision making process. A subcommittee was appointed to make a recommendation to our NEC 50 group.

The subcommittee of Rabenhorst, chair ad hoc, Fanning, Bryant, and Veneman reported back at a second session of our meeting with a draft of a resolution objecting to the use of hydric indicators. The NEC 50 members voted 9 to 0 to adopt the resolution which is included as a part of this report.
It is our recommendation this resolution be forwarded to the National Technical Committee on Hydric Soils and the Staff of the Soil Survey Division, USDA-SCS.

Exoeriment Station Representatives to the Soil Taxonomv Committee

The following representatives were approved to represent the Northeast Experiment Stations on the Northeast Soil Taxonomy Committee:

John Galbraith, New York, 94-96
Chris Evans, New Hampshire, 95-97
Martin Rabenhorst, Maryland, 96-98

Elected Representatives to the National Meetina in 1995.

Martin Rabenhorst, Maryland
Chris Evans, New Hampshire

1994 Soil Genesis Field Trio Review

Virginia will host this trip in July. The trip will begin in the Williamsburg, Va. area and focus on natural and reconstructed wetlands, land use, acid-sulfate soils. Heavy mineral mining, restoration plans, fall zone geomorphology, and wetlands/soil/hydrology will comprise the second day. The trip will end in the Blue Ridge and Valley and Ridge provinces, where paleosols in old alluvial fans stream terraces, and soil and land-use interactions will be observed.

1995 NEC 50 field trio

Maine will host this trip in 1995.

Resolution of the NE Expt. Station Representatives to the National Coop. Soil Survey of ***Hydric Soils in the*** United ***States***

To the National Technical Committee on Hydric Soils, and
The Staff of the Soil Survey Division, USDA-SCS

Whereas, there is a fundamental contradiction between the professed intended use of the Field Indicators [essentially a two category classification either a soil 'is hydric' or 'we're not sure if it is and the actual use of the Field Indicators [circulated by ***the*** COE and being utilized by the Sÿÿ in certain states-which says 'The 'criteria" are not meant for on-site identification

cases) ***but*** at ***the*** same time retaining concepts requiring the expert ***know/edge***

disagree with the fundamental philosophy and approach of the Field Indicators, and

Hampshire); Del Fanning, (Maryland); Rabenhorsc (Maryland); Robert Rourke (Maine); John Sencindiver (West Virginia); Peter Veneman (Massachusetts).

[1]Quote from the minutes of the National Technical Committee on Hydric Soils meeting held January 24-26, 1994 as Revised April 13, 1994, page 4.

[2]By "criteria" are meant the four enumerated criteria listed below the definition of hydric soils stating: 1. All Histosols except Folists, or; 2. Soils in Aquic suborders, Aquic subgroups...[with various hydrological conditions]; 3. Soils that are frequently ponded...; 4. Soils that are frequently flooded...

SCS BREAK-OUT SESSION
DISCUSSION NOTES

June 9, 1994

SCS personnel at the Conference met on Thursday morning from 8:00-9:30 a.m. The meeting was conducted by Karl Langlois and minutes recorded by Steve Hundley.

Northeast Soil Taxonomy Committee

At each Conference SCS state office soil scientists are selected to serve on the Northeast Soil Taxonomy Committee. The committee consists of 3 university and 3 SCS members and their term is for 3 years.

Ken LaFlamme, a current member has retired and Daryl Lund, a current member is expected to transfer out of the region. These members were replaced. The appointed members are:

Scott Anderson will replace Ken LaFlamme.	92 - 94
Shawn Finn will replace Daryl Lund.	93 - 95
Marge Faber will serve a term from	94 - 96
Alex Topalanchik will serve a term from	95 - 97
Gerry Rosenberg will serve a term from	96 - 98

Karl explained that if the By-Laws are approved at the business meeting on Friday, then the National Leader, Soil Taxonomy, currently Bob Ahrens, will be the permanent chair of the Regional Soil Taxonomy Committee. The Head, Soils Staff, Karl, will be a permanent member.

By-Laws of the Northeast Cooperative Soil Survey Conference

Karl distributed a copy of the draft By-Laws to all participants in January 1994. There were 16 responses to a questionnaire that accompanied the By-Laws. All responses were favorable although one individual did not agree with the change of the chair and vice-chair being from the same state.

A revised draft was distributed at this meeting and there was no discussion on the By-Laws. Voting will take place on Friday morning.

Communication

As a result of discussion early in the week about field indicators for the identification of hydric soils, there appears to be a need for better communication between SCS, Universities and other federal and state agencies. Experiment station representatives have felt left out of the process of developing the indicators. There are several reasons why this may have happened but the main reason is a lack of communication.

Karl suggested that all states need to make a renewed effort to make sure all Cooperative Soil Survey information is distributed to the Universities and other NCSS agencies. This is especially a necessity for material that should be reviewed.

Karl also recommended that all states should have an annual work planning conference. This will help maintain a forum for communication among NCSS and state cooperators. The work planning conference should deal with work loads for the coming year and not just a show and tell session. Karl will plan to have someone from his staff attend the state work planning conferences.

There was some discussion as to the possibility of setting up an electronic communications system between SCS and the experiment stations in the Northeast. It was noted that there is an **internet** program called **"soils"** that is already in place.

Field Indicators for the Identification of Hydric Soils

There was a half hour discussion about the indicators. The following points are a summary of the discussion:

1. Many questioned whether the Indicators are required.

2. If so, why.

3. If we must use indicators then it was agreed that we would move ahead and develop them as best we can.

4. SCS and NCSS need to maintain the lead on development of the hydric soil indicators.

MLRA's

The Northeast State Conservationists have supported the recommendations of the MLRA Workgroup which state that 100 percent of the **MLRA's** in the Northeast will have a steering committee established, and responsibilities assigned, leading to the development of a **MOU** by May 1995.

There was discussion that more clarification is needed as to what exactly is expected to meet the goal by May 1995.

The **MLRA** Workgroup recommended that the NNTC will keep track of state's progress and report to the Assistant Chief on a quarterly basis.

Circular 1

Concerns were expressed about the contents of Circular 1 pertaining to what soil scientists can and cannot do relating to field work to check maps. Also questions arose as to what is an

Committee Charges

Charge 1. Should Order 1 Soil Surveys, made by the private sector be included as a part of the National Cooperative Soil Survey?

Committee Recommendations:

There is a divergence of opinion on this issue.

A. An opinion voiced by a significant portion of the committee says no.

The opposition to charge one stems from several factors.

1) There is currently no formal review process to evaluate or critique the work of the private sector in the National Cooperative Soil Survey. With out such a review process, this would be an open invitation to potential challenges through the courts if problems surfaced.

2) Currently the National Cooperative Soil Survey, with leadership by the USDA Soil Conservation Service, has no mandate to do this work. Additional staff time and funding would be required to expand current responsibilities of the SCS into Order 1 Surveys made by the private sector.

B. **An opposite opinion expressed by several members of this committee is that since there are many private sector consultants currently makino Order 1 Survevs and collecting data; these data could (should) be incorporated into the NCSS data base and tested. However, without guidelines and/or standards that are approved by the NCSS, these data** may never get **to be utilized.** The SCS has responsibility for the leadership of the NCSS and has the technical staff to help set the rules for Order 1 Surveys.

Thus to "serve the public good," SCS should help develop guidelines such that a single set of "rules" is adopted, approved, and applied to Order 1 Surveys by NCSS.

Charge 2. Are standards as currently defined adequate for Order 1 Soil Surveys?

Committee recommendations:

NO. A better definition or differentiation of degrees of Order **1 Surveys should be made. As currently defined, an Order 1 Survey is anything: more detailed than Order 2, yet, it is still a comprehensive, multi-use, survey. This** includes surveys that are somewhat more detailed than current Order 2 Surveys, and ranges to very detailed, high intensity (perhaps special purpose) surveys.

There are likely to be more Order 1 Surveys made in the future, and they will probably cover the whole range of mapping intensities. It was suggested that perhaps some level of cartographic detail; as well as, some level interpretative accuracy be specified by each survey regardless of who makes it.

Charge 3. Should the Order 1 legend be the same as the Order 2 legend?

Committee recommendations:

A difference of opinion was expressed on this issue.

A. NO, the Order 1 surveys meet different needs from Order 2 Surveys thus the legends should be different.

B. YES, there may be the same series and map units in the more intensive surveys but occurring in smaller delineations. If the same series are used the amount of detail should not influence interpretations

Charge 4. A. Is the composition of map units the same in Order 1 mapping as in Order 2 mapping?

Committee recommendation:

We don't really know the answer to this. It could be argued that in some instances they could be the same, in others, they are different.

Charge 4. B. What data needs to be collected to assess this?

Committee recommendation:

We need some studies of Order 1 Soil Surveys that relate to reliability for interpretative purposes, and map unit purity.

Charge 4. C. By what mechanisms would such data be acquired?

Committee recommendation:

The necessary data should be collected by standard methods for statistical analysis of map units.

Charge 5. Pertinent References and Literature cited are listed. (See attachment.)

Final Recommendations for Committee 1: Order 1, Soil Surveys.

I) Our committee feels this is an important issue that needs further study, discussion, and evaluation. We recommend it involve a much larger segment of the NCSS, the soil science community in general, and may require national policy changes for the NCSS.

Literature Reviewed
Committee 1, Order 1 Soil Surveys

1. __________ 1993. Order 1 Soil Mapping Standards for New Hampshire. Sponsored by the Society of Soil Scientist of Northern New England. SSSNNE Publication No. 2, P.O. Box 986, Durham, NH 03824. 15 p.

2. __________ 1994. Memorandum of Understanding, Relative to Order 1 Soil Survey Mapping Standards for New Hampshire.

3. Grossman, R.B., 1994. Information Pertaining to Interpretive Soil Property Reliability form Standard Soil Survey Operations. Draft 1. National Soil Survey Center. USDA SCS. 8 p.

4. Soil Survey Staff, 1994. Order 1 Soil Survey Criteria for Research Areas. Soil Technical Note. No. 6.(not released) National Soil Survey Center, USDA SCS. 6 p.

5. Mount, H., W. Lynn, R. Vick, and B. Dubee. 1993. Unpublished. Micro Soil Survey of the El Verde Long-Term Ecological Research Grid, Puerto Rico. USDA-SCS.

6. Hatch, D. 1993. Fauquier County, Virginia, Zoning Ordinances, Soils, Hydrologic Testing. Personal communication.

7. Edmonds, W.J., A.C. Blackburn, and J.M. Gass. 1994. Use of Soil Taxonomy for Sustainable Agriculture and Environmental Stewardship. (Accepted) Proceedings of International Soils Conference, Mexico City, Mexico.

8. Soil Survey Staff. 1992. National Soils Handbook (Draft) USDA-SCS National Soil Survey Center, Lincoln, NB.

9. Soil Survey Division Staff. 1993. Soil Survey Manual. USDA Handbook no. 18. USDA. U.S. Govt. Printing Office, Washington, D. C. 20402

10. Thomas, P.J., J.C.Baker, and T.W. Simpson. 1989. Variability of the Cecil Map Unit in Appomattox County, Virginia. Soil Sci. Soc. Am. J., 53:1470-1474

Report from Committee #2, Disturbed Soils:

committee Members

Ray Bryant
Chris Evans (chair)
Del Fanning
Tyrone Goddard
Jim Patterson
John Short
Chris Smith
Alex Topalancik (vice chair)

part One--Discussion and modification of charges

1. 'What kinds of interpretations are needed?

a) Baeed on request for information: One way to respond to this charge is to develop surveys that are sent to all SCS and Cooperative Extension offices (and others?). For example, Jim Patterson reports that prospective and current customers include landscape architects, foresters, horticulturists, arboretums and botanical gardens. Many requests will be concerned with plant and turf establishment and adaptability of disturbed soils to plant requirements.

b) Based on projected needs for additional interpretationa: One set of needs is suitability for urban plants (ornamentals and trees)? soil stability for various urban uses; management options for these soils: need for amendments, drainage, exposure probleme, lithologic discontinuities); identification of areas of particular concern (metals, other contaminants); corrosion potential; safety hazards. Also, because of higher temperatures and increased pollution associated with urban environments, plant species may need to be selected more carefully to be compatible with soil conditions (Urban Forestry Research, Syracuse, NY). The implication is that soils in these areas will need to be characterized in more detail than those in "standard" soil surveys. Micro-level characterization may also be important, perhaps exceeding detail employed currently for soil organisms--fungi, bacteria, ants, etc.-- in order to make a more adequate assessment of soil ecology.

2. What kind of procedure(s) should we have for data gathering on disturbed soils? Last year, the committee proposed four criteria for properties common to disturbed soils, including: Color of mottling not related to drainage; disordered coarse fragments in soil profiles; pockets of dissimilar material that are randomly oriented in the profile; irregular distribution of organic carbon not associated with fluvial processes. They also recommended that data on acreage and type of disturbance be compiled on a state-by-state basis. It seems useful to address this question in several parts, which include previous recommendations:

a) Which data should be collected? In addition to those listed above, others could include: average area size, relationship to topographic features or adjacent natural soils, as well as bulk density, hydrologic properties, sulfidic materials, pH, soluble salts, EC, CO_2 or CH_4 evolution, other soil gases (oxygen, nitrogen, ethylene), radioactivity levels. Del Fanning suggests that penetrometer readings may provide a sufficiently accurate assessment of bulk density, and have the advantage of being more standardized and easier to obtain. Moisture content at time of determination could be important, also. Soil solution composition will also be especially important: e.g., benzene compounds or other herbicides, fatty acids or alcohols.

b) what sources exist that could be accessed for information on disturbed soils? At the state level, these sources could include MLRI results, GIS-STATSGO data and information from environmental services/protection departments related to fill and mitigation permits, large developed areas, landfill closures, contaminated sites and areas used for land disposal/application of materials such as sludge. On a national level, a NASCIS search for "orthents" and "arents" map units could be useful. In some instances, historical records could prove invaluable.

c) Host critically, how will the work get done? Who will do it, and how will it be funded? If data are collected on a need to know basis, the party contracting for the data will pay for information that they need to make decisions. Does client-driven data collection provide a suitable long-term data base?

d) Where will the data be stored, organized and summarized? Chris Smith suggests that, ultimately, the national Hap Unit Interpretation Record (MUIR). Tom Ammons has also volunteered to coordinate data storage. It is essential that data structures be available to accommodate the parameters collected, which, in may instances, will be new elements. Also, it is imperative that data storage be in GIS-compatible format.

3. **How can we map disturbed soils?** Probably just as we map "natural" soils. This process is closely tied into data-gathering, and will require:

a) identification of key soil properties and their distribution and association in the field

b) organization of those properties as descriptors/diagnostic properties at appropriate taxonomic levels

c) collection of standard data on map unit composition, including definition of contrasting and similar inclusions

d) Does initial recognition at the suborder level permit sufficient "branching room" for appropriately-spaced hierarchical categories that reflect the anticipated importance and range of disturbed soil properties? For example, are "Garbents" and Psamments squally different from/similar to Aquents or Fluvents?

e) How will scales of mapping and interpretation affect classification of these soils? Jim Patterson suggested map detail of 1:12000, as in soil survey of Washington, D.C. Prince William Forest Park and Catoctin Mountain Park. Should we expect to classify and interpret soils primarily from Order One data on a site by site basis? We have seen some dangers of interpretation-driven classification in the hydric soil controversies and the difficulties of incorporating soil moisture regime characteristics and soil organic carbon data into global change models.

Part Two--Outline of charges and recommendations

1. **Charge: Assess the** kinds of **interpretations** needed for disturbed soils.

A Based on requests for information

B Based on projected needs

Recommendations:

1. It is important to work to define and agree upon what will constitute a "disturbed" soil. (The committee prefers the term "anthropogenic"). It was agreed that epipedon loss due to erosion should not be the kind of alteration addressed under this category. Examples of "proper" anthropogenic soils would include landfills of various types, mine spoils or other areas in which subsoil materials are strongly influenced by human activities.

2. Develop a list of appropriate locations to query (e.g., SCS offices, urban ecology and forestry centers) and a questionnaire to be sent to those offices to determine who is looking for information and what kind(s) of information they are requesting. This function is/should be covered by the efforts of the national committee, chaired by Tom Ammons.

3. Standard soils interpretations should be expanded to include hazard identification, more intensive characterization of soil-plant relationships, and information about ecosystem processes (e.g., nutrient/elemental cycling and microbial activities).

4. Additional data columns in NASIS forms would facilitate inclusion of this information as part of routine soils data collection.

5. It would also be useful to store data under common descriptive names, such as "mine soils", "dump soils", etc., particularly in the interim while data collection has not been sufficient to develop a more formal classification (e.g., by proposed amendments to Soil Taxonomy).

6. Recommendations for reclamation procedures should be included in interpretative data bases.

2. Charger Recommend procedures to **be used** to gather **data** for disturbed **soils.**

A Information **sources:** Federal data bases, state agencies, historical records

B Data parameters

1. Relational properties: total and average area sire, topography, relationship to adjacent natural soils, type of disturbance, historical records, engineering records and treatment records

2. Fixed properties

a. Properties used to identify disturbed soils

b. Properties important to use and management

1) Physical properties: particle-size distribution, bulk density. hydrologic properties, artifact content (by volume % and size)
2) Chemical properties: sulfidic materials, pH, soluble salts, conductivity, organic matter

3. Dynamic properties: soil gases, radioactivity, solution composition, hydrology, subsidence rates

C Data storage, organization and dissemination

Recommendations:

1. It is important to understand and clarify what kinds of data to collect. For example, in these soils, presence of "lumber" in the soil profile could be diagnostic, while the presence of "wood" may not be.

2. Data bass queries should be developed to inventory significant areas of disturbed soils at national, regional and stats levels. Again, this should/will be the responsibility of national and ICOMANTH committees.

3. GIS-compatible data storage structures should be designed to accommodate and record relational, fixed and dynamic properties of disturbed soils.

1994 NCSSC WORKING COMMITTEE 3
MLRA/Physiographic Areas

COMMITTEE MEMBERS

Scott Anderson (Chairman), USDA-SCS, Syracuse, NY
Edward Ciolkosz, Penn. St Univ., University Park, PA
Paul Puglia, USDA-SCS, Salamanca, NY
Loyal Quandt, USDA-SCS, Lincoln, NE
Larry Ratliff, USDA-SCS, Lincoln, NE
Dean Rector, USDA-SCS, Richmond, VA
John Sencindiver (Vice Chairman), Div. of Plant & Soil Sci., W Univ., Morgantown, W
Ron Taylor, USDA-SCS, Somerset, NJ

BACKGROUND

Soil Surveys, and soil survey legends, have generally corresponded to political boundaries such as counties. The soil survey division is recommending that all future soil survey projects follow boundaries associated with Major Land Resource Areas (MLRAs) which closely parallel physiographic areas (see attachment A). It is now the policy of the National Soil Survey Center (NSSC) not to approve the updating of a published soil survey unless it is part of an MLRA project with, at least, a draft Memorandum of Understanding.

This new charge is to bring existing surveys up to a uniform standard so that they will better meet our customer's resource technology needs. It is not a mandate to re-map all existing surveys. The concept is not new, but there is little past experience from which to draw from. We in the Northeast region have been aware of the idea of managing soil surveys on an MLRA basis for several years now.

The goals of managing soil surveys by MLRA include:
- A uniform map scale and detail of mapping.
- A uniform map legend.
- Digitizing all maps for inclusion in a GIS.
- Accurate join of all maps between counties, states, and MLRAs.
- Coordinated computer database of soil properties.
- Better descriptions of map unit composition.
- Up-to-date, coordinated interpretations.
- Emphasis on collection of data to support soil interpretations.

The charges this committee has been asked to address relate to technical advantages/disadvantages of soil survey management by MLRAs, and how to proceed with legend development. Questions relating to functional management-of these projects have been addressed by previous committees.

EFFORTS BY SIMILAR COMMITTEES OR WORKGROUPS

Our charges are similar to those of a committee of the National Work Planning Conference that was held in Vermont last July. Their charges focused on leadership, marketing, funding, technology, and data collection in the MLRA soil survey update process.

"Soil Survey by Geographic Area", prepared by the NSSC in December 1993, gives guidance for management of MLRA projects.

The Northeast MLRA Work Group was established to consider procedures for managing and developing soil surveys on an MLRA basis for the Northeast region. Their final report was completed in May 1994 and sent to Richard Duesterhaus, Assistant Chief for the Northeast, and to all State Conservationists in the Northeast.

COMMITTEE REPORT

The charges of the committee were used as the basis to poll committee members as to their thoughts concerning the current initiative in the NCSS to update soil surveys by MLRA. The results of those responding were summarized and sent to the committee members for further comment. The charges are stated below, followed by member comments and discussion.

Charge 1: What are the merits of conducting a soil survey on a MLRA/Physiographic area basis?

- The MLRA is a logical physiographic region to coordinate soil survey activities around since we are dealing with similar soils, vegetation, climate, topography, water resources, and land use.

- Former soil survey processes were adequate for the 1st generation of soil survey information needs. The process of updating (modernizing) soil surveys utilizes many more resources to expedite the update process more effectively and efficiently.

- Consistency of joining soil survey's across political boundaries, line for line, map unit for map unit, interpretation for interpretation (one legend per MLRA).

- Better compatibility with GIS.

- Will accommodate more accurate extrapolation of research data.

- Ability to generate interpretations at multiple scales to suit the diversity of user needs. line for line,f -0.ð erpr ` ÿþÿþ lerpr ` ÿþÿþ ` ÿþÿþ

- Greater communication across political boundaries. Sharing of data, experience, and expertise between counties, states, and regions.

- Will promote a common standard of documentation for soil profiles, map unit transects, soil-land form notes, quantitative measurements of map unit composition.

- A coordinated soils data base with less maintenance and storage than 3SD.

- We would be better served to look at all our data for the landform or landform segment we have mapped regardless of political lines, and base our decisions on map unit composition from this data.

- This will bring existing county soil surveys up to current NCSS

MLRAs will allow us to focus on data needs, classification standards, out dated soil maps, and improved interpretations over similar physiographic areas. Soil delineations will flow across political boundaries giving better credibility to our work. Managing soil surveys by MLRA may also prove the most efficient use of limited personnel.

Charge 2: What are the limitations of conducting a soil survey on an **MLRA/Physiographic** area basis? How do we overcome the limitations?

Most of the comments to this charge relate to the management and administration of MLRA soil survey projects. These problems have been dealt with by other committees and will not be considered in great detail by this group.

- Does not fit with current political structure for procuring support.

- Many users of soil survey's operate in a environment oriented towards political boundaries (notably units of government).

- State funding: expenditures from local and state funds can only be used within that state.

- NCSS guidelines for determining state allowances focus on mapping production (code 184 or 185) and not on collection of data which is the focus of an MLRA soil survey project.

- Will not work if State Conservationists and State Soil Scientists do not "buy" into process.

- Size constraint: how do we physically do the field work in a reasonable period of time, with reduced personnel, over such a large area?

- Travel limitations: no funding for lodging for traveling longer distances.

- Will this system accommodate special local or regional priorities of our clients?

- New technology, such as GIS, GPS. EM technology, etc., is not readily available in all areas.

- There is no standardized method (quantity and quality) for collection of field documentation.

- State biases will hinder progress of MLRA steering committees when dealing with technical matters. Criteria for slope classes, drainage classes, water table depths, stoniness/rockiness classes, field indicators of Oxyaquic subgroups, and

State Conservationists need to support the data acquisition focus of MLRA maintenance projects. This will ensure that data collection remains in the forefront of project activities. Goals should not be based solely on acres updated.

Charge 3: How do we correlate or re-correlate soil surveys within a MLRA/Physiographic area that are at different stages of completion?

- The older soil surveys will have map units of soil series, variants, taxadjuncts, and miscellaneous land areas. The more recent surveys recognize a number of new series for some of the older established series with numerous phases. We now have series in place of variants, miscellaneous land areas, and for some taxadjuncts. Many of the newer (last 15 years) surveys have laboratory data and other resource data (remote sensing data, transects, descriptions to 60 inches or more), to document and support the design and composition of map units.

- On-going soil surveys will need to be completed according to the correlation criteria initiated at the start of the survey. We cannot change course in mid-stream and start managing a "county" survey as part of a MLRA project.

- MLRA projects should be updates of previously published county soil surveys.

- MLRA projects should include all ongoing progressive soil surveys.

RECOMMENDATIONS:

The process of managing soil surveys by MLRA should include progressive and update (maintenance) soil survey projects.

All map units on progressive soil survey legends will be included on the combined MLRA legend.

Progressive soil survey projects should be correlated according to the MLRA concept.

Charge 4: How should legends be combined in a MLRA/Physiographic area?

- A subcommittee or steering committee (group) representing Soil Scientists from each of the states involved in the MLRA update process should review the MUUF file and legends from progressive soil surveys and develop a coordinated legend for the entire MLRA. If available, legends from adjacent MLRAs should be reviewed and included in the coordination process. The taxonomic unit may be a representative pedon for the entire MLRA or may be the type location for the official series.

- We should establish common slope breaks. Slope phases are the most variable and difficult to correct. Similar map units within the MLRA may have numerous slope phases, none of which are consistent.

- An attempt should be made to name map units as we have in the past, with the soil name, surface texture, and slope. But, one should be open to new ideas to reflect various uses of the legend. Do we need a legend with soil names only regardless of slope or surface textures (these would be inclusions within the unit)? Priorities and management goals will dictate the type of legend.

- The MLRA legend should consist of unique, numerical symbols to allow for easy insertion of new map units as the survey project progresses.. The numbering system could be set up to correspond to specific parent material (ie: 1 to 100 for alluvial soils). This numerical symbol will never change once it has been assigned to a particular unit.
County subsets could have their own unique alphabetical legends for publication purposes.

- Consideration should be given to coordinating map unit symbols throughout the entire region.

- A unique four digit <u>numeric</u> symbol (0001 through 9999) should be assigned to each map unit within the MLRA. The alphabetical slope class would be left off. The easiest method would be to assign symbols to alphabetically sorted map units. The MLRA number could be added as a prefix for sorting purposes. For example, map unit 140.0420 would represent map unit 0420 in MLRA 140.

- A new column representing the MLRA map unit symbol (MLRAMUID) should be added to the map unit table of the MLRA soils data base.

- The master legend, as generated from the MLRA soils data base, would include MLRA map unit symbol (MLRAMUID), state and county ID (STSSAID), state map unit symbol (MUID), and state map unit name (MLJNAME) .

EXAMPLE:

(MLRAMUID)	(STSSAID)	(MUID)	(MUNAME)
140.0420	NY025	025LaC	Lackawanna flaggy silt loam, 8 to 15 percent slopes

- Why do we need an MLRA legend? Which of our customers are interested in using such a legend?

RECOMMENDATIONS:

Legend development is a time consuming task and should be given priority early in MLRA update. All states involved should have input into the legend. This should be conducted during formal workshops if possible.

Current convention for naming map units may not be adequate for MLRA legends. NCSS leaders should be open to new ideas once states begin legend development.

NSSC, or NENTC staff should provide leadership to states in agreeing upon uniform slope, stoniness, rockiness, etc., classes regardless of parent material. These standards should be developed early in the MLRA project.

The NSSC should approve guidelines for **MLRA** legend development. An attempt should be made to ensure consistency throughout the region.

The initial working legend should be a concatenation of map units from all progressive and published soil surveys in the MLRA. Do not combine similar map units until sufficient data has been collected. There is concern that we may loose useful data if similar map units are combined prior to progressive correlation. The Project Leader will combine, add, and delete map units as updating progresses throughout the MLRA.

A unique four digit numeric symbol should be assigned to each map unit within the MLRA. The alphabetical slope class would be left off. The easiest method would be to assign symbols to alphabetically sorted map units.

MLRA Project Leaders should be given adequate time to evaluate existing legends, major landforms, and parent materials in the survey area. They will be responsible for collecting supporting data necessary for combining similar map units.

Steering Committees should approve of any changes to the legend.

Charge 5: If legends are developed by physiographic **areas,** what size should the area be?

- Some MLRAs may only represent 1.4 million acres (minimum size), others may represent several million or more acres.
Subsets may be needed to recognize prioritized areas (local

funding) to provide information within one or two years for specified projects (watersheds, river basins, planning groups). Separate taxonomic units may be needed for a group of subsets in the MLRA.

- The entire MLRA would be the survey area.

- For practical purposes, large MLRA projects should be broken up into several smaller areas having similar soils, geology, topography, and landforms. Legend development and evaluation would continue across the MLRA as these smaller, workable areas are completed. It may be necessary for the MLRA Project Leader to spend time in several areas of an MLRA evaluating widely mapped units.

- The difference in map unit composition across an MLRA may only be the result of how we gather and examine our data. We sample such a small part of the landscape and have compounded that deficiency by making decisions on map unit names and composition by using only on a small part, usually a county part, of those data. We would be better served to look at all our data for the landform or landform segment we have mapped regardless of political lines, and make our decisions. This will serve to simplify mapping legends.

RECOMMENDATIONS:

MLRAs should serve as the boundary for soil survey maintenance projects. Manageable subsets will have to be established which can be completed within a reasonable period of time. Subsets may be counties or physiographic areas such as USFS Eco-Subregions.

The working legend will contain map units from all subsets within the MLRA. New map units should be established according to handbook guidelines.

A more detailed MLRA map for the NE region should be drafted at a scale of 1:24,000.

ADDITIONALRECOMMENDATIONS:

The members recommend this committee be discontinued.

ATTACHMENT A

U.S. DEPARTMENT OF AGRICULTURE

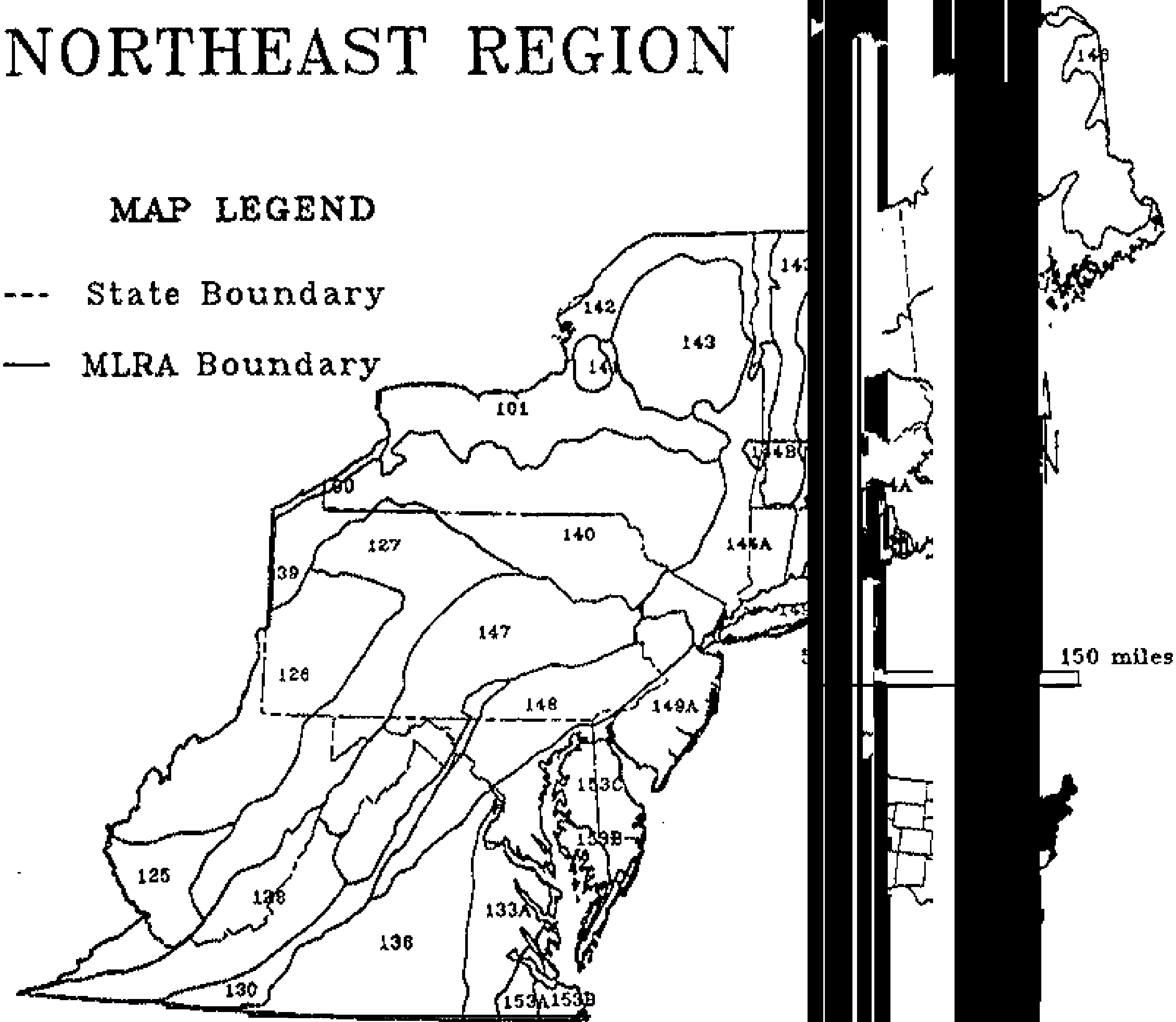
S[illegible]vation Service

NORTHEAST REGION

MAP LEGEND

--- State Boundary

— MLRA Boundary



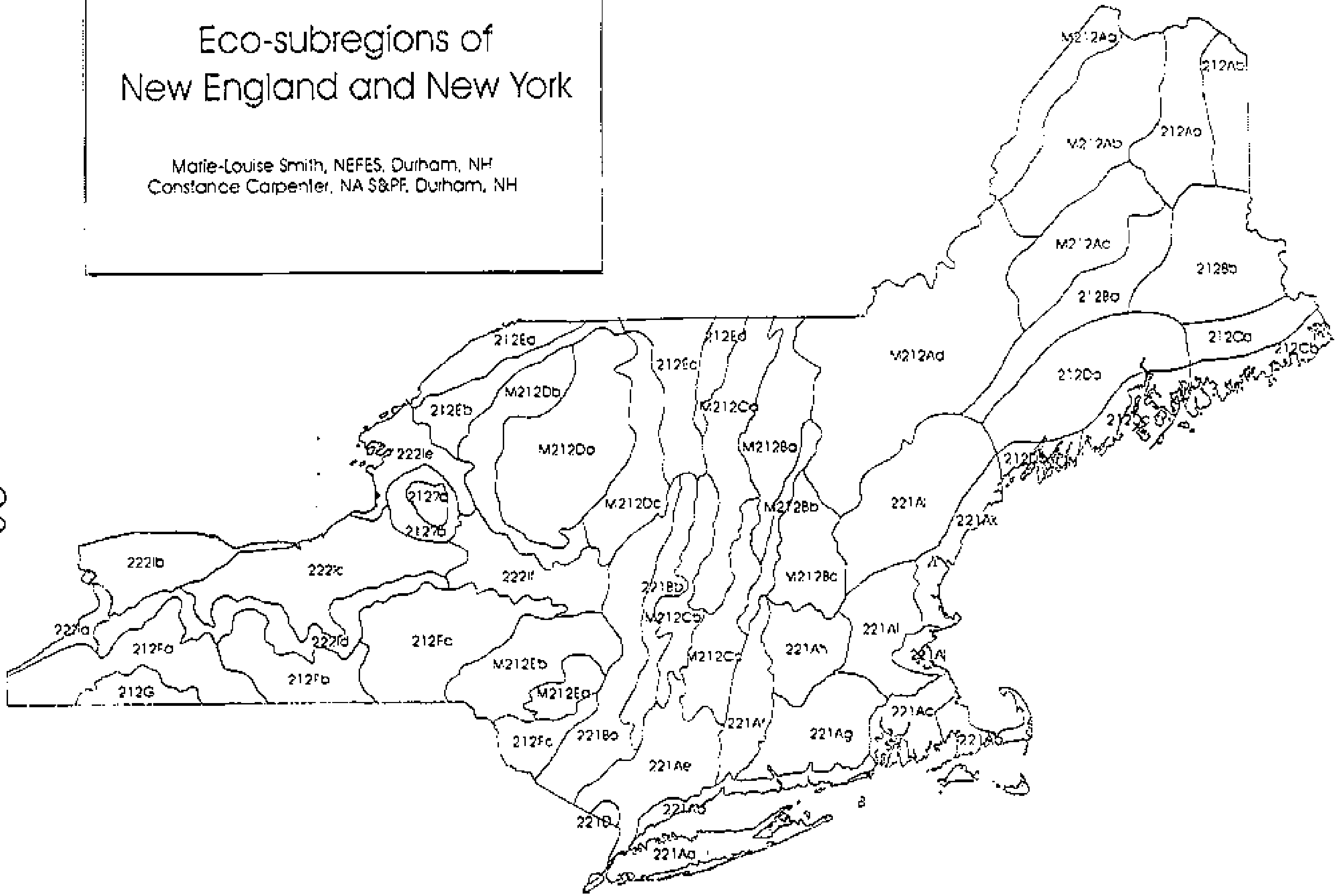
Northeast National Technical Center
Chester, Pennsylvania February 1993

Da[illegible]ce: [illegible],000,000 DLGs
[illegible]iec[illegible]ers Equal Area

98

Eco-subregions of New England and New York

Marie-Louise Smith, NEFES, Durham, NH
Constance Carpenter, NA S&PF, Durham, NH



ECO-REGIONS AND SUB-REGIONS
NEW ENGLAND AND NEW YORK

M212 NEW ENGLAND-ADIRONDACK PROVINCE

M212A White Mountain Section
- M212Aa Boundary Plateau
- M212Ab St. John Upland
- M212Ac Maine Central Mountains
- M212Ad White Mountain-Rangley Lakes

M212B Vermont-New Hampshire Upland Section
- M212Ba Vermont Piedmont
- M212Bb Northern Connecticut River Valley
- M212Bc New Hampshire Upland

M212C Green Mountain Section
- M212Ca Green Mountain
- M212Cb Taconic Mountain
- M212Cc Berkshire-Vermont Upland

M212D Adirondack Mountain Section
- M212Da Central Adirondack
- M212Db Western Adirondack Hills
- M212Dc Adirondack Low Mountains

M212E Catskill Mountain Section
- M212Ea Catskill Mountains
- M212Eb Catskill Highlands

221 EASTERN BROADLEAVED FOREST (OCEANIC) PROVINCE

221A Southern New England Coastal Hills and Plain Section
- 221Aa Long Island Coastal Lowland
- 221Ab Cape Cod Coastal Lowland
- 221Ac Narragansett-Bristol Lowland
- 221Ad Southern New England Coastal Lowland
- 221Ae Western New England Coastal Hills and Plains
- 221Af Loner Connecticut River Valley
- 221Ag Massachusetts Coastal Hills and Plains
- 221Ah Worcester-Monadnock Plateau
- 221Ai Southern New England Coastal Plain
- 221Aj Boston Basin
- 221Ak Northeastern New England Coastal Lowland
- 221Al Sebago-Ossipee Hills and Plain

2218 Hudson Valley Section
- 221Ba Hudson Valley
- 221Bb Taconic Foothills

222 EASTERN BROAD LEAVED FOREST (CONTINENTAL) PROVINCE

2221 Erie-Ontario Plain Section
- 222Ia Lake Erie Plain
- 222Ib Erie-Ontario Lake Plain
- 222Ic Eastern Ontario Till Plain
- 2221d Cattaraugus-Finger Lake Foothills
- 222Ie Eastern Ontario Lake Plain
- 222If Mohawk Valley

212 LAURENTIAN MIXED FORESTPROVINCE

212A Aroostook Hills and Lowlands Section
- 212Aa Aroostook Hills
- 212Ab Aroostook Lowland

2128 Maine-New Brunswick Foothills & Lowlands
- 212Ba Maine-New Brunswick Foothills
- 212Bb Maine Footbills

212C Fundy Coastal and Interior Section
- 212Ca Maine Eastern Interior
- 212Cb Maine Eastern Coastal

212D Central Maine Coastal and Embayment Section
- 212Da Central Maine Embayment
- 212Db Penobscott Bay
- 212Dc Casco Bay

212E St. Lawrence and Champlain Valley Section
- 212Ea St. Lawrence Marine Plain
- 212Eb St. Lawrence Hills
- 212Ec Champlain Valley
- 212Ed Champlain Hills

212F Northern Glaciated Allcgbeny Plateau
- 212Fa Cattaraugus Highlands
- 212Fb Allegheny Low Hills
- 212Fc Eastern Allegheny Plateau

212G Unglaciated Allegheny Plateau Section

212? Tug Hill Plateau Section
- 212?a Tug Hill Plateau
- 212?b Tug Hill Transition

Exhibit 649-1 A List of the Major Land Resource Areas Assigned to Each State.

Alabama, South Region, 129, 133A, and 135.
Alaska, West Region, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, and 182.
Arizona, West Region, 35, 39, 40, and 41.
Arkansas, South Region, 117. 118, 119, and 131.
California, West Region, 4, 5, 14, 15. 16, 17, 18, 19, 20, 21, 22, 30, and 3 1.
Caribbean Area, South Region, 270, 271, 272, and 273.
Colorado, West Region, 48A. 48B, 49. 51, 67. and 69.
Connecticut, Northeast Region, 145.
Delaware. Northeast Region, 153C.
Florida, South Region, 138, 152A, 154, 155, 156A, and 156B.
Georgia, South Region, 136.
Hawaii, West Region, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, and 167.
Idaho, West Region, 11, 12, 13, and 43.
Illinois, Midwest Region, 108, 110, 113, and 114.
Indiana, Midwest Region, 111.
Iowa, Midwest Region, 104 and 107.
Kansas, Midwest Region, 72, 73, 74, 76, 79, and 112.
Kentucky, South Region, 120, 121, and 125.
Louisiana, South Region, 151.
Maine, Northeast Region, 143 and 146.
Massachusetts, Northeast Region, 144A.
Michigan, Midwest Region, 92, 94A, 94B, 96, 97, 98, and 99.
Minnesota, Midwest Region, 57, 88. 89, and 103.
Mississippi, South Region, 134.
Missouri, Midwest Region, 109, 115, 116A, and 116B.
Montana, West Region, 44, 46, 52, 53A. 58A, 59. and 60B.
Nebraska, Midwest Region, 65, 71, 75, 102B, and 106.
Nevada, West Region, 24, 25, 26, 27, 28B, and 29.
New Hampshire, Northeast Region, 144B.
New Jersey, Northeast Region, 149A.
New Mexico, West Region, 36, 37. 42, and 70.
New York, Northeast Region, 101, 140. 141. 142. and 149B.
North Carolina, South Region, 130.
North Dakota, Midwest Region, 53B. 54, 55A, 55B, 56, and 58C.
Oklahoma, South Region, 78, 80A, and 84A.
Ohio, Midwest Region. 100. 124, and 139.
Oregon, West Region, 2, 8, 10, and 23.
Pacific Basin, West Region, 190, 191. 192, 193. 194, 195. 196. 197, 198, 199, 200, 201, 202, and 203.
Pennsylvania, Northeast Region, 126 and 127.
South Carolina, South Region, 137, 153A, and 153B.
South Dakota, Midwest Region, 53C, 55C, 58D, 60A, 61, 62. 63A, 63B, 64, 66, and 102A.
Tennessee, South Region, 122. 123, and 128.
Texas, South Region, 77, 80B, 81, 82, 83A, 83B, 83C, 83D, 84B, 84C, 85, 86. 87, 1338, 150A, 150B, and 152B.
[illegible]

1994 Northeast Cooperative Survey Conference

Committee 4 - GIS - SSURGO

Backaround

SSURGO is the electronic database for detailed soils information that is generally an order 2 or order 3 soil survey. SSURGO consists of spatial data which is the soil map, and attribute data which is tabular soils information.

NATIONAL BULLETIN NO. 430-2-3 dated November 25, 1991 states that states are to review and certify all digital soils data available for their state and submit it to the National Cartographic and GIS Center (NCG) in Fort Worth, Texas.

It is important that our customers receive accurate soils information. It has been a concern, however, of what and how much detail needs to be certified.

Committee Charses:

1. Adress the SSURGO certification process. With a dynamic database what are we certifying?

The SSURGO "product" should be the most accurate, up to date digital data that is available for public distribution. It should include attribute data as well as metadata (data about the data). It should meet National Map Accuracy Standards (when finalized) and have an accuracy level compatible with other nationally accepted GIS digital layers.

States feel strongly that they should be responsible for quality issues while NCG and Soil Survey Quality Assurance (SSQA) should be responsible for technical aspects such as data format. (See charge 2, below)

Guidelines and standards now apply to digitizing soil surveys from 1:12,000 or 1:24,000 scale orthophoto quads or USGS maps. These should be expanded to 1:12,000 to 1:62,500. Virginia is mapping and compiling at 1:15,840 and a mapping scale of 1:62,500 is being used in New York and Maine.

Most requests for spatial data have been for whole counties rather than by 7.5 minute quad. As part of quality control, Virginia is patching quads together into a county coverage. Specifications should be expanded to allow this to be the archived data format.

2. What do we need to check for certification?

The overall feeling of the committee was that quality decisions as to the line placement of the compilation, accuracy of digitizing the compilation, and completeness and accuracy of the attribute data should be made by the state soil scientist. Technical specifications for compilation, digitizing, and attribute data validation must be followed, but once all reasonable editing has been completed, each state should decide if that data is ready to be certified as SSIJRGO data.

Metadata can carry some quality qualification statements such as "The source soil survey maps are on 7.5 minute USGS mylar quads that were recompiled from unrectified soil maps in the published Alpha County, Soil Survey. The size and shape of some soil polygons may differ slightly from the published maps in order to conform with contour information on the 7.5 minute quads."

There may also be a need for a metadata statement to describe descepencies between hydrography on the USGS topo and what we show on published soil survey maps.

NCG and the Soil Survey Quality Assurance (SSQA) staff should be allowed the opportunity to review the data and offer constructive criticism. NCG should address the technical aspects of digitizing, data format, map projection, etc.

3. Row do we combine updated SSSD data with the spatial data?

States agree that periodic updates of SSSD data are necessary. If spatial data or attribute data is updated, the corresponding data should also be updated so both data sets are current.

Corresponding versions of spatial and attribute data could be numbered and the number possibly could be embedded in the data.

4. What is the official copy of the soil survey?

The official copy is defined in a recent General Manual Directive (430-SOI) part 402, Issue 2, pages 402-5 to 402-7. The official copy of the soil survey is the most current soil information for a survey area that is certified for official use within the Field Office Technical Guide by the State Soil Scientist. It includes correlated maps and their attribute data.

The maps may be correlated field sheets, published maps, or a set of the most recent maps generated from digital data.

A disclaimer should state that the product, if willingly modified, is no longer considered as official. Inadvertent modifications of the official copy are the liability and responsibility of the modifier.

5. How often should an official copy be updated? Do updated copies need to be re-certified?

The committee had a wide range of responses on how often the official copy should be updated. They ranged from every time an area is remapped or revised, to every five years, to when (and if) cooperators are willing to pay for it.

The same General Manual Directive cited above spells out the policy fairly clearly. The official copy of the soil survey should be changed only if the need for the revision is identified and supported in a documented evaluation of the entire soil survey area. Changes may be extensive of limited in scope. Extensive revisions warrant a memorandum of understanding and a new soil survey publication of record.

Partial or limited revision to soil maps in the official copy will be at the same scale and intensity as the initial maps.

Supplemental mapping provides more detailed information for areas of limited extent as a result of more intensive on-site investigations. Although maintained, supplemental soil maps are not considered changes to the official copy of the soil survey.

Any changes to the official copy copy of the soil survey information whether maps or data must be made official by certificaion of the state soil scientist.

Most of the committee tended to agree with this policy, thinking we should not try to work every on-site investigation into the official copy. Rather, updates should be planned and should include our cooperators.

However, there should be a way to update errors on maps, such as mislabels, at some specific interval, perhaps 5 years.

6. How can GIS be used by soil scientists in their daily operations? As a mapping tool?

Digitized soil maps allow us to group and view our data in ways that we have not had in the past. Displaying different groups of data show us patterns that may have not been apparent before. They may also point out where attribute data needs to be examined.

- Progressive digitizing or digitizing before updates
  - can be published as interim map
  - interpretative maps can be made and tested
  - temperature/elevation/aspect layers can help define frigid, mesic, thermic boundaries
  - geology, slope, landuse can help define boundaries
  - eliminates map finishing
  - generate random points and evaluate data
  - use with other point data such as typical pedons, site index, etc., and GPS
  - soil correlation, mixed vs. siliceous, etc.
  - generate general soils map
  - MLRA correlations

RECOMMENDATIONS

RECOMMENDATION 1. Digitizing software and automated methods should be identified and developed for meeting the 100 percent edit requirement for SSURGO certification.

These should include methods to accomplish and check:
- Soil survey area boundaries and map unit composition match across soil survey area boundaries
- Data are edgematched to adjoining quads (both lines and labels)
- No lines with same label on both sides
- Four corners of neatline are explicity entered
- Nodes are present in required locations
- Every map feature is labeled
- Descriptive labels match the publication or approved updated legend
- Labels are correctly placed
- Each attribute file has one data record for each feature in the DLG file
- Each space delimited record in the attribute file contains a left justified sequential record number, a major code, and a descriptive label.
  The major/minor code pairs in the attribute file match the major/minor code pairs in the DLG file
  Major/minor code pairs are correctly assigned
- Tabular data base tables are current and accurate
  Tabular data can be downloaded from SSSD or NASIS

RECOMMENDATION 2. States and NCG need the same software to run edit checks. Currently edit checks for SSURGO have been developed in ARC/INFO at NCG, but ARC/INFO is not available to most states. States need to be able to run the same checks before they submit data to NCG.

RECOMMENDATION 3. The INFO SHARE process should be aware of our digitizing needs when choosing national hardware and software. The selection process should involve those actively in production style digitizing. To date, no one from NCG, NTC, or states had been contacted from INFO SHARE for input on hardware and software needs.

RECOMMENDATION 4. Adequate funding should be made available to states to purchase nationally selected hardware and software. Funding should include vendor hardware and software support. Technical approval needs to be provided at the national level.

RECOMMENDATION 5. NCG will provide integration of LTPLUS, GRASS, SSSD (NASIS) and SCS approved hardware and provide hotline support for the whole process of creating SSURGO.

States need support for production digitizing for LTPLUS, GRASS, SSSD, NASIS, scanners, plotters, 386's and SUNs. LTPLUS, GRASS, and SSSD will be with us for at least another year. Right now there are LTPLUS experts at NCG, GRASS experts at NCG, SSSD experts at NSSC, no one in IRM to support scanners, plotters, and SUNs. There needs to be someone somewhere who understands the whole process.

RECOMMENDATION 6. Metadata should make it clear whether USGS hydrography or an SCS hydrography (from soil survey field sheets) was used as a base to compile soil lines.

RECOMMENDATION 7. This committee should be continued to address progress on these recommendations and to address new changes in technology.

Committee Members

Bruce Stoneman, SCS, VA, chairman
Thomas Bailey, USFS, VA
Dean Cowherd, SCS, MD
William E. Hanna, SCS, NY
Norman P. Kalloch, Jr., SCS, ME
Charles D. Parker, SCS, DE
Alfred Roberts, SCS, CT
Steve Carlisle, SCS, NY
John Galbriath, Cornell University
Darlene Monds, SCS, NNTC
Robert Rourke, University of Maine

Committee 5 Report

WHO ARE OUR CUSTOMERS AND WHAT ARE THEIR EXPECTATIONS?

BACKGROUND

Soil surveys have been used for agricultural purposes since the beginning of the soil survey program. In recent years the soil survey program has expanded to include many non-agricultural users. This is especially the case in the Northeast. As a result of this diversity, soil scientists have expanded the type of interpretations needed for our customers. Soil scientists have also taken a more active role in working with customers.

This committee was asked to identify and list the customers we work with in soil survey. The results of this committee will help us better understand our customers and their needs. It will also help in determining our research needs, the detail of soil surveys needed in the future, and the kinds of interpretations that need to be developed.

COMMITTEE CHARGES

1. Who are our customers?

2. Are we providing the interpretations our customers need?

3. What additional data do we need that our customers require?

DISCUSSION

The following committee members met during the week of June 6, 1994:

Margie Faber, Co-chair, CT
Bob Nielsen, NSSC
Dick Scanu, MA
Dave Van Houten, VT
Bruce Dubee, VA
John Hudak, PA
Everett Stuart, RI
Shawn Finn, NJ
Ed White, PA

Committee members made the following observations that there are four basic types of customers:

1. People who need to know about soil suitability relating to the conversion of a parcel to a different land use

realtors
planners
individual land owners
consultants
public interest groups

2. People interested in the dollar value of land

appraisers
tax assessors
IRS
individuals
units of government
realtors
farmland preservation commissions

3. Natural resource managers/users

SCS conservationists, etc
SWCD managers
state agency and federal agency specialists
foresters
farmers
water quality specialists
extractive industries
teachers at all levels
university researchers
students
utility companies
biologists
cultural resources professionals
geographers and users of GIS

4. Regulators and the people undertaking regulated activities

wetland regulators
transportation agencies
FPPA
consultants
sanitarians
individuals

Regarding the questions "are we providing the interpretations our customers need?" and "what additional data do we need that our customers require?" committee members focused on the following themes:

We know some things customers are asking for. But should we and/or can we provide this information? We can't take on every job people ask us to do.

What information does the "severe" limitation rating really provide? One committee member commented that "you don't need a GIS to paint a map red".

Members agreed that a proactive approach is needed to satisfying customer needs or the program will be hurt in the long run.

There needs to be a clear break between production soil survey activities and technical soil services.

Funding is a major problem -- the committee discussed the SCS funding formula and the idea of regionalizing money more fairly. There are more customers in the Northeast than in any other region of the United States.

Examples of information requested by customers:

- digitized maps
- access to our databases
- soil potentials
- increase in accuracy of maps
- information about pesticide/nutrient movement
- vadose zone information
- stormwater detention/retention basin interpretation
- phosphorus retention capabilities
- prolonged time data for soil moisture, soil temperature
- narrower ranges of data for physical and chemical properties

We can speculate among ourselves all we want about what our customers need and want; why don't we ask them? Shouldn't this be a part of reinventing government?

RECOMMENDATIONS

To fully address the issues of this committee, we make the following recommendations:

1. NCSS cooperators devise and implement a system to gather additional information on who their customers are and how the customers use soils information. This information should be compiled and prioritized. This system might include the state soil survey work planning conferences, keeping a log of customers, or the use of a survey.

2. Have soil survey representatives at as many of the 1994 Chief's Reinvention Forums as possible.

3. A national committee be formed as a part of the 1995 National Cooperative Soil Survey Conference to identify impediments to meeting customer needs.

4. This committee reconvene or be reformed for the 1996 Northeast Cooperative Soil Survey Conference to assess progress in meeting our customers needs.

MINUTES OF THE
NORTHEAST COOPERATIVE SOIL SURVEY CONFERENCE
BUSINESS MEETING

STAMP UNION, COLLEGE PARK, MARYLAND

JUNE IO.1994

The meeting was called to order by Chair, Steve Hundley at 9: IS AM

Minutes of Last Meeting

Marty Rabenhorst moved that we accept the minutes as distributed. Motion seconded and passed.

Old Business;

The location of the 1996 Northeast Cooperative Soil Survey Conference was discussed. Vermont was the only state that volunteered to host the meeting. Ron Taylor moved that the 1996 Northeast Cooperative Soil Survey Conference be hdd in Burlington, Vermont. Motion seconded and passed.

Karl Langlois announced that the 1995 National Cooperative Soil Survey Conference will be held in San Diego, California. The following individuals will attend, by virtue of their position:

Karl Langlois, Steering Committee Chair
Martin Rabenhorst, Conference Vice Chair, 1994 NECSSC
(Chris Evans, New Hampshire, Alternate)
State Soil Scientist, SCS, one from the Northeast to be'selected at a later date.

Karl announced the Soil Taxonomy Committee appointments:

1992 - 1994	Scott Anderson replaces Ken LaFlamme	
1993 - 1995	Shawn Finn replaces Daryl Lund	
1994 - 1996	Marjorie Faber	Chris Evans
1995 - 1997	Alex Topalanchik	John Gailbraith
1996 - 1998	Gerry Rosenburg	Marty Rabenhorst

Bob Ahrens, Lead Soil Scientist, Soil Taxonomy, Permanent Chair
Karl Langlois, Head, Soils Staff, NNTC, Permanent Member

A draft of the By-Laws of the Northeast Cooperative Soil Survey Conference was mailed to the membership on January 11, 1994, for review and comment. The draft By-Laws were discussed.

Ron Tavlor moved that we accept the By-Law changes for the Northeast Cooperative Soil Survey Conference. Motion seconded and passed.

Ray Bryant brought up a concern about the chair and vice chair being from the same state as is written in the new By-Laws. Karl gave an explanation of the steering committee composition for the 1996 NECSSC. We have agreed to go to Vermont in 1996. The chair and vice chair from Vermont; and past vice chair, Marty Rabenhorst will help plan the next conference.

Steering Committee for 1996 NECSSC:

Conference Chair	Bill Jokela
Conference Vice-Chair	Dave Van Houten
Conference Past Vice-Chair	Marty Rabenhorst
Steering Committee Chair	Karl Langlois

New Business:

Ray Bryant suggested that we submit "Information Highway Technology" as a new topic for the 1995 National Cooperative Soil Survey Conference in San Diego. This technology may go directly to the classroom in the **future,** where grade school children can learn about the Soil Survey. Other new clients will also be able to get on the Internet system.

Think of a computer as a "Node on a Worldwide Web"
(Example of information that could be on the Internet: Status Maps, Digital picture of State Soil) This could be thought of as a hub, with SCS and many Universities connected

Del Fanning is Chair of a committee to have soils information computer interactive in the Smithsonian. The committee will be developing information at the pre-college level (Update Vision 2000). Del needs names of individuals in SCS to work with. Dennis Lytle in Lincoln was suggested.

Ray moved that the NECSSC suggest the topic of Interfacing with information Technology (Highway) be addressed at the 1995 National Cooperative Soil Survey Conference in San Diego. Notion seconded and passed.

Ed White suggested that images of State Soils were possible with the NASIS software.

Dean Cowherd reported that Gary Muckel has asked for historical soil survey equipment for the Soil Survey Centennial Celebration and that anyone knowing of possible sources should contact Gary.

Marty Rabenhorst was given an ovation in thanks for a good job of setting up the 1994 Northeast Cooperative **Soil Survey Conference.**

Meeting adjourned at 9:50 AM.

Respectfully submitted by Dave Van Houten.

BY-LAWS OF THE NORTHEAST COOPERATIVE SOIL SURVEY CONFERENCE

ARTICLE I -- NAME

Section 1.0 **The** name of the Conference shall be the Northeast Cooperative Soil Survey Conference

ARTICLE II -- PURPOSE

Section 1.0 **The** purpose of the Northeast Cooperative Soil Survey Conference is to bring together representatives of the National Cooperative Soil Survey in the northeastern states for discussion of technical and scientific questions. Through the actions of committees and conference discussions, experience is summarized and clarified for the benefit of all; new areas are explored; procedures are synthesized; and ideas are exchanged and disseminated. The conference also functions as a clearing house for recommendations and proposals received from individual members and stale conferences for transmittal to the National Cooperative Soil Survey Conference.

ARTICLE III -- PARTICIPANTS

Section 1.0 Permanent participants of the conference are the following:

Secfion ***1.1*** The SCS state soil scientist responsible for each of the 13 northeastern states: Connecticut, Delaware. Maine, Maryland (also representing the District of Columbia), Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Virginia, West Virginia.

Section *1.2* The experiment station or university soil survey leader(s) of each of the 13 northeastern states.

Secfion 1.3 Head, Soils Staff, Northeast National Technical Center (NNTC), Soil Conservation Service.

Section 1.4 National Soil Survey Center Liaison to the Northeast.

Section 1.5 Cartographic Staff Liaison to the Northeast.

Section 1.6 Three representatives from the soils staff of the USDA Forest Service **as** follows:

1. One from the Eastern Region, National Forest System
2. One from the Southern Region, National Forest System
3. One from the Northeastern Area, Slate and Private Forestry

Section 2.0 On the recommendation of the Steering Committee, the Chair of the Conference may extend invitations to a number of other individuals to participate In committee work and In the conference. Any soil scientist 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.

(Revised June 1994)

ARTICLE IV -- ORGANIZATION AND MANAGEMENT

***Section* 1.0** Steering Committee

A Steering Committee assists in the planning and management of biennial meetings. including the formulation of committee memberships and selection of the committee chair and vice-chair.

Section 1.1 **Membership**

The Steering Committee **consists** of the following four members:

1. Head, Soils Staff, NNTC, SCS (steering wmmittee chair)
2. The conference chair
3. The conference vice-chair
4. The past conference chair

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

Section 1.2 Meetings and Communications

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

Most of the committee's wmmunications **will** be in writing. Copies of all correspondence ***between*** members of the committee shall be **sent to** the chair.

Section 1.3 Authority and Responsibilities

Section 1.3.1 Conference **participants**

The Sleeting 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 lo the conference for extra and special participants in specific conferences.

Section 1.3.2 **Conference** Committees and Committee Chair

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

The Steering Committee is responsible for the formulation of committee charges.

Section 1.3.3 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.

Section 1.3.4 Liaison

The Steering Commillee is responsible for maintaining liaison between **the** regional conference and
1. The Northeastern Experiment Station Directors,
2. The Northeastern Slate Conservationists, SCS,
3. Director, **Soil** Survey Division of the **Soil** Conservation Service.
4. Regional and national offices of the U.S. Forest Service and other cooperating and participating agencies, and
5. The National Cooperative Soil Survey Conference.

Section 1.4 Responsibilities of **the** Steering Committee Chair are:

Secfion 1.4.1 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.

Section 1.4.2 Develop with the steering wmmittee the first and final drafts of the conference's committees and their charges.

Section 1.4.3 Send committee assignments to committee members. The committee assignments will be determined by the Steering Committee at the planning meeting. The proposed chair and vice-chair of each committee will be contacted personally by the conference chair or vice-chair and asked if they will serve prior to **final** assignments. SCS people will be contacted by a SCS person end experiment station people will **be** contacted by an experiment station parson.

Section 1.4.4 Compile and maintain a conference mailing list that can **be copied** on mailing labels.

Section 1.4.5 Serve as a member of the editorial board of the Northeast Cooperative Soil Survey Journal.

***Section** 2.0* Conference Chair and **Vice-**Chair

An experiment station representative and a SCS state soil scientist alternate as conference chair and vice-chair. This sequence may be altered by the steering wmmittee for special sttuations. The conference chair and vice-chair will **serve** a two-year term. The conference chair and vice-chair are chosen following the selection of a **place** for the next meeting and are from the state where *the* meeting is to be held.

Section 2.1 Responsibilities of the conference chair include the following:

*Section **2.1.1*** Function as chair of the biennial conference.

Section 2.1.2 Planning and management of the biennial conference.

***Section** 2.1.3* Function as a member of *the* Steering Committee.

*Section **2.1.4*** Send out a firs! announcement of the conference about **3/4** year prior to the conference.

Section 2.1.5 Send written invitations to all speakers or panel members and representatives from other regions. These people will be contacted beforehand by phone or in parson by various members of the Steering Committee.

Secfion 2.1.6 Send out written requests to experiment station representatives to **find** out if they will be presenting a report at the conference.

Section 2.1.7 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.

*Section **2.1.8*** Preside over the conference.

Section 2.1.9 Provide for appropriate publicity for the conference.

Section 2.1. ***10*** Preside at the business meeting of the conference.

Section 2.1.11 Serve as a member of the editorial board of the Northeast Cooperative Soil Survey Journal.

Section 2.2 Responsibilities of the conference vice-chair include the following:

Section 2.2.1 Function as Program Chair of the biennial conference

Section 2.2.2 Serve as a member of the Steering Committee.

Section 2.2.3 Act for the chair in the chair's absence or disability.

Section 2.2.4 Develop the program agenda of the conference.

Secfion 2.26 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 arrangement for the conference (rooms, etc.). Included in the last mailing will be a copy of the

Section 2.2.6

Secfion 2.2.7

Section 3.0

Section 3.1

Section 3.2

Section 3.3

Section 4.0 Each committee shall make an official report al the designated time at each biennial conference. Chair of committees are responsible for submitting the required number of committee reports promptly to the vice-chair of the conference. The conference vice-chair is responsible for assembling and distributing the conference proceedings. Suggested distribution is:

Section 4.1 One copy to each participant on the mailing list.

Section 4.2 One copy to each State Conservationist, SCS, and Experiment Station Director of the Northeast.

Section 4.3 Five copies to the Director of Soil Survey, SCS. for distribution to National Office staff.

Section 4.4 Ten copies to the National Soil Survey Center (NSSC) for distribution to staff in the Center.

Section 4.5 Five copies to each SCS National Technical Center Head of Soils Staff for distribution and circulation to both the SCS and cooperators within their region.

Section 4.8 Five copies to the Region 8 and 9 Forest Service Regional Directors.

Section 4.7 Three copies to the National Canadian Soil Survey office,

Section 6.0 Much of the work of committees will of necessity be conducted by correspondence between the times of biennial conferences. Committee chairs are charged with the responsibility for initiating and carrying forward this work.

ARTICLE VII -- REPRESENTATIVES TO THE NATIONAL AND REGIONAL SOIL SURVEY CONFERENCES

Section 1.0 The Experiment Station chair or vice-chair will attend the national conference the year prior to the regional conference for which they were selected. A second Experiment Station representative also will attend the conference. The second representative is to be selected by the Experiment Station representatives at the regional conference.

Section 2.0 The SCS representatives are usually selected by the Director, Soil Survey Division, SCS, in consultation with the NNTC Diredor and State Conservationists.

Section 2.0 One member of the Steering Committee will represent the Northeast region at the South, Midwest and West 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.

ARTICLE VIII -- NORTHEAST COOPERATIVE SOIL SURVEY JOURNAL

Section 1.0 The Northeast Cooperative Soil Survey Conference will publish a journal on soil survey and related topics at least once between Conferences. 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 chair. Their responsibility will be to assist in gathering information for the journal. as well as printing and distributing the journal.

ARTICLE IX -- NORTHEAST SOIL TAXONOMY COMMITTEE

Section 1.0 Membership of the standing committee is as follows:

1. Lead Scientist, Soil Taxonomy (permanent chair).
2. Head, Soils Staff, NNTC. SCS (permanent member).
3. Three Federal representatives.
4. Three State representatives.

Section 2.0 The term of membership is three years, with one-third replaced each year. The Experiment Station conference chair or vice-chair is responsible for overseeing the selection of state representatives. The Head, Soils Staff, NNTC. is responsible for oveneeing the selection of federal representatives.

ARTICLE X -- SILVER SPADE AWARD

Section 1.0 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 chair of the selection committee. If multiple awards were given at the previous meeting, the chair of the selected committee will be elected by the committee. The recipients of the award will become members of the Silver Spade Club.

ARTICLE XI -- AMENDMENTS

Section 1.0 Any part of this statement for purposes. policy and procedures may be amended any time by majority agreement of the conference participants.

By-Laws Adopted January 16, 1976
By-Laws Amended June 25.1 982
By-Laws Amended June 15.1964
By-Laws Amended June 20.1966
By-Laws Amended June 17.1900
By-Laws Amended June 10, 1994

(Revised June 1994)

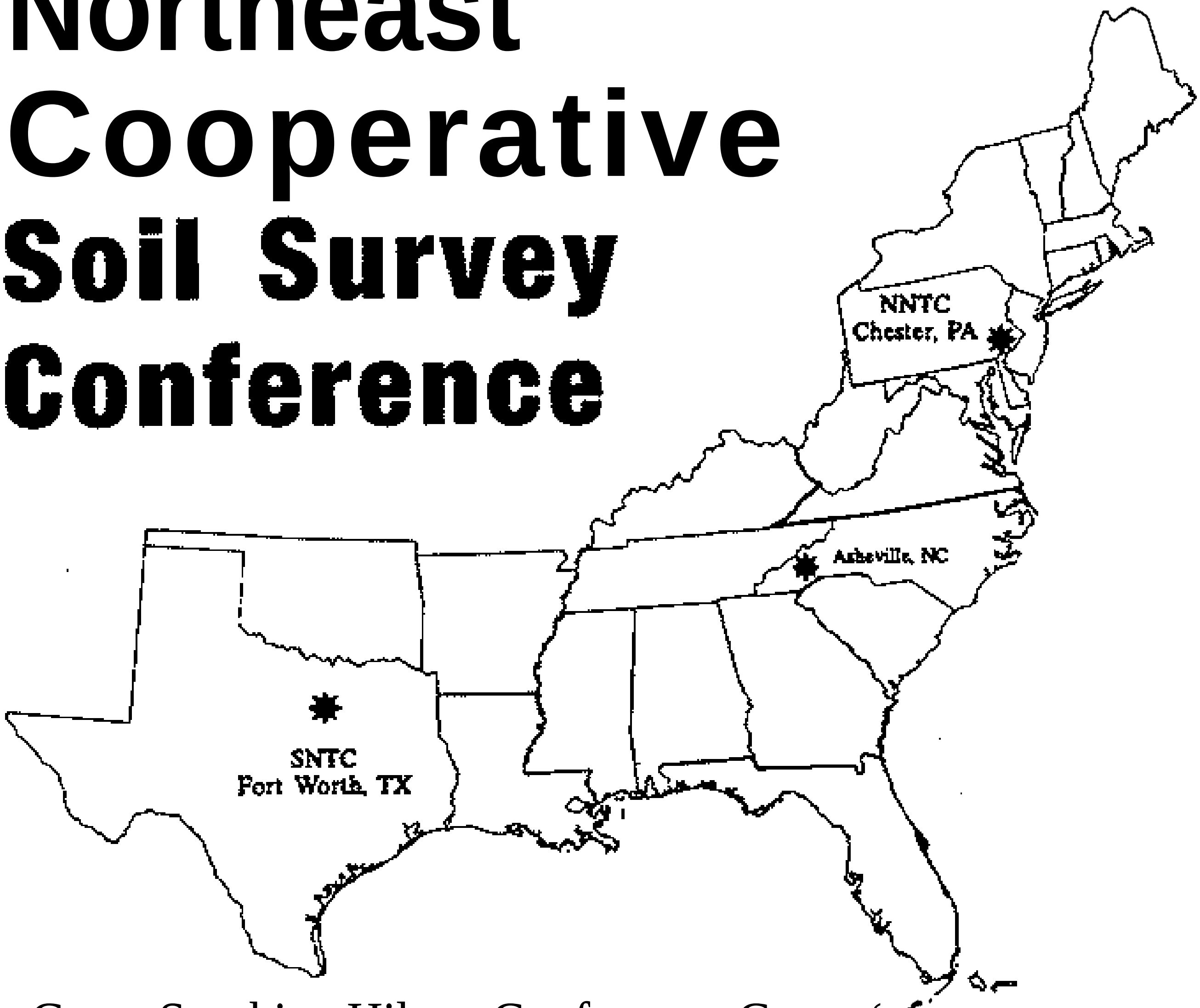
NATIONAL COOPERATIVE SOIL SURVEY

South and Northeast Regional Conference Proceedings

Asheville, North Carolina
June 14-19, 1992

Proceedings Of The Joint Session Of The

South And Northeast Cooperative Soil Survey Conference



Great Smokies Hilton Conference Center'
Asheville, North Carolina

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PROCEEDINGS OF THE JOINT SESSION

OF THE

SOUTH

AND

NORTHEAST

COOPERATIVE SOIL SURVEY

CONFERENCE

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Great Smokies Hilton Conference Center

Asheville, North Carolina

Sponsored by

National Cooperative Soil Survey - South
National Cooperative Soil Survey - Northeast
Southwestern NC RC&D Council
Mountain Valleys RC&D Council

Assembled by

Horace Smith, State Soil Scientist
USDA, Soil Conservation Service
4405 Bland Road, Suite 205
Raleigh, North Carolina

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SOUTH-NORTHEAST COOPERATIVE SOIL SURVEY CONFERENCE
GREAT SMOKIES HILTON CONFERENCE CENTER
ASHEVILLE, NORTH CAROLINA
JUNE 14-19, 1992

AGENDA

SUNDAY AFTERNOON, JUNE 14

O'Henry Suite, Room 167

3:00-6:00	Registration and Mixer	

MONDAY MORNING. JUNE 15

O'Henry Suite, Room 767

8:00-12:00	Registration	
	Mt. Mitchell Room	Horace Smith, Moderator
9:00-9:10	Introductions and Announcements	Horace Smith State Soil Scientist SCS, Raleigh, NC
9:10-9:35	Welcome/Overview of North Carolina's Soil and Water Conservation Program	Bobbye J. Jones State Conservationist SCS, Raleigh, NC
9:35-9:45	Purpose and Objectives	Joe D. Nichols Head, Soil Interp. Staff SNTC, Ft. Worth, TX
9:45-10:40	Opening Remarks	William W. Cobey, Jr. Secretary NCDEHNR, Raleigh, NC Everett R. Emino Adm. Advisor, SRSSWG University of Florida, Gainesville, FL Eugene J. Kamprath Head, Dept. of Agronomy NCSU, Raleigh, NC Bjorn Dahl Forest Supervisor USDA-FS, Asheville, NC

10:40-11:10	Break	
11:10-11:40	Regional Perspectives	
	Northeastern States	Arthur B. Holland, Director NNTC. Chaster, PA
	Southern States	Paul F. Larson, Director SNTC, Ft. Worth, TX
11:40-12:00	National Cooperative Soil Survey--A National Perspective	Richard W. Arnold, Director Soil Survey Division SCS, Washington, DC
12:00-1:00 p.m.	Lunch	

<u>MONDAY AFTERNOON. JUNE 15</u> MI. *Mitchell Room* John C. Sencindiver. Moderator

1:00-1:20	Soil Resource Inventory Program--USDA Forest Service	Randy Moore Soil Scientist USFS, Washington, DC
1:20-1:40	Report from the 1890 Universities	Burleigh C. Webb Dean, NC A&T SU Greensboro, NC
1:40-2:00	Report from the National Society of Consulting Soil Scientists	Dennis J. Osborne Past President, NSCSS Washington, DC
2:00-2:20	Report from the National Soil Survey Center	C. Stephen Holzhey Director, NSSC Lincoln, NE
2:20-2:40	Break	
2:40-3:00	USDA/SCS Global Climate Change Activities	John M. Kimble Research Soil Scientist NSSL, Lincoln, NE
3:00-3:20	Soil Correlation Issues	Berman D. Hudson Sup. Soil Scientist NSSC, Lincoln, NE
3:20-3:40	National Cartographic and GIS Center--Support for Soil Survey	Richard W. Folsche, Head NCG, Ft. Worth, TX
3:40-4:00	Status of Policy on Hydric Soils end Wetlands	Maurice J. Mausbach N'tl. Ldr., Tech. Soil Services SCS, Washington, DC
4:00-5:00	Committee and Task Force Meetings (Breakout Rooms)	

O'Henry Suite (Room 167)

5:00-6:45	Mixer	

<u>TUESDAY MORNING, JUNE 16</u> — *Mt. Mitchell Room* — Carroll Pierce, Moderator

8:00-8:20	World Soil Resources-----------------	David Yost Soil Scientist World Soil Resources SCS. Washington, DC
8:20-8:40	Feasibility of Using Satellite------------- Imagery in Soil Survey	Carter A. Steers, Asst. Director NCG, Ft. Worth, TX
8:40-9:55	Panel Discussion-SCS Academic Requirements and Hiring Procedures for Soil Scientists	
	Academic Requirements and ----------- Hiring Procedures	Melvyn H. Goldsborough Head, Special Examining Unit SCS, Washington, D.C.
	University Curriculum Changes -----	Joe Kleiss Assoc. Professor NCSU, Raleigh, NC
	Soil Science Curriculum, ----------------- Present and Future Needs	Peter L. M. Veneman Assoc. Professor U of Mass., Amherst, MA
	SCS National Headquarters ----:------ Soil Survey Division Role	James H. Ware Soil Scientist SCS, Washington, D.C.
	Broad Duties of an SCS Rater----------	F. Dale Childs Asst. State Soil Scientist SCS. Morgantown, WV
9:55-10:15	Break	
10:15-12:00	Committee and Task Force Meetings [Breakout Rooms)	
12:00-1:00 p.m.	Lunch	

<u>TUESDAY AFTERNOON, JUNE 16</u> — Mt. *Mitchell Room* — Jerry Ragus, Moderator

1:00-1:30	Recent Developments------------------ in Soil Taxonomy	John E. Witty, N'tl. Ldr. Soil Classification, NSSC Lincoln, NE

1:30-2:00

Status of NSSL Investigations in
the South and Northeast

Northeast ---------------- - ------ ------------Laurence E. **Brown**
Research Soil Scientist
NSSL, Lincoln, NE

South --Warren Lynn
Research Soil Scientist
NSSL, Lincoln, NE

Classification of Soils of the---------Stanley W. **Buol,** Professh 1 0 17à 4esÿ

Break

THRUDSAY AFTERNOON, JUNE 18 — *Breakout* Rooms — James C. Baker, Moderator

1 :oo-3:oo — Agencies and Experiment Stations Meetings by Regions

3:00-3:15 — Break

Mt. *Mitchell Room*

3:15-4:00 — Task Force Reports

Task Force 1 -Soil Survey and Management of Forest Soils -------------- James Keys, Jr.
Soil Scientist
USFS, Atlanta, GA

Task Force 2--Soil Temperature and Moisture Regimes ----Edward J. Ciolkosz
Professor, PSU
University Park, PA

4:oo — Adjourn

THURSDAY EVENING, JUNE 18 — *Mt. Pisgah/Mt. Pilot Rooms* — Bobbye J. Jones, Moderator

6:00-9:00 — NCSS Banquet

'Evangelists, Scholars, Historians, Lab Types, Computer Buffs, Map Makers, and Auger Pullers in the Soil Survey' ----Ralph J. McCracken
SCS Deputy Chief (Retired)
Greensboro, NC

RIDAY, MORNING, JUNE 19 — *Mt. Mitchell Room* — *Betty* McQuaid, Moderator

8:00-9:30 — Committee Reports

Committee I--Soils of the Northeastern United States -------------------- Ronnie L. Taylor
State Soil Scientist
SCS, Somerset, NJ

Committee 2--Soils of the Southern States and Puerto Rico -------------------Larry West
Asst. Professor
UG, Athens, GA

Committee 3--Classification, Mapping and Interpreting Disturbed Lands ---------------- John T. Ammons
Assoc. Professor
UT, Knoxville, TN

Committee 4-National Cooperative Soil Survey and Private Sector Cooperation ------John C. Meetze
State Soil Scientist
SCS, Auburn, AL

	Committee 5--Representative Taxa for Modeling	Ray B. Bryant Assoc. Professor Cornell University Ithaca, NY
	Committee 6--Extrapedonal Investigations	William J. Edmonds Professor, VPI & SU Blacksburg, VA
9:30-9:45	Closing Comments	Karl H. Langlois, Jr. Head, Soil Interp. Staff NNTC, Chester, PA
9:45	Adjourn	

It is with a great deal of pleasure that I open this joint Northeast-South Region Soil Survey Conference here in Asheville, North Carolina.

The soil survey is critical and a base foundation to all that we do in the Soil Conservation Service. It is also critical to all publics as they deal with our natural resources, whether planning, developing, conserving or preserving those resources.

I have planned for you, today, a slide presentation covering the state of North Carolina. It will provide you with an opportunity to see the complexity of the state and to see the importance of soils as we make decisions relative to our resources here in North Carolina.

Before I present the overview, I want to take this opportunity to recognize a few of our cooperators and partners in conservation. My recognition is for those that I work closely with from day to day. I realize that most have already been recognized.

First of all, I am pleased to recognize and consider a real friend of ours, Secretary Bill Cobey. When I first met Secretary Cobey, he was U.S. Congressman Cobey. I am now most pleased to be able to work with him as Secretary, North Carolina Department of Environment, Health, and Natural Resources.

The next person is a close friend and partner in conservation, David Sides. David is the Director of the Division of Soil and Water, North Carolina Department of Environment, Health and Natural Resources.

I also want to recognize Horace Smith and his staff for putting together all of the arrangements for this meeting. A job well done. To the Steering Committee, I want to say thanks for your hard work. And, to all the Soil Conservation Service employees in this area, under the leadership of Jacob Crandall, a hearty thanks, also.

I am especially pleased to see those of you from other states that I have met, previously, and worked with. Especially, I see Dr. James Baker from Virginia Tech University.

Opening Remarks by Bobbye J. Jones, State Conservationist, North Carolina, at the Joint Northeast-South Region Soil Survey Conference, Asheville, NC, June 15-19, 1992.

It is especially gratifying to see Dr. Stan Buol, our own here in North Carolina. My special recognition could go on and on, and, you always run the risk of not mentioning someone that you should have mentioned.

Maybe the last few that I would make mention of would be Dr. Dick Arnold of our National Headquarter. Good to have Dick here. And, from the 2 National Technical Centers, we have Art Holland, NE National Technical Center, and Paul Larson, South National Technical Center.

Well, it is so good to have all of you here. you have an outstanding program planned. If there is anything we can do for you while you are here, please do not hesitate to ask some of us from North Carolina.

The uniqueness of this group is Federal, State, and local governments working together in a National Cooperative Soil Survey effort. Not many endeavors could be as successful as this effort. I compliment you all.

May I present to you an Overview of North Carolina. Thank you!

Purpose and Objectives of the 1992 Conference

Joe D. Nichols

The purpose of our work planning conference, according to our bylaws is as follows:

> "To bring together southern States Representatives of the National Cooperative Soil Survey for discussion of technical and scientific questions. Through the actions of the committees and conference discussions, experience is summarized and clarified for the benefit of all; new areas are explored: procedures are synthesized; and ideas are exchanged and disseminated. The Conference also functions as a clearing house for recommendations and proposals received from individual members and State conferences for transmittal to the National Cooperative Soil Survey Technical Work-Planning Conference."

This conference allows us to get acquainted, to discuss general problems and to conduct side conferences. The coffee breaks and meal times offer possibilities to discuss the merits of certain sharpshooters or the newest computers. This is communication at the practical level.

The field trips are important in that they allow us to see different soils. The mountain soils that will be seen on this trip allowed the state, local, and laboratory people a chance to show their latest techniques and findings. I think you will be pleased with the results:

A study of the committee assignments for this conference offers a history into the problems and opportunities of that time. Much of the important work of the Cooperative Survey has been through conference work. I suspect that each of you have favorite projects that you like to remember. I think the development of the interpretation record with the guides, was one of the biggest accomplishments.

We made an important decision when we combined the Northeast and Southern conferences for this year. We hope the reasons will be more apparent to you as the conference progresses. "one soil survey" is not accomplished without effort. The state general soils maps (STATSGO) will test our commitment.

We have well thought out committee and task force assignments. Some are finishing up projects and one new committee is designed to stretch our thinking. It may "spin-off" into other future committees.

We are being challenged to update soil surveys to keep them as current as possible. We are being asked to interpret the soil surveys for more and varied uses. We must learn how to best use soil surveys with GIS and with the many models that seem to spring up almost daily.

It is good that we have a week to reflect and to try to solve some of our problems. Have a good conference.

SECRETARY COBEY'S REMARKS
SOUTH/NORTHEAST COOPERATIVE SOIL SURVEY CONFERENCE

I'm happy to address the South and Northeast Cooperative Soil Survey Conference, because it gives me an opportunity to brag about our North Carolina program to those who understand the business of soil surveys and the value of a cooperative spirit. Just over 80 percent of the land area of North Carolina is mapped. This fortunate circumstance is the result of the dedicated effort of many people over decades. The solid partnership among the Cooperators in North Carolina provides the basis for an effective soil survey program.

I want to especially emphasize the excellent relationship between our department and SCS in soil mapping. A true team effort is leading our common goal. In North Carolina, soil survey parties are composed of soil scientists from both agencies. The responsibility of leadership for the surveys is shared. Our department currently provides the party leader for five county surveys.

To help you understand the Cooperative Soil Survey Program in North Carolina, I'll briefly review my department's role. In 1977, the state legislature appropriated funds to establish the soil survey section in the Division of Soil and Water Conservation. Since then, division's soil scientists have mapped 5.5 million acres.

The Division of Soil and Water Conservation is beginning to shift resources toward interpretive services. Two interpretive positions now exist, one here in Asheville and the other across the state in the department's Wilmington regional office.

Our department's role in the Cooperative Soil Survey Program was somewhat shaken last summer. Like many of your states, North Carolina experienced a shortfall in revenue last year which forced the legislature to reduce state expenditures. Unfortunately, our soil survey program budget was cut in half; we lost 8 positions. Thankfully, the SCS was able to come to our assistance enabling the department to keep three productive soil scientists mapping soils. Naturally, we are very grateful to SCS in Raleigh and in Washington for helping during this tough period. With the improving economy, our hopes are to regain state funding for these positions next year.

As an outsider to many of the technical issues and administrative matters taken up this conference, I can better relate to how the soil surveys are used. Soil surveys are a "user manual" for natural resources and a necessary tool for proper land use management. The availability of soils data and the ability to relate soil parameters to land use continues to become more important.

A primary reason is the increasing demands placed on our natural resources. Therefore, the application of soil science is a key element for maintaining environmental quality.

In summary, our department is proud of the progress made in the soil survey in North Carolina and of the relationship among cooperators. The Cooperative Soil Survey is an increasingly important mission necessary to provide quality natural resource management.

On behalf of Governor Martin, I want to offically welcome you to the Great State of North Carolina. We hope you have an enjoyable and productive meeting while in Asheville. We invite you to come back with your families and experience more of "North Carolina, the variety vacationland".

Thank you!

Welcome Connnents
1992 South-Northeast Regional Soil Survey Conference
Great Smokies Hilton Conference Center
Asheville, North Carolina

Everett R. Emino, Administrative Advisor
Information Exchange Group 22, Soil Survey

It is a pleasure for me to be here with you today and add to your welcome to the 1992 South-Northeast Regional Soil Survey Conference. My role at this conference is as Administrative Advisor to the Southern Region Information Exchange Group-22 on the Soil Survey. This is my third meeting with you. As Administrative Advisor, I represent the Association of Southern Experiment Station Directors and facilitate the participation of Soil Scientists from the Southern Land-Grant Universities to this conference.

At the Southern Directors meeting in May of 1991 our proposal to renew the Information Exchange Group was approved until May 1995.

As I thought about what a non-soil scientist (myself) might say to a group of soil scientists in my welcoming remarks, I thought back to my comments in 1990. At that time the Farm Bill was filled with soil related issues such as ground water quality, sustainable agriculture, wetland protection, Acreage Conservation Reserve, and occurrence, fate, and transport of chemicals in soils, as examples. The public and Congress were tuned in to the environment and natural resources. That trend has continued.

Since that time there has been, in my perception, an ever increasing awareness of the American public that soil is a natural resource. They have come to recognize that soil is essential to the production of food, fiber and forest products and to the health and well-being of humans and animals. I would encourage you as soil scientists to emphasize that soil, along with water and air, is a basic natural resource that when poorly treated has a negative effect in addition to decreased productivity of croplands and forests, on water quality, recreation, land development potential, wildlife habitat as examples. Ed Runge, Head of the Soil and Crop Science Department at Texas A&M University advocated to you that as a soil scientist you should claim the top 2 to 5 meters of the earth surface because you have the expertise in this area and are capable of designing an effective education and interpretation program for others to utilize your expertise. The heightened awareness of the American public that soil is a natural resource and soil scientists have the expertise should help you as professionals. However, we must constantly remind the public so they do not forget.

As you go about the business of this conference and the important detail of the soil survey that fundamentally contributes to the stewardship of our soil, please also-remember the broader issues of the in our society that the soil survey contributes to.

I look forward to continue to work with the Southern Regional Soil Survey and this year especially with the combined resources of the Southern and Northeast Regions for an outstanding conference. It is a pleasure to be with you and on behalf of the Southern Experiment Station Directors, welcome to the conference. Best wishes for a very successful meeting.

Remarks made by Eugene J. Kamprath

On behalf of the College of Agriculture and Life Sciences and the Soil Science Department at North Carolina State University I want to also welcome you to North Carolina. I have a strong attachment to soil survey since for three months after finishing my BS and starting graduate school I was a GS-4 with the Division of Soil Survey, Bureau of Plant Industry mapping soils in the Platte Valley in Nebraska. With the Earth Conference in Rio bringing attention to environmental issues, this conference is particularly pertinent. No discussion of the environment is complete without giving special attention to soils and their properties. I want to briefly discuss three activities of the Soil Science Department which relate to the use of soils and the environment.

Sustainable agricultural systems for producing food and fiber must be profitable, protect the environment and conserve our natural resources. We need to know the productive capacity of our soils and the management practices required. As an example data for corn production on several of our soil series point out the differences between soils and management practices which must be used to utilize the full productive capacity of the soils.

Table 1. Corn yields as influenced by soil productivity and soil productivity and soil management practices.

Soil	Treatment	Grain Yield
Wagram (Arenic Paleudult)	subsoil +150 lbs N/a	86
Dothan (Plinthic Paleudult)	Conventional tillage +150 lbs N/a	104
	Subsoils +150 lbs N/a	182

The Wagram is a deep sandy soil with limited water holding capacity and therefore its yield potential is limited. The Dothan is a productive Coastal Plain soil with proper tillage practices. With conventional tillage a tillage pan develops which restricts root growth and utilization of soil water in the B horizon. Soils with an E horizon are very subject to developing tillage pans particularly use of a disk. Subsoiling permits root growth into the B horizon and utilization of the soil moisture in this horizon. This kind of information is needed if our farmers are going to compete on the world market. Soil surveys provide us the profile data which enables us to group soils which respond to different soil management practices.

One of the major issues that face us is how do we get rid of the tremendous amounts of waste generated each year. Land application is considered a major alternative for disposal of organic, biodegradable waste materials. North Carolina livestock and poultry industry generate approximately 21 million tons of fresh manure each year. Animal manures can supply 21% of the N, 75% of the P and 53% of the K annual requirements for North Carolina's agronomic crops. Municipal and industrial wastes are also being applied to soils. Loading rates have generally been based on the amount of available N supplied by the waste. High rates of manure application can cause nitrate to accumulate and result in groundwater pollution. Attention now is also being given to loading rates for phosphorus and heavy metals. High concentrations of phosphorus in the surface soil can be a source of surface water contamination. The capacity of our soils to adsorb phosphorus varies considerably (Table 2).

Soil	P added lbs/a	Soil test P, ppm
Norfolk (Typic Paleudult)	114	34
Georgeville (Typic Hapludult)	348	22
Porters (Umbric Dystrochrept)	360	25

Since Coastal Plain soils are often very high in available P and have a relatively low P adsorption capacity their loading rate for P may be limited. Applications of municipal and industrial sludges are restricted based on slope, depth to groundwater and allowable heavy metal loading rates.

An extensive research program is being conducted with septic systems and on-site waste management. Fifty percent of the homes in North Carolina are on septic systems. As a consequence information on suitability of soils for on-site waste disposal is essential. Studies are underway to characterize soil solum-saprolite sequences in the Piedmont and Mountain regions with respect to their potential for on-site wastewater treatment and disposal. There is an increasing need for saprolite classification and research in order to evaluate the suitability of saprolite for on-site wastewater treatment.

Considerable attention is being given to maintaining the quality of surface and groundwater. Any successful program must take into account the soil properties which affect the movement and transport of chemicals and nutrients. In the poorly drained soils of the Lower Coastal Plain controlled drainage has reduced the amount of nitrogen efflux from agricultural fields by one-third. With better drained soils of the Coastal Plain keeping a natural buffer area at the edge of fields next to the drainage ways reduced the transport of nitrate in drainage water from 32 kg/ha/year to less than 5 kg/ha/year. The marshy nature of the natural buffer areas results in denitrification of the nitrate. Vegetated filter strips are a means for accumulating nutrients and sediment contained in surface runoff. Grass filter strips 20 feet wide at field edge have caught 90% of the nitrogen and sediment and 50% of the phosphorus transported by surface water from cultivated fields with 4 to 5% slope.

To protect our environment it is necessary that we have up to date soil surveys along with data on their chemical and physical properties. This will enable soil scientists and agronomists to make those recommendations on use of soils, nutrients, chemicals, and management practices which will safe guard our environment. We look forward to continued cooperation with the Soil Conservation Service and the North Carolina Department of Environment, Health and Natural Resources.

BJORN DAHL'S JUNE 15 OPENING COMMENTS
FOR THE
SOUTH AND NORTHEAST REGIONAL SOIL SURVEY CONFERENCE
OF THE
COOPERATIVE SOIL SURVEY

GREAT SMOKIES HILTON CONFERENCE CENTER
ASHEVILLE, NORTH CAROLINA
JUNE 15-19, 1992

Welcome to Asheville. As the only person on the agenda who resides in the Asheville area, I'd like to welcome you to the mountains of Western North Carolina. And, as the Forest Supervisor for the National Forests in North Carolina, I'd also like to invite you to visit our National Forests while you are here.

There are four National Forests in North Carolina, with a total acreage of 1.3 million acres of public land. Most of these National Forest lands are in the mountains-in fact, the one-million-plus acres of the Pisgah and Nantahala National Forests provide much of the "scenery" you see as you drive through this area. We also manage the Uwharrie National Forest in the central (Piedmont) part of the State and the Croatan National Forest on North Carolina's Atlantic coast.

In the past, these were lands nobody wanted. Now there is a great demand for their various goods and services that they can provide. For example:

> The National Forests offer a broad spectrum of recreational opportunities. Last year alone, the National Forests in North Carolina had over 35 million visitors. In addition to the more traditional recreational opportunities or uses, our several Congressionally-designated Wilderness Areas and thirteen Wild & Scenic Rivers provide opportunities that appeal to the more adventurous members of the public.
>
> The National Forests in North Carolina produce an abundance of clear, high quality water-one of our most important resources. There are thirteen multiple-use municipal watersheds and one industrial watershed on the National Forests.
>
> The National Forests provide approximately 60 percent of North Carolina's public hunting opportunities.
>
> While meeting such demands, the Forests also produce approximately 70 million board feet of timber per year.

Today, the Forest Service is an organization responding to great changes brought about by:

Scientific developments and findings. We're constantly exploring and finding new and better ways of doing things.

Our various publics' needs, desires, and values-that is, how they want their public lands to be managed.

The--often conflicting-demands and the complexities of management, i.e., commodity vs. non-commodity.

We have a Congressional mandate to protect environmental quality, while also producing goods and services that people need. We must make a conscientious effort to uphold our public trust and meet our legal mandate. You may ask how do we do that. Our approach: applying ecosystem management to the National Forest System.

Ecosystem management is a method of "balancing" multiple use management. This implies that the system, or integrated ecological unit, is the context for management rather than just its individual parts. Since it is obvious also that every acre can't be everything to everybody, we must look at landscapes and regions as we take a truly ecological approach to management.

But such an approach must be based on a solid foundation, The more we understand about those "individual parts" and their relationships, the more effective we can be in applying an ecosystem approach. Therefore, getting and applying the best soils information practicable is paramount to good, long-term management decisions. Soil survey is a key component of the integrated resource inventories needed for such an approach.

Soil Scientists in Western North Carolina already are bringing together the expressed effects of climate, vegetation, topography, and parent material into MAPPABLE units-with important implications for management. In effect, scientists and managers (soil survey users)-perhaps without even being conscious of such terms as "ecosystem management" or "integrated resource inventories"-nevertheless have taken an integrated approach to conducting recent soil surveys in this part of the country.

In this respect, the Forest Service has benefitted greatly from its long-term partnership in the National Cooperative Soil Survey (NCSS) and the joint efforts of its Cooperators. Many of the more recent and ongoing inventories here in North Carolina are on National Forest land.

We appreciate the capable efforts of the Soil Conservation Service in its role as as the lead agency in NCSS.

We value our relationships with the universities, including North Carolina State University (Raleigh) and North Carolina Agricultural and Technical State University (Greensboro).

We recognize the important role of the North Carolina Department of Environment, Health, and Natural Resources in the NCSS. With a good cadre of State-employed soil scientists, North Carolina ranks high among state governments from the standpoint of its support and involvement.

It is very good that you, as a group, are here now to pool resources; to share knowledge; to better define our respective roles in NCSS; and to plan for the future.

It's also good to see that the Forest Service is well represented. A speaker from the Forest Service's Washington Office Soil Resource Program is on the agenda this afternoon. A number of other participants-from both the National Forests (Regional Office and Forest levels) and Forest Research-are serving on several of the committees and task forces.

I am confident of our abilities. Through our joint efforts-and the synergism that evolves from working together-we will respond to the expanding and changing needs and demands from the people and environment we serve. And, in the process, we will benefit from the rapidly evolving technologies such as GIS, GPS, etc. I expect GIS to be a valuable tool in helping us further integrate, apply, and refine our inventories and information.

Out of this meeting, I am confident that we will develop recommendations that will continue to maintain a spirit of excellent public service and maintain our proud tradition of being good stewards of the land.

Once again, welcome to Asheville and Western North Carolina. Visit the National Forests in North Carolina while you're here if you have chance.

REGIONAL PERSPECTIVE – NORTHEAST

By Arthur B. Holland,
Director Northeast National Technical Center

This is a great opportunity, having the people from the Northeast and South regions of the National Cooperative Soil Survey program meeting together this week. I know that there will be ample opportunities for exchange of technology and each of you will return to your offices with additional knowledge that will make your jobs more interesting and productive.

From a Regional Perspective, I want to discuss with you your role regarding the Food Security Act of 1985 (FSA) and Food, Agriculture, Conservation, and Trade Act of 1990 (FACTA), then I have a couple of other comments on current topics that I will share with you.

-History of National Compliance Control Team

As many of you are aware, last year, the Soil Conservation Service had a three tier review of the Food Security Act (FSA) compliance plans and how they were being implemented. The field offices looked at more than 71,000 tracts or about 5 % of FSA plans and the state offices looked at 5,500 of the 71,000 (8.2% of the 71,000). These were all randomly selected. The National Headquarters also looked at 799 tracts in 561 counties using NTC staff, called the National Compliance Control Team (NCCT).

The SCS Management Report on Quality of Field Office Decisions for FSA Compliance was prepared from these reviews and published in May 1992.

Part of the reviews had to do with information available in the Field Office Technical Guide, Section II, in which soil scientists are very much involved and interested.

The information that I'm going to display came from that report and deal with the Highly Erodible Soil Map Units and the County Hydric Soil Lists.

-Highly Erodible Soll Map Unit List

First let me compliment NH, MA, RI, CT, NJ, DE, MD, NC, SC, AL, MS, AR, and OK for having Highly Erodible Soil Map Unit Lists in all the counties that the NCCT visited.

A. Policy - the Highly Erodible Soil Map Unit List will be a part of Section II of the Field Office Technical Guide (FOTG).

B. **Finding** - Fifty three counties or approximately 10% of the counties visited in 22 states reviewed by the NCCT did not have or were unable to find their Highly Erodible Soil Map

List. On the other side of the coin, 508 counties or 90% plus had the **HESML** as according to policy.

C Recommendation - State Conservationists, for states haying counties without the Highly Erodible Soil Map Unit List, amend their State Quality Control Plan to provide for review to determine availability of the list, Where it is missing, develop the list as required by policy. The list must be in the **FOTG** and available to all persons within the field office.

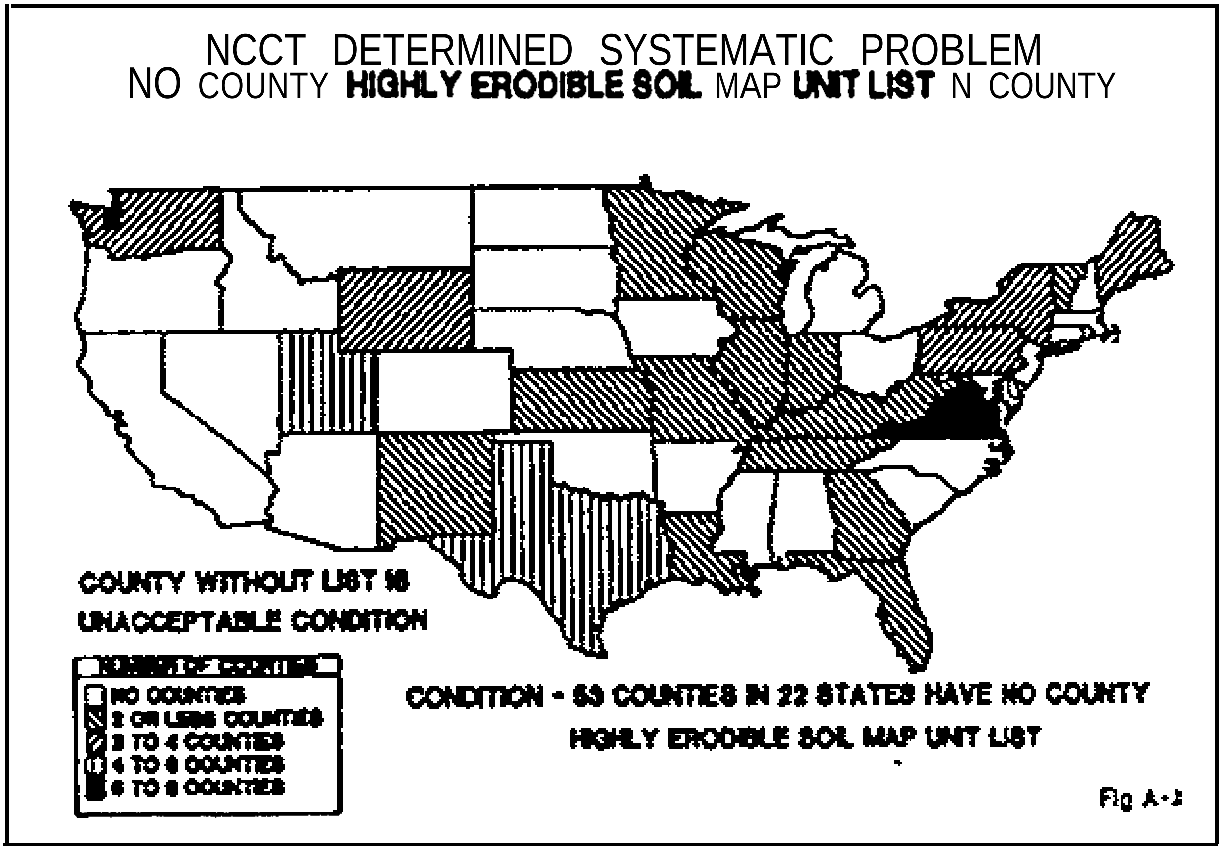


Fig A-2

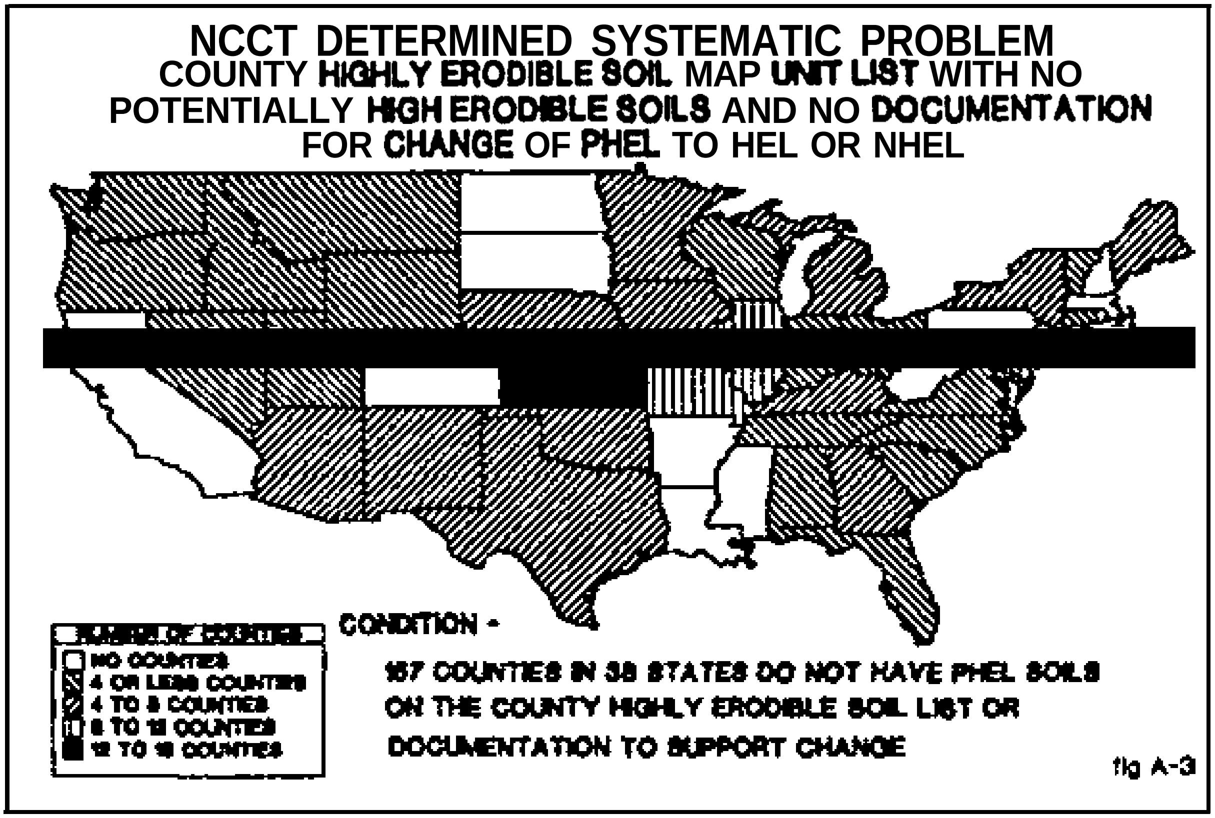
-Inclusion **of Potentially Highly Erodible Land (PHEL) Soils In The Erodible soil Map unit List**

Now let me **praise** NH, MA, RI, PA, NJ, DE, WV, MS, IA, PR and AR, for haying Potentially Highly Erodible **Soils** and Documentation for Change of PHEL to HEL or NHEL in all counties checked.

A. Policy - The Highly Erodible Soil Map Unit List includes highly erodible and potentially highly erodible soil map units in **effect** as of January 1, 1990 and remains unchanged for FSA purpose with exception of those **areas** with active soil surveys.

B. Fiidiigs - Highly Erodible Soil Map Unit Lists in 157 or 25% of field offices in 35 states did not have PHEL soils on the HEL Soils List or no PHEL Documentation to justify change to the HEL or NHEL.

C Recommendation - State Conservationists, for states identified as having more than four counties without PHEL soils on the county highly erodible soil map list or no documentation for changing PHEL to HEL or NHEL, provide a procedure in their State Quality Control Plan to restore PHEL soils to the HEL list and where documentation is insufficient to justify PHEL changes to HEL or NHEL.



- **County** Hydric **Soil** List

You have done best in getting Hydric Soil Map Unit Lists into the **FOTG's.** ME, NH, VT, MA, CT, NY, NJ, MD, DE, NC, SC, TN, AL, AR, PR and OK all had **Hydric** Soil Lists **in** all counties visited by the **NCCT.**

A. Policy - Maintain an official list of hydric soil map units in Section **II** of the **FOTG.**

B. **Findings -** A Hydric Soil List **was** not found in the **FOTG** and one did not exist as working copy in 35 or 6% of the field offices **reviewed** by the **NCCT.**

C Recommendation - State Conservationist provide a procedure in their State Quality Control Plan to review counties for availability of the County Hydric Soil List and where missing develop the list as required by policy. The list must be in the FOTG and available to all persons within the field office.

NCCT DETERMINED SYSTEMATIC PROBLEM
PERCENT COUNTIES WITHOUT **COUNTY HYDRIC SOIL** MAP **UNIT LIST**

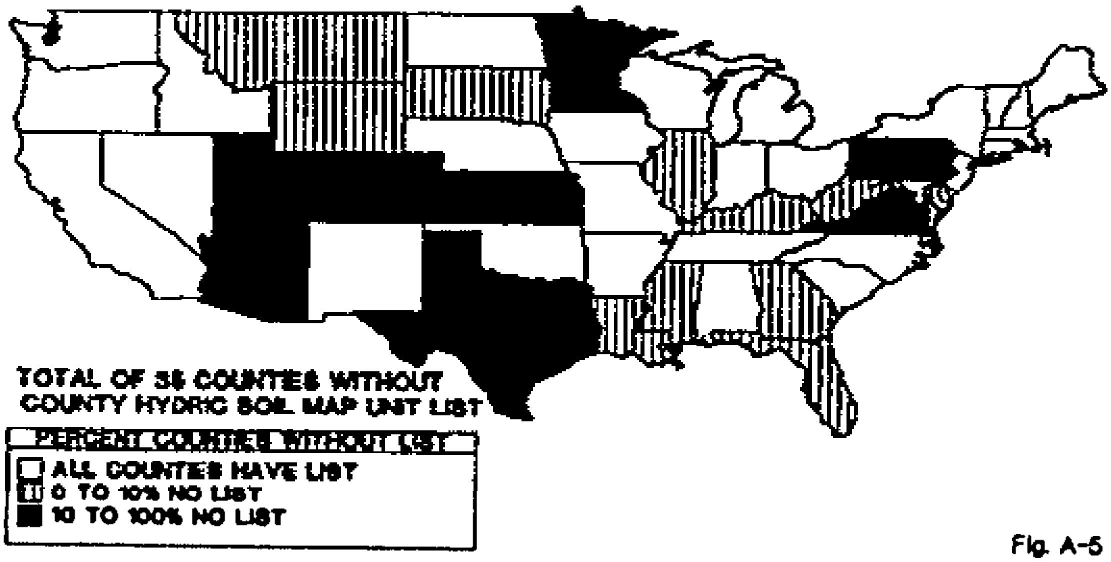


Fig. A-5

The FSA and FACTA are a very high priority for the Soil Conservation Service and that is why I have taken the time to show the results of the compliance checks made last year.

Let me move onto a couple of other topics while I have the chance.

1. *The* FOTG is a vital tool in assuring that our field offices can do their job and you need to help them by giving them the information they need. The Hydric Soils List can be kept current by using the Hydric Soils Module in 3SD. I understand that this is to be completed by July 1, 1992.

Section II of the FOTG needs to be completed as soon as possible but at least no later than Sept. 1992. Again the 3SD module is a major data base for this information.

2. The Northeast has much of the area mapped and the Soil Surveys published. However many published soil surveys need to be updated or modernized to be usable with current technology such as GIS. This means using otthophotography for the Base Survey Maps etc. We also will be using an MLRA concept for *the* legends. We need to use the same legend within an MLRA and not let political boundaries control soil survey legends. This will allow better uniformity and more consistent soils information when working with users.

Regional Perspectives from the Southern States

Prepared for the Combined South and Northeast Soil Survey Work Planning Conference - Paul F. Larson

I am pleased to address the combined South and Northeast Regional Technical Work Planning Conference of the Cooperative Soil Survey. I understand, this is only the second such meeting and the first for the South and the Northeast.

The National Cooperative Soil Survey gives State and Federal groups an opportunity to work together for a common cause. These regional work planning conferences are a good example of this cooperative effort. We, at the South National Technical Center, understand more about cooperation than we did two years ago. We have adopted Total Quality Management as a way of doing our work. We have had training and are attempting to practice what we have learned. We believe, we are doing well, but we also realize that cooperation is not easy, but is worthwhile. Your group is to be congratulated for years of working together.

You have a full agenda of work with six committees and two task forces. This work seems geared to answer questions that we ask in the near future. Modeling is being tested to answer questions for water quality in the future. It is being coupled with (GIS), Geographical Information Systems or automated map systems. Users want and should be able to load soils data for models, tailored to the mapping unit in the county. The data may need site adjustment, but this is a good beginning.

Your committee on cooperation with the private sector indicates increased use of soils information. Early work on this opportunity should clarify objectives.

The mined soils committee has a difficult problem but the combined groups should be able to attain some answers.

The work on the two regional soils maps, comes at an opportune time to make some very worthwhile contributions to the geography of soils to a particular group of users.

The task forces are completing work from past work planning conferences to get those items into operation.

The Soil Conservation Service is making time consuming changes in our conservation management for land users. A new planning manual is being written along with a comparison training course. Our field office technical guide (FOTG) is getting a re-look with some changes. New methods of displaying the effect of treatment in soils are a part of this system. A new computerized management and planning system is "about" ready. We are counting on this to help our delivery system. The soil survey data base and the accompanying list, such as hydric soils are the key information for this new system.

We are looking ahead to the completion of this system and getting back some time to do some jobs that had to be put on hold. One of these is training soil scientists at the area level to assist users. The problem remains involving how much soil scientist time we should use to help users of soil surveys and how much time we use to update our older surveys.

THE NATIONAL COOPERATIVE SOIL SURVEY; A NATIONAL PERSPECTIVE

Dick Arnold, Director of the Soil Survey

As the premier landscape artists of America, what is America to us?

It is an unspoiled wilderness that still contains the excitement of our pioneering spirit. It is a rich agriculture striving to be in harmony with its environment - with many examples of success. It is vast grazing lands, both public and private, that expand our perceptions of natural resources. It is an overwhelming diversity of forests as they fulfill functions so vital to the growth and development of our country.

America is blessed with natural resources - soils that locally hold the world together, that regionally have intriguing patterns. Soil is the resource that gives rise to our discipline. Water resources will always be crucial to building a better future. Water quantity and water quality capture more and more of our attention.

The biodiversity of America may not quite be as great as a tropical rain forest - but WOW! We still have a lot to learn about biological niches and the future options for mankind. Animals interact with soil, water, plants and air. Be they domestic life or wildlife - animals are important components of America's natural resources. Our most common resource is air - moving across continents and oceans. Good air quality is a valuable commodity; ask anyone who must live in smog. People are also resources: they cause most of our environmental problems; and they must be responsible for their solutions.

In America, we still have some disasters that will be costly to correct. But we also have some wonderful artistry of building harmony with nature. We have many isolated domains of fragile ecosystems where the forces of nature still prevail over those of mankind. And of course, we have the hustle and bustle of cities, yet there are many who enjoy and thrive in these artificial creations.

Well, where else but in America have we such wonderful diversity, complexity, beauty, and potential? It is in this setting that the National Cooperative Soil Survey came into being and has flourished. The NCSS. Decades of working together and numerous achievements of which we are justifiably proud!

What makes us feel good? Why have we been so successful?

For one thing, we have a model of soil that has stood the test of time and permitted Pedoloqy to evolve. We recognize many separate and specific features in soils. They have many properties that can be described and measured. We have developed standards that have brought consistency to our descriptions of soils, and their use lets us correlate together similar soils. We have a system and nomenclature of soil classification that comprehends most of the soil universe. It didn't just happen. What an accomplishment, what an achievement!

We feel good when we see dramatic soils - and there are thousands of them. A mystery world beneath our feet. We use our standards to gather basic facts of Pedoloqy - they are soil descriptions. As we store more and more basic facts in information systems it makes us feel good.

We recognize that soil is a continuum but that it is easier to handle information if we divide it into more manageable segments. We feel good about our successes in understanding and mapping soil variability. We feel good about the models we have developed and use to deal with soil variability. We go into the field - we observe - we make relationships among our observations. We know that soils are "out-of-doors" objects and our understanding must be consistent with that reality.

We feel good when we verify the relationships in our models and prepare the best soil maps that we can at the time with the available resources. And we really feel good and are proud when we can provide interpretations that are relevant to the needs of our clients and customers. Sizes,. shapes, patterns - fascinating! Fascinating1

Just think of it this way -- with diversity and with the necessary skills and dedication - a team can come together and tackle huge environmental issues. They can attack the wooly mammoths of the day. Teamwork - NCSS. Teamwork - NCSS.

By the year 1992 the NCSS had progressed a long way on their journey to map and interpret the soil resources of the U.S. About 92% of the privately owned lands had been surveyed and about 75% of the whole country. You can be proud of these accomplishments. I'm proud of you!

The time to look ahead is always with us. A number of you have been hammering out ideas and issues to help guide our future. You have suggested that our mission is to provide leadership and service to produce and deliver scientifically-based soil information to help society to understand, value, and wisely manage global resources. This gives rise to a vision - the desired stated of the future where there is "quality sol resource information for science and society".

You have suggested some important principles that guide our behavior. We value our employees, colleagues, customers, volunteers, and partners. We value global resources, research authorizations, innovation and creativity. We also value professionalism, reputations and a code of ethics. Notice that 8 of these 10 items are about people , not soils.

Groups of our peers have been discussing, debating, and reaching consensus on some major issues for us to consider. Let me share nine of these issues with you.

(1) Implementing a marketing plan for NCSS
(2) Automating more of our information system
(3) Team building to help each other achieve more
(4) Balancing technical services and survey projects; personal assistance versus data collection.
(5) Building and using standards of reliability
(6) Maintaining state level program managers
(7) Soil interpretations for better environments
(8) Alternative sources of funding
(9) Developing the MLRA approach for updating soil information

These are serious issues. They are worthy of our attention. As we move ahead with strategic planning and operations, we need to keep in mind the power of teamwork, of cooperation, of sharing our talents and skills with each other.

Also keep in mind new and evolving technologies that help sustain resources; such as low pressure irrigation nozzles. Keep in mind that all knowledge is based on relationships - of things that covary. And always with differing degrees of uncertainty. A challenge exists to document and present information about our reliability.

Remember why we study, learn, work, teach and team up. It is for technology transfer; soil-related technology transfer. There is a challenge to estimate the population carrying capacity of the world's soil resources. FAO did it for Africa. We should do it for the United States.

There are new clients and customers to reach out to every day. There are really great opportunities to satisfy the needs of others. There are new cultures to understand: there are generations to bridge: there are hopes and dreams to fulfill.

I am reminded that the National Cooperative Soil Survey continuously changes. Some portions are older, perhaps more mature; some are coming into their own magnificence and there are the new comers who will flush out with time. We are a thing of changing excellence.

Each in our own way has come to understand and to believe that a conservation ethic can be a way of life. It is fundamental to stewardship. And throughout the whole wide world there is the need for, the request for, the desire for - conservation and a new way of global living.

With the strategy of the NCSS, with its solid foundation, and with its dedicated members - there is a vision of beauty for the whole world that includes our vision of quality soil resource information for science and society.

And that my friends, is the day's viewpoint of the NCSS from national headquarters, as reported by your Washington correspondent. Thank you.

SOIL RESOURCE INVENTORY PROGRAM
USDA FOREST SERVICE
June 15, 1992

RANDY MOORE

Its a pleasure to be here at the South-Northeast Cooperative Soil Survey Conference. As you all know the Forest Service has been an active partner in the National Cooperative Soil Soil Survey (NCSS) for over 3 decades, and we look forward to this same cooperative participation for future decades to come. We are going through some new but very exciting changes in the Forest Service. This change is called Ecosystem Management. What this means to the Soils Program? For one, it means we are taking a" integrated approach to how we inventory soils. Our primary focuse is soils, landform, geology, vegetation and aquatics. We invite you to become a part of this change and become more intimately involved in the correlation of this data. In order for me to stay within the time allowed on the program I would like to present a short summary of the status of the soils program as followed:

SUMMARY

A. **Status**

1. 'Once-over" inventory of soil resources is about 83 percent of the National Forest land base. Completion is impeded by a lack of skilled manpower, funding, and priorities.

2. SRI reports, inservce, and NCSS cover about 67 percent of the mapped acreage. This leaves about 50 million acres mapped but with incomplete reports.

3. Participation with SCS in the NCSS has been only partially successful in publishing FS SRI's. Cooperative data sharing and mapping efforts resulting in NCSS soil correlation of FS SRI's is routine.

B. Implementation of SRI

1. Soil inventories are being conducted under a variety of names.

2. Interpretations are based on soil taxonomy and other landscape components using specific criteria, research, and monitoring data to meet inventory objectives.

3. Map unit design is constrained only by the objectives of the inventory. The idea is to use climatic factors and components of geologic structure, landform, vegetation, and soil to delineate landscape segments important to land use.

4. FS integrated SRI's meet standards of the NCSS. Map unit definition may be nontraditional for NCSS and some interpretations go beyond interpreting the soil component. However, the soil taxonomic components and their extent are determined and map units are phased by other topographic features.

5. Quality control end testing of validity of ❑ ep units has become very important.

C. Trends

1. Increased contracting of SRI.

2. Stabilized decline of soil scientist numbers in FS.

3. Increased involvement in interagency sharing of soils date through the NCSS.

4. Increased use of DBMS and GIS to store and display soils data and information.

5. Soil inventories are being conducted es integrated inventories.

6. Interpretations are based on multiple landscape components.

7. Interdisciplinary teems require more or different kinds of data for project development and environmental assessments.

8. Concerns on long-term soil productivity from erosion, other soil disturbance, and acid deposition.

9. More precise determination of land capability to improve plan projections.

10. Increasing attention to quality of inventories.

D. Needs

1. More detailed soils information for project work end models for Forest Plan implementation. This is partly in response to increased concern for protecting soil productivity and reducing erosion for off-site effects.

2. Research data to improve interpretation of map units for productivity ratings, regeneration capability, and effects of management practices on soil quality.

3. Interpretation of soil properties for acid deposition, pesticides, and intensive management practices.

4. Soil quality standards.

5. Improved quality control measures of inventory operations.

6. Improved handling of soils information for users.

7. Training in use of soils information.

8. Use of soils information in a wider variety of management activities, i.e.. monitoring, riparian management, end bio-diversity assessments.

9. More imaginative ways to display and integrate soils information to make it more useful.

NATIONAL FOREST SYSTEM
US FOREST SERVICE
STATUS AND NEEDS FOR SOIL RESOURCE INVENTORIES 1/
(MILLIONS OF ACRES)
April, 1992

REGIONS	NF ACRE:	ORDER 2 OR : NEEDS	ACRES PRINTED NCSS	IN-SERVICE	ACRES CORRELATED NCSS
1	25.3	6.4	0.4	13.2	11.5
2	22.0.	2.7	7.1	1.9	16.1
3	20.7	12.2	3.2	8.3	3.2
4	31.8	10.0	5.3	19.9	9.3
5	19.9	7.0 (O2)	.8	3.1	19.9
6	24.6	13.0	3.6	24.6	4.5
8	12.7	12.7	6.5	5.1	9.7
9	11.8	4.5	3.8	4.1	6.0
10	22.5	3.7	0	8.0	8.0
TOTALS	191.3	72.2	30.7	88.2	88.2

REPORT FROM THE 1890 UNIVERSITIES 1/

Burleigh C. Webb, PhD 2/

I am indeed honored by the opportunity you have given me to share my thoughts as a part of the 1992 South-Northeast Cooperative Soil Survey Conference. I am pleased also to bring you greetings and best wishes from the faculty, staff and students of the School of Agriculture at North Carolina A and T State University. Thank you very much for inviting me. I have elected to spend my time on the topic I call, "Through the Years With SCS".

In 1890, the second Morrill Act was passed in response to the need to enlarge provision of the original Horrill Act of 1862, setting into place the wellknown system of land-grant colleges and universities which would provide college instruction in agriculture, mechanic arts, and other branches of learning, not to exclude military science and tactics. And government-owned land as a source of the nation's wealth was to be offered for sale and interest generated would help to support this novel educational plan the same as land associated with the Homestead Act of 1862 provided the incentive for settling the country west of the Mississippi River.

While the second Morrill Act was designed to enlarge certain provisions of the first Horrill Act, southern states wishing to benefit were required to provide opportunities for its Afro-American citizens at established land-grant institutions or to develop others to accommodate them. Thus was formed the 1890 land-grant colleges system as separate institutions with the narrow mission of teaching agriculture and mechanic arts, even though the Hatch Act establishing the Experiment Station network for research was determined to be a necessary adjunct to quality teaching in the land-grant college setting.

Today, this group of colleges and universities, like its 1862 counterparts, has through actions in the States and other events, moved well beyond the restrictive original mission and has risen within this group's 100-year history to full service; comprehensive universities offering undergraduate degrees in agriculture and a wide variety of other options, including nursing, most of the standard engineering programs, business and accounting, education, industrial technology, as undergirded by strong programs of the Arts and Sciences, and graduate degree programs including the Ph.D. in technical areas as well. As expected, most have matured, developed, and grown into full-service institutions, helped tremendously in agricultural service through the Evans-Allen Agricultural Research and the Agricultural Extension Program as provided in the Farm Bill of 1977.

1/ Delivered to the general session of the South-Northeast Soil Survey Conference June 15, 1992

2/ Dean, College of Agriculture, North Carolina A&T State University, Greensboro, NC.

Other significant events have occurred in recent years, like the Nashville Conference of a few years ago, leading to the Strengthening Grants Program and Capacity Grants Program, following In the wake of the Facilities Bills for improving agricultural research and agricultural extension, which have provided effective leverage for truly outstanding programs in agriculture and related areas. All of the 1890 universities are fully accredited by the appropriate body. Many have program accreditation (eg) the American Chemical Society, Business and Accounting, Nursing, NCATE for Education, ABET for Engineering and Technology Programs. More than fifty percent of the faculty holds the Ph.D. degree.

In many instances important, unique and non-duplicative academic offerings are evidence that the 1890 university group is worth investments made in them that should be enlarged so as to improve access for any race or creed. Alabama A&M offers the Ph.D. In Soil Science, an undergrad option in remote sensing, and a new and comprehensive forestry program. The University of Arkansas at Pine Bluff, Maryland Eastern Shore, Delaware State College, Virginia State University, Southern University are developing strength in acquaculture and marine science. Langston University, Fort Valley State, Prairie View, and Tuskegee are involved in goat production enterprises.

My own institution has an ABET-approved program in agricultural engineering offered jointly with the School of Engineering, with emphasis in hydrology, water engineering, and soil conservation. It offers the B.S. degree in Landscape Architecture and a unique program leading to the B.S. degree in Laboratory Animal Science--an animal health-oriented program. Tuskegee University offers the DVH degree and Tennessee State offers a specialty in ornamental horticulture. The uniqueness, acquired academic strengths, and commitments to excellence exhibited by this group of institutions make it possible for them to function admirably with the complex issues and events of today's world and help position these institutions for ever-increasing roles in campus affairs of the future. We've come a long way past the comparatively simpler environment of 1890. While there is considerable commonality within this group, collectively they represent desirable diversity in higher education.

In a similar sense, the Soil Conservation Service, out of sheer necessity, has evolved from the relative simplicities of on-farm concerns of the 1930s to assuming an appropriate role in non-farm global issues--evidence of the current Earth Summit in Rio--where man's industrial activities and man's agricultural activities cannot be effectively consldered In isolation and as if there were no interrelations or immediate action interface.

As pointed out in the book, Aaro Ecology, by Carroll and others, soil erosion almost as a single issue came to the nation's attention during the "dust bowl" of the 1930s when no one living in the affected areas could escape the view of skies blackened by whirling dust from over-grazed range lands and drought-affected fields. As you know, it was during this period that SCS was formed under the energetic leadership of H. H. Bennett. While SCS encouraged tree planting for shelter belts, establishing grass waterways, planting on the contour--economic influences of farm prices, increased export of farm commodities, expanded production onto fragile and erosion-prone lands, large machinery appearing where terraces were considered to be obstructions, all led to accelerated loss of soil, even to the present. The National Resource Inventory, (or NRI) of 1961 provided a comprehensive review of sheet, rill, erosion over a cropland base of 413 million acres, indicating an estimated 6.4 billion tons of topsoil was washed or blown away as revealed in the United States Soil Loss Equation (USLE) or the WEE (Wind Erosion Equation), but losing sight of soil loss in gully erosion.

Here in June 1992 each day as we read our morning paper, concerns of the Earth Summit complicate our thinking and our peace of mind; for in global terms, ocean pollution, removal of the protective ozone layer, concern for soil loss at continental levels, global warming, population growth in affected areas In millions, desertification, are in dimensions or in an order of magnitude that will just about "blow one's mind". Yes, conditions are very much more complex than they were in the thirties when contour lines and terraces were laid out with the high technology tool consisting of the farm level--when today the technology of remote sensing, satellite photos, etc., almost render the oldfashioned aerial photograph obsolete. In addition, we find overlapping interests and sometimes mutual interests in having other agencies share the increasing load of total environmental consideration beyond that generated only by activity In agriculture, and might include EPA, NASA, NIEHS, and Forest Service, along with SCS.

We've come full circle - 1890 land grant institutions as a group have developed to the point that they can be full partners in a collaborative mode in assisting SCS, EPA and other agencies to address goals and objectives of their distinctly different, detailed mission. In many ways, thanks go to the soil conservation service. In my view, as supported by others, there has been a kind of coming together with the 1890s for mutually beneficial advantaaes. I would like to take a few minutes to bring some of these accomplishments to a proper state of enlightenment and credit.

While the Nashville Conference was sorely needed and has been quite rewarding to university and agency alike as partnerships are developed, my own personal experiences and those of my colleages put cooperative partnerships with SCS well ahead of most other agencies of USDA and--at least for the last 30 years--well ahead of Nashville.

As institution and SCS agency have improved over the historical span of their existence, as their respective missions have enlarged and become more complex over time, there is strong evidence pointing to parallel interests within the last 30 years (1962-1992). Accordingly, I would like to cite firsthand some favorable interventions of SCS in response to institutional requests or overtures.

1. As a recently hired dean in 1962, I was appointed by Secretary of Agriculture Orville Freeman to his Advisory Committee on Soil and Water Conservation and later to the Advisory Committee on Rural Areas Development (RAD) where I received useful insights of value to fledgling programs in soil science and agronomy, underway at my institution.

2. Later on I was able to establish acquaintance with Mr. Llnstrom and Mr. Novac of SCS to negotiate cooperative education or summer tralneeshlps for our students.

3. In the mid-60s Mr. Wllllams, then Administrator of SCS, helped us establish a plant materials lab on campus, enabling us to assist SCS in evaluating different cultlvars for erosion contact potential. The laboratory-nursery is still in operation.

4. In the latter 60's faculty were given short-term assignments durlng summer months, assisting SCS in land use planning activities.

5. A three-year IPA assignment from SCS personnel, a post-doctoral assignment from an SCS scientist, and collaborative activity with the Purdue University Soil Erosion Lab helped a great deal in winning ABET accreditation for our program in agricultural engineering.

6. Locally situated demonstration plots for conservation practices have been underway for several years as conducted by at least one SCS assignee. as is the case at present.

7. Assistance from the office of Jim Tatum is identifying special expertise to help in conservation research.

a. In the interest of getting an accurate picture for the past 30 years of involvements between 1890 institutions and SCS, I did a-survey of these universities. Of the ten questions which were raised with the university representative as listed below, results indicated that eight of the ten questions provided a "yes" answer:

(1) Assisted in establishing a plant materials lab for evaluating plants with erosion control?

(2) If yes, is the lab still operational?

(3) Carried out cooperative soil conservation demo/research projects?

(4) Engaged students in cooperation education, summer work assignments, or other form of experiential learning opportunities?

(5) Provided expertise through IPA assignments of SCS personnel?

(6) Provided summer experience for Agricultural faculty with SCS?

(7) Provided visits of faculty/administrators to SCS Centers?

(8) Employed graduates in permanent positions?

(9) Provided soil mapping, etc., for University farmland?

(10) Write other activities in which your institution has become involved with SCS as a partner.

In terms of other involvements in the near future, we welcomed the suggestion made a few months ago when SCS personnel attended a conference on telecommunications held on the A&T campus and wish to follow up on the notion that the distance learning and telecommunication capacity my university and others are expected to have In place shortly for uplink satellite transmission, as well as downlink receiver capacity, will facilitate jointly developed and jointly managed in-service training for SCS personnel in the field, and advanced graduates on campus. We believe, too, that the future could hold promise for a jointly developed Center of Excellence stemming from a combination of Agricultural Engineering and Civil Engineering on our campus, with SCS field personnel. Centers involving other 1890s might focus on conservation cropping systems, improvements in no-till operations, flood control, remote sensing, sustainable production, etc.

In conclusion, let me say that while the mission, purpose and capacity of the 1890 universities have improved tremendously, as they certainly should have; and though the mission, purpose and service parameters of SCS have improved as well, we anticipate a more extensive "coming together" from these resources leading in the long term to a more satisfactory human environment, and a safer and more productive agriculture. New technologies will come to the forefront, especially in terms of water quality, recycling water for agricultural and industrial use, water storage and delivery, while concern for environmentally compatible land use will continue at an accelerated pace where scientists of SCS, or its new or more inclusive title, will operate at more demanding and more sensitive global levels. The 1890s would want to be a part of this exciting trip into the future.

We believe surface soils and underlying geologic strata can be identified suitably for solid waste disposal outside the community of black folks--such that environmental toxins will not be harbored there at the exclusion of other places, certainly a desirable role for soil survey.

We believe the special interest the 1890s have in those of limited resources will remain at a high level; that the concept of the family farm justifies expenditures from public coffers. However, the greater issue confronting the small farmer today is as much land loss in terms of acres in farm ownership as in terms of loss of soil washed or blown away; or loss in spirit or loss in hope lest this farm operator group becomes an endangered species. For we believe there can be strength in the diversity of human activity as there may be strength in biological diversity in the environment; and the 1890s would join SCS and similar agencies in giving serious attention to this premise.

Thank you for listening, and I wish you continued success for the remainder of your conference. Your work in soil survey is an important part of urban planning, regional planning, and certainly important to rural development and environmental management in general. You are to be conended.

REPORT FROM THE NATIONAL SOCIETY OF CONSULTING SOIL SCIENTISTS TO TNE 1992 SOUTH-NORTHEAST COOPERATIVE SOIL SURVEY CONFERENCE

BY DENNIS J. OSBORNE, Ph.D.*

Both personally and as a representative of the National Society of Consulting Soil Scientists (NSCSS) I want to thank the Organizing Committee of this 1992 South-Northeast Cooperative Soil Survey Conference of the National Cooperative Soil Survey (NCSS). I am quite pleased to have this opportunity to acquaint some of you in the NCSS audience with NSCSS and to explain to you some of our goals and objectives.

All of us here have worked in creating meetings such as this, so we all know that when thing5 run smoothly and seemingly effortlessly, that someone did a lot of planning and coordination. Especially then I want to thank Horace Smith, his staff, and the local field staff who prepared our pits. I know they must have worked quite hard and we see the results1

In this matter of productive work I'm reminded of how one day Professor Buol, passing through our Soil Genesis Laboratory at North Carolina State University early in the morning, as he did every morning, saw me busily doing some task. Be asked what I was doing and I replied in the vein that I was "busy at so-and-so". He replied, "Well, I can see you're busy, but what are you trying to do?"

I've kept that in my thoughts over the years, because what I and many of us can often be seen doing is being busy, but exactly what we are doing isn't readily apparent1 So what have I as last year's President and our other officers and members who constitute the National Society of Consulting Soil Scientists (NSCSS) been doing?

I could summarize by saying that over the past four years we created an organization, stated long and short term goals as an organization, developed a most thorough and rigorous Code of Ethics, a National Registration Program for Professional Soil Scientists, a Board of Examiners to support that program, published a newsletter, have held five annual meetings, and the list could continue.

However, our time and the valuable contributions to be offered by others on the program limit how much I could "go on" as we say here in the South, so I wish to focus on the general rather than the particular.

*Past President, National society of Consulting Soil Scientists and President, Dennis J. Osborne and Associates, Box 5064, Raleigh, NC 17650

In addition, because our organization (NSCSS) like yours (NCSS) is ultimately an organization of individual men and women working with a common goal from relatively similar educational and experiential backgrounds, I want to speak from the personal case and urge you to extrapolate to **your** particular case and imagine the NSCSS membership not here today is actually just like anyone in this room.

consider that **I am a** processor of information. Relatively little of **my time is** spent conducting field soil surveys or laboratory analyses. While I certainly can do these and enjoy them, by far the greater call for my skills is to be an **interpreter** of basic or detailed soils data.

If I make my full or part-time living charging for this activity I am a consultant. Isn't this the same as in your Field, State, and National office? Do you think that because you are salaried you are not a consultant7 Of course you are and of differences between private sector and agency "consultants" I see but one: an agency "consultant" avoids downside risk at the expense of upside potential.

If we have common cores in experience and skills would you not expect that we would have common core problems too? We do indeed and these problems are what NSCSS deals with in an effort to minimize downside risk.

The National Society of Consulting Soil Scientists is a business organization composed of businesses engaged in the Professional Practice of Soil Science. We are a lobbying, educational and professional networking organization.

Why do you think Professional Engineers as a group are so "strong"? As a registered group they are not too old; here in North Carolina they gained registration in the **1960's,** I believe. So how did they become so recognized?

Simply put, they demanded to be recognized. As a trade association NSCSS demands recognition of the unique skills Soil Scientists bring to a problem. We bring the strength of numbers to bear on issues, and the strength of our commonly bound funds to spend on our activities.

Management of these activities is what separates NSCSS from most state societies or from an individual's efforts. We have a central office, and Executive Secretary, a Board of Directors, which meets twice yearly, and a group of officers elected on merit and past performance in the cause. Our President this year is Laurel Mueller, a lively lady with a wide-ranging business headquartered in **Penns** Park, Pennsylvania.

President Mueller has traveled to Indiana, New England, and the Midwest to explain this year what NSCSS does and to help form local organizations. Because we have a national membership, we have held annual meetings in Washington, Atlanta, St. Louis, Denver, and Newport Beach, California, so that we could meet with local soil scientists. Our meeting in January of this year was in California and was held as a joint meeting with PSSAC, the Professional Soil Scientist's Association of California. We were honored to have Dr. Bill McFee, President of the Soil Science Society of America address us and attend the meeting.

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National Soil Survey Center Report
South and Northeast Regional Soil Survey Conference

June 15-19, 1992
Prepared by James R. Culver and C. Steven Holzhey[1/]

We appreciate the opportunity to share some highlights of current Natknal Soil Survey Center activities.

Today's challenges are both exciting and demanding. As concerns of tight budgets dash with the excitement of new opportunities, we must look carefully at ourselves. our priorities, our products. and expectations of our customers. As a viable, dynamic Cooperative Soil Survey we must adjust to change, and we must market ourselves to changing clientele.

One step la to develop a strategic vision of where we are now and where we are going. This needs to be In a form that allows us to share our visions and expectations among ourselves and with others. Coordination of a strategk plan is one of the current activities In the Natknal Headquarters and the National Soil Survey Center. Through several sessions this year, involving the Soil Survey Division, Technical Centers and the States, we began formalizing a strategic plan for our soil survey of the future.

A wide variety of excellent items on strategk planning have been identified and discussed In each of these sessions. A brkf summary on the demand for more products and services by three broad categories is as follows:

Demand for more:

Activities related to data

- Current data
- Electronic data
- Soil research
- Soil monitoring
- In-house model
- Levels of generalization of our soils Informatlon

Activities related to assistance

- Training for users
- Accessibility of expert knowledge
- International activities
- Consultations
- Multiple discipline Invdvement

Activities related to quality soil survey

- Maintaining soil surveys (MLRA)
- Quality of our soil maps and data
- Kinds of soil interpretations

1/ Presented by C. Steven Holzhey, Assistant Director, Soil Survey Division, Natlonal Soil Survey Center, Lincoln, NE. James R. Culver is National Leader, Soil Survey Quality Assurance Staff, National Soil Survey Center, Llncdn, NE

Discussions covered several broad strategic Issues related to future demands for products and services. These include: program responsiveness and flexibility; staff technical capabilities: delivery and automation systems; international responsibility; and funding altematkes.

As a start, a plan Is In preparation which will outline *the Sol* Conservation Service - USDA perspective. Some of the factors and developments In this process are outlined below.

SOIL SURVEY IN THE FUTURE:

The concept of "finishing the once-over' no longer fits what we are dolng for at least three reasons:

(1) the once-over keeps changing as human activities change,

(2) dder soil surveys do not always meet current needs for data and interpretations (They wear out at accelerating rates.), and

(3) there Is Increased need for continuity of map joins and interpretations between survey areas.

Dr. Randy Brown, University d Florida, wrote an Interesting article

In a more graphic sense, the soil scientist must carry the **knowledge** across the interface between us and our customers in partnerships somewhat as fdlcws:

(1) **Soil** Survey production **(soil sclentlst** with knowledge of customer needs),

(2) Interface to customers (soil **sclentlsts/customers** in **partnership)** to assure transfer of **approprlate** knowledge In approprlate media and **formats, and**

(3) Customers reaching through the interface to obtain the information and knowledge they need.

We need people who know the patterns and processes **behind** the property data, people who know our information systems and how to use them, people who know the **quality** control procedures, and people who know the languages of customers We have to be Increasingly more knowledgeable about applications of Information. and **will** have to work In teams **with** others **outside** of **soil** survey to **remain** acquainted with needs of customers

SOME IMPORTANT FACTORS

-- The way we do buslness (Focus on total **quality** In terms of customer **expectatlons.).**

-- Greater **competltion** for funds.

-- **Maintalning** or **modernizing** soil surveys by **MLRA** Instead of by county.

-- **Geographic** Information Systems.

-- Documentation and **validation** of **Informatlon.**

-- Global **perspective** to environmental concerns.

NATIONAL SOIL SURVM CENTER

Location: Uncdn, Nebraska **Established: 1988**

Personnel: Roughly **100** Full-Time Employees (Roughly 43 soil scientists and 55 other)

staffs:
- Quality Assurance - Roughly **40**
- Laboratory - Roughly **40**
- **Classification** *
- interpretations *
- **Soil** Geography and **Information** Systems •
  - Roughfy 20 total among the fast 3 staffs above

Facilities:
- **Soil characterization** laboratory
- **Editorial section** w/desktop **publishing**
- Access to university mini and mainframe computers
- Offices for visitors
- Training facilities
- Databases, **GIS**
- **Statistical** packages

Prime **responsibilities include:**

1. **Technical quality** of the National **Cooperative Soil** Survey

   - Making **soil** surveys
   - **Maintaining** and updating the soil survey information base
   - **Delivering** knowledge about how to use **soil** Information

2. Technical **evolution** of the National Cooperative Sol Survey

   - Defining and orchestrating needed change **(maintaining** the **scientific** and **technical capability** to orchestrate needed change)
   - Logistical and **organizational** support to the processes of technology transfer, research and development, impfementatbn

3. Sdvfng technical probiems **involving** soil resources **(international,** natlonai, and **SCS** priority)

   - **Interdisciplinary** and interagency consultations, research and development. techndogy transfer
   - **International** consultations, technology transfer

The Natlonai **Soil** Survey Center is a very busy **place, with** a wide **variety** of concurrent **activities** at all stages of development. Shared **seminars,** Interaction **with various** staffs, a stream of visitors and cdlaborators, and **cooperative** work on projects present excellent **opportunities** to Improve **professional skills** in **producing quality** products.

Activities at the National Soil Survey Center can be broadly grouped as **follows:**

DOCUMENTS
- National Soils Handbook
- Soil **Survey** Manual
- Keys to **Soil** Taxonomy
- **Guide** to Authors d **Soil Survey** Manuscripts
- Field Procedures Manual
- Laboratory Procedures Manual
- **MLRA** Handbook

MLRA
-- 20 plus MLRA's with some activity
-- Numerous multiple state sessions to develop MLRA MOU plans

CORRELATION
-- Eroded Mollisols
-- Dense Till
-- Andisols
-- Fraglpans

NASIS
-- Programming at Ft. Collins
-- Soil Survey Business Analysis Group. Interaction among Soil Sur. Dk.. NTCs, states and Ft. Collins
-- Conversion of Data to Informix Format
-- Soil Survey Schedule
-- SoilNet
-- Hydric Module

ADVISORY GROUPS
-- State Conservatlonlsts
-- National Cooperative Soil Survey
-State Soil Scientists - Futuring Group
-- Numerous Project Groups within the National Soil Survey Center - Le., transects

LABORATORY DATA
-- Soils-8: Excellent Progress Poward Completion
-- Soil Investlgatlon and Sampling Projects

RESEARCH AND DEVELOPMENT
-- Soil Genesis
-- WEPP, DRAINMOD, etc.
-Water Measurements and Studies
-Analytical Methods
-- Field Characterization of Ephemeral and Use-Dependent Properties

GLOBAL PROJECTS
-- Monitoring Sites
-Wet Soils
-- EMAP
-- National Soil Moisture and Temperature Map
-- Geomorphdogy Studies, MLRA 77

PUBLICATIONS
-- Cdor Photographs
-- Manuscript Tables Prepared from Edited 3SD
-- Two(or three)-part Manuscript

BUDGET INITIATIVES
-- Aerial Photographs
-- Computers - Project Soil Survey Offices

TECHNICAL - INTERPRETATIONS
-Water Quality
-Crop Yield Models
-- Hydric Soils
-- FOCS

SOIL GEOGRAPHY
-- STATSGO
-- MLRA update map

TRAINING
-- Soil Correlation
-- Basic Soil Survey - Field and Lab
-- Laboratory Data and Use
-- National Soil Correlation Workshop
-State Soils Workshop
-- Soil Scientists to NSSC
-- 3SD and Databases

CONCLUDING COMMENTS

A draft of Soil Survey Division priorities for Fiscal Year 1993 is included as a handout Based on current staffing and budget projections, several activities will have to be dropped or delayed. Such decisions require fairly intense communications, during the next few months, amongst the groups represented at this conference. The National Soil Survey Center has an excellent mix of professional staff collectively working toward a set of common goals. As these are adjusted, we want to be sure the adjustments are In accord wfth and complimentary to the goals of the National Cooperative Soil Survey at large.

Schedules for next fiscal year are now solidifying. This past year our Soil Survey Quality Assurance Staff accelerated the shift from traditional field assistance on final field reviews to more emphasis on soil survey operations in the early part of the project soil survey, special field studies, and multiple state MLRA activities. If you concur with this shift, we will appreciate your help in giving priority to those services through requests for assistance.

Please visit with our staff on any issues where we may be of assistance. We want to know how to better serve in these times when a day's quality service becomes ever more precious.

I have enjoyed sharing some thoughts with you today and am looking forward to a productive conference. The organizers deserve our compliments for succeeding In arranging this joint conference In which regions can Interact and In arranging a fine agenda and field trip.

USDA/SCS/Global Climate Change Activities

by John M. Kimble

Global change is more than a greenhouse driven change. It includes interactions among our climate, soils, water, air biological, and man-related factors

The Soil Conservation Service is involved primarily because of its leadership in the National Cooperative Soil Survey (NCSS). Soils are key factors in: (1) carbon cycling and sequestration; (2) desertification, productivity, and plant succession; (3) nutrient cycling and hydrologic processes, storage, transmission and transformation of environmental contaminants. The objective is to build links between the spatial/attribute data of soil survey and the teams working on global change and modelling global balances.

Soil physical, chemical, biological, and mineralogical properties are impacted by climate change and the activities of man. These have major impacts on the listed items.

SCS in cooperation with other partners in the National Cooperative Soil Survey (NCSS) are mapping soil carbon sources and sinks around the world, this includes carbonates and organic carbon.

Maps are being made of paleosols that are benchmarks of past vegetative shifts and climates regimes. These will help in making determinations of the possible effects of future climate changes based on earth systems history.

SCS and the NCSS are developing process models of soil genesis to evaluate impact scenarios of climate change on soil properties and landscapes.

Soil maps at the county, state, major land resource areas, or national scales are being developed. SCS is developing small scale digital soil geographic data bases for the United States to support global circulation models (GCM's). As well as developing maps, SCS is updating the clarifications of all the pedons in its data base and getting all of them georeferenced.

A national SCS soil moisture/temperature pilot project is underway to measure soil moisture and temperature and other atmospheric measurements at selected sites using meteor burst communications.

SCS is working with the University of Alaska and Agriculture Canada to gather information on permafrost affected soils. This is one of the largest potential sinks or sources of soil carbon if there are global climate changes. It is also an area with the least understanding.

SCS is working with its NCSS partners actively studying wetland processes in Texas, Louisiana, Oregon, Alaska, Minnesota, North Dakota, Indiana, and New Hampshire. These are long-term projects that will provide a better understanding of the wetlands and the genetic process in development of redoxomorphic features in soils.

SCS is working with universities to organize and hold meetings on soil modeling, wet soils, permafrost affected soils, and carbon dynamics. These meetings contribute to the increasing data base needed to understand possible climate change effects.

SCS is providing soil characterization and mapping support to the Long Term Ecological Research Network (LTER's).

The activities of SCS fall under the following science elements of the overall global change work: Climate & Hydrologic Systems: Biogeochemical Dynamics: and Earth System History.

SOIL CORRELATION ISSUES

Berman D. Hudson

June 1992

In about the year 2001 the last once-over soil survey on private land will be completed - probably somewhere in Michigan or Georgia. However, the approaching end of the once-over soil survey is already affecting us. For example, a number of things we once took for granted are now open to question. Most of us who have worked during the last 20 years or so have had a pretty comfortable, predictable existence. This is because those who came before us made some major decisions. When starting a new soil survey, we did not worry that much about the kind and scale of mapping materials we would use or how we would proceed with the soil survey.

With the advent of GIS and the emphasis on correlation throughout MLRA's, this has changed. We are now in the process of "remaking' a lot of decisions, which is forcing us to reconsider many of our assumptions and value judgments. We are also learning that decision making is not straightforward or linear, but more often involves a continuous process of backing up and re-assessing as technology changes. Decisions do not always stay made.

An example of this is mapping scale. A few years ago the decision was made that the standard mapping scale provided by SCS would be 1:24,000 orthophotoquads. If states wanted to use 1:12,000 scale, they would be required to fund the considerable difference. However, recently, USGS has developed a way to produce 1:12,000 quarterquads at about the same cost as 1:24,000 quads. This removes an economic and technological constraint, and theoretically allows us to use either 1:12,000 or 1:24,000 scale base maps for soil mapping. However, this raises additional technical issues. Are the two scales compatible? Will the mapping be so different that we cannot use the same map units at the two different scales? This forces us to rethink the relationship between soil-landscape mapping and map scale. This is done in the following issue paper titled "Map Scale in the Soil Survey." This issue paper is not presented to advocate a certain course of action. Instead, it is meant as an example of the kinds of basic re-assessment and fundamental analysis we soon may be forced to go through in many areas of the soil survey.

MAP SCALE IN THE NEXT GENERATION OF SOIL SURVEY

INTRODUCTION

Existing soil surveys in the United States are at a variety of scales. Most common are 1:20,000, 1:15,840, and more recently, 1:24,000. A number of on-going soil surveys will be mapped and compiled at 1:12,000. This scale will become increasingly common in the future. A recent policy directive mandated that all SCS soil surveys completed in the future will be compiled and published at a scale of either 1:12,000 or 1:24,000.

In meetings to plan for the regional correlation of soil surveys (i.e., MLRA update meetings), scale often is an area of discussion. Someone identifies a part of an MLRA in which a scale of 1:12,000 is needed. Someone else usually asserts that in other areas of the MLRA all important soil areas can be delineated at a scale of 1:24,000. This creates an apparent dilemma. Can both 1:12,000 and 1:24,000 scales be used for mapping and compiling soil maps in the same MLRA? If so, can the same map unit be compiled at two different scales? If only one scale is to be used, which one should it be?

The question of scale also arises when one decides to recompile existing soil surveys originally published at scales of 1:20,000 or 1:15,840 onto a new base without remapping. What scale should the new base be? Should it be the same, larger, or smaller than the original scale?

This paper examines these issues in light of our basic assumptions about soil mapping and map scale. These topics are very important as we plan for the next generation of soil surveys in the United States. This paper presents two options for dealing with map scale in the soil survey and recommends one of them.

SOIL SURVEY AND MAP SCALE

Soil scientists refer to maps at a scale of 1:24,000 as "detailed," and maps at a scale of 1:12,000 are considered detailed indeed. Since we think of our product as a "detailed map," we forget how large a piece of the actual world is condensed onto a typical soil survey atlas sheet. When represented on our 1:12,000 four) such a large leap? When placed in the entire scale contuinuum from 1:1 to 1:24,000 the change from 1:12,000 to 1:24,000 is extremely small proportionately.

The logical response to this, of course, is something like the following: "In the entire range of scale, the difference between 1:12,000 and 1:24,000 may not be so large. However, when you are working at those scales, at that particular place on the continuum, the difference is pretty great." This individual might continue, "I <u>know</u> that the same area on a 1:12,000 map is four times bigger than on a 1:24,000 map, so I can map a lot more detail - up to four times as much."

The last sentence above is based on an assumption that is fairly common in the soil survey. It is widely assumed that the amount of detail that will be mapped in a soil survey is highly correlated with scale. For example, assume that an individual mapped the soils in an area at a scale of 1:24,000. Then assume that another individual came in and mapped the same area at a scale of 1:20,000. The conventional thinking is that he/she would prepare a recognizably more detailed soil map. If yet another individual came in and mapped the same area at yet a larger scale, such as, 1:15,840, it is assumed that the third set of maps would have even more detail. By the time a fourth individual arrives on the scene and maps the area at a scale of 1:12,000, it is assumed that there would be much more detail than on the original 1:24,000 soil map. That is, as one progresses from 1:24,000 to 1:20,000, then to 1:15,840, and ultimately to 1:12,000, the amount of detail shown on a soils map will increase proportionately.

The scenario described above is based on the assumption that the amount of detail that will be shown on a soils map is highly correlated with scale. However, examining almost any published soil survey will provide ample evidence that this is not true. At a given scale, some parts of a soil survey will have many small delineations - "a lot of detail." However! other locations in the same survey area will have a relatively few large delineations. Just because one can cartographically delineate smaller areas on a soils map, he/she does not necessarily do so. <u>The amount of detail on a soils map is mostly determined by the natural soil-landscape relationships in the survey area.</u> One is not able to delineate increasingly smaller soil areas at larger scales unless these smaller, heretofore undelineated but mappable soil-landform units actually exist -- and can be identified on the photograph.

The following analysis shows what kind of soil areas might be affected as one goes from a scale of 1:24,000 to 1:12,000. The smallest delineation that can be shown on a soil map with an included symbol is about 1/4 inch by 1/4 inch, as shown here.

Table 1 shows the acreage represented by an area 1/4 inch by 1/4 inch on soil maps of different scales.

Table 1. Minimum Acreage Delineated at Various Scales

Map Scale	Acreage in 1/4 x 1/4 Inch Square (Approx.)
1:12,000	1.5 Acres
1:15,840	2.5 Acres
1:20,000	4.0 Acres
1:24,000	5.5 Acres

The information in Table 1 is informative. It tells us which soil-landform units can be delineated at a scale of 1:12,000, but which cannot be delineated at 1:24,000. These are soil areas which are larger than 1.5 acres (the 1:12,000 limit), but smaller than about 5.5 acres (the 1:24,000 limit). Therefore, going from a scale of 1:24,000 to a scale of 1:12,000 will affect only those mappable soil-landform

SUMMARY

Based on the preceding discussion, the following general propositions are offered concerning map scale in the soil survey.

1. The amount of detail that can be mapped in a soil survey area is mostly determined by the size of the naturally occurring soil-landform units. Simply going to a larger scale will not enable (nor force) one to carve increasingly smaller delineations out of existing soil-landform units.

2. Therefore, in the scale range of 1:12,000 through 1:24,000, the amount of detail that can be delineated on a soil map is not greatly affected by changing scale. Only a small proportion of total delineations will be affected in most soil surveys.

3. Changing scale from 1:12,000 to 1:24,000 will affect only those naturally occurring soil-landform units larger than about 1.5 acres (the 1:12,000 limit) but smaller than about 5.5 acres (the 1:24,000 limit). Soil-landform units larger than about 5.5 acres can be delineated at both scales. Similarly, changing scale from 1:12,000 to 1:24,000 will affect only those linear units (floodplains, etc.) wider than 250 feet but narrower than 500 feet.

RECOMMENDATIONS

Considering the foregoing discussion, there are at least two viable options for dealing with scale in the soil survey. One option is, depending upon local need or preference, to map both at 1:12,000 and 1:24,000 in the same MLRA. Most map units will not be affected. However, some smaller (1.5 to 5.5 acre) soil-landform units will be delineated at 1:12,000 and not at 1:24,000. For example, a 1:24,000 scale survey might map alluvium and colluvium in the same unit as a complex. A 1:12,000 survey with the same landform might separate them. Such situations will cause some correlation and joining problems. However, only a small proportion of map units will be affected. Reasonable correlation and joining could be achieved.

Another option is to designate 1:12,000 as the mapping scale for the next generation of soil surveys. This would involve a phase-in program so that, at the end of, for example, five years, all soil surveys would be mapped and compiled at a scale of 1:12,000. There are several advantages to this. First, 1:12,000 allows one to show small areas of contrasting soils. Although units between 1.5 and 5.5 acres in size are relatively few in number, they can be very important. For example, small alluvial areas often are either wetland or prime farmland. In soil survey areas with strong relief, most soil use and management occurs on either ridges or alluvial/colluvial areas less than 500 feet wide. It is important to use a scale that allows one to show these small areas cartographically.

Mapping soils at larger scales has been viewed with some apprehension. The biggest fear is that going to a larger scale will inevitably result in a proliferation of delineations in every landscape position. This, it is feared, would lead to reduced mapping productivity and greatly increased cartographic costs. However, in the scale range of 1:12,000 to 1:24,000, such fears have little scientific basis. Underlying soil-landscape relationships, not map scale (at the 1:12,000 to 1:,24,000 range), largely determine the detail that can be mapped. Therefore, by going to a universal 1:12,000 scale, one could delineate small, contrasting, important soil areas in the size range of 1.5 to about 5.5 acres - areas which could not be shown at 1:24,000. However, larger soil delineations would not be affected. In summary, going to a universal 1:12,000 scale for the next generation of soil surveys has the following advantages.

1. One common scale will expedite joining, and correlation among areas.

2. Much of the cartographic limitations to delineating small, but important soil areas will be eliminatedd. This will permit us to provide a better product by delineating small, contrasting areas where needed.

3. Most delineations (those larger than about 5.5 acres) will not be affected. Therefore, mapping rates will not decrease significantly, nor will there be a large increase in compilation time and cost.

SOUTH AND NORTHEAST REGIONAL SOIL SURVEY CONFERENCE
NCG - SUPPORT FOR SOIL SURVEY
June 15-19, 1992

W. R. FOLSCHE
HEAD, NCG

* Name change from National Cartographic Center to National Cartography and GIS Center (NCG).

* Change in Branch Chiefs - Hugh Allcon now the NCSS Branch Chief.

* Hoff Owen has been hired to coordinate SSURGO. She will work through the regional GIS person in coordinating work in states.

* NCG will provide 60 percent of the cost of digitizing to SSURGO standards for surveys sent to NCG for contracting. This is up to $100,000 (NCG's total funds for the year). First come--first served. The 60 percent is for only the first three quarters of the fiscal year.

* Future publishing on ortho will be at 1:24,000 and 1:12,000 scale.

* NCG can use map finished digitally for going directly to negatives and then to press,

* NCG is now putting the text for published soil surveys through a device (image setter) for a high quality text.

* NCG is working on a process to reduce the time on general soil maps used in soil survey publications. Plans are to provide the states with a digital formatted generalized soils map, STATSGO, and have states make any changes needed. The digital map can easily be changed and negatives can be made directly from digital products.

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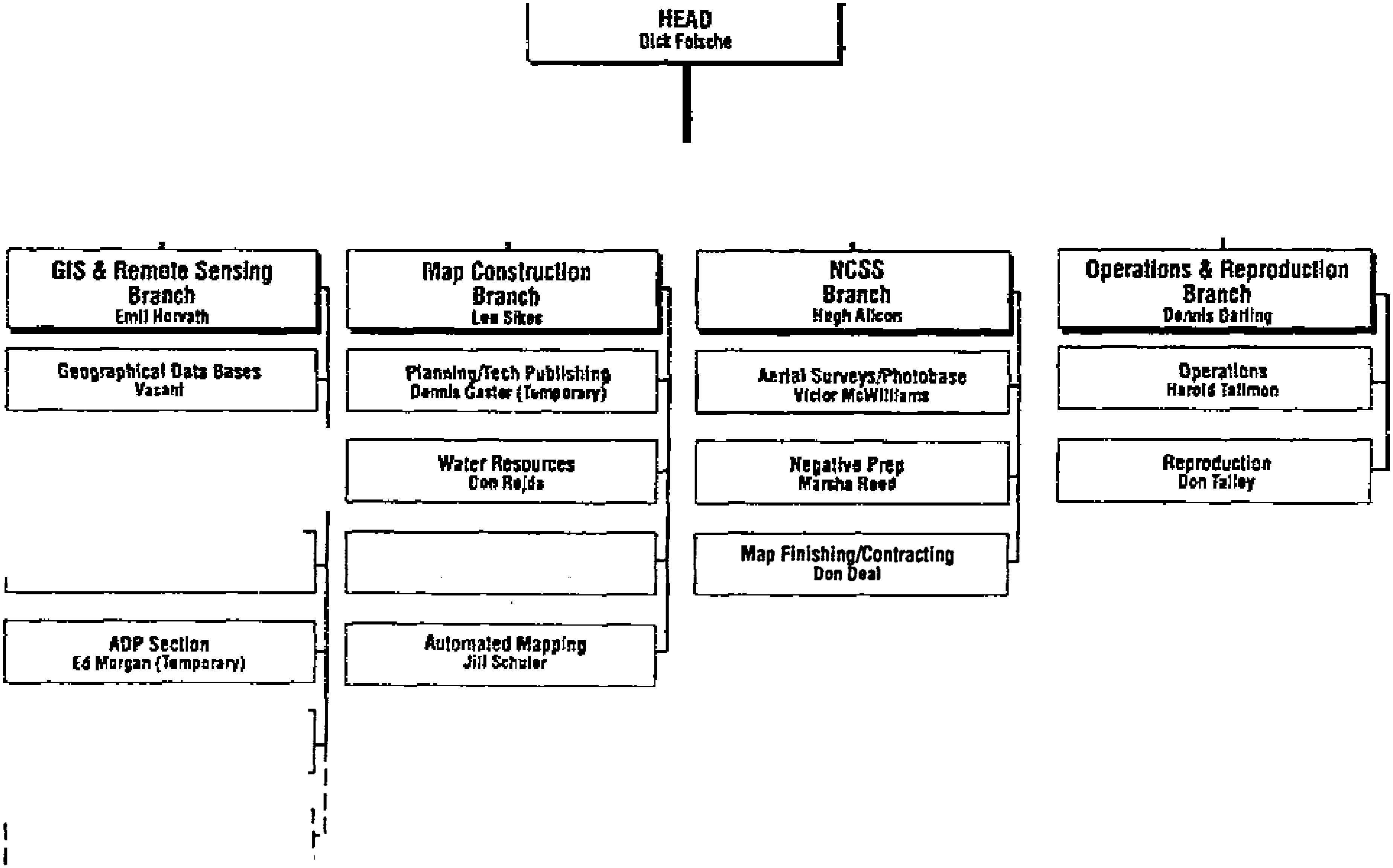

April 1992

Status of Policy on Hydric Soils and Wetlands
Prepared By
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For Presentation at the South/Northeast and West Regional Work Planning Conferences

Introduction: I find myself repeating things when reporting on hydric soil and wetland issues. One of the things I keep saying is that the hydric soil defintion and criteria are a continuing issue especially with respect to the public comment on the Federal Manual for Identifying and Delineating Jurisdictional Wetlands. Special interest groups on both sides of the wetlands fence are keenly interested in how we in the National Cooperative Soil Survey (NCSS) manage and control the quality of the hydric soil lists. Some groups just plain do not trust us. Other groups are very interested in the scientific basis for the hydric soil definition and criteria and will perhaps challenge the National Technical Committee for Hydric Soils (NTCHS). In this report, I will discuss a brief history, organization, and activities of the NTCHS, some current issues concerning hydric soils, and some issues on the Federal Wetlands Manual and our agency's National Food Security Act Manual.

Background: The Soil Conservation Service (SCS) began work on a hydric soil defintion in 1977 at the request of the Fish and Wildlife Service (FWS). Blake Parker, a soil scientist, was working with FWS to develop a definition of hydric soils. Keith Young was assigned the task to work with Blake on developing a defintion of hydric soils and a list of hydric soils for use in the FWS National Wetlands Inventory. From 1977 to 1981 definitions were developed and tested in field studies. In 1981 the NTCHS began as an ad hoc group with the charge to develop a definition and criteria for hydric soils and a list of hydric soils. Dr. Guthrie chaired the group which consisted of Keith Young, Blake Parker, Keith Schmude, Carl Thomas, Arville touchet, Paul Johnson, and Del Fanning.In October of 1981 the first national list of hydric soils was distributed for state and NTC review. This list generated many comments both from SCS and the Land Grant Universities.

In early 1985 the present National Technical Committee for Hydric Soils was organized by the SCS Deputy Chief for Technology and the Corps of Engineers (CE); Environmental Protection Agency (EPA), and FWS were invited to assign permanent members to the committee. Dr. Guthrie also invited experts from the university community to join the committee. Keith Young replace Dr. Guthrie as chair of the NTCHS shortly after the committee was formed. It was under his leadership that the criteria were developed. In 1985, I replaced Keith as chair.

In 1985 congress passed the Food Security Act (FSA) which cited the hydric soil criteria as part of the definition of wetlands as part of Swampbuster legislation. Also in 1985, the committee published the first edition of Hydric Soils of the United States. The NTCHS published the second edition in 1987 and the third edition in 1991. The 1987 wetland manuals of the CE and EPA also required the use of hydric soil lists.

National Technical Committee for Hydric Soils: The NTCHS is an interagency, interdisciplinary committee. Its functions are to:

- Develop and improve hydric soil definition and criteria

- Publish a national list of hydric soils

- Respond to comments on hydric soil criteria

- Provide technical consultation on hydric soils to other technical groups

- Investigate new technology for defining hydric soils

The committee representation includes 7 from the Soil Conservation Service (SCS), 5 from universities, and one each from EPA, FWS, CE, Bureau of Land Management (BLM), Forest Service (FS), and a private consultant. Of the 18 total members we have 13 soil scientists, 4 biologists, and 1 engineer. The SCS members include:

- Maurice Mausbach (Chairperson)
- Ray Miles (West representative)
- C. L. Girdner (Midwest representative)
- De Wayne Williams (South representative)
- H. Chris Smith (Northeast representative)
  (State soil scientist representative)
- Billy Teels (National Biologist)

The other members are:
- D. Fanning, University of Maryland
- Richard Guthrie, Auburn University
- W. Patrick, Jr., Louisiana State University
- R. W. Skaggs, North Carolina State University
- J. Richardson, North Dakota State University
- P. Reed, FWS
- R. Theriot, CE
- W. Sipple, EPA
- C. Voigt, BLM
- P. Avers, Forest Service
- W. Blake Parker, private consultant

The committee is chaired by SCS. Committee membership has gradually grown to the present 18. Avers, Voigt, and Richardson have been added in the past year.

The committee usually meets once a year to review comments on the hydric soil definition and criteria. They often meet in an area to study hydric soil issues in the field. The next meeting is scheduled for Fargo, North Dakota in August. The committee will tour the hydric soil research sites in the pothole area.

Hydric soils: The most recent changes in the hydric soil criteria added frequency to the saturation criterion to require frequent saturation (more than 5 out of 10 years). This change matches frequency criteria for flooded and ponded soils. Duration for saturation was increased to more than two weeks during the growing season. This change reflects current research that shows, on average anaerobic conditions occurring after 10 to 20 days of continuous saturation. These changes do not affect the list of hydric soils as our soil property record is not specific enough to distinguish between 1 or two wekks of saturation. The NCSS definition of a seasonal high water table is:

> "A zone of saturation at the highest average depth during the wettest season. It is at least 6 inches thick, persists in the soil for more than a few weeks, and is within 6 feet of the soil surface."

The NTCHS revised the criterion for depth of water table in sandy soils to occur above 0.5 feet instead of 1.0 feet. Sandy soils have sand, coarse sand, or fine sand textures in the upper 20 inches. This requires the water table at the surface for these sandy soils. This change is supported by the thickness of the capillary fringe in these soils. The major affect of this change is for sandy soils on the lower Atlantic Coastal Plain.

The current hydric soil definition and criteria are given in the appendix. The SCS publishes a national list of hydric soils for the Umted States. The list is computer generated by matching the criteria to soil properties on the Soil Interpretations Record (SIR). Soils are added and deleted from the national list only buy changing the estimated properties on the SIR. The national list contains taxa at the series level of Soil Taxonomy. The third edition was published in June 1991. This publication is in high demand by wetland delineators and other users of the information. This national list is maintained on computer file and can be subdivided by state.

The local or field office lists of hydric soils are the most specific for use in wetland determinations. They are generated using the specific information in the state soil survey database for the soil survey area by matching the criteria with soil properties of the map unit components. The software also allows for adding information about included soils. The lists contain information on the landscape position of the hydric component of the map unit. It is extremely important that the sod property records for components of map units are of the highest technical quality because these lists are coming under extreme scrutiny.

Hydric soil issues: The major issue for hydric soils is our quality control and quality assurance procedures on the soil properties used in the hydric soil criteria as they reflect changes in the hydric soil lists. I emphasize that we must document any changes that affect a soil either being added or deleted from the list of hydric soil map units or hydric soil series. The NTCHS has a subcommittee drafting proposals for the kind and amount of documentation. I know that Florida has already developed a system to track and document changes in hydric soils. I believe the South National Technical Center has circulated this system to all states for comment. Other National Technical Centers (NTC's) are doing the same. We have been asked by outside groups to monitor these changes at the National level, but have been able to respond that our NTC's and National Soil Survey Center Quality Assurance staffs are performing this function.

Some individuals are suggesting that the NTCHS publish changes in hydric soil criteria in the Federal Register for public comment. We presently file notice of change. We have been able to thwart these suggestions but the pressure remains. These same individuals think we should publish for public comment changes to the lists of hydric soils. It is extremely doubtful that this will happen, but if it did it would impact most of what we do in soil survey. Because of these issues, we must be extremely attentive to our quality assurance of the soil property record and of changes to the hydric soil lists.

The NTCHS continues to review our understanding of soil processes in wet soils. The period of saturation, flooding and ponding necessary for a soil to become anaerobic is a crucial issue. In this respect, I am working with Dr. Jimmy Richardson, North Dakota State University, to review the literature on the biogeochemical processes in wet soils. One of my goals is to develop a generalized kinetics framework from which to deal with time needed to develop anaerobic conditions. Major factors are organic matter content, soil temperature, soil wetness characteristics, pH, and the kind of organic matter available to the microorganisms.

Depth to water table and saturation in the capillary fringe are continuing issues with the hydric soil criteria. Saturation in the capillary fringe is part of the current water table definition. The criteria now read that water tables are less than a certain depth such as 1.5 feet. By our database convention, this in fact means that the water table is at 1.0 feet, because we only record water table depths by 0.5 foot increments. There is a difference of opinion as to the capillary fringe and development of anaerobic conditions. There are some reports in the literature of reducing conditions in the wetter part of the capillary fringe.

In an effort to resolve some of the issues, the SCS in conjunction with the CE has extended the wet soils research projects. In addition to the sites in Louisiana and Texas, we are contracting with Dr. Richardson, North Dakota State University; Dr. Huddleston, Oregon State University; Dr. Ping, University of Alaska; Dr. Franzmeier, Purdue University; and Dr. Veneman, University of Massachusetts to study water tables, oxidation reduction potentials, and other soil processes. The information will help in understanding soil processes in these wet soils, help to support or refine hydric soil criteria, and assist in defining aquic conditions in soils. The study in Alaska will also help refine biological zero in cold soils.

Federal Wetlands Manual: The first edition of the Federal Manual for Identifying and Delineating Jurisdictional Wetlands was published in 1989. During 1990 the CE and EPA held a series of public hearings on the manual. The interagency committee responsible for the manual has redrafted the manual addressing the concerns of the public and wetland delineators. The revised manual was then revised by the National Council for Competiveness which is chaired by the Vice President. These revisions were then published in the Federal Register for public comment. We received over 80,000 comments, which the EPA is now summarizing. The interagency technical committee is reviewing the technical comments and are making technical recommedations to the Vice Presidents committee on the Federal Manual. The soils section of the Federal Manual needs major reviewions regardless how the hydrology criterion develops.

Changes in the 1989 manual include:

- The hydrology criterion is separate from hydric soils and requires 15 days of inundation to the surface and/or 21 days of saturation at the surface.

- The growing season for hydrology is the interval between 3 weeks before average date of last killing frost in spring to 3 weeks after average date of first killing frost in fall.

- Specifies the use of hydric soils criteria and minimizes the use of hydric soil (morphological) indicators but requires field verification of hydric soils.

- Emphasizes that all three criteria must be met for an area to qualify as wetland.

- Allows for the use of wetland hydrology indicators to determine hydrology under certain circumstances.

The hydrology criterion remains the major stumbling block and it is anybody's guess at what it will be. I can guarantee you that it will be different from what we are presently using in the National Food Security Act Manual (NFSAM).

The wetland delineation community has asked us to develop wetland hydrology (hydric soil) indicators for saturated soils. Hydrology from saturation is the most difficult criterion to measure and evaluate in the field. Measurements must be made over a multiyear period when weather is close to normal. Therefore, soil characteristics that correlate to wetland hydrology are extremely important in identifying wetlands in the field. We started out by trying to have a national list of indicators, but have now decided to develop lists of indicators on a regional or perhaps a state basis with the NTC's monitoring their development and approving the use of the indicators. Florida has set develop an excellent set of indicators which may work in other states. One of the key problems in developing indicators is that non soil scientists use and sometimes misuse of them. Most of the indicators are very technical and require a soil scientist's expertise. It is my believe that one of the main problems with the 1989 Federal Wetlands manual was the misuse of the hydric soil indicators.

Summary: Hydric soil and wetland issues are at the forefront, politically and scientifically. We in the National Cooperative Soil Survey are being asked to better quantify are information on soil saturation, flooding and ponding and to further develop our knowledge on genetic soil processes in wet soils. We must develop documentation to support our technical decisions to change soil properties that impact the hydric soil status of a soil series or map unit delineation. We must also have quality assurance and qualify control procedures in place and operating to be albe to respond to public question on the changes in the lists.

APPENDIX
DEFINITION OF HYDRIC SOIL

A hydric soil is a soil that is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper part. The following criteria reflect those soils that meet this definition.

CRITERIA FOR HYDRIC SOILS

1. All Histosols except Folists, or

2. Soils in Aquic suborder, Aquic subgroups, Albolls suborder, Salorthids great group, Pell great groups of Vertisols, Pachic subgroups, or Cumulic subgroups that are:

a. Somewhat poorly drained and have a frequent1y occurring water table at less than 0.5 ft from the surface for a significant period (usually more than 2 weeks) during the growing season, or

b. poorly drained or very poorly drained and have either:

(1) a frequently occurring water table at less than 0.5 ft from the surface for a significant period (usually more than 2 weeks) during the growing season if textures are coarse sand, sand, or fine sand in all layers within 20 in, or for other soils

(2) a frequently occurring water table at less than 1.0 ft from the surface for a significant period (usually more than 2 weeks) during the growing season if permeability is equal to or greater than 6.0 in/h in all layers within 20 in, or

(3) a frequently occurring water table at less than 1.5 ft from the surface for a significant period (usually more than 2 weeks) during the growing season if permeability is less than 6.0 in/h in any layer within 20 in, or

3. Soils that are frequently ponded for long duration or very long duration during the growmg season, or

4. Soils that are frequently flooded for long duration or very long duration during the growmg season.

Revised NTCHS 9/27/90

Peaaibility of Using Satellite Imagery in Soil Survey

Carter A. Steers

The intent of my presentation is to cover three topics:

1. Examples of satellite imagery,
2. Uses of this imagery in soil survey and resource monitoring, and
3. Project test of Wet Area Classification and Wetland Maps.

I often feel we have exaggerated the use of multi-scanner data for resource surveying and monitoring; and then comes along a project in which satellite imagery is an extremely beneficial tool. Most all resource scientists have seen examples of satellite imagery and all of these imageries have been used or tested for various resources survey and monitoring with varying successes.

The following *Table 1* compares satellite imagery scenes. Examples that have been sent to field from the National Cartography and Geographic Information Systems Center (NCG) are a LANDSAT scene from northern Alabama, a TM scene from Lawton, Oklahoma, and a SPOT scene from the Dallas/Fort Worth area, Texas.

Use of satellite imagery for soil mapping has been limited. Minor uses have been made where color infrared (CIR) imagery has been used as a tool to aid in delineating soil map units, especially where vegetative changes or surface moisture differences are obvious on CIR imagery and inseparable with black and white photography. Also, LANDSAT imagery has been used as base source data for general soil maps of states or regional size area, such as the State Soil Geographic Data Base (STATSGO).

We have recently tested, and are still testing, SPOT panchromatic lo-meter imagery for field base maps or for compilation base for digitizing STATSGO. These tests include Polk County, Iowa; Benton County, Arkansas; Stone County, Mississippi; and Greenbriar County, West Virginia. The tests in these states have proved satisfactory for soil compilation and digitizing. Image quality has been appraised by the states form very poor to acceptable. In the Polk County, Iowa, test, which included a scale blow-up to 1:20,000, image quality was very poor but coordinate accuracy was acceptable. Arkansas and West Virginia are making good use of SPOT quads in re-compilation and field compilation at a scale of 1:24,000. Stone County, Mississippi, is updating a soil survey using 1:24,000 SPOT quads and has plans for publishing a survey on such images.

Quadrangle information, such as streams, contour, and transportation, have been photographically reproduced on the SPOT quad to enhance the base map for field work or map compilation. SPOT quads are not meant to be a replacement for orthophoto quads, but may be a substitute when no geo-referenced photobases are available.

Wetland and wetland maps are of great interest to most of us who deal with topics of the present farm bill. NCG has been involved in an 8 state Remote Sensing Wetland Recertification Project, to test the use of this same imagery in detecting land cover change, as a part of a review and update process.

As source data, 3 to 5 digital scenes from TM or SPOT were acquired and Soil Conservation Service (SCS) and U.S. Fish and Wildlife Service (FWS) wetland maps were digitized. The objective was to test SPOT 20-meter and TM 30-meter data to detect land use changes and wet surface areas. One scene from each site was selected for use as the standard for dry surfaces, minimum plant growth, or dormant season. Additional scenes were selected to represent wet periods after an average runoff rainfall had drained from the surface.

I have limited the results of this presentation to Delaware County, Indiana; Webster County, Georgia; and Moyock Quadrangle, Virginia; because of the time involved and the fact that these are a good representation of study results. *Table 2* gives a percentage of the area of agreement of FWS and satellite imagery classifications with SCS delineated wetlands.

There are three comments I would like to make about the findings:

1. water areas were not included as wetland in SCS wetland maps,
2. water and riparian areas were the sources of wetlands for most of the FWS wetland maps, and
3. remote sensing classifications included most water, wet surface soils, and native hydric vegetation, and remote-sensed areas were consistently higher in total acreage in map presentation.

A high degree of accuracy was accomplished for land-use changes, in areas of native vegetation to open or cropped areas, but the process requires multi-images classification in some instances. Multi-image classification increased the accuracy assessment of water, wetness, and vegetation and, in the the instance of Delaware County, Indiana, SPOT scenes were merged to create a multitemporal hybrid image for accuracy improvement. When this hybrid image was classified, the following accuracies were assessed, using photo interpretation as a qualifier. Water areas were 100 percent correct, woody vegetation 100 percent correct, and wet or saturated soil was 86 percent correct.

Based on the study, the following recommendations would be made:

- Ground truth should be built into the process with close cooperation with field offices.
- Multitemporal satellite image data should be a part of planning.
- Use of late spring and early fall imagery are best scenes for this work.
- Limit imagery use to only LANDSAT and TM data because of cost, availability, and number of spectral bands.

Table 1.
Satellite Remote Sensing for Resource Management
Comparison of LANDSAT to SPOT

Platform	LANDSAT-4,5		SPOT-1,2	
Altitude	705 km (438 mi)		832 km (516 mi)	
Instrument package	Single mode instruments -Nadir only		Dual mode-twig instruments-off Nadir to 23 possible	
	Multi-spectral Scanner (MSS)	Thematic Mapper (TM)	Multi-spectral Scanner (XS)	Panchromatic Scanner (PAN)
Area imaged, per scene	180 by 180 km (112 by 112 mi) (8 million acres)		At Nadir:	60 by 60 km (37 by 37 mi) (889,000 acres
Pixel ground resolution	80 by 80 m 262 by 262 ft	30 by 30 m 98 by 98 ft 120 by 120 m 394 by 394 ft	20 by 20 m 66 by 66 ft	10 by 10 m 33 by 33 ft
Number of bands	4	7	3	1
Spectral sensitivity of bands	l-green 2-red 3-low near IR 4-low to upper IR	l-blue 2-green 3-red 4-near IR 5-mid IR 6-thermal 7-mid IR	l-green 2-red 3-near IR	l-combined green, red, near IR

Table 2.
Percentages Agreement in Test Quadrangles
with SCS Delineations

	Indiana	Georaia	Viroinia
FWS	21 %	__	82 %
SPOT	69 %	__	--
TM (1986)	__	67 %	82 %
TM (1991)	__	63 %	74 %

The academic requirements for the entry level (GS-5/7) soil scientist positions are: A degree in soil science or a related discipline which includes thirty (30) semester hours, or equivalent biological, physical or earth science, with a minimum of fifteen (15) semester hours in such subjects as soil genesis, pedology, soil chemistry, soil physics and soil fertility.

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A combination of education and experience with courses equivalent to a major in soil science or a related discipline which includes at least thirty (30) semester hours in the biological, physical, or earth sciences. At least fifteen (15) of these semester hours must be in the area of the above stated courses, plus appropriate experience or additional education. (The quality of the combination of education and experience must have been sufficient to demonstrate that the applicant possesses the knowledge, skill and abilities required to that normally acquired through the successful completion of a full four (4) year course of study in soil science or a related discipline).

The requirements for GS-9 and above are as following:

In addition to meeting the basic entry qualification requirements, applicants must have either specialized experience or directly related education in the following:

	EDUCATION	SPECIALIZED EXPERIENCE
GS-9	Two (2) full years of graduate level education or master's or equivalent graduate degree	One year at least equivalent to GS-7
GS-11	Three (3) full years of graduate-level education or Ph.D. or equivalent graduate degree	One year at least equivalent to GS-9
GS-12 and above		One year at least equivalent to next lower grade

Classification Standards and Qualification Requirements are revised by OPM. Recommendations for revision may be issued from SCS, Human Resources & EEO Division, through USDA, Office of Personnel, to OPM for approval/disapproval. The soil scientist Qualification Requirements were revised on October 1990. The soil scientist Classification Standards have not been revised recently, and I am not aware of any plans to do so in the near future. However, if you have questions or concerns regarding the soil scientist Classification Standards, you may wish to contact the;Classification and Evaluation Branch, Human Resources and EEO Division, in Washington, D.C.

The hiring procedures for vacancy soil scientist positions at the entry level (GS-5/7) are made through the SEU registers. Employing offices submit requests to SEU to fill their vacancy positions. SEU submits the top qualified applications by score order to the requesting office(s), and that office or state makes the selections for the vacancy position(s). For GS-9 and above, selections may be made through the merit promotion procedures within SCS.

1992 South-Northeast
Cooperative Soil Survey Conference

Panel Discussion on
SCS Academic Requirements and Hiring
Procedures for Soil Scientists

Comments on University Curriculum Changes by:

H. J. Kleiss
N. C. State University

Nearly thirty years ago as I was embarking on a B.S. degree program in Soil Science, the career opportunities, that I was aware of, included work with the Soil Conservation Service or other federal agency or perhaps a state agency with land resource responsibility. The other major career goal was for university research or teaching and of course required an advanced degree. Curricula dealing with soil science were fairly narrowly focused and certainly maintained a strong agriculture orientation. It was about this time, however; that the dramatic environmentalmovementheightened concerns for land use planning, promulgated sweeping regulations and mandated environmental impact assessments. Demands for improving waste disposal focused attention on septic systems and land application of municipal sludges and other wastes.

It was in this context of a changing role for soil scientists that, twenty years ago, armed with a Ph.D. in Soil Science, I was hired by an environmental and geotechnical consulting firm. Soil Scientists had not quite made the transition to the private sector, at least not by title, because my title was Ecologist. A Soil Scientist was still seemingly an unknown profession in those circles at that time.

It is clear that the twenty years since have seen great changes in the role of soil scientists in the private sector. Soil scientists have had to expand their understanding of soil properties and of how soils are distributed across the landscape. The making of a soil map and preparation of a good inventory **of soil properties** no longer satisfied employer needs. This included the Soil Conservation Service. More than a strong basic science approach to soils was desired in our B.S. graduates. At least at N.C. State, students with degrees in our agronomy curriculum or our natural resource based conservation curriculum seemed to be more competitive in the job market than graduates with a pure B.S. degree in Soil Science. Our soil science curriculum was very strong in math, chemistry and physics. While this may have been appropriate as preparation for graduate school, it apparently did not serve the B.S. level graduate. Decreasing student numbers in our soil science curriculum prompted us to drop this B.S. degree track in 1984 and to emphasize the soil science options within our agronomy curriculum and the conservation curriculum.

The past 3 or 4 years have seen a very Significant resurgence in environmental interest. students from very diverse backgrounds and many with an urban perspective are seeking curricula in "environmental science". This became very evident at N.C. State when we proposed to change the name of our conservation curriculum to natural resource curriculum. Campus wide interest resulted in restructing this curriculum and increasing to seven the number of concentrations within the new natural resource curriculum. Two of these options or concentrations are focused on soils. One is called Soil Resources and the other is entitled Soil and Water Systems.

As these changes have occurred over the past 20 years, it is interesting to note that the basic soil science core courses have remained relatively stable. Following our introductory soils course, we still include a course on soil fertility, one on physical properties, one on genesis classification and mapping, one dealing with water management and a capstone course called soil and crop management. Two newer additional courses entitled " Alternative Agricultural Systems" and "Role of Soils in Environmental Management" illustrate expanded applications of the traditional core.

The changing focus of soil science related curricula is most vivid not in the soils courses themselves, but in related courses that complete the curriculum package. We now include opportunities to take courses in hydrology, hydrogeology, waste management, environmental economics and environmental law. Unfortunately, needs and demands have generally outpaced our ability to develop and offer new courses especially in a period of diminished faculty, staff and resources.

The challenge facing Soil Science teaching programs is illustrated by the diversity of students in our introductory soils course. Out of 130 students in one semester, 35-40 different curriculum options may be represented. These range from geology and engineering to botany and animal science. Providing a distinct focus for teaching the application of soils knowledge is certainly difficult with this many unique interests. It also seems that today's students exhibit less tolerance for subjects that aren't narrowly confined to their immediate needs and application.

Reviewing and hopefully improving our courses and curricula is a continuous albeit sometimes slow process. Regular reviews require input from alumni and from employers as to the appropriateness of our programs. Curricula must be justified in terms of the training and preparation provided. The concern for the training of soil scientists now has national attention. This Fall at the Soil Science Society of America annual meeting in Minneapolis, a one-day symposium entitled "Soil Science Education: Philosophy and Perspectives" is planned. Some of the concerns and challenges that I have mentioned are to be discussed.

As Universities strive to improve our teaching programs and satisfy employer and professionals needs, your input is certainly necessary. We ask for your assistance and cooperation in preparing future soil scientists.

SOIL SCIENCE CURRICULUM, PRESENT AND FUTURE NEEDS

Peter L.H. Veneman
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The needs of the modern soil science student are different from those several decades ago. Most of the students in the past either came from a farm background or had considerable exposure to the agricultural aspects of society. In general, the student's future was clearly identified: most would end up mapping, researching, or teaching in agriculturally related fields. Their training was strongly rooted in the physical sciences including geology. Some actually were trained in geography or geology before gaining an interest in soils. Whatever the student's background, the typical soil science curriculum some 15 to 20 years ago consisted of en introductory soils course fortified with additional courses in fertility, chemistry, physics, and morphology and classification. Depending on the institution, the student also may have taken courses in mineralogy and forest soils. Additional courses were required in agronomy, plant physiology, plant nutrition, geology, geomorphology, and air-photo interpretation.

With changing times, the educational and social background of the students has changed es well. Especially in the more "urbanized" states, students with a non-agricultural background dominate. Agricultural knowledge, in the past assumed to be common, now needs to be acquired. In our agronomy course et the University of Massachusetts, for example, we have to spend several class and laboratory hours teaching about farm machinery. While the lack of a farm background by itself may not be detrimental, most of the modern students lack the special bond with agriculture. Instead, they often have a strong interest in the environment. This change in direction is a reflection of the changing market place. Most of our graduates will be working outside the traditional areas of employment like government agencies and universities. Just like the role of the soil scientist wihin the Soil Conservation Service is changing from a mapping to a service mode, modem soil science students should have a curriculum reflective of the maturing of soil science as a profession. A modern soil science curriculum still requires the broad background in the biological and physical sciences, however, additional courses in computers, GIS, remote sensing, hydrology, and modeling are needed to prepare our students adequately for the outside world.

Although there always will be a place for students educated in the traditional fashion, a modern curriculum has to reflect the changes occurring in society. Even the role of the soil scientist consultant is continuously changing. Initially, most of the private soils consultants were retired SCS personnel who had strong backgrounds in the procedures of the National Cooperative Soil Survey. Many of our younger private soils consultants often lack this SCS tradition, and certainly lack the soil surveying experience.

soil science education of the future should incorporate the points discussed above. There also is a great need for continuing education programs to train the working professional. In the regular 4-year program we should require courses in hydrology, computer science, remote sensing, and GIS. Team-taught courses discussing the fate of chemicals in the soil environment should be seriously considered as well. Our traditional course* should not just get a facelift by changing the name, but it should be accompanied by changes in content reflective of the actual needs of the future soil scientist professional. New courses need to be created to provide a strong soil science-based knowledge of processes affecting the quality of our environment. The curriculum of the future needs to be more quantitative. General statements do not suffice any longer but need to be quantified. With ever diminishing resources at most state institutions, we may even consider creating regional courses. A good example is the Northeast Regional Soils Fieldtrip, which allows students a better appreciation for the regional variability in soils. A similar program perhaps can be created in soil survey through a regional summer camp.

In addition to the above suggested changes in our educational approach, we should provide up-to-date training for working professionals. Soil scientists are not the only professionals interested in the vadose zone. Whether we like it or not, many non-soil scientists are eager to move into this area of expertise if the products of educational programs are not meeting the needs of the real world. Geologists. engineers, biologists, and environmental scientists generally have some soils background but require additional training to adequately function as a soil scientist. In New England, we have established a regional soil science certificate program. Students can take soil science courses at any of the New England landgrant institutions and are granted a certificate upon completion of 15 credits in soil science. Most courses are offered at night or during weekends. These are standard university courses taught by regular university faculty. During the past 2 years some 32 students enrolled in the program, 9 of which have been issued a certificate of completion.

The next few years will be quite challenging. Reorganizations at most educational institutions will result in fewer soils faculty who have to teach more courses to a more demanding clientele. This shift in resources seems ironic at a time when interest in soil science is rapidly increasing and the profesional opportunities are probably greater than ever before. Only if we are willing to change our curriculum in anticipation of future needs of our graduates, can we assume that Soil Science will be a viable profession for years to came.

SCS ACADEMIC REQUIREMENTS AND HIRING PROCEDURES FOR SOIL SCIENTISTS.

A PANEL DISCUSSION - NHQ, SOIL SURVEY DIVISION ROLE

JAMES H. WARE, SOIL SCIENTIST, SCS

SOUTH AND NORTHEAST REGIONAL SOIL SURVEY CONFERENCE
ASHVILLE, N C
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As my part in the panel discussion, I have been asked to discuss the SCS interactions with OPM and the Personnel Division, to provide some insight into the information that goes into job announcements for soil scientists, and to give some perspective for courses in soil science in the future. I can best accomplish these objectives by presenting some information in two overheads. (See Attachments # 1 and # 2.)

The first overhead summarizes roles that the Soil Survey Division plays in the process of job announcements for soil scientist positions and the various other groups with which we interact. I will discuss these briefly.

POSITION STANDARDS AND QUALIFICATION REQUIREMENTS - This will be discussed in detail by Mel Goldsborough. I will not go into detail about this role, other than to say that from time to time we are called upon to work with the Special Examining Unit/OPM to re-evaluate the position standards and qualification requirements for soil scientists. These are contained in the "Classification Standards for the Soil Science Series, GS-470", and the "Supervisory Grade Evaluation Guide (SGEG)".

CLASSIFICATION CRITERIA/POSITION DESCRIPTIONS - We work closely with the National Headquarters Classification Branch on a continuing basis to ensure that positions are properly classified according to the classification standards and the position descriptions for various grade levels contain the appropriate duties for the grade and for the position. A major effort was completed in cooperation with the Classification Branch with the publication of National Bulletin No. 360-l-61 in July 1991. This document titled "Personnel Administration Guidance for Soil Scientist Positions" consists of position descriptions, evaluation statements, job analyses, KSA's, and performance elements and standards for GS-9 thru GM-13 positions. It has been well received across the country.

POSITION VACANCIES/POSITION DESCRIPTIONS - Before a soil scientist position at the GS-12, and above, grade level is approved for advertising, the Employment Branch usually asks the Soil Survey Division to review the job announcement package. We pay particular attention to the Knowledge, Skills, and Abilities (KSA's) portion since this is where the major duties of the position are reflected, and they are what the applicants must respond to in writing when applying for the position.

RATING CRITERIA FOR KSA's - For each KSA in a vacancy announcement, numerical rating criteria must be developed and used when more than ten (10) qualified people apply for a position. The Employment Branch considers Soil Survey Division personnel as the "Subject Matter Experts" (SME) who should identify and develop the KSA rating criteria.

EVALUATION OF CANDIDATES - The Employment Branch requests that NHQ Soil Survey Division personnel evaluate and rate qualified candidates who apply for position vacancies. When ten (10) or less individuals apply for a position, the Alternative Evaluation Procedure is used. This requires one SME to review the experience, education, and training documented in the individual's application and determine if the candidate meets the evaluation criteria. When more than ten (10) qualified candidates apply for a position, two SME's must evaluate each candidate using the numerical rating criteria and must agree on a numerical rating for each candidate.

CANDIDATE AVAILABILITY - Upon request from selecting officials, we will assist in soliciting potential candidates to apply for vacancies and/or advise them of individuals who may be interested in a particular vacancy. I emphasize the words "upon request".

The second overhead provides some insight into the information that goes into job announcements in SCS, especially the Knowledge, Skills, and Abilities (KSA's) portion. I have listed the KSA's that are directly stated or implied in most vacancy announcements from the GS-9 thru the GM-13 grade levels. The six (6) that are highlighted and have an asterisk are the "common threads" that become especially important at supervisory and managerial positions. These elements are listed on the overhead.

The second overhead also reveals some insight into areas of knowledge that soil scientists will need to expand in order to function into the future. In addition to a solid foundation in soil science and related natural resource disciplines, the areas of computer science and database management of soils information and soils interpretations will be essential for almost all soil scientist positions. As professionals we must also increase our managerial and supervisory skills as well as our abilities to effectively communicate in writing and orally. These are some of the areas that should have expanded emphasis in curriculums across the country.

ROLE of SOIL SURVEY DIVISION - NHQ

SOIL SCIENTIST POSITIONS
&
VACANCY ANNOUNCEMENTS

- POSITION STANDARDS AND QUALIFICATION REQUIREMENTS
  (Special Examining Unit/OPM)

- CLASSIFICATION CRITERIA/POSITION DESCRIPTIONS
  (Classification & Evaluation Branch)

- POSITION VACANCIES/POSITION DESCRIPTIONS/KSA's
  (Employment Branch)

- RATING CRITERIA FOR KSA's (SME)
  (Employment Branch)

- EVALUATION OF CANDIDATES (SME)
  (Employment Branch)

- CANDIDATE AVAILABILITY (Upon Request)
  (Selecting Officials)

ATTACHMENT # 2

COMMON KNOWLEDGES, SKILLS, & ABILITIES (KSA's) in SOIL SCIENTISTS VACANCY ANNOUNCEMENTS

1 *KNOWLEDGE OF SOIL SCIENCE

2 KNOWLEDGE OF DISCIPLINES RELATED TO SOILS

3 ABILITY TO MAP, ANALYZE, & INTERPRET SOILS

4. SKILLS/KNOWLEDGE - CARTOGRAPHIC PROCEDURES

5 *KNOWLEDGE OF NCSS POLICIES AND PROCEDURES

6 KNOWLEDGE OF SCS PROGRAMS AND POLICIES

7 *ABILITY TO MANAGE - SOIL SURVEY PROGRAM

8 *ABILITY TO WORK WITH OTHERS

9 *ABILITY TO SUPERVISE - DIVERSITY

10 *ABILITY TO COMMUNICATE - ORALLY, ETC.

11 *ABILITY TO COMMUNICATE - WRITING

12 KNOWLEDGE OF SOIL DATABASES & INTERPRETATIONS

13 KNOWLEDGE OF COMPUTER-BASED SOIL OPERATIONS

South-Northeast Cooperative
Soil Survey Conference
Asheville, NC
June 16, 1992

Presentation By:
F. Dale Childs
Asst. State Soil Scientist
Morgantown, WV

Good Morning,

I am going to discuss:

1. Broad duties of an SCS rater.

2. Interaction between an SCS rater and universities.

3. Creditable soil courses.

I. SCS raters have a rather unique role. We are SCS employees but must operate within the guidelines and regulations of the Office of Personnel Management (OPM). Raters cannot discuss the rating process or the rating criteria with anyone except another rater or the Special Examining Unit (SEU). Raters develop and maintain a list of creditable courses for all colleges/universities within their state.

The rating process requires that the rater:

A. Determine basic eligibility of applicant.

1. Degree in soil science or related area.

2. Thirty semester hours in biological, physical or earth sciences.

3. Fifteen semester hours in soils, or

4. Combination of education and experience plus 2 and 3 (above).

B. Review SF-171.

1. Review work experience.

2. See if degree is awarded.

3. Evaluate college transcript.

4. Note membership in professional organization.

5. Note membership in honor societies.

6. Less than 120 semester hours, use experience plus education.

7. Check for scholastic achievement.

8. Complete worksheet.

C. Rate applicant for grades 5 and 7, if applicable.

D. Use rating procedure that will give the highest rating.

E. Assign extra points in accordance with the standard procedure.

F. Return application to Special Examining Unit (SEU).

II. I suspect that the interaction between SCS and the universities within a particular state are, for the most part, very good. Raters may consult the universities regarding subject matter covered in specific courses. However, raters are not permitted by OPM regulations to discuss rating criteria, the rating schedule, or the rating process.

III. Do Universities know what courses qualify for the 15 semester hours in soils? Answer: probably not. At least they (universities) should not know the specifics because course listings are confidential. Announcements for the 470 series list such subjects as soil genesis, pedology, soil chemistry, soil physics, soil fertility, etc. Thus, one can get a good idea what courses would likely be credited by raters.

IV. I want to share a few comments that Ed White (Pennsylvania) sent me regarding his philosophy of the rating process. Ed was originally scheduled to be on this panel, but was unable to attend the conference. I have paraphrased Ed's comments so he wouldn't recognize them:

A. What kind of educational background do we want in a soil scientist today? Has the need changed over the years? Are the 15 semester hours in soils an absolute necessity? I am certain most raters have had to declare an applicant "not qualified" because they lacked one course or one semester hour. We need to find ways to prevent good students from falling through the rating system cracks. Perhaps students need a constant reminder of the basic requirements for a soil scientist.

B. Ed goes on to say, "We need scientists today with expertise in soils." To put it another way, we need soil scientists well versed in the sciences. Most of all, we need to let colleges and universities know what kind of educational background we want in soil scientists. We cannot delegate this responsibility to our personnel people. We, you and I, need to be involved! We seem to be getting only a few soil scientist applications today. We need to encourage more people to get into soils, or at least get more to qualify for the 470 series.

RECENT DEVELOPMENTS IN SOIL TAXONOMY

Soil Classification Staff
John E. Witty
June 1992

During the past year the chairs from three international committees: ICOMAQ, ICOMOD, and ICOMERT; submitted their recommendations to Dr. John Witty, National Leader for Soil Classification. The charges and summary of the major changes from each committee are outlined below.

ICOMAQ

The International Committee on Aquic Moisture Regime (ICOMAQ) was established in 1982 and chaired initially by Frank Moormann, then by Johan Bouma (since 1985). The main classification problems which the committee undertook to solve were the inadequate definition of the term aquic soil moisture regime, the lack of distinction between soils with perched and ground watertables, and the question of wetness induced by rice culture (paddy soils).

The following is a summary of the major changes in terminology proposed by ICOMAQ that will be implemented by the soon to be released amendment, NSTH issue 16:

1. The concept of aquic conditions will replace that of the aquic moisture regime. Aquic conditions in a soil or horizon require saturation, reduction, and redoximorphic features. The new term aquic conditions has a wider range of application than the term aquic moisture regime and will be used extensively in Soil Taxonomy.

2. Use of the term mottles that have chroma of 2 or less will be discontinued, and so is the use of the term mottles, with few exceptions. The following terms are introduced as replacements:

   a. Redoximorphic features, which essentially includes all wetness mottles:

   b. Redox concentrations, which are concentrations of Fe and Mn and include the high-chroma wetness mottles;

   c. Redox depletions, which represent low-chroma wetness mottles (mottles with a chroma of 2 or less) where Fe and Mn have moved out; and

   d. Reduced matrix, which represents reduced soil materials that change in color when exposed to air.

3. **The new term endosaturation means the saturation of a** soil with water in all layers from the upper boundary of saturation to a depth of 200 cm or more from the mineral soil surface.

4. Episaturation means a saturation with water of one or more layers above a depth of 200 cm from the mineral soil surface in a soil that also has one or more unsaturated layers below the saturated layer.

5. The term anthric saturation characterizes a variant of episaturation which is associated with controlled flooding, e.g., of rice paddies.

Also included are changes in criteria for acid sulfate soils. Although ICOMAQ has not emphasized the revision of acid sulfate soils, Circular Letter No. 4 presented an update following the third International Symposium on Acid Sulfate Soils held in Senegal in January of 1986. The revisions included in this amendment were reviewed by the International Symposium on Acid Sulfate Soils held in Ho Chi Minh City, Vietnam, in February 1992, and included in a paper "Fanning, D.S., and J.E. Witty. 1992. Revisions of Soil Taxonomy for acid sulfate soils," which was presented by Fanning at that symposium.

ICOMOD

The International Committee on Spodosols (ICOMOD) was **established in 1981 and chaired initially by F. Ted Miller, then by Robert V. Rourke (since 1986). The committee's mandate was to:**

1. **Evaluate chemical criteria for defining spodic horizons;**

2. **Evaluate thickness requirements;**

3. **Improve the classification of Aquods;**

4. **Propose criteria that would adequately distinguish Spodosols from Andepts (Andisols); and**

5. **Recommend changes in the classification of Spodosols and define appropriate taxa as well as the diagnostic properties required for their definition.**

The following is a summary of the changes proposed by the committee that will appear in the next National Soil Taxonomy Handbook issue:

1. The new criteria adds emphasis to the spodic morphology. Most soils presently classified as Spodosols will meet the new morphology, pH, and organic carbon requirements.

2. The albic horizon is used to separate most Spodosols from Andisols.

3. Spodic materials are introduced to allow more flexibility in defining the spodic horizon.

4. Iron and aluminum extracted by ammonium-oxalate rather than pyrophosphate and dithionate-citrate are used for the chemical criterion.

5. The "Al" great groups of Aguods and Orthods are added to capture the soils with low ammonium-oxalate-extractable iron contents.

6. The suborder of Cryods is added and "Trop" great groups are deleted.

ICOMERT

The International Committee on Vertisols (ICOMERT) was established in 1980, with Juan Comerma serving as chair. The objectives of the committee were to:

1. Identify those criteria in the classification of Vertisols that have resulted in taxa with misleading or vague definitions or very few identifiable soils;

2. Propose improvements in the classification of Vertisols, considering both genetic and practical implications; and

3. Test the proposals and submit recommendations to the Soil Conservation Service for improving the classification of Vertisols in Soil Taxonomy.

The following is a summary of the major changes proposed by ICOMERT and that will appear in the next amendment to Soil Taxonomy:

1. Establishment of two new suborders, Aquerts and Cryerts, and their respective great groups and subgroups;

2. Introduction of new great-group and subgroup criteria to provide better interpretive groupings:

3. Elimination of the pell and chrom great groups because of the questionable value of the resulting classes: and

4. Redefinition of the vartic subgroup criteria to include rore toils with high shrink-swell potential.
In addition to the changes mentioned above, the Fifth Edition of "The Keys to Soil Taxonomy" has had an English edit and should be easier to use. The Fifth Edition should be available in the fall.

Other Committees

The International Committee on Aridisols (ICOMID) has submitted their recommendations to John Witty. The Soil Classification Staff will evaluate these recommendations later this summer and early this fall. The International Committee on Families (ICOMFAM) made excellent progress this spring and should have their final recommendations available in about a year. The International Committee on Soil Moisture and Temperature Regimes (ICOMMOTR) has one of the biggest challenges and has made good progress. However, this committee will need a couple years to complete their task.

July 14, 1992

Soil Survey Laboratory
Laurence E. Brown, SCS, Lincoln, Nebraska

The number of soil samples received at the Soil Survey Laboratory in Lincoln from the South and Northeast Regions was 23% of the total for FY 1991. Slightly larger percentages were received from both the West and Midwest Regions. Most of the samples from the South and Northeast were for complete characterization, whereas many samples from the other regions were reference projects requiring only a few analyses per sample. The university laboratories have provided analytical services for many soil surveys in the South and Northeast Regions, thereby reducing the requests for both reference samples and complete characterization. Unfortunately, funds for these other laboratories have decreased in some states; This trend has already increased our analytical workload in Lincoln and is expected to increase for the foreseeable future.

The number and different kinds of analyses have been increasing each year. This is due in part to changes in Taxonomy requiring more laboratory data. This is part of the overall historical trend of increasing demand for hard data to support soil ratings and interpretations.. Some people have suggested that the number of soil samples will decrease in areas where soil surveys have been completed. To the contrary, the requests for laboratory services have increased in many of these states.

We know that a faster turn-around time is needed for laboratory analyses, and we are trying to provide better service. Substantial increases in production at the lab have been countered by equivalent increases in the volume of samples submitted. Preliminary distribution of data before all the analyses for a project are completed has helped provide information as it becomes available.

The Soil Survey Laboratory Methods Manual, Soil Survey Investigations Report No. 42 has been completed. This new manual replaces SSIR No. 1. Presently, we have a limited number of copies. Additional copies of this manual will be available in October. By formatting to a smaller print and using two columns per page, we are substantially reducing the number of pages. We hope that SSIR No. 42 provides better documentation to our analyses and better describes the procedures for duplication in the laboratory.

Status of Soil Survey investigations - South

Report to South-Northeast Soil Survey Work Planning Conference, Asheville, NC, June 15-19, 1992 by Warren Lynn, SCS - Soil Survey Laboratory.

The teaching season at the NSSC for Soils courses has just concluded. Approximately 150 participants attended formal training sessions.

Basic Soil Survey - Field and Laboratory: Two sessions of two weeks each, with 24 participants from SCS and 6 from other agencies.

Soil Laboratory Data - USE: Three sessions of one week each for (50) participants from SCS and (10) from other agencies.

Soil Correlation: Three sessions of one week each for over 60 participants.

The effort to update soil surveys by MLRA and the interpretive need to examine materials below a depth of 2 meters should naturally compliment each other, and have done so, recently, in practice.

MLRA 77/72, High Plains: Carolyn Olson and crews have sampled transects of deep cores between the Arkansas and Cimarron Rivers to examine stratigraphy and buried soils.

MLRA 131/134, Southern Mississippi River alluvium/Loess Hills: Doug Wysocki participated in sampling of a ioess section in Tennessee in conjunction with USGS and SCS soils staffs. The USGS is commensing a project to correlate the ioess and alluvium stratigraphy in the lower Mississippi River Valley.

Soil pedon characterization data base.

The Soil Survey Laboratory pedon characterization data base of 18,000 to 19,000 pedons is to be available on CD-rom in July 1992

The Soil Survey Lab has been concerned for some time about collating University data with SCS-SSL data. Please contact Benny Brasher for details or discussion.

There is an eternal spark in soil scientists to unravel a small piece of the soil puzzle. Some of these sparks are kindled in the southern region.

St. John: Henry Mount/Bruce Dubee/John Davis have instailed soil moisture and temperature sensors in the Virgin islands National Park, a cooperative effort with the National Park Service. One wish is to learn the connection between tropical soils and tropical dry forest vegetation with the help of forester, Gary Ray.

Alabama-Mississippi Vertisols: With the urging of DeWayne Williams, we gathered John Meetse, David Jones, Dave Pettry, Ben Hajek, and others around and in soil pits on the Black Prairie of Alabama and Mississippi - to help us unravel the mystery of vettisols.

North Carolina - western mountains - near Asheville: Soil characterization sampling sites demonstrated that mineralogy can vary from one rise to the next, but left me with the question, Why?

St. Croix: John Davis. Evidence of faunal activity in soils is impressive. Included was a concentration of 'chitin-looking' material that Entomologists tell us is not from an insect • still hanging with a 'What?'.

Kentucky Inner Bluegrass: Tasos Karathanasis/ John Robbins/ Bill Craddock/ Mike Wilson. Soils on phospatic Ordovician limestones are prized for nourishing strong bones in young Thoroughbred horses, but raise a Taxonomic question, 'Can we separate these soils from soils with Anthropic Epipedons?

Classification of Soils of the Southern Blue Ridge
Challenges and Opportunities

Abstract and References

S. W. Buol

The Southern Blue Ridge is an excellent area to study soil formation on acid igneous, mainly gneiss and schist, bedrock. The area is udic to perudic, and mostly forested.

Timber harvests have deforested almost all of the area two or even three times since European settlement. The lower slopes and floodplains have been utilized for farming using slash and burn techniques until the early part of the 20th century when fertilizer enabled more permanent agriculture.

Taxonomically, most of the soils classify as Dystrochrepts and Hapludults with some Haplumbrepts at the higher elevation. The definitions of argillic and cambic horizons are constantly tested in classifying pedons. Rather recent studies have revealed several features that challenge further pedological research. Most of the soils have remarkably uniform particle size distribution that centers on the fine-loamy to coarse-loamy family particle size class separation of 18% clay. Gibbsite is a mineralogical component of most of the soils, especially the Dystrochrepts, apparently forming from alteration of feldspar. The gibbsite appears to attract silica in the more stable landscape positions and become kaolinite. All the soils on the steep mountain sides appear to be formed in friable material that has been and is subjected to colluvial and movement creep. Few, if any, profiles appear to be truly residual.

Deep saprolite underlies most profiles on the steep slopes and probably under the deep colluvial deposits near the toe of the steep slopes.

The low clay contents, high gibbsite contents and moderate iron oxide contents cause many pedons, regardless of higher category placement, to qualify as oxidic mineralogy families according to the present definition. Some pedons have high mica contents and classify into micaceous families. Also, many of the higher elevation soils have oxalate extractable Al and Fe contents that place them in Andic subgroups with some as Andisols, although they differ in several properties normally attributed to these taxonomic terms. It is probable that the amorphous properties result from processes active in Spodosols rather than those associated with Andisols but further studies are needed.

Almost all of the soils are acid in reaction and base saturation decreases with depth. Although usually well supplied

with exchangeable potassium, probably the result of mica weathering, they are extremely low in content of exchangeable calcium. There appears to be practically no calcium in most of the saprolite and total elemental analyses often find calcium contents below detectable levels. What this deficiency may mean *to* tree growth and future generations of the forestry industry is not known.

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GENESIS AND CLASSIFICATION OF BOREAL FOREST SOILS OF THE SOUTHERN APPALACHIANS

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ABSTRACT

The Late Pleistocene/Early Holocene periglacial environment on the high peaks of the southern Blue Ridge resulted in widespread slope instability and mixing of parent materials on all landscape positions. Following warming conditions and the relatively recent establishment of the boreal forest cover (-10 ka), podzolization has been the dominant pedogenic process occurring in most of these high-elevation soils, regardless of the presence or absence of distinct eluvial/illuvial features. Based on the presence of classic Spodosol weathering trends, and the translocation of both Fe and Al within most soil profiles, we recommend establishment of a spodic subgroup of Haplumbrepts rather than classification of these soils as Andic Haplumbrepts.

INTRODUCTION

Boreal forests of the Southern Appalachians are isolated from related northern vegetation and are confined to elevations above -1450 m on the higher mountains of eastern Tennessee, western North Carolina, and southwestern Virginia. The influence of elevation has had a dramatic effect on the nature of the weathering environment in these areas, and as a result, rocks from areas with diverse bedrock al. (1991b) provided evidence suggesting that podzolization was the dominant pedogcnic process occurring in most soils of the frigid zone despite lack of distinct E/Bhs horizonation. Many soils with Haplumbrept morphology in this and another study (Feldman et al., 1991a) were in fact re-classified as Typic Haplorthods, based on the criteria of both the Soil Survey Staff (1990) and newer proposals (ICOMOD, Circular no. 10, 1991). More recently, considerable controversy has evolved regarding the distinction between soils with andic vs. spodic properties in these areas.

Our objectives in this paper are to: 1) discuss the influence of Late Pleistocene/Early Holocene geomorphic processes on parent material emplacement in the southern Appalachians, 2) outline dominant weathering and pedogenic mechanisms in the modern environment, and 3) review and recommend criteria for taxonomic placement of these soils. Our discussion will include data from a developmental sequence of four soils ranging from those having distinct spodic field morphology (E plus Bhs horizons), to soils with either minimal (weak E horizons) or no spodic character (umbric epipedons/cambic horizons). Sampling site description, geologic setting, and analytical methods are detailed in Feldman et al. (1991a,b).

GEOMORPHOLOCY OF THE SOUTHERN BLUE RIDGE

Palynological evidence demonstrates that alpine tundra vegetation occupied the high-elevations of the southern Appalachians as recently as 16,500 yr B.P. (Delcourt and Delcourt, 1984, 1986; Shafer, 1984) during which time periglacial processes had a marked influence on landscape development and soil parent material formation. Patterned ground, in the form of sorted stripes, nets, and polygons, is considered unquestionably diagnostic of past periglacial environments (Mills and Delcourt, 1991), and has been extensively documented in the unglaciated Appalachians (Clark, 1968; Michalek, 1968; Richter, 1973; Torbett and Clark, 1985; Connors, 1986; Clark and Ciolkosz, 1988; Braun, 1989). During full-glacial times (20-16.5 ka), intense freeze-thaw processes on exposed mountain slopes resulted in fracturing of rock, development of block streams, and accelerated transport and churning of sediments. The colluvial deposits that blanket the steep sideslopes and even low-gradient summits in the southern Appalachians are largely the result of frost creep, gelifluction, and saturated mudflows which have transformed residuum on all parts of the landscape into mixed congeliturbate or congelifractate parent materials. From 16.5 to 12 ka, increases in mean annual temperature and precipitation resulted in continued gelifluction and subsequent invasion of boreal forests across the high peaks (Fig. 1). Fluvial incision, gravity-driven colluvial processes, and mass-wasting events have been the dominant geomorphic processes in these areas since -10 ka, when continued establishment of boreal and temperate forests began to stabilize the hillslopes.

MINERALOGY, WEATHERING, AND PEDOGENESIS

Although bedrock lithologies are quite diverse throughout the southern Blue Ridge (Feldman et al., 1991a), many soil characteristics such as field morphology, degree of profile development, and clay mineralogy are quite similar (Table 1), owing both to the physical mixing of parent materials derived from these rocks during the Late Pleistocene, and to the dynamic interaction between modem climate, vegetation, and landscape stability (or lack thereof). These factors create a unique weathering environment which contrasts sharply with climatic conditions at adjacent lower elevations.

Average annual rainfall in the area exceeds 2000 mm with evapotranspitation exceeding precipitation only in rare drought years. Cool temperatures and continually moist conditions enhance the accumulation of organic matter and cause intense leaching which results in conditions favorable for the cheluviation of Fe and Al to lower horizons and rapid removal of base cations and Si from the profile. Lack of wet/dry cycles also restricts neoformation, illuviation, and flocculation of fine clays thus inhibiting argillic horizon development in the -10 ka since the establishment of forest cover.

The four soils selected for detailed analysis in this study were classified in the field as loamy-skeletal, mixed, frigid Typic Haplumbrepts with the exception of pedon GSM-14 which exhibited distinct spodic morphology and was field-classified as a member of the coarse-loamy, mixed, frigid family of Typic Haplorthods (Table 1). Pedon GSM-5, with only minimal E horizon expression, met the chemical requirements for a spodic horizon while pedons BM-17 and MR-7, which lacked any evidence of an E horizon, failed to meet this requirement. Although GSM-14 had well-expressed E/Bhs horizonation, it failed to meet the spodic criteria because the pyrophosphate Fe + AI to clay ratio was <0.2.

All soils exhibit mineralogical trends that exemplify the classic weathering profile of Spodosols (Kodama and Brydon, 1968; McKeague et al., 1983). Upper horizons are dominated by expansible 2:1 layer silicates while gibbsite, kaolinite, hydroxy-interlayered vermiculite (HIV), and mica commonly increase with depth (Table 2). Regularly interstratified mica/vermiculite (RMV) predominates in surface horizons of all pedons, decreasing with depth. This mineral, which gives diffraction peaks at both 24Å and 12Å, is particularly well-crystallized in the E horizon of GSM-14 (Fig. 2A). The abundance of RMV in surface horizons progressively increases in soils which have more well-expressed E horizon morphology (Fig. 2A) and thus appears to be related to podzolization processes. Its presence in other soils that lack spodic morphology (Fig. 2B-D) suggests that podzolization is a common genetic pathway occurring in the majority of these soils, regardless of morphology.

In contrast to surface horizons that are dominated by more reactive clay minerals, gibbsite and HIV characteristically increase with depth. Gibbsite comprises >30% of all subsoil clay fractions with the exception of MR-7, which is dominated by kaolinite (Table 2). Hydroxy-interlayered vermiculite is nearly absent in surface horizons (Fig. 3) and is inversely related to vermiculite in each profile, reflecting both the mobility of Al-organic complexes out of surface horizons and the inability of hydroxy-Al interlayers to form in the presence of organic acids (Huang and Keller, 1971; Vincente et al., 1977). Successive heat treatments of K-saturated samples from the E horizon of pedon GSM-14 resulted in complete collapse of vermiculite x-ray diffration peaks to 10Å with heating to 110°C (Fig. 3). Diffractograms for the Bw horizon of this same pedon show the resistance of vermiculite to collapse, indicating that mobile Al is fixed in clay interlayers in lower horizons (Fig. 4).

Whereas the mineralogy of sand and silt fractions reflects inheritance from parent materials (Feldman et al., [illegible] peak. Vermiculite either weathers to a high-charge smectite phase in surface horizons, or, as discussed previously, becomes interlayered with mobile hydroxy-Al phases lower in the profile. The lack of a conspicuous 7Å peak in these grains (Fig. 5) also demonstrates that biotite kaolinization is not an important weathering mechanism in these soils, in contrast to conditions observed in most Piedmont, Coastal Plain, and low-elevation Blue Ridge soils (Harris et al., 1985; Rebertus et al., 1986; Daniels et al., 1987; Norfleet and Smith, 1989). In contrast to the trends observed for biotite, unaltered muscovite grains from this same horizon show that this mineral is relatively resistant to weathering in this environment (Fig. 5).

Gibbsite occurs in nonclay fractions of all soils indicating that its formation is primarily the result of rapid reprecipitation of Al after feldspar dissolution and therefore not a reliable index of either relative soil age or weathering intensity. Coexistence of gibbsite and HIV in the same horizon commonly occurs in these subsoils. The occurrence of these two minerals in the same profile has also been noted by others (Daniels et al., 1987; Norfleet and Smith, 1989) who have raised questions regarding the efficacy of Jackson's (1963) 'antigibbsite effect' in mountain soils of the southern Blue Ridge. We believe, however, that conditions responsible for gibbsite formation in these soils are independent of mechanisms of HIV formation. Our data suggest that gibbsite precipitation is inhibited by organic acids and low pH in surface horizons and by vermiculite/HIV in subsoil horizons. The low degree of interlayer filling by hydroxy-Al polymers suggests that vermiculite/HIV continues to be an important sink for Al in these soils, inhibiting the formation of pedogenic gibbsite. The majority of Al transported to subsoils is apparently fixed by vermiculite/HIV whereas the bulk of existing gibbsite is the result of in *situ* geochemical alteration of feldspars.

SOIL CLASSIFICATION

Soils with boundaries intermediate between Spodosols and Andisols pose a unique taxonomic problem, particularly with the elimination of the requirement of an E horizon in the Spodosol concept (ICOMOD, 1991). Of the soils we studied, pedons GSM-14 and MR-7 meet the proposed criteria for spodic materials (ICOMOD, 1991) while pedons GSM-5 and BM-17 qualified as Andic Haplumbrepts (Fig. 6).

The concept of translocation of Fe and Al within pedons is the critical feature that distinguishes Spodosols from Andisols which are otherwise thought to result from the weathering of aluminosilicates in-place. Pedons GSM-14 and MR-7, which meet the requirement for spodic materials (Fig. 6), clearly show increasing trends in organic-bound Fe and Al with depth (Fig. 7). However, pedon BM-17, shows a dramatic increase in pyrophosphate-extractable Fe (Fep) which denotes translocation of a soluble organic-Fe phase. Pyrophosphate-extractable Fe is also greater than Alp in the upper horizons of these soils, whereas the opposite is true in lower horizons, suggesting that organic-Al complexes are more mobile than organic-Fe complexes in these soils and/or that Fe is biocycled preferentially over Al in surface horizons. Similar trends in elemental mobility were reported by Johnson and McBride (1989) for Adirondack Spodosols and by Singer et al. (1978) for Spodosols of the Pacific Northwest.

CONCLUSIONS

Soils in the frigid zone of the southern Appalachians were influenced by Late Pleistocene/Early Holocene periglacial weathering processes which have transformed residuum to the mixed colluvial parent materials that occupy all landscape positions throughout the area. Because soils on even 'stable', low-gradient summits are only rarely underlain by saprolite (usually well below the solum), the concept of residuum as a parent material in these high-elevation soils should be dismissed.

Podzolization has had a direct role in the genesis of these soils following the establishment of the modern boreal forest cover. This observation is supported by the relatively high color values of soil B horizons which contrast with published reports of andic soils (Parfitt and Clayden, 1991), and the presence of classic Spodosol mineralogy in soils both with and without E/Bhs horizonation. This conclusion is also corroborated by a pilot soil survey conducted in 1984 in the area between Clingman's Dome and Newfound Gap in the Great Smoky Mountains National Park, in which map units delineating ridgetop positions were described as being comprised primarily by Haplorthods (C. McCowan and M. Sherrill, USDA-SCS, Nashville, TN and Raleigh, NC, personal communication). Regardless of morphology, however, most soils are dominated by high-charge 2:1 phyllosilicates in surface horizons, and by gibbsite and HIV in subsoil horizons. This common trend, and data shown for both pyrophosphate- and oxalate-extracts, indicate that soluble Fe and Al phases are translocated and immobilized lower in these soil profiles.

Soils with well-expressed eluvial/illuvial features commonly meet the new proposed spodic criteria. Soils that lack E horizons typically have morphological umbric/cambric horizon sequences and meet the chemical requirements for either 'spodic soil materials', or for Andic Haplumbrepts. None of the soils we examined, however, had sufficiently high levels of oxalate-extractable Fe and Al to meet the higher requirements for andic soil materials (Fig. 6) in these areas where volcanic glass deposits are not recognized (Mills and Delcourt, 1991).

Based on these mineralogical trends and the redistribution of Fe and Al within most soil profiles, we recommend establishment of spodic subgroups of Haplumbrepts to accomodate soils that lack distinct spodic morphology, rather than placement of these high-elevation soils of the southern Appalachians into andic subgroups of Inceptisols. Additionally, our data, and the field data of McCowan and Sherrill (1984, personal communication) overwhelmingly support the placement of these soils into families with loamy-skeletal particle-size control sections.

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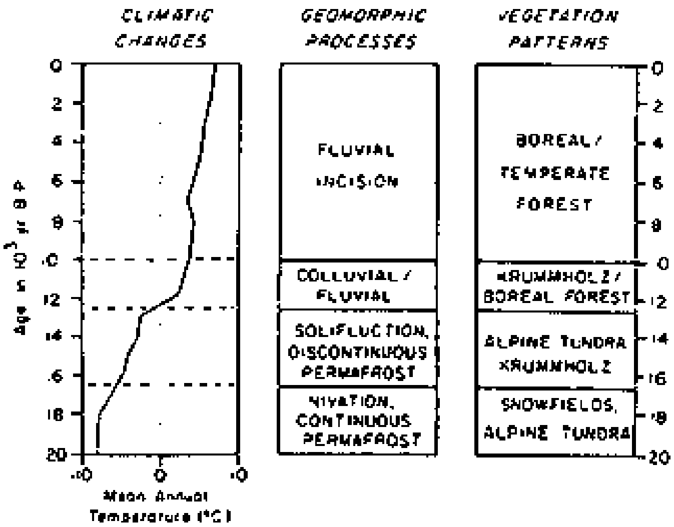


Fig. 1. Late-Quaternary climatic, geomorphic, and vegetational history above 1,500 m in the southern Blue Ridge Province (after Mills and Delcourt, 1991).

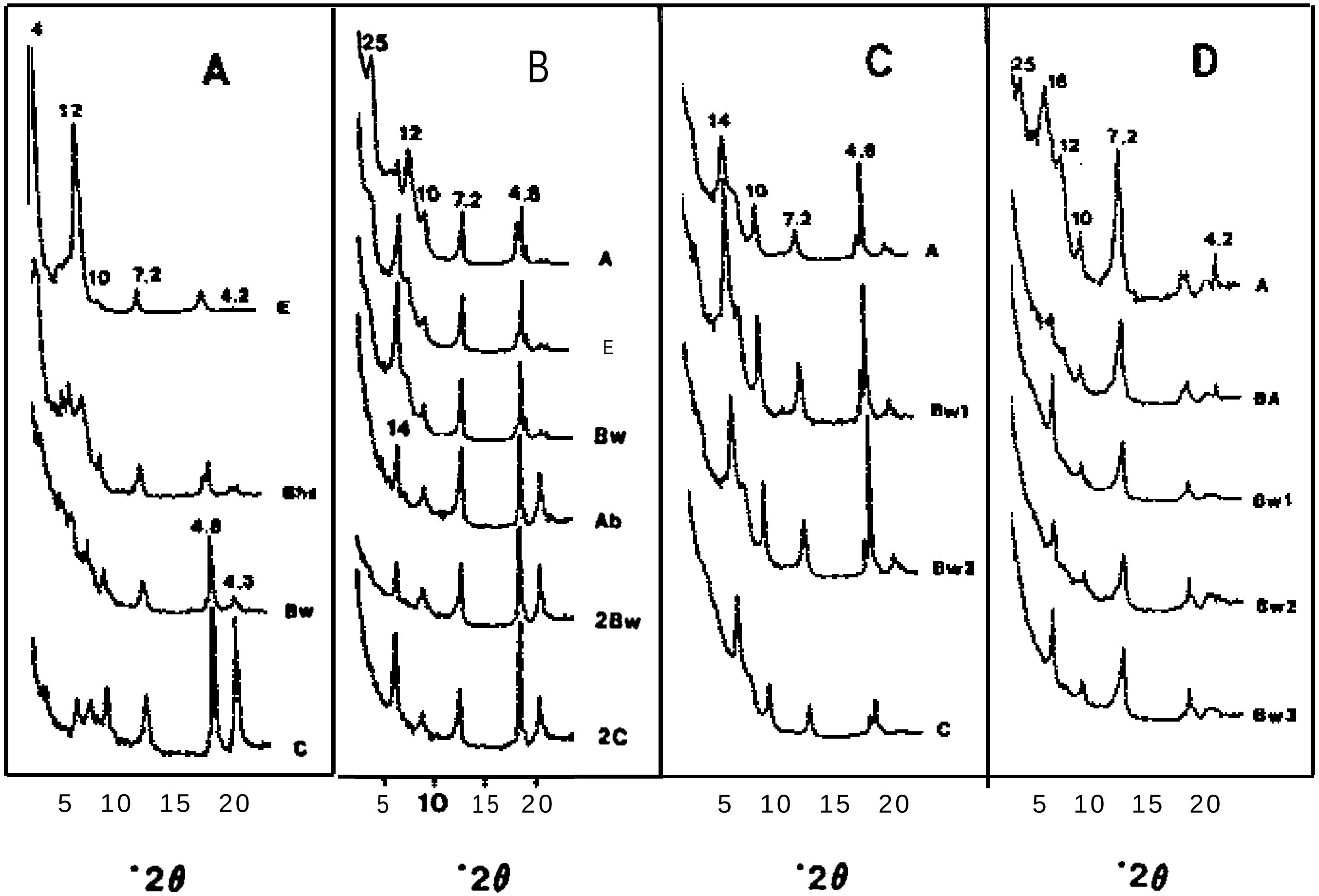


Fig. 2. X-ray diffractograms of Mg-gly (25°C) clay fractions from pedons GSM-14 (A), GSM-5 (B), BM-17 (C), and MR-7 (D). A) has distinct spodic morphology (E and Bhs horizons), B) has minimal spodic morphology (weak E horizon), and both C) and D) have no spodic character (umbric/cambric horizons). Note the well-crystallized RMV in surface horizons, and gibbsite. HIV, and mica increasing with depth. Peak positions are labeled in Å.

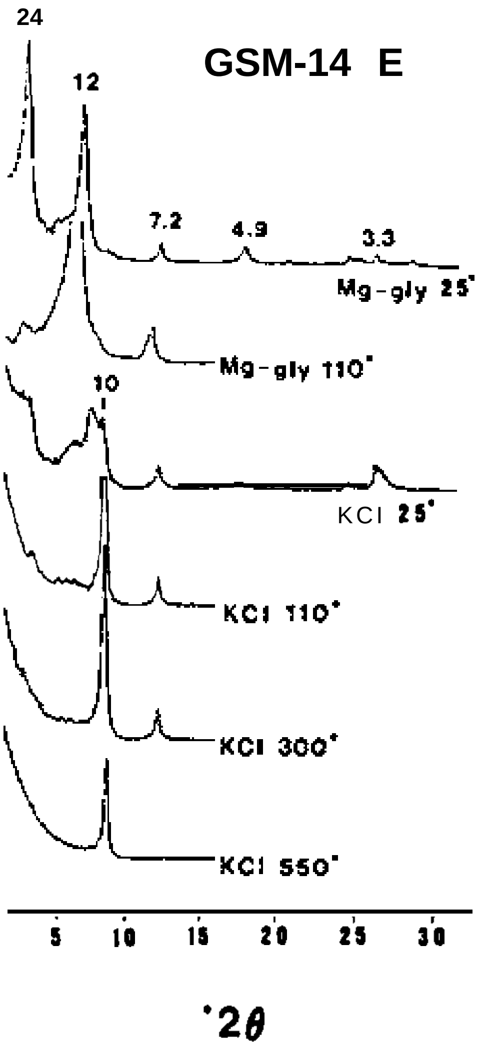


Fig. 3. Successive heat treatments of Pedon GSM-14 E horizon clay fraction showing XRD peak collapse to 10Å after K-saturation (KCl) and heating to 110°C. (Mg-gly is Mg saturated, glycerol solvated.)

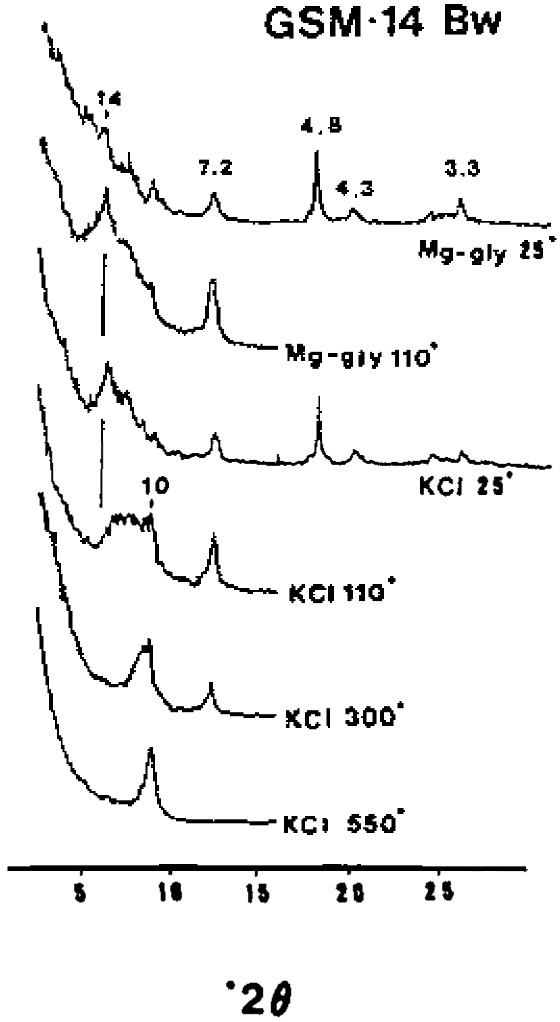


Fig. 4. Successive heat treatments of Pedon GSM-14 Bw horizon clay fraction showing increased hydroxy-Al interlayering of vermiculite in subsoil horizons. Peak positions are labeled in A. (Mg-gly is Mg saturated, glycerol solvated.)

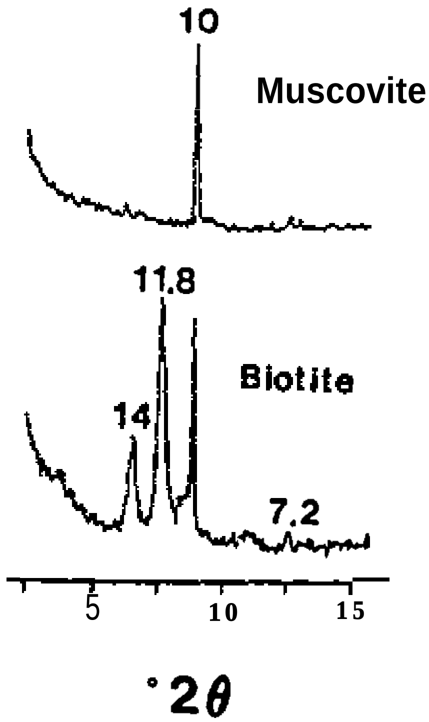


Fig. 5. X-ray diffractograms of representative muscovite and biotite single grains from the Bw horizon of Pedon GSM-14. Note the pseudomorphic transformation of biotite (10Å) to both hydrobiotite (11.8Å) and vermiculite (14Å), and the relative stability of muscovite.

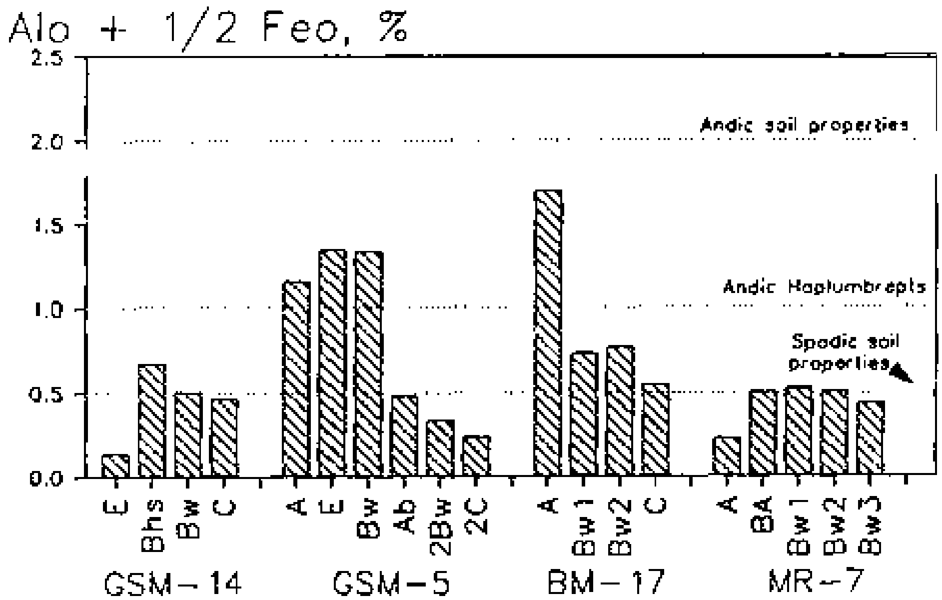


Fig. 6. Oxalate (o)-extractable-Fe and -Al criteria for classification of Pedons GSM-14, GSM-5, BM-17, and MR-7.

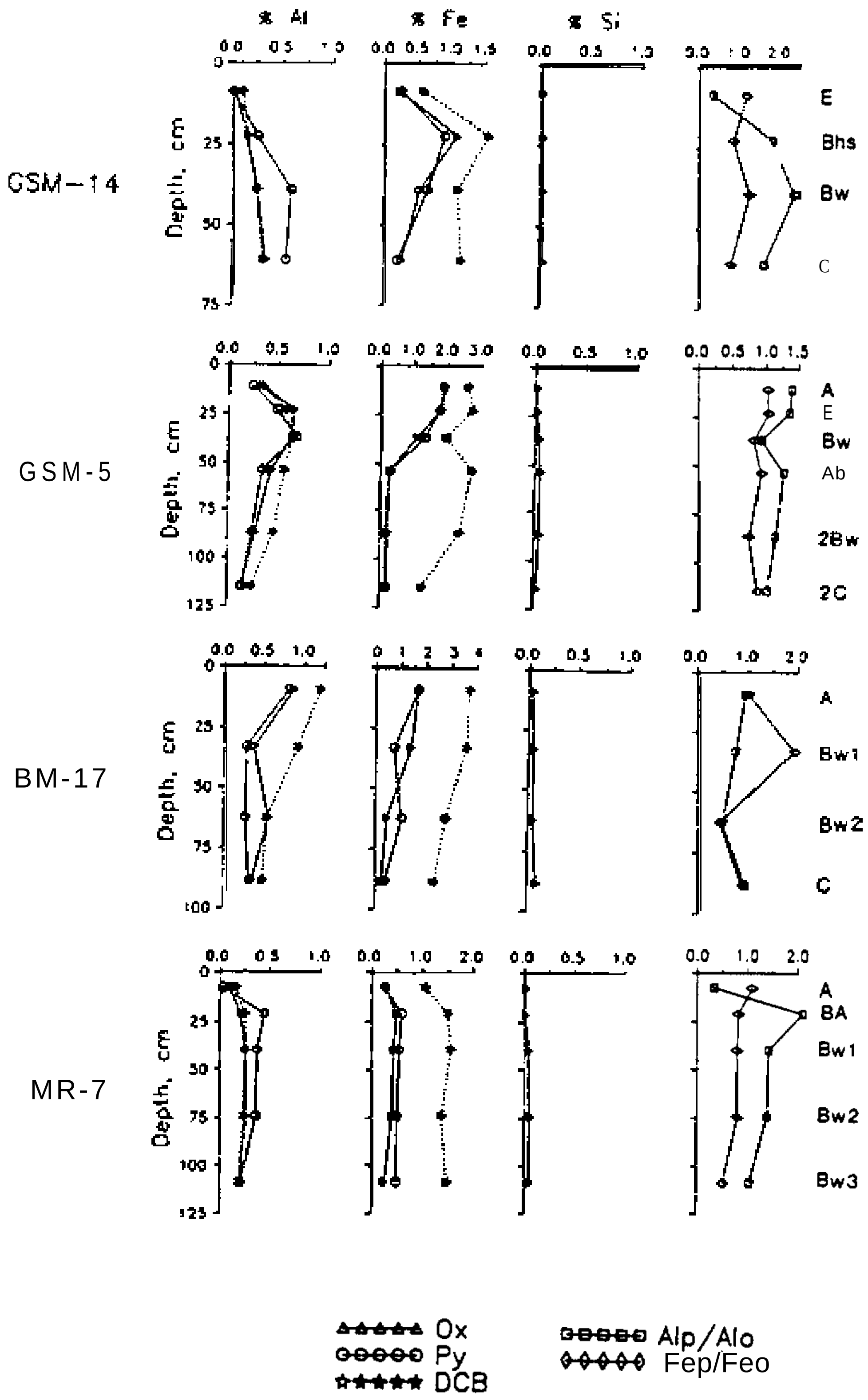


Fig. 7. Oxalate (ox)-, pyrophosphate (py)-, and dithionite-citrate-bicarbonate (DCB)-extractable-Al, -Fe, and -Si levels for Pedons GSM-14, GSM-5, BM-17, and MR-7. Ratios of Alp/Alo and Fep/Feo are also shown.

Table 1. Site characteristics, soil classification and morphological properties, and critical values for spodic horizon determination.

Land- scape	Elev-		Moist		% Pyro. Fe + Al	% Pyro. Fe + Al	Index of
			fr	cs			
			fm	--			

Table 2. Mineralogy of the clay ($<2\ \mu$) fraction and whole soil (<2 mm) gibbsite content.7

Horizon	KK	VR	SM	HIV	CHL	MI	RMV	QZ	GI	FD	WSGI
	%										
					GSM 14						
E	5	--	8	—	—	5	78	2	2	--	Tr
Bhs	11	6	5	6	--	9	46	2	15	--	I
Bw	11	--	--	15	--	11	30	—	33	--	5
C	11	--	--	5	--	10	10	—	63	--	14
					GSM 5						
A	14	5	10	--	3	20	32	3	13	--	2
E	14	12	5	--	3	23	23	3	15	--	6
Bw	13	9	Tr	10	46	32	15	1	24	--	5
Ab	24	—	--				5	1	36	2	20
2Bw	18	--	—	5		18	3	1	45	3	19
2c	18	—	—	15	42	2323	Tr	Tr	36	4	II
					BM 17						
A	11	12	—	5	Tr	21	20	2	29	—	5
Bw1	13	—	—	16	Tr	30	15	I	25	—	7
Bw2	16	--	--	14	Tr	28	10	Tr	32	—	8
C	9	--	—	35	--	40	7	—	9	—	6
					MR 7						
A	37	8	'4 '	—	—	12	18	7	2	2	1
BA	38	—	8	16	--	16	10	7	2	3	1
Bw1	38	--	2	23	2	16	5	4	7	3	1
Bw2	43	—	—	19	4	16	2	4	10	3	2
Bw3	45	—	—	14	4	18	2	3	11	3	2

† KK = kaolinitc; VR = vermiculite; SM = smectite; HIV = hydroxy-intcrlaycrcd vermiculite; CHL = chlorite; RMV = regularly interstratificd mica/vermiculitc; QZ = quartz; GI = gibbsitc; FD = feldspar; WSGI = whole soil gibbsite.

GIS SUPPORT FOR SOIL SURVEY AND RESOURCES INVENTORIES

Presented by Darlene Monds, USDA-SCS
Northeast National Technical Center (NNTC)
Northeast/South Cooperative Soil Survey Conference
June 14-19, 1992

As most of us already know it is quite cumbersome to analyze large volumes of data in hard copy form. Coupled with the need to analyze two or more data layers, the task becomes at the least, frustrating. Increasing need for electronic data (both tabular and spatial) began the evolution of Geographic Information Systems (GIS) within SCS and soils data was the driving force. Soils data, in particular, has become one of the most valuable and sought after data layers for use in natural resource GIS databases. No longer are we getting requests for copies of the published soil surveys. Electronic copies are now the preferred format.

In response to this need, SCS has established 3 soil geographic data bases at differing levels of detail. A brief overview of each of these will follow, however, this presentation will focus mainly on the uses of STATSGO.

The three databases include the National Soil Geographic Data Base (NATSGO) at 1:7,500,000 scale; the State Soil Geographic Data Base (STATSGO) at 1:250,000 scale; and the Soil Survey Geographic Data Base (SSURGO) at 1:24,000 scale. Interpretations are made differently for each data base to be consistent with the level of detail expressed. Data User's Guides are being developed for use with these data bases.

All three databases are composed of map unit components which are linked to an attribute data file, the Soil Interpretations Record (SIR) data base. For each major layer for approximately 18,000 soil series, the SIRs contain data for more than 25 soil properties such as available water capacity, bulk density, reaction, and cation exchange capacity. The proportionate extent and properties of the component soils are identified through this linkage to the computerized attribute data. The data base also contains interpretations for numerous uses such as sanitary facilities and woodland.

SSURGO was designed to be used at the local level for landowner, township, and county natural resource planning. The source mapping scale usually ranges from 1:12,000 to 1:31,680. The data is captured digitally at 1:12,000 or 1:24,000.

In general, the more detailed the map and the larger the map scale the fewer the number of map unit components. For example, SSURGO contains 1 to 3 map unit components which are each linked to Soil Interpretation Record (SOI-5). Most SCS soil interpretations have been made using the most limiting soil component, not the dominant component. GIS technology allows us to query each map unit component'for a particular criterion. Then the percentage of components are aggregated for each category (slight, moderate, or severe) by map unit id (muid). A map and a report can then be generated for each category with a legend showing the percentage of map units (not delineations) that meet the criteria. Instead of the entire map unit being rated as severe for septic field suitability, now only a percentage is rated severe.

STATSGO was established for use at the multi-county, state, and regional level. Soil delineations were generalized from more detailed soil survey maps. Map unit composition was determined by transecting the detailed soil maps. Where detailed soil maps were not available, other soil data, geology, topography, vegetation, and climate were used in the development of STATSGO map units.

A STATSGO map Unit may contain up to 21 map Unit components. It is most difficult to decide on a dominant or most limiting component. Just as in SSURGO, one can use GIS to query each map unit component for a criterion. The percentage of components are aggregated for each category (slight, moderate, or severe) by map unit id (muid). A map and a report can then be generated for each category with a legend showing the percentage of map units that meets the criteria.

NATSGO is primarily used for national resource planning, monitoring, and appraisal. The Major Land Resource Area (MLRA) boundaries were developed primarily from state general soil maps and were used as the spatial data for NATSGO. Presently, NATSGO map unit composition was determined by sampling done as part of the 1982 National Resources Inventory (NRI), therefore, the attribute data comes from the NRI and SOI-5s. When all the STATSGO data is available for the U.S., a new NATSGO will be developed by aggregating STATSGO map units.

SCS has written GIS interfaces for STATSGO and SSURGO. These GRASS interfaces help the agency overcome inexperience in GIS and assure consistent, accurate interpretations. User's manuals have been developed also.

Our staff is beginning to utilize preliminary STATSGO data for the Northeast for a variety of applications. Regional, state, and multi-county soil pesticide leaching potentials, shallow bedrock, and erosion potential maps are but a few of the interpretative products that can be generated from STATSGO.

Some of these preliminary products have been generated for regional projects such as the Chesapeake Bay watershed. This watershed covers 64,000 sq. miles and has been targeted for 40 percent nutrient reduction (nitrogen and phosphorus) by the year 2000. Only approximately 15 percent of the watershed has SSURGO data available and much of the watershed needs varying degrees of soil survey updates. STATSGO is an excellent soils database for a project of this size and could be used to prioritize more detailed soil survey activities in the watershed.

The integration of STATSGO with other data'can be a useful tool for identifying areas that are most vulnerable to ground and surface water contamination. STATSGO products can be integrated with Agricultural Census data, for example. Agricultural Census data is county level data that is collected every five years and is used by Congress to assist with farm program management. GIS is a superb mechanism for analyzing and displaying the data that traditionally has been distributed as volumes of tables in hardcopy format.

This year, our staff worked very closely with NNTC soil scientists, agronomists, water quality specialists, nutrient management specialists, and economists on the integration of 1987 Agricultural Census data with STATSGO. We used Pennsylvania STATSGO as the prototype and have plans to expand the project over the entire Northeast. Interpretative maps and reports were generated to identify soil areas in Pennsylvania that are most vulnerable to leaching. This digital map was overlain with counties that have high manure production and/or high chemically treated cropland.

STATSGO is also proving to be an excellent correlation tool and check for data quality. We are presently generating products for use in addressing concerns importdnt to mapping, correlating, and interpreting soils in the glaciated Northeast. This geographic area is Land Resource Area R, which covers six New England states and parts of New York, New Jersey, Pennsylvania, and Ohio. Some of the STATSGO products will include maps and reports showing the extent of dense till, spodosols, temperature regimes, and fragiaquepts. The GIS will also make it more apparent where there are data gaps or data quality problems in the attribute data.

Additional resource data should be analyzed with soils information in a GIS to better define those areas that have been contaminated and those with the greatest potential for ground and surface water pollution. I am in no way advocating using only one or two layers of information to identify and assess the water quality of an area. However, when you do not have readily available digital resource data such as specific chemical application rates, geology, topography, hydrography, land use and land cover, precipitation, atmospheric data, water quality monitoring data, and population data, then why not utilize what is available? Chances are that many good resource management decisions would better be made utilizing only a few databases than none at all. Of course, there is never any substitution for the information that a cadre of technical specialists from many disciplines can offer in performing the most accurate interpretations.

In addition to using GIS for the generation of soil survey end products, GIS may also be used as the "front end" to soil survey. In some instances, GIS may be useful in making soil surveys as conveyed in a paper prepared by Bruce Stoneman, SCS-VA and Maxine Levin, SCS-CA. The paper entitled "Ideas for Using GIS to Enhance, Expedite, and Improve Soil Survey Activities", emphasizes the use of present soil line work, if available, with digital slope, aspect, elevation, geology, precipitation, and other available data.

In conclusion, SCS has established three soil geographic databases to meet the needs of our soil survey users. There are countless GIS applications utilizing geographic soils data. Our foremost use of digital soils data and GIS is as; a tool in making soil surveys; the mechanism by which interpretations are generated and displayed thus allowing users to make more informed resource management decisions: and assist with soil correlation.

GIS SUPPORT FOR SOIL SURVEY AND RESOURCE INVENTORIES

Javier E. Ruiz

The use of GIS in soil survey can be categorized into four areas, they are:

- New Surveys
- Survey Updates
- Special Studies
- Technical Soil Set-vices

New Surveys

Examples of data that can be used includes:

DEM Data
TIGER Data
- STATSGO Data
- SSURGO Data

Survey Updates

Examples include:

MIADS data which serves as the basis for development of interpretive maps using the SSURGO interface.

Special Studies

Watershed projects where the area is digitized and utilized with existing MIADS, SSURGO or STATSGO data.

Masks of the data can be developed using the project outline to work only with the soils within the project.

--Technical Soil Services

The most beneficial use of GIS is in soil survey, because it can generate the interpretations found in published soil surveys.

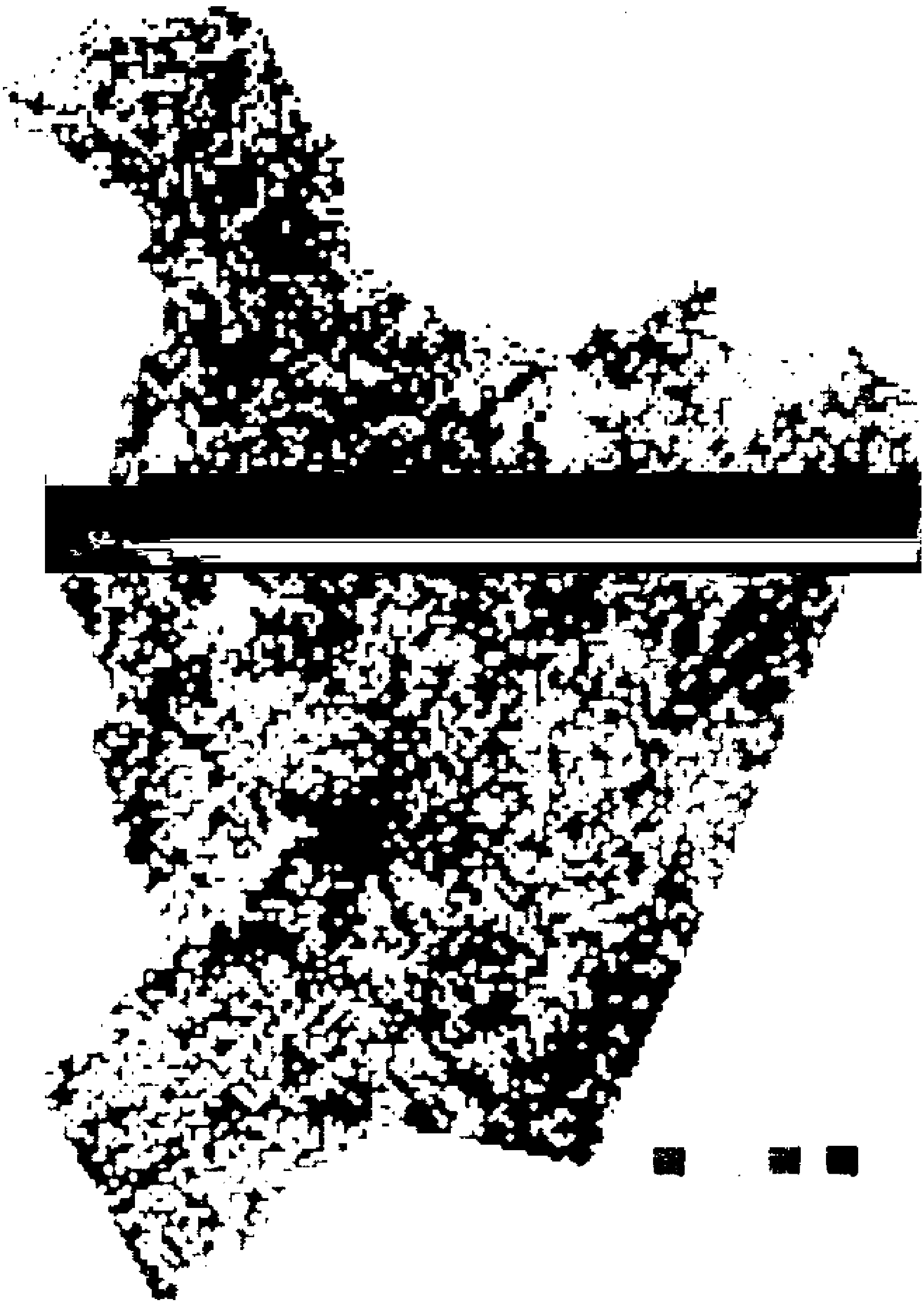
Relies on the use of STATSGO and SSURGO tabular data and the SSURGO and STATSGO interfaces.

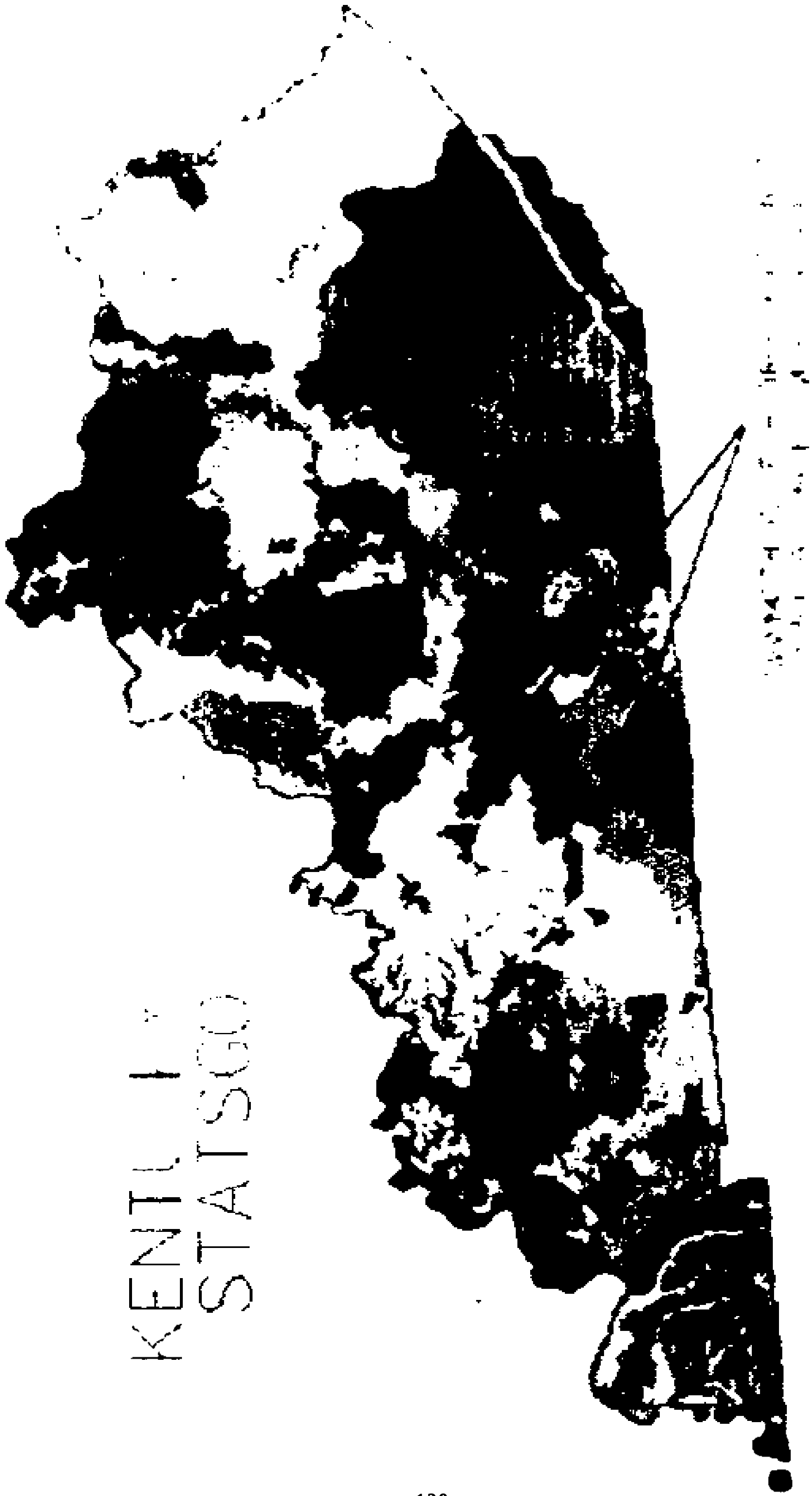
Allows for development of customized interpretations that are not normally found in published soil surveys.

MASK: none

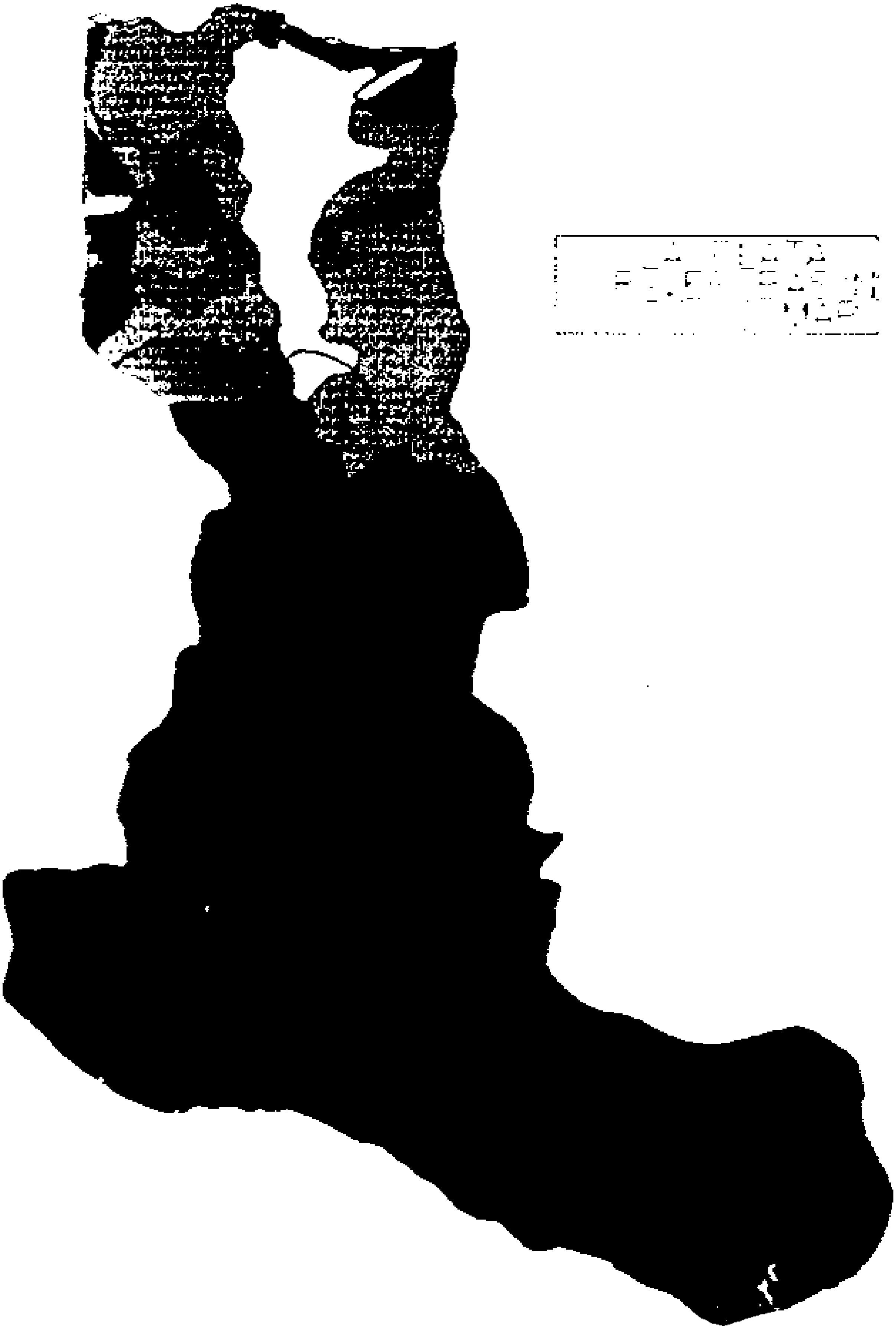
Produced by: USDA Soil Conservation Service
Software: GRASS

TITLE: Soils of Habersham Co. Georgia
LOCATION: HABERSHAM COUNTY, GEORGIA





STATSGO
SOILS



North Carolina Center for Geographic Information & Analysis
Digital Soils Resources Program

TOM TRIBBLE

The North Carolina Center for Geographic Information 8 Analysis (CGIA) operates a geographic information system (GIS) and serves as the official repository for digital geographic data for the State of North Carolina. A receipt-funded agency established in 1977. CGIA is located in the Office of State Planning.

CGIA's mission is to build and maintain a statewide database of digital geographic information; to provide GIS services to other government agencies, universities, and private sector; and to address GIS coordination within state government.

The U.S. Department of Agriculture's Soil Conservation Service (SCS), the North Carolina Division of Soil and Water Conservation, and individual counties are participating in a cooperative effort to complete modem Soil Surveys for all 100 counties in North Carolina. CGIA, through an active Digital Soils Resource Program, is converting the County Soil Surveys to a digital format for inclusion in the State's corporate GIS database.

CGIA uses source materials prepared by SCS through the Cooperative Soil Survey Program. Because the mapping procedures have evolved over time, the multidated county soil surveys exhibit differences in soil classifications, mapping intensity, and the imagery used for publications. The CGIA Digital Soils Resource Program attempts to achieve a uniform and contiguous soils data layer by minimizing the effects of the multidated county soil surveys. CGIA has established standards and procedures for preparing and digitizing the data designed to minimize the problems inherent to the source materials.

CGIA cooperates closely with SCS in developing a digital soils database that matches the published SCS county soil survey. However, if the soil survey was not produced with orthophotography as a base, corrections must be made for image displacement problems. In order to property capture the data in a GIS, soil lines are transferred to stable hase, 1:24,000 scale, 7.5 minuta orthophotos. When resources are available, SCS reviews the soil line transfer work and resolves problems caused by differences in classification, mapping intensity and in the definition of county boundaries.

The soil lines are digitized, processed, edited, and stored by 7.5 minute quadrangle in a topological data format. To facilitate use in the GIS, CGIA interactively edits the data to match soil lines at quadrangle boundaries. CGIA uses ARC/INFO software from Environmental Systems Research Institute.

In 1992, CGIA will test and evaluate the use of scanning technology to convert soil surveys to a digital format. Digital soil survey data are available in ARC/INFO format for 16 counties. Attached is a digital soil survey status map for North Carolina. The SCS general soils association mapping for North Carolina is also available in digital format at CGIA.

For additional information on CGIA's Digital Soils Resource Program or on how to obtain data or products, please contact Zsolt Nagy at CGIA's main office in Raleigh (919) 733-2090 or Tom Tribble at the Asheville Field Office of CGIA at (704) 251-6223.

SOUTH-NORTHEAST REGIONAL TECHNICAL
WORK PUNNING CONFERENCE

ASHEVILLE, NORTH CAROLINA
JUNE 14-19, 1992

TASK FORCE 1 REPORT - SOIL **SURVEY** AND **MANAGEMENT** OF FOREST SOILS

Chairman: Jim Keys (South)
Vice Chair: Willis E. Hanna (Northeast)

Objective:

To determine how to effectively deal with interpretations that have local application.

Charge:

To review the convention, criteria, and coordination of making local interpretations.

Task Force members reviewed current handbook and manual instruction relating to local interpretations, and discussed ways of effectively dealing with local interpretations.

Responses to the Charge:

Committee V of this Conference identified interpretation needs of cooperators following the 1988 meeting in Knoxville, Tennessee. During the 1990 conference in Puerto Rico, committee members determined that only twenty-one of the seventy-five interpretation needs had regional or national application. The remainder should be addressed locally with limitation or suitability ratings or soil potentials. There was a concern that current direction did not allow for effective convention, criteria and coordination of local interpretations.

Direction for the convention, criteria and coordination of local interpretations is found in SSM Chapter 11, NSH Part 603, and NFM Part 537. The SSM provides definitions for kinds of soil ratings and soil potentials. But. a definition is not provided for national, regional or local interpretations. The SSH does provide instruction in development of soil potentials, and includes examples. The NSH and NFM identify responsibilities in interpretation development, and identify approved guides for selected interpretations. NSH 603.00(d) provides for the local field and state staffs and their cooperators to make the decision on the selection of land uses for which soil interpretations are to be developed for a survey area. Specific direction concerning coordination between cooperators, technology transfer, and how to handle not only local. but regional and national interpretations is not adequately addressed.

The following were considered important when dealing with local interpretations:

1. Need **a** standard procedure for developing local interpretations to meet cooperator/user needs.

2. Peer review by cooperators is a must.

3. Approved guides should be made accessible to everyone.

4. Provide for ratings that ere positive to the user; limitation ratings sometimes have **a** negative coneration to the user (you can't do this because **it** has severe limitations).

5. Use research data when available to establish criteria.

6. Make it clear what can go in a database to support/develop local interpretations.

7. A local interpretations database may include climatic information es well es soil site properties.

8. Criteria should be developed that utilizes soil properties of major soil components of the map unit.

Recommendations:

The National Soil Survey Center provide the NCSS with more precise direction in handbooks and manuals for the convention, criteria and coordination of local interpretations.

-Assure that handbooks and manuals do not contradict each other in both definition of terms and direction.

-Provide direction for technology transfer of local interpretations between cooperators allowing for peer review. information sharing, and application.

The Task Force would like to propose that this issue be considered in the National Work Planning Conference.

There ere no current issues to address in the 1994 Conference.

ATTACHMENT 1

TASK FORCE MEMBERS

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S.Browning	B.Wood	D.Van Houten
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D.Williams		

National Soil Survey Center

Dennis Lytle

1992 South-Northeast Soil Survey Conference
Ashville, North Carolina
June 14-19, 1992
Soil Temperature and Moisture Regimes
Task Force 2 Report
by

Edward J. Ciolkosz, William J. Waltman, and Wayne Hudnall

Background

Soil temperature and moisture information has become a very high priority area of investigation in recent years both in soil classification and in addressing global change issues. The cooperative soil survey has both the expertise and data to address many of the needs in soil classification and global change work Attempts to address some of these needs are outlined in the charges given below.

Charges

A. General

1. Identify, describe, and evaluate existing models that can be used to predict soil moisture and temperature regimes (i.e., Newhall, EPIC, WEPPS, etc.)

2. Compile a listing of studies that have related soil climate to local or regional trends in soil development. For example, Jenney's classic 1941 text graphs of clay content in soils vs. temperature and precipitation, or Stanley and Ciolkosz's (SSSAJ 45:912-917.1981) attempt to relate soil temperature to

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Northeast

The **work** of the Task Force is given under the sections Action and Recommendations. An exception is a report of the Task Force Subgroup which follows.

Task Force Subgroup 1 Report

Modeling Approaches to Soil Moisture and Temperature Regimes

H. R. Mount, J. B. Nichols, and W. J. Waltman*

Introduction

The complexity of soil/landscape/climate relationships both spatially and temporally will make soil moisture/temperature regime models a necessity to help predict ecosystem responses and provide a spatial (GIS) linkage to general circulation models (GCMs). Predictive models that precisely characterize soil climate regimes are not only needed by soil scientists for classification, but may provide the missing spatial element that allows ecologists to extrapolate climatic changes and ecotone shifts to the landscape. The purpose of this paper is to describe and evaluate current models of soil climate regimes and provide recommendations for future research.

The Newhal'l Model

This model has long been used by the USDA Soil Conservation Service to estimate aridic, xeric, ustic, and udic soil moisture regimes as defined in Soil Taxonomy. Franklin Newhall and C. R. Berdanier have recently submitted the documentation and description of the model for publication as a Soil Survey Investigations Report Since its original release, their model has been modified by Van Wambeke et al. (1992). The modified model introduces subdivisions of soil moisture regimes and variable soil moisture storage. Although the original Newhall Model was developed in COBOL and FORTRAN, the Van Wambeke modified version is now written in BASICA and runs on most PCs.

The Newhall Model was intended to run on monthly 30 year normals for precipitation and temperature, but it can be run on annual monthly records to develop a frequency distribution of soil climate regimes. Newhall relies upon a Thomthwaite approach to the calculation of potential evapoaanspiration (PET). PET is assumed to be uniformly distributed during each month. Monthly precipitation (MP) is arbitrarily divided between heavy precipitation, which equals 1/2 of MP and is fixed to the middle of the month, and light precipitation that occurs over several minor events. Given the vintage of the Newhall Model, the computer hardware consaaints, and the difficulty of managing daily climatic records, this "tipping-bucket" approach and the needed assumptions were fairly reasonable. Table 1 presents a typical summary from the original Newhall Model (Newhall and Berdanier, 1992) and Table 2 gives a summary from the Van Wambeke modified version of the model.

Figure 1 gives Newhall soil moisture regimes for the conterminous U.S. based upon 1957 to 1976 climate records. Apparently, the earlier version of the Newhall Model did not recognize the perudic moisture regime. Figure 2 compares the Newhall Model results with the dominant soil moisture regimes (SMR) derived from STATSGO (State Soil Geographic Database). Soil scientists familiar with Nebraska soils generally commented that the Newhall Model interprets rhe ustic/udic boundary further west than the STATSGO map. Figure 3 relates precipitation isohyets to Newhall SMR for Kansas. The additional subdivisions of SMR in the Van Wambeke version may provide some new climatic interpretations relative to agricultural production (see Tables 1 and 2).

Soil Scientist, NSSC; Soil Scientist, SNTC; and Research Soil Scientist, NSSC, USDA/Soil Conservation Service.

Table 1. Report format from the original version of the Newhall Model (Newhall and Berdanier, 1992)

SOIL MOISTURE REGIME DEVELOPED FROM THE EXTENDED RECORD OF MONTH-BY-MONTH PRECIPITATION AND PE NORMALS

ROSEMONT, WEBSTER CO., NEBRASKA   40.3N 98.4W 610M   STATION # 257330-7   PRECIPITATION RECORD 1931-1960

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
NORMAL AIR TEMPERATURE DEGREES CELSIUS	-3.9	-0.6	3.6	11.6	17.1	22.4	25.4	24.8	19.1	12.8	4.2	-1.0	11.2
NORMAL POTEN. EVAPOTRANSPIRATION MM	0	0	13	47	88	134	161	142	94	45	9	0	733
NORMAL PRECIPITATION MILLIMETERS	15	22	36	51	86	112	74	64	62	31	22	17	594

SOIL MOISTURE PROBABILITIES TO DETERMINE SOIL MOISTURE REGIME FOR SOIL TAXONOMY

	PERCENT PROBABILITY	- - - - - CRITERIA FOR MOISTURE CONTROL SECTION (MCS) - - - - -		
1	73	DRY SOME/ALL PARTS MCS	90 OR MORE DAYS CUMULATIVELY	WHEN SOIL TEMP 5 DEG C OR HIGHER
2	33	DRY SOME/ALL PARTS MCS	6/10 OR MORE OF DAYS CUMULATIVELY	WHEN SOIL TEMP 5 DEG C OR HIGHER
3	10	DRY ALL PARTS MCS	1/2 OR MORE OF DAYS CUMULATIVELY	WHEN SOIL TEMP 5 DEG C OR HIGHER
4	0	DRY ALL PARTS MCS	3/4 OR MORE OF DAYS CUMULATIVELY	WHEN SOIL TEMP 5 DEG C OR HIGHER
5	67	MOIST SOME/ALL PARTS MCS	90 OR MORE DAYS CONSECUTIVELY	WHEN SOIL TEMP 8 DEG C OR HIGHER
6	33	DRY ALL PARTS MCS	45 OR MORE DAYS CONSECUTIVELY	DURING 120 DAYS AFTER SUMMER SOLSTICE
7	97	MOIST ALL PARTS MCS	45 OR MORE DAYS CONSECUTIVELY	DURING 120 DAYS AFTER WINTER SOLSTICE

SOIL TEMPERATURE REGIME: MESIC   ESTIMATED FROM NORMAL AIR TEMPERATURES

SOIL MOISTURE REGIME: USTIC   ESTIMATED FROM PROBABILITY VALUES IN LINES 1, 3, 5, 6, 7

AND MOISTURE REQUIREMENT IS "TYPIC" FOR:
HAPLUSTALFS, PALEUSTALFS, USTOCHREPTS, ARGIUSTOLLS, CALCIUSTOLLS, HAPLUSTOLLS, NATRUSTOLLS, PALEUSTOLLS
ARGIALBOLLS

AND MOISTURE REQUIREMENT IS "NON-TYPIC" FOR:
DURARGIDS, HAPLARGIDS, PALEARGIDS, CALCIORTHIDS, CAMBORTHIDS, DURORTHIDS, PALEORTHIDS, TORRIFLUVENTS, TORRIORTHENTS, TORRIPSAMMENTS

ESTIMATED DATES AND DURATION WHEN SOIL TEMPERATURE IS 5 DEG C AND ABOVE. BEGINS APR 10. ENDS NOV 22. DURATION 226 DAYS.

ESTIMATED DATES AND DURATION WHEN SOIL TEMPERATURE IS 8 DEG C AND ABOVE. BEGINS APR 22. ENDS NOV 7. DURATION 199 DAYS.

USDA-SCS-SOIL SURVEY 04/06/76

FORMAT OF COMPUTER PRINTOUT OF SOIL MOISTURE PROBABILITIES, ROSEMONT, NEBRASKA, BASED ON CALCULATED SOIL MOISTURE REGIME FROM 30 YEARS OF PRECIPITATION RECORD.

Table 2. Report format from the Van Wambeke et al. (1992) version of the Newhall Simulation Model. Based upon the Mt. Washington, NH, weather station, 1951 to 1980 normals.

```
Station:Mt. Washington       Country:usa          Latit:  44  16  N
Elevation:  6262                                  Longit: 71  18  w

Annual rainfall 2284 mm                  Waterholding capacity:  200  mm
Temperature  regime:  pergelic                  Moisture regime: Perudic

              SOIL CLIMATIC REGIME ACCORDING TO NEWHALL COMPUTATION
              (soil temp.-air temp.+2.5 C; amplit. reduced by 1/3)

    JAN   FEE   MAR   APR   MAY   JUN   JUL   AUG   SEP   OCT   NOV   DEC

  monthly rainfall (mm)
   185.7 203.5 208.0 178.6 164.1 179.3 175.3 193.0 181.6 170.9 216.9 227.1
  monthly air temperatures (Celcius)
   -14.9 -15.1 -11.1  -5.3   1.3   7.0   9.3   6.4   4.8  -0.8  -6.5 -12.7
  monthly evapotranspiration (Thornthwaite), mm.
     0.0   0.0   0.0   0.0  29.1  83.1  99.7  86.5  52.8   0.0   0.0   0.0

           TEMPERATURE CALENDAR                    MOISTURE CALENDAR
     (- : T<5) (5 : 5<T<8) (8 : T>8)        1 = DRY ; 2 = M/D; 3 = HOIST

     1************15***************30       1************15***************30

 JAN                                        333333333333333333333333333333
 FEB ------------------------------         333333333333333333333333333333
 MAR ------------------------------         333333333333333333333333333333
 APR                                        333333333333333333333333333333
 NAY ------------------------------         333333333333333333333333333333
 JUN ------------------------555555         333333333333333333333333333333
 JUL 555555555555888888880888888888         333333333333333333333333333333
 AUG 888088888888888808888888888888         333333333333333333333333333333
 SEP 8885555555555555555555--------         333333333333333333333333333333
 OCT                                        333333333333333333333333333333
 NOV ------------------------------         333333333333333333333333333333
 DEC    ________                            333333333333333333333333333333
```

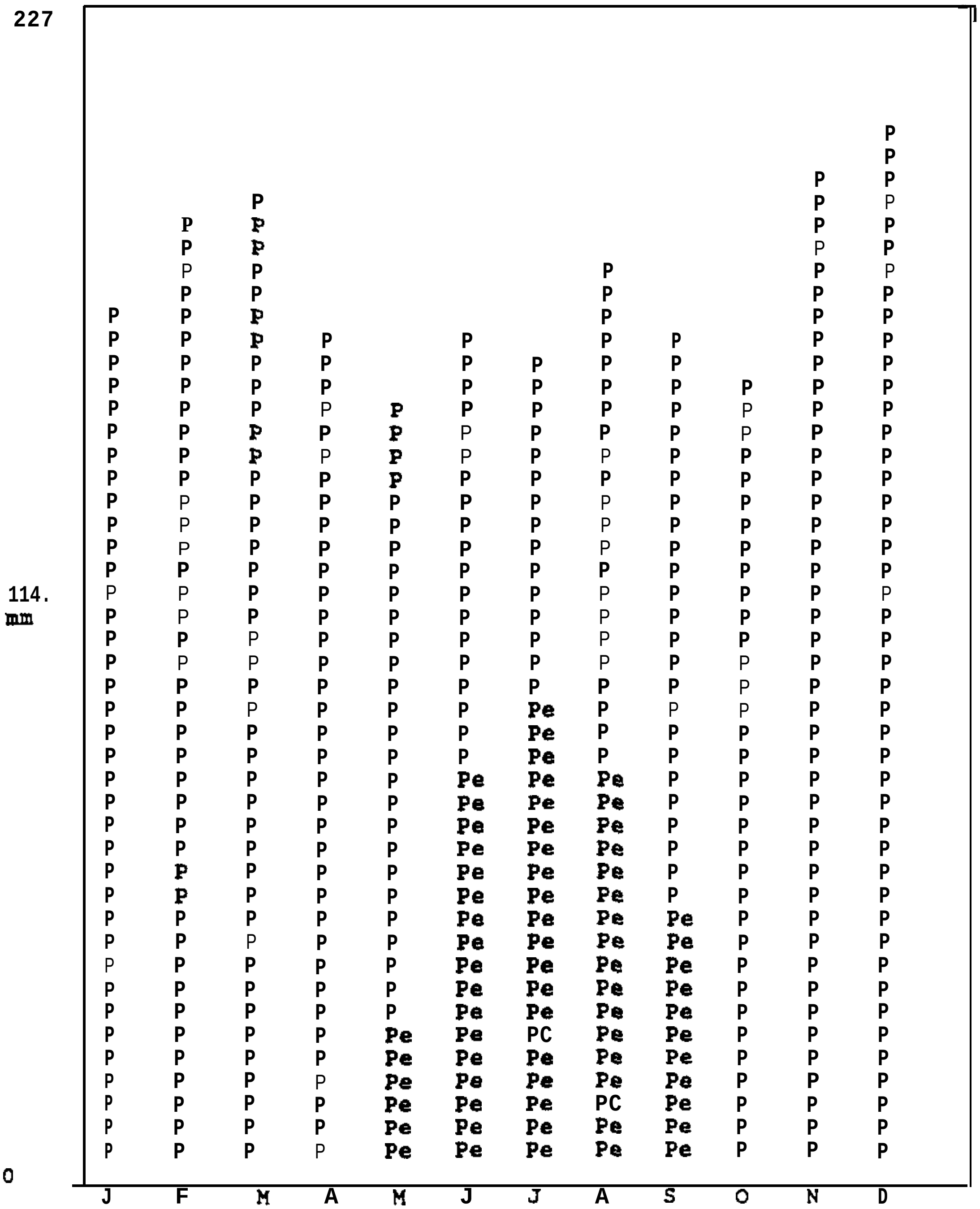
Number Of cumulative days that the moisture control section						Highest number of consecutive days that the MCS is			
During one year is			When soil temp is above 5 deg. C			Moist in some parts		Dry after summer	Moist after winter
DRY	M/D	MOIST	DRY	M/D	MOIST	YEAR	T>8	solstice	solstice
0	0	360	0	0	89	360	51	0	120

* Computed by BASIC program FLEXNSM (FEB 1991).
Tentative subdivision: for a waterholding capacity of 200 mm

Table 2 (cont.)

Station: Mt. Washington country: usa

P = precipitation e = potential evapo-transpiration



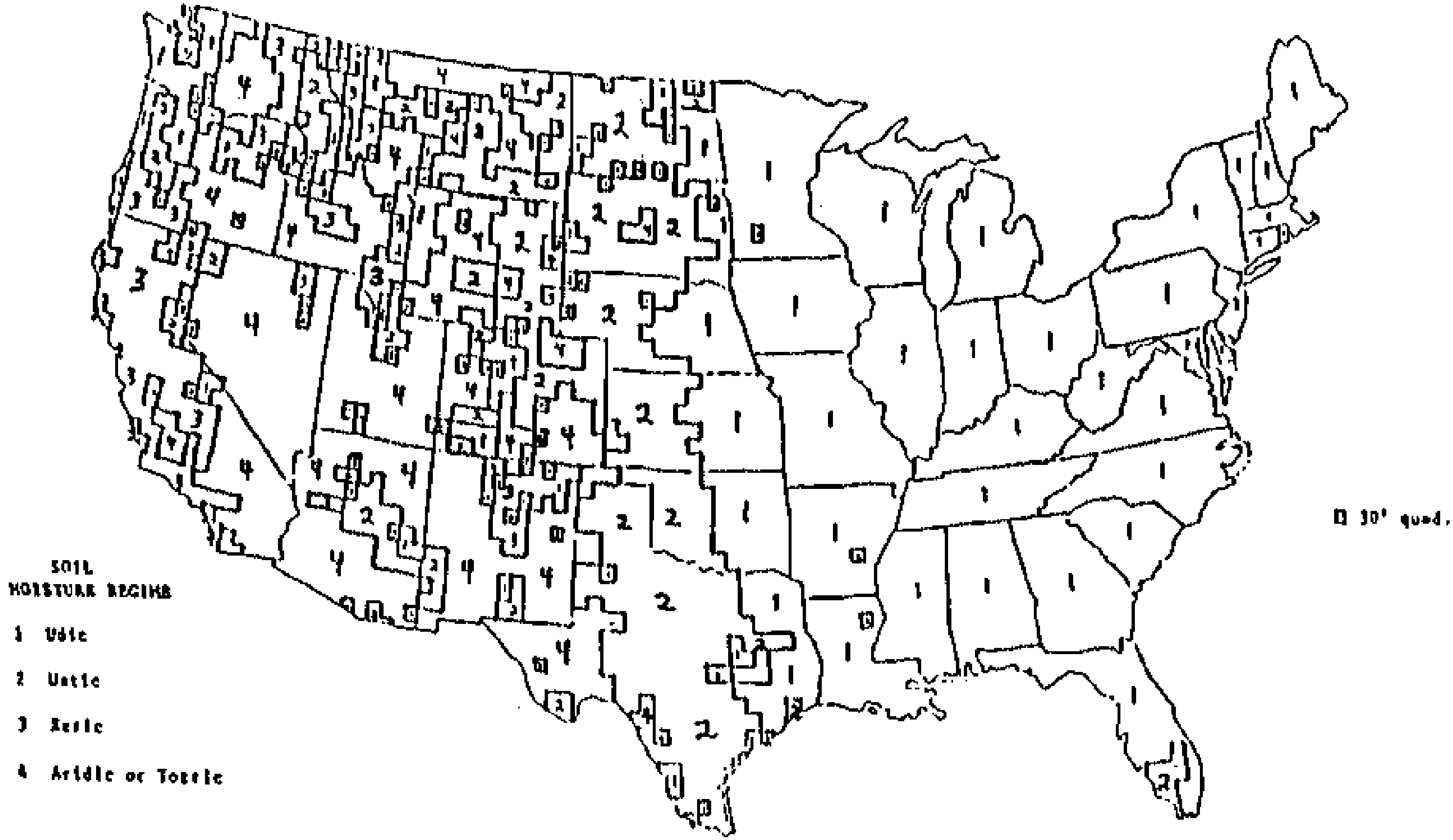


Fig. 1 Calculated soil moisture regime by 30-minute quadrangles for the conterminous United States derived from the Newhall Model using a 1957 to 1976 dataset (Newhall and Berdanier, 1992).

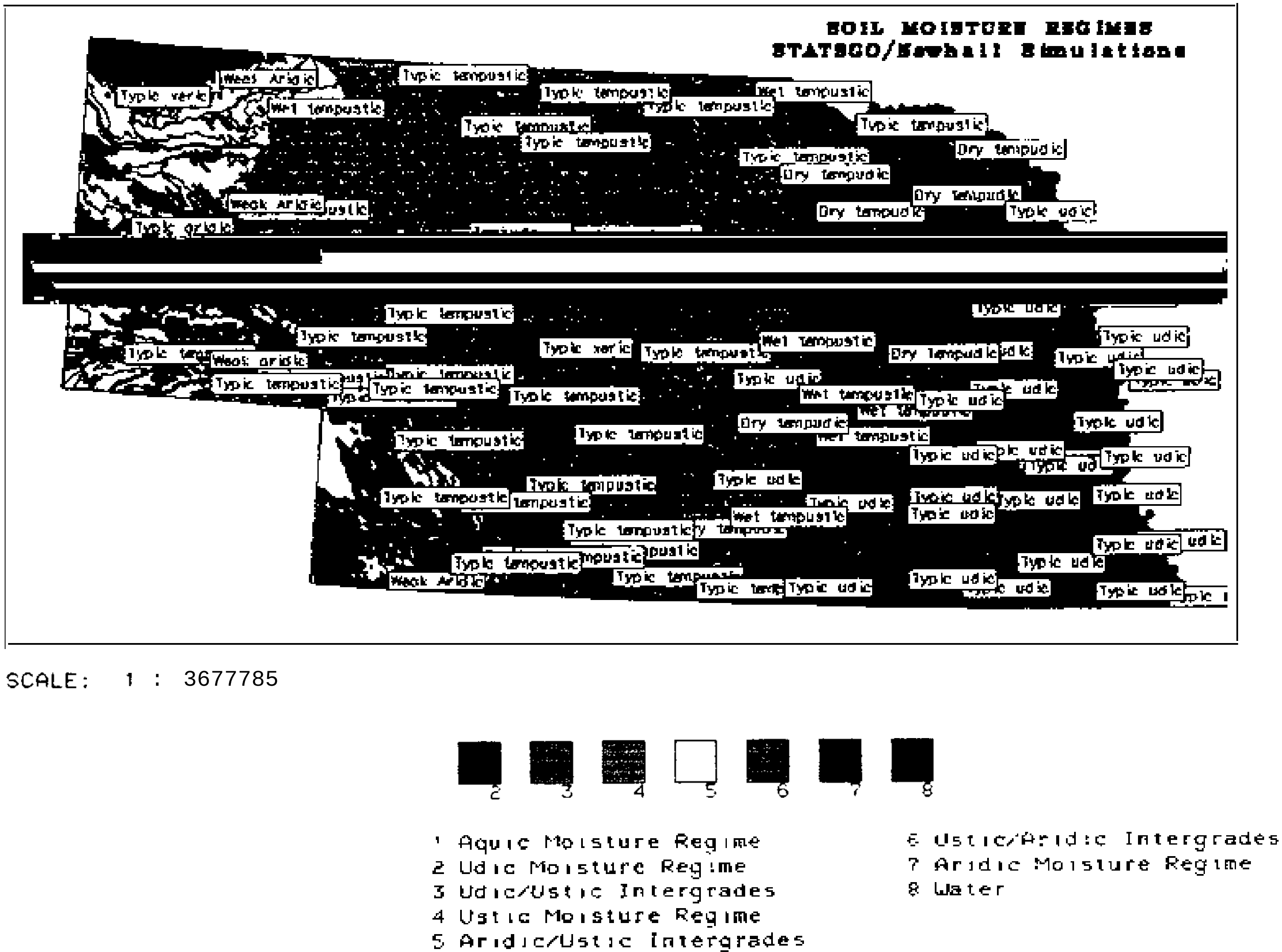
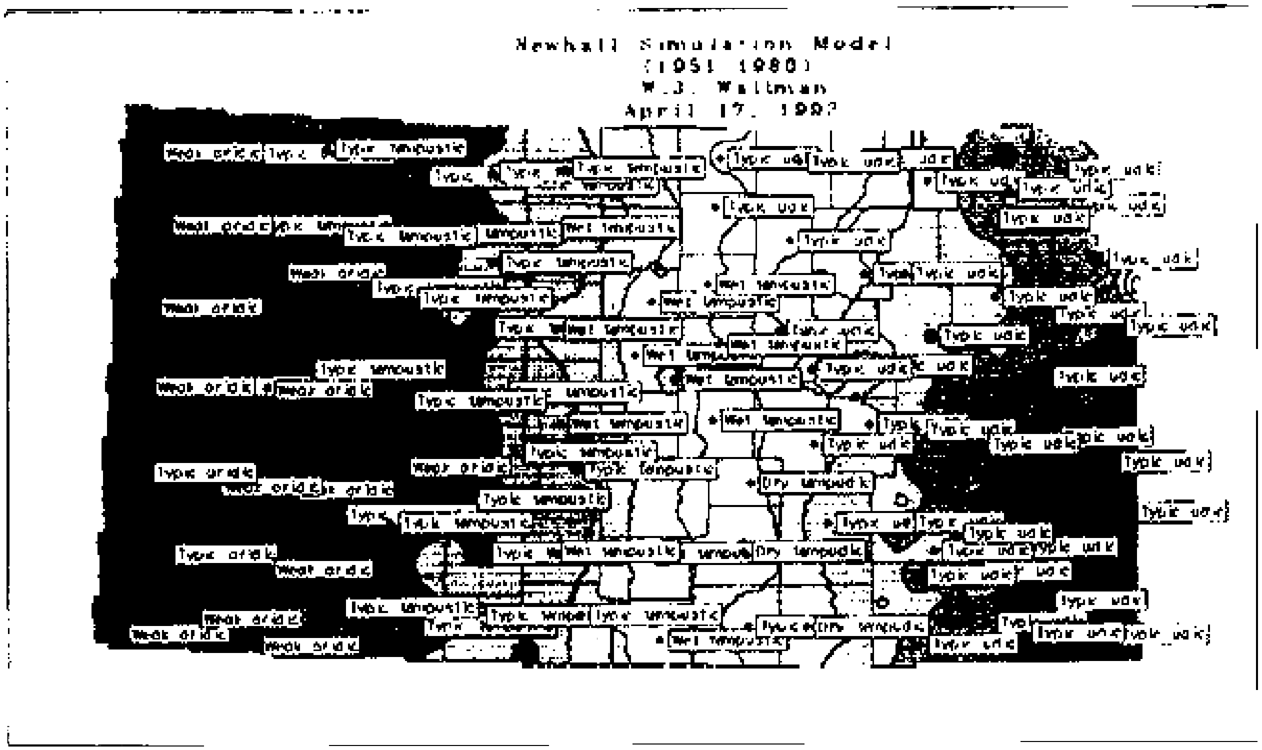


Fig. 2 Comparison of Newhall Simulation results with Nebraska STATSGO. The SMRs derived from Newhall Model were based upon 1951 to 1980 normals of Nebraska weather Stations and use proposed subdivisions of Van Wambeke et al. (1992).

TITLE Mean Annual Precipitation (1951 - 1980 normals)
LOCATION [illegible]



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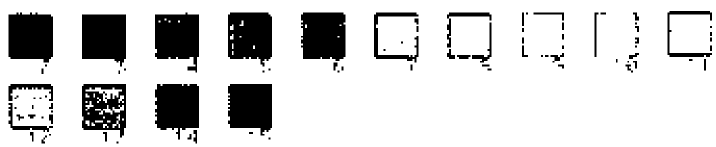


2 13 to 14 inches	7 23 to 24 inches	12 33 to 34 inches
3 15 to 16 inches	8 25 to 26 inches	13 35 to 36 inches
4 17 to 18 inches	9 27 to 28 inches	14 37 to 38 inches
5 19 to 20 inches	10 29 to 30 inches	15 39 to 40 inches
6 21 to 22 inches	11 31 to 32 inches	

Fig. Comparison of Newhall Simulation results for SMR in Kansas with precipitation isolines (1951 to 1980 normals). Each location represents a weather station with 30 yr normals for temperature and precipitation.

More recent work (Lytle et al., 1992) with the Newhall Model for global soil moisture regime and soil temperature regime maps indicates that the model becomes biased at high latitudes and predicts much of the tundra and spruce-fir forest regions as having aridic moisture regimes. The model appears to overestimate PET at the higher latitudes.

The weakest part of the Newhall Model may be its estimation of soil temperature regimes (STR). In the original version, mean annual soil temperature (MAST) was estimated by adding 1 C to the mean annual air temperature (MAAT). However, in the Van Wambeke modified version, MAST is approximated by adding 2.5 C to MAAT. Table 3 presents a brief literature search of soil temperature/air temperature relationships. From a combination of literature search and the SCS's Global Change monitoring stations, more sophisticated algorithms could be developed to predict MAST.

Table 3. Estimating MAST from MAAT.

Reference	Relationship*	Location
Smith et al. (1964)	MAAT + 1.1 C	Midwest & New York
Vann and Cline (1973)	MAAT + 2 C	New York
Carter and Ciolkosz (1980)	MAAT + 1.2 C	West Virginia &Pennsylvania
Ouellet (1972)	MAAT + 3.6	Canada
Mueller (1970)	MAAT + 0.6-2.5 C	Montana
McDole and Fosberg (1974)	MAAT + 2.3-3.6 C	Idaho
Newhall Simulation Model**	MAAT + 2.5 C	Global

*Depends upon snow cover, vegetative cover, and ET
**(Van Wambeke et al., 1992 version)

Figure 4 presents the Newhall (1980) map of soil temperature regimes (based on 30 minutes USGS quadrangles), which presumably represents the 1957 to 1976 climate record. This mapping/modeling approach did not differentiate between cryic and frigid regimes. In the Northeast, frigid and cryic regimes were largely restricted to areas north of the Mohawk Valley. Carter and Ciolkosz (1980) suggest that the frigid soil temperature regime extends farther south along the eastern Allegheny Plateau (MLRA 127) into West Virginia (Figure 5). The relationships developed by Carter and Ciolkosz (1980) between latitude, elevation, and MAST were later verified by Waltman et al. (1988) for the Glaciated Allegheny Plateau and Catskill Mountains (MLRA 140) and the Eastern Allegheny Plateau in southern New York.

Figure 6 shows a comparison of MAST in Kansas between the original Newhall Model and the Van Wambeke modified version using the same climate record (1951 to 1980). Again, the original version basically followed assumptions given in Smith et al. (1964). The mesic/thermic border is displaced approximately 200 km northward to the Manhattan and Lawrence, Kansas weather stations. Similarly, in the Northeast, under the Van Wambeke version, the mesic/thermic border would extend to Newark, Delaware, and southern New Jersey (Cape May), putting all of the Eastern Shore of Maryland in the thermic zone.

As the authors of the Newhall Model have pointed out, this model should be applied judiciously because the calculated soil moisture/temperature regimes are only estimates derived from climatic data, not soils data (Newhall and Berdanier, 1992). The Newhall Model results often look reasonable, until the spatial and temporal exuapolations are considered. Often, soil scientists tend to consider SMRs and STRs as static properties associated with a given pedon. However, SMRs and STRs have shifted through time and space during the Quatemary, which raises the following issues:

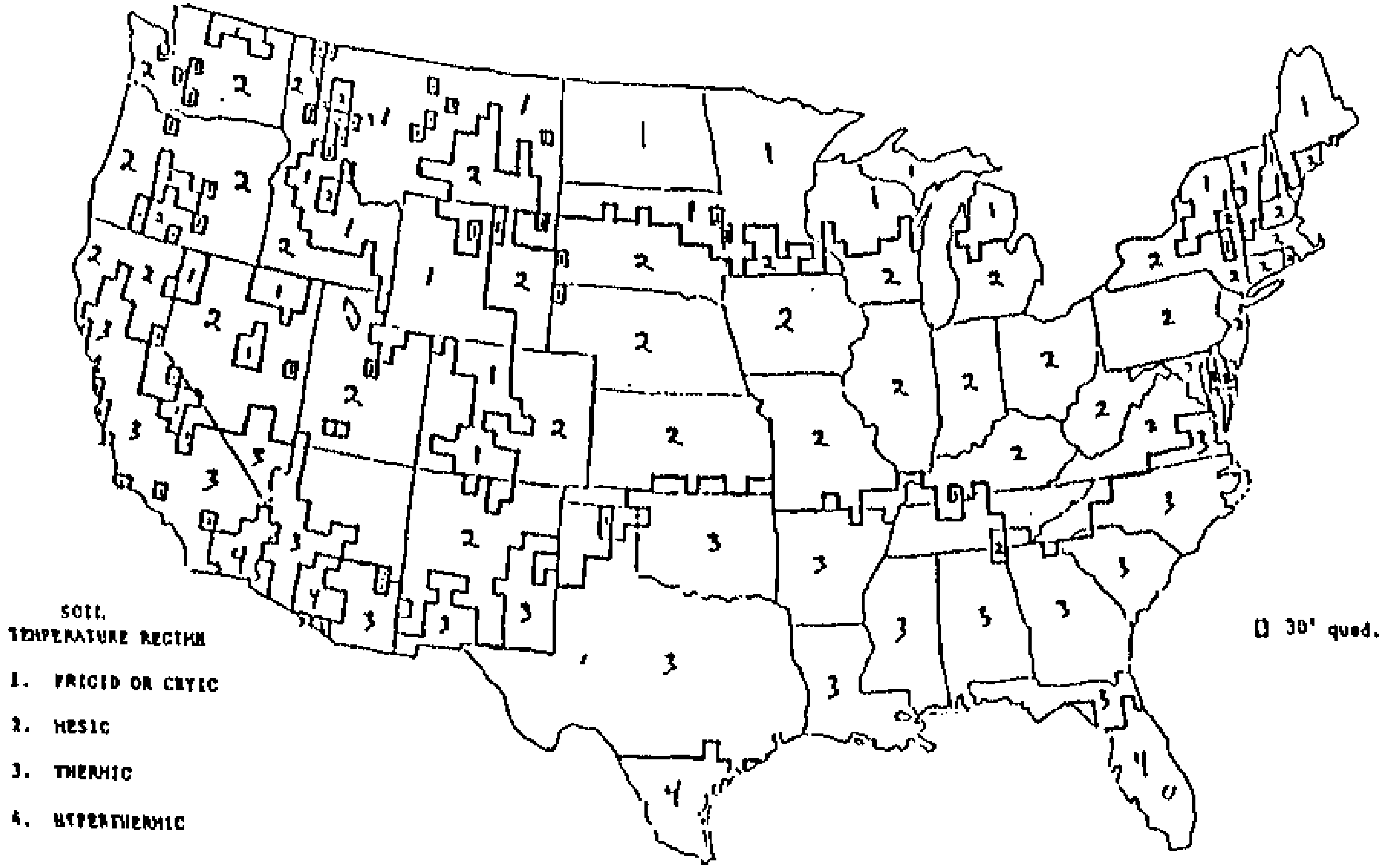


Fig. 4 Estimated soil temperature regimes by 30-minute quadrangles for the conterminous United States derived from the original Newhall Model using a 1957 to 1976 dataset (Newhall and Berdanier, 1992).

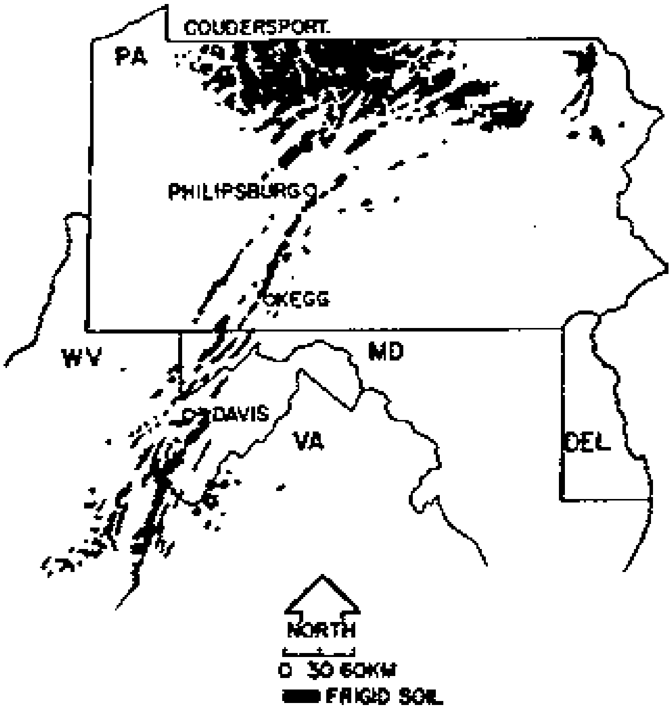


Figure 5. Map of areas of predicted frigid soil temperature regimes in Pennsylvania (PA), West Virginia (WV), Maryland (MD), and Virginia (VA), (unshaded areas have mesic soil temperature regimes), and location of soil temperature study areas (From Carter and Ciolkosz (1980).

1. Which climatic records (1931 to 1961; 195 1 to 1980; 1961 to 1990) should be used for Newhall Model runs?

2. Should the climatic record chosen vary by geographic region?

3. What methodology should be used to aggregate the Newhall results from individual weather stations and allow extrapolation to landscapes?

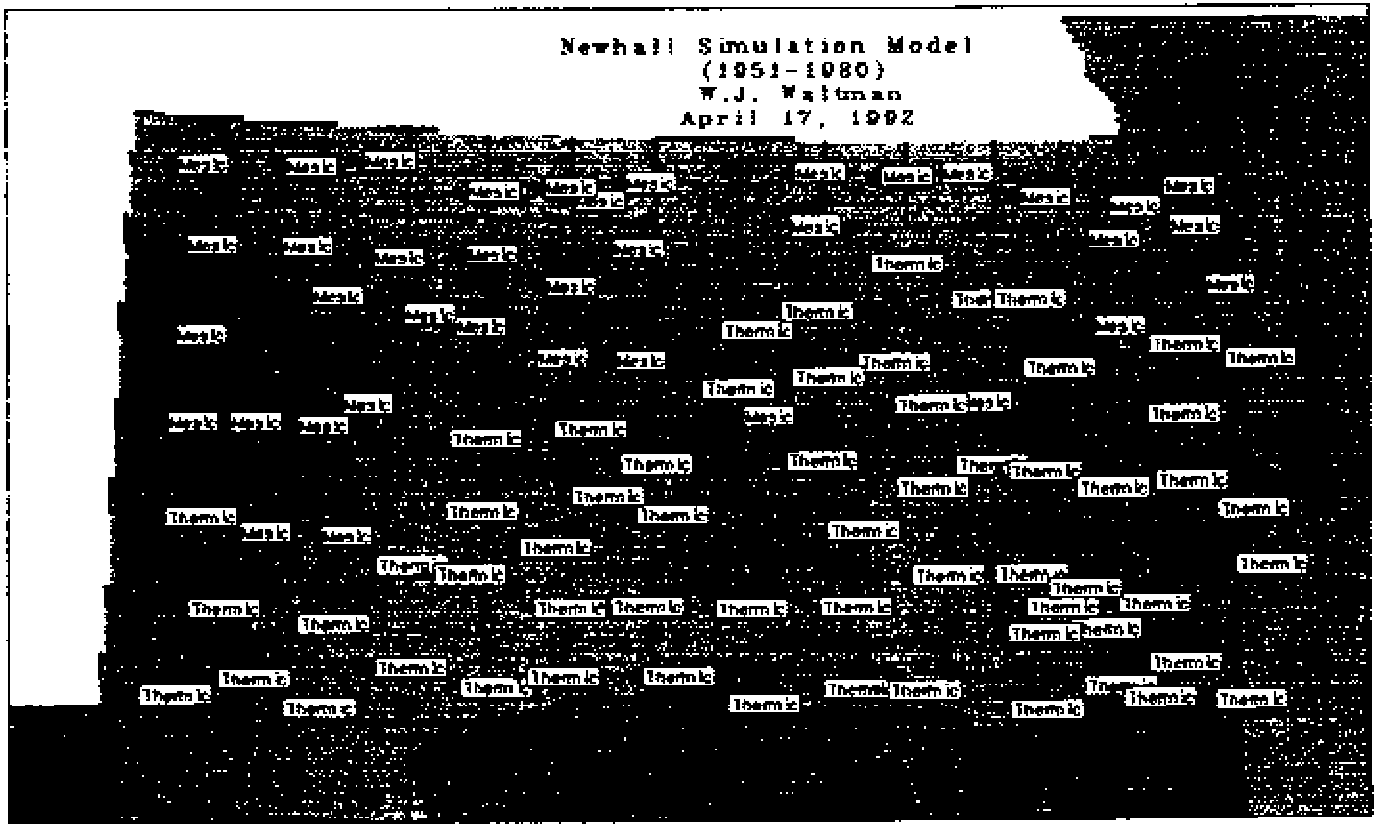
4. How can interpretive differences be reconciled between presumed SMRs/STRs in STATSGO and the Newhall Model approach?

5. How can temporal and spatial shifts in SMRs/STRs be illustrated at STATSGO and NATSGO levels?

ERHYM-II/RANGETEK

ERHYM-II is a climate, water-balance model that provides a daily simulation of soil and plant evaporation and water routing through the profile (Wight, 1991). ERHYM-II is driven by daily inputs of maximum and minimum air temperatures, precipitation, and solar radiation. The model incorporates infiltration and runoff calculated from daily precipitation and SCS curve number (Sharpley and Williams, 1980). Although the ERHYM-II model was intended to simulate daily soil water content and soil/plant evaporation in forecasting forage production, it could be adapted to predict soil climate regimes (Nichols, 1990; Nichols et al., 1991).

TITLE: SOIL TEMPERATURE REGIMES (1951-1980 normal)
LOCATION: National Soil Survey Center GIS



SCALE: 1: 3626432

1 Mesic Soil Temperature Regime (47 to 59 F)
2 Thermic Soil Temperature Regime (59 to 72 F)

Fig. 6 Comparison of Newhall Simulation results for STR. Each weather station is identified with the Newhall estimation of MAST. The background colors represent a Smith et al. (1964) approach of MAST - MAAT + 2°F.

RANGETEK, unlike the Newhall Model, introduces vegetative cover and range (forage) yield relationships to the estimation of SMRs/STRs. In the Great Plains, the adaptation of ERHYM-II/RANGETEK to prediction of SMRs/STRs might be useful in understanding ecotone shifts in grasslands.

EPIC

Nichols et al. (1991) have proposed that EPIC (Sharpley and Williams, 1990) be adapted to refine subgroup definitions of soil moisture regimes. Since this model can be run for a number of crops. range, and pasture, EPIC also provides the opportunity to bring vegetative cover into the prediction of soil moisture regimes. EPIC uses daily inputs of temperature, precipitation, and radiation from actual data or generated weather data

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Action

1. All collected soil climate data has been turned over to the SCS Climate Data Access Facility at the Portland SCS WNTC including the data collected by Ron Paetzold (Soil Climate Notes, 1988, Vol. III, No. 2 1/2).

2. Soil climate references have been combined with those of Ron Paetzold (Soil Climate Notes, 1990. Vol. V, No. 2) and are presented as Appendix 1.

Recommendations

1. NCSS should target support to develop SMR/STR modules for existing models, such as ERHYM-II and EPIC, which rely upon daily weather parameters rather than monthly averages.

2. Through the Global Change Pilot Project and other SCS monitoring programs, an experimental design should be considered and implemented to foster development of predictive models for SMRs and STRs.

3.

4.

CDAF have responsibility for the archiving and distribution of the soil monitoring network inventory data.

8. To support the modeling of soil temperature/moisture regimes, it is recommended that the SCS conduct an inventory of slope, aspect, georeferencing by GPS, soil map unit, landform, and surrounding landuse for the national cooperative network weather stations.

9. It is recommended that Task Force 2 be discontinued

Appendix 1

SOIL CLIMATE LITERATURE[1]

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EVANGELISTS, SCHOLARS, HISTORIANS, LAB TYPES, COMPUTER BUFFS, MAP MAKERS AND AUGER PULLERS IN THE SOIL SURVEY 1/

Ralph J. McCracken 2/

If I were to be asked which of the activities in the title are most important for a modern soil survey, I would resoundingly answer "all of the above." A model of a modern major soil survey (to paraphrase a Gilbert & Sullivan song about a model of a modern major general) must include all of these aspects if it is to be fully effective. Each can and should contribute significantly and be considered fully equal to the other components, irregardless of Federal or state agency affiliation and disciplinary background (not some more equal than others as has been the case sometimes in the past) in a well-balanced modern soil survey program as full team members. This hasn't always been the situation. However, it seems progress is being made and additional progress is forthcoming, growing out of the planning and the cooperative attitudes you are displaying here in this conference. The soil survey must continue in promoting cooperation and joint planning if it is to be effective and serve our country well.

I should like to congratulate you for agreeing to and participating in what I understand to be the first South-Northeast Cooperative Soil Survey Conference. Special commendations go to the Steering Committee which arranged this well-planned, well executed conference. Such a joint session would have pleased Dr. Charles Kellogg greatly, for he was always concerned about the "fault lines" (as he called them) between the various regions of the USA. From what I hear and have seen during the time I have been at this conference there are not no iron curtains or trenches between the two regions and among the several agencies participating in this conference. Ecologists and other natural scientists have studied and written about the "tension zones" between the types of forests, vegetation zones, climates and soils (the Alfisol-Ultisol interface) along and near the boundaries of these two Regions. My observation and thought has always been that the tension was in the minds of scientists either side of the regional boundary due to disagreement on placement of human-defined boundaries between these types of natural resources. It is encouraging that you have worked this week to ease this tension in the minds of scientists either side of the South-Northeast boundary.

Your steering committee has shown good judgment in choosing Asheville in the midst of these beautiful Great Smoky Hountains as the scene for your conference. It was also good judgment to set this conference where participants would have opportunity to see in the field the very interesting soils of this mountain-foothills area which are different in many respects from soils of the Piedmont, Coastal Plain and northern glaciated regions to which we are accustomed.

1/ Delivered to banquet session of South-Northeast Soil Survey Conference June 20, 1992

2/ Deputy Chief, Retired, USDA Soil Conservation Service

Here in the Smokies there is a different interplay of soil forming factors. it is good to see these soils are finally getting some research and classification attention. Previously they were given little serious attention other than soil mapping with strong Tennessee Valley Authority financial support, but recently have come under more intensive investigation and characterization by several of you here.

I well remember the unexpected results I experienced when I started studying these high mountain soils in the middle 50's jointly with Dr. Royal Shanks. ecologist, University of Tennessee (now deceased).

Because you have been studying these soils and this environment on your field trips here, let me share with you the lighter side of some of my mountain and foothills experiences while working with soils in this area.

One incident occurred while soil mapping in the foothills of the Smokies, on the Tennessee side. While moving along a rough track in a densely wooded area, a representative of a local industry stepped out from behind a tree with the query "where be you headed fer and what brung you here?" I replied that I was mapping soils for a soil survey of the county. He replied, "Ain't no soils down this way." So I found another way to check the veracity of his pedologic pronouncement, using stereoscope and geologic and topographic maps. That was when I found it was good practice to stop in the country stores for an RC and a Moon Pie, letting the'word out as to what we were doing in the area.

Another interesting experience occurred while Dr. Shanks and I were studying and sampling soils in the Great Smoky Mountain Park in the spring of 1957 for our mountain soil study. We had obtained our special permit for the soil sampling from the park ranger headquarters and were opening a soil "profile pit" for sampling when we were approached by a person obviously a local citizen who sidled up to us and asked "You uns found any sang yet?." Shanks, who had a great deal of experience in the area, translated this to mean that the person was asking if we had found any ginseng yet, roots of which brought a good price for sale overseas, especially in China, because of the alleged value of the root for medicinal purposes and for the sexual prowess. The fellow showed up a couple of more times during the morning with the same question. We finally concluded that he thought that we had "cut a deal" with the rangers to be able to collect ginseng roots in the Park and he was hinting that he wanted to be let into the deal.

Back to soil science in these mountains - after sampling several representative high mountain soils, we proceeded with lab analyses with the help of colleagues in the NC State Soil Science Department. When we got the results, we were astonished to find the soil properties rather different than we expected from these dark brown loamy and, in places, thin soils. WWith the help of Nat Coleman, then professor of soil chemistry at NC State, it was determined that relatively large amounts of exchangeable aluminum were associated with the "permanent charge" exchange capacity of these soils and large amounts of "true" exchangeable hydrogen were associated with the variable charge sites, and some of the primary minerals had been altered to hyrdoxy aluminum interlayered vermiculite type clays.

These results didn't coincide with the then conventional wisdom. These findings and the findings of large amounts of exchangeable aluminum associated with 2:1 clays in some soils of the Piedmont led Coleman and associates to publish a definitive paper on exchangeable aluminum, which was not widely recognized to exist at that time.

Another surprise came from studies of soils of the foothills and lower slopes of the Smokies. To our surprise, we found relatively large amounts of gibbsite associated with the finer soil fractions. This led us to conclude that under intense weathering related to high rainfall with rapid removal of silica from the soil system due to good rapid soil drainage, the soils could be driven far along the weathering sequence leaving gibbsite without appreciable resilication. So we had much to relearn about soil forming factors and their effect on mountain and foothill soils in this region.

Back to the components mentioned in the title of this presentation:

Soil Evangelists:

I first heard this term when it was directed at me when I was presenting an orientation lecture on soil resources and soil conservation to ministerial students at the seminary in Wake Forest, NC. These were students expecting to go into rural ministry. After my lecture and during the discussion period, one future preacher said to me, "In our terminology, you are a soil evangelist - one who is trying to save soils whereas we ware trying to save souls." I took this as a compliment.

Of course, the greatest soil evangelist of all time was North Carolinian Hugh Harmnond Bennett, founding father of the Soil Conservation Service. He sensitized the public, not only in the US, but also in several other countries on the importance of soil conservation. The work that you all have done in support of the soil conservation program stands as a monument to "Big Hugh." But soil conservation is now more important than ever, with many needs broader than soil erosion control, which was the Bennett emphasis (appropriately at the time). Now there are many other soil conservation needs - controlling erosion to reduce sediment pollution of our waters, identifying prime farmland for protection against urbanization, conserving the soils of the wetlands, protecting the soils of the grasslands, and assuring we have sufficient supply of productive soils to meet future world food needs in face of a growing global population. So there is still a need for soil evangelism in the soil survey, with the fervor and enthusiasm which Bennett brought to the program, The battle is not done. One of the few persons now engaged in soil evangelism in the soil survey is Francis Hole, retired Professor of Soil Science, University of Wisconsin. He has many calls to present his soils programs to a wide range of public groups in Wisconsin and surrounding area - with his violin and soil songs. This involves adjusting the wording of well-known folk and popular songs to reflect soil conservation concerns and the importance of knowledge of and appreciation for our soil resources. The repertoire includes songs such as Home, Home on the Loam; Simple Gifts paraphrased to "Tis a gift to have land" and many others. In his programs, he brings out the importance of knowledge of soils and the use of soil surveys. This is an example of kind of soil evangelism that is needed in the soil survey.

Scholars :

At times, in some quarters, there is lifting of eyebrows about basic research and scholarly pursuits in the soil survey. There occasionally arises this question or implication - why do we need these eggheads involved in the soil survey program? Ye need new ideas, new ways of thinking about soils - as to their genesis, their classification and mapping, and the need for accumulation of basic data to support the applied soil survey programs. We've been fortunate in the past in having some intellectual giants affiliated with the soil survey who could see the "big picture.' For example, Dokuchaiev and his Russian colleagues and Hilgard in America were among those responsible for making a significant leap forward with their studies of the effects of climatic and vegetation gradients on soil properties. This contributed to the development of the concept of soil as a natural body owing its properties to varying combinations of soils forming factors. Hans Jenny in California first quantified the concept of five soil forming factors which has led to fuller understanding and appreciation of the soil-forming processes. (contrary to some beliefs, Guy Smith and others of the Soil Survey Division were in frequent contact with Hans Jenny).

He also developed and expanded the concept of the soil as an important component of ecosystems. This has led to a more precise, quantitative and rigorous study of soil formation. Curtis Harbut and Charles Kellogg (and associates) were prime movers in America in establishing the philosophy and intellectual basis for scientific study and classification of soils. Dokuchaiev was among the first to establish the concept of soil as a natural body; Marbut brought to the soil survey the application of basic geologic and geomorphic principles to soil survey and turned it away from the emphasis on soil texture and the practice of relating soils to specific geologic formations. Kellogg was a renaissance man with both basic and applied research concern, soil use interests and contributed greatly to development of soil survey as a scientifically-based endeavor applicable to a number of uses - agricultural and nonagricultural. Jenny was the epitome of a true natural scientist. All these men were scholars who contributed basic concepts with life long interests in soil genesis, ecology, soil conservation and soil chemistry.

Hilgard of California and Russian emigre C.C. Nikiforoff of the US soil survey are examples of the different kinds of scholars which the soil survey needs. Hilgard was also among the first to recognize soil as a distinct entity worthy of study by scientific methods and as a natural object; he was also concerned with soil use and improvement. Nikiforoff, with his Russian background, is an example of the kind of person a program like the soil survey needs - one who considers soil as a natural object worthy of study to understand it better as a part of nature, without attention to the applied practical uses of soil.

But these scholars are gone and new challenges are arising for basic understanding of soil systems and how to use basic soil information for applied problems. We must continue to have scholars on the soil survey team - those who can put their feet on the desk and think big but who are also sensitive to practical applications. Now more than ever there is an ongoing need for scholars in the soil survey.

Soil Historians:

The philosopher Santayana said in effect - those who do not study history are doomed to repeat it. But some of us in the soil survey haven't seen much need for historians and historical studies in the soil survey program. Now, at the end of my career in soil science, I am strongly convinced we must maintain historical records and collect and preserve oral histories associated with the soil survey. Ye need to know the reasons for previous actions and activities in the soil survey - for example, why various soil classification systems were developed in the fashion in which they were structured. This is especially true for our present Soil Taxonomy. We need to know and understand its roots, origin, and procedures used in its development and why certain key decisions were made as they were. This will help us in using this classification system and will be useful in future adjustments of its present structure and criteria. We need to be aware of the origins of soil survey from geology, soil chemistry and agronomy. As former President Truman is reported to have said - the only history that is not useful is that you haven't read or don't know about. We must understand the origin of the concepts, theories, terminology and jargon blended into Soil Taxonomy.

These matters relating to history of soil survey must be recorded for future use. Ue're no longer able to discuss these historical matters of the soil survey program with the early day giants of the field who've passed on. We'd like to think they've gone on to soil survey heaven - where there is no spatial variability, all mapping units are 100% pure and there are no soil correlators. Some, but unfortunately not all of their thinking and reasons for the action taken have been recorded.

A few soil scientists have made efforts to record the history of soil survey programs in the USA. For example. Macy Lapham of California recorded in his book "Crisscross Trails" many of his experiences in the early days of the development of soil surveys in the United States - from the perspective of an "auger puller" and of an "inspector" as they were called earlier (now known as soil correlators). Roy Simonson has done a superb and very useful work in writing about the evolution of the American soil survey since its inception just before the turn of the century to recent days. This study is laid out in three articles in "Soil Survey Horizons." He was "present at the creation" of some of the intermediate and latter phases of the soil survey program in America, and has recorded the events and actions in a very useful and readable way.

Douglas Helms, present Soil Conservation Service historian, has recorded oral history from some of the pioneers in soil conservation, which is very useful information.

Understanding and appreciating the evolutionary changes which have taken place in soil survey and soil classification over the past 100 years not only makes the field auger puller's work more interesting, it helps in doing a better job of soil survey. Probably few present day soil surveyors are aware of the great time pressures and stresses that accompanied the development of Soil Taxonomy, mostly accomplished within one decade. Most natural scientific classification systems in other fields evolved gradually over a period of nearly a century. An example is the botanic classification of Linnaeus. And they probably are not aware of the many temper tantrums, scorching letters and even insults that Dr. Guy D. Smith had to bear in leading and coordinating the preparation of Soil Taxonomy. These were mostly from soil scientists incensed because some one had dared to tinker with classification of "their soils." It can be said that soil surveyors are a group of people who tend to "think otherwise."

You, as present day soil surveyors are heirs and beneficiaries of this giant step forward. The torch is passed to you to keep Soil Taxonomy adjusted and updated as needed - to carry on the proud tradition.

And let's not be too critical of our soil survey "ancestors". Looking back without a feel of history, it's easy to question why they did what they did. But it takes some study and effort to understand their reasoning and use this knowledge to help us improve soil survey. These early day scientists were caught in a dilemma. They couldn't classify and map soils without knowing their significant characteristics but couldn't know these until a wide range of soils had been studied in fields and forests, experimental plots and in the labs. In looking back to our roots in soil genesis and classification we shouldn't identify heroes whose views anticipated present ones while criticizing other soil scientists of the past as having been wrong, too narrow, too subjective. Changes in theory and scientific background of our field are not only due to new discoveries but also due to creative imagination and nature of contemporary scientific, social and political thought.

Adjustments in Soil Taxonomy and in ways of doing soil survey to avoid rigor mortis and acconvnodate new findings will continually be necessary. There is a need to be flexible and adjust to new information.

A summary of why it's important to know and understand history of soil surveys and classification:

1. Demonstrates the field is dynamic, changing as new information and ideas develop. As Victor Hugo wrote "Nothing is more powerful than an idea whose time has come."
2. Shows importance of keeping in touch with developments and new ideas in other countries (we don't have a monopoly on soil knowledge!)
3. Help us understand where present concepts came from and why.
4. Demonstrates importance of coordination of field and lab activities and developments.
5. Gives us inspiration and incentive to keep pushing ahead in trying new ideas and approaches.

Speaking of history of soil survey, I want to share with you a very recent finding of mine - the first identification of need for soil surveys in America, written about North Carolina in 1709:

Lawson, John. A description of North Carolina, from a new voyage to North Carolina. This was published in American Garden Uriting, p. 107-112. Edited by Bonnie Maranca and published by PAJ Publishing, New York City:

> "The wheat of this place is very good, seldom yielding less that 30 fold, provided the land where it is sown. I have been informed by people of credit that wheat which was planted in a very rich piece of land brought a hundred and off pecks for one peck. If our planters when they found such great increase, would be so curious as to make nice observations of the soil, they would soon be acquainted with the nature of the earth, and be better qualified to manage their agriculture to more certainty and greater advantage, whereby they might arrive to the crops and harvests of Babylon. But I must confess, I never saw one acre of land managed as it ought to be in North Carolina."

Lab Types:

The term "lab types" is a term we have sometimes used in the soil survey to denote those who make their contributions to the soil survey through laboratory analyses (not intended as a derogatory or pejorative term).

The increasing importance of quantifying soil information with "hard data" makes this component of the soil survey team even more important to the program. This is especially true for use of soils data in solving environmental concerns.

Lyle Alexander is my model of the way in which laboratory-based soil scientist can support an 'action" program like the soil survey. He participated in field collection of soil samples as much as possible and was receptive to new approaches and new technology. He and his colleagues maintained high standards of lab analyses. His was a true success story, having grown up as one of 10 children in a sharecropper family and became a self-made outstanding scientist. His work in measuring fallout on soils from atomic and nuclear bomb explosions is a classic. I well recall a personal experience with his dedication to high standards of careful soil analyses. As party chief of a soil survey party in Iowa, I wrote Dr. Alexander a request for what I (unfortunately) called 'routine analyses" (referring to customary analytical procedures for soil survey samples) of samples of several soils with which we were having problems. He inmediately responded with a curt note that no "routine analyses" were done in his labs as careful attention was given to each sample analyzed.

Another example of a dedicated lab type very supportive of the soil survey is John Cady. His work with soil mineralogy and soil micromorphology contributed much to support of the soil survey. He was quite willing and made himself available for discussion of problems with field soil survey personnel and for assistance with the hard work of field sampling of pedons.

Laboratory-oriented soil scientists supporting the soil survey face a wide range of new and challenging problems in the soil surveys of the future, These would include, for example, characterization of permeability of soil material in saprolite for a number of chemicals other than water in relation to waste disposal and chemicals, measurements of release and sequestration of carbon in soil-plant systems in relation to potential global warming, measurement of nitrous oxide evolution or of potential for such evolution from soil systems, measurements of soil-iron and soil-carbon interactions using new technologies, and need for predicting soil behavior In nonfarm situations based on soil property measurements.

Computer Buffs :

A potentially important component of the soil survey program is the use of computers and new software for making soil survey data more accessible and useful for multiple purposes. This especially includes increasing the accessibility of the soil survey data for the growing group of non-soil scientist non-agriculturally oriented soil information users. This means that computer buffs should be an integral part of the soil survey team, working alongside soil scientists with an interest and a capability for working with numbers and computers.

In the Pedon Data Base at Lincoln, NE the soil survey has a potential Ft. Knox gold mine of soil information, which will become increasingly useful and important as the soil survey moves into the next phase after completion of the national soil survey "once over." The development of software particularly applicable to access and use of soil data is a strong future need and opportunity. This includes geographic information systems designed specifically for use and interpretation of soil survey data, expert systems (artificial intelligence) for use in the advisory work with soil survey data and software specifically designed for production of computer-generated soil maps and interpretive maps based on the soil survey - for both agricultural, forestry and nonagricultural purposes. Here is a special opportunity for the computer-literate city-bred young men and women interested in real-life applications of soil information to environmental protection, resource conservation and the development and protection of soil resources for future food needs of the world's growing population.

Mapmakers in the Soil Survey:

The US soil survey has a long, strong history of pioneering by cartographic members of the soil survey team. The old printed line maps on topographic bases (yes, the kind that blew in the wind and which you could never get refolded properly) were improved with the aid of innovations by soil survey cartographers who pioneered new techniques in map making - especially the use of airphotos for the base maps for the soil delineations. And soil survey cartographers also contributed to pioneering the use of computer-generated automated map making. It was soil scientists such as William Battle Cobb of North Carolina and Tom Bushnell of Indiana who instituted the use of airphotos as the basis for soil mapping in the 1920's and early 1930's. Cartographers with the SCS soil survey group also were part of a multidisciplinary. multiagency team that tested and instituted the use of high altitude and infrared air photography which has made soil mapping much easier for the soil surveyors.

Now there are new challenges for the soil survey map makers. These include greater use of new remote sensing technology for improving and accelerating soil surveys and for special purpose interpretive studies such as measurement of ephemeral soil erosion, detection of salt-affected soils, rangeland soil mapping and software for producing computer-drawn multiple and single purpose interpretive soil maps at the local level. It will be very important for soil surveyors and cartographers to continue to work closely together in the future.

Auger Pullers :

Last in this discussion but first in importance, we come to the infantry of the soil survey - the soil scientists doing the field mapping in the heat and the cold in the fields, forests and swamps - watching for snakes, mean farm dogs and answering the inevitable questions by farmers and others "Looking for oil? (or gold?). They face a real challenge in the future - with the completion of the US soil survey "once over" (all areas of the US with reasonably up-to-date soil maps). This calls for a stronger move to updating and interpreting soil information for a multitude of purposes agricultural and nonagricultural. This also will call for helping the rest of the world complete soil surveys of all the arable land areas of the globe. A significant percentage of the world's land mass lacks the soil information needed to aid in preparing to meet the food supply needs of the world's rapidly growing population.

The future field soil survey force will of necessity be of a different character than that to which we've been accustomed. Tomorrow's soil surveyors will have had little or no farm background, must be broad gauged with respect to preparation of maps and their interpretation for a wide variety of uses in addition to agriculture and forestry. Future projections are that by 2000 AD the majority of entrants into science field (including soil survey) must of necessity be women, Blacks and Hispanics because of the makeup of our younger population at that time and this will be increasingly so in the 21st century.

These future developments (lack of agricultural experience through living on a farm, the demographic transition to many more minorities and greater number of women interested in and being encouraged to enter the fields of soil survey and related fields) will call for different orientation, training and procedures than in the past (and the soil survey must be prepared to put to good use the enthusiasm, training, computer capability and environmental interests of this new breed.) The soil survey has made good progress in employment and upward mobility of females and minorities, so this should not be as large a problem as some might think.

Professional Pride:

It is important to have pride in your profession - both for your own mental welfare and your personal satisfaction in being able and willing to make contributions to your own chosen field, to environmental protection and resource conservation and to helping to ensure an adequate world food supply. As Dr. Kellogg said on several occasions: "If you want to be treated like a professional, then act like one" and "You cannot be humiliated or put down unless you allow it."

Valedictory:

As a retiree, who looks ahead to the future soil survey like Moses looked out to the promised land he couldn't enter, I foresee a soil survey program which Kellogg, Harbut, and Dokuchaiev would not recognize, but of which they would highly approve and of which they would be proud. They would be delighted with the widespread use of soil data for so many purposes and with the increased recognition of the importance of our soil resources. They would, I think, be pleased and proud with all the components of soil survey working together as a team, composed of men and women of varying backgrounds and national origins working together to make a better, more livable and better-fed world. That's your challenge and opportunity for the future.

Good wishes to all of you for a fine future in some aspect of a broader based, more diversified soil survey program. This old auger puller fades away with the feeling that he did the best he could with the tools given him and with fine help and support from soil survey colleagues. Special appreciation for their support and encouragement goes to those who served as my advisors in my undergraduate and graduate studies - James Thorp, Marlin Cline and Frank Riecken.

REPORT

COMMITTEE 1

SOILS OF THE NORTHEASTERN UNITED STATES

JUNE 19, 1992

BACKGROUND

Bulletin 848, of the Pennsylvania Agricultural Experiment Station, Soils of the Northeastern United States, was published in 1984. The supply of Bulletin 848 is exhausted.

Committee 4 of the 1984 Northeast Cooperative Soil Survey Conference suggested that an additional teport be prepared that would provide interpretations for the map units on the General Soil Map in Bulletin 848. This has not been done.

Task Force 1 of the 1988 Northeast Cooperative Soil Survey Conference had the following recommendations:

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 STATSGO 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 committee and an overall committee chairman to get the job done.

In October 1991, STATSGO maps for all states in the Northeast were received at the Northeast NTC. The NNTC planned to load STATSGO data into GRASS and produce a General Soil Map for the Northeast to be used by the committee for comparison to the map in Bulletin 048.

CHARGES

1. Compare the "General Soil Hap of the Northeastern United States" published in 1984, with the composite STATSGO map of the Northeast. Determine whether the 1984 map should be used in a new publication of "Soils of the Northeastern United States" or whether a new map using STATSGO data should be developed for the publication.

2. Develop a format for the bulletin so it is consistent

and complete. Develop an outline for chapters so they will be consistent and uniform when written by different authors.

3. Recommend authors for chapters in the bulletin.

4. Determine what interpretations should be developed and included in the bulletin.

5. Who should publish the revised bulletin?

DISCUSSION

The AT&T 6386 was not adequate to handled all of the STATSGO data for the northeast. The NNTC is in the process of purchasing a Sun - SPARC station 2. After this station is installed, the NNTC will be able to print STATSGO for comparison with the "General Soil Map of the Northeastern United States" published in 1984.

As the committee convened during the week of June 15, 1992, the following members were present:

Martin C. Rabenhorst
Ronnie L. Taylor
Stephen Gourley
William F. Hatfield
Norman R. Kalloch, Jr.
Travis Neely
Dean D. Rector
Richard Scanu
William R. Wright
Karl Langlois
Layal A. Quandt

The committee felt the need to **revisit the original question regarding whether or not the NE** Soils bulletin should be re-written, re-published or re-issued. Questions were raised concerning the audience for the bulletin, the demand for this publication, and whether or not there really was experiment station/university personnel generally feel a stronger need to have the publication republished than SCS personnel.

3. Because of their greater interest in the bulletin, University personnel should be the ones to head up any effort to republish the bulletin and this task should not be thrown back onto the steering committee of the NE work planning conference. If there is no initiative introduced by the University people (and some individual or committee to head up the effort), then the idea of republication of the bulletin should be dropped.

4. The SCS, especially the staff at the NNTC and the NCG, have expressed their willingness to support the efforts and initiative of the University personnel. In particular, they have indicated that they would be willing to develop a STATSGO based map for the NE with appropriate summary tables of acreage of soil taxa within the states and region.

An impromptu meeting (caucus) of the NEC-50 committee was held in order to determine how individuals from each University felt concerning republication of the bulletin. A report was brought back to the entire committee, after which the following items were decided.

5. Because there was consensus among the University personnel on this matter, the idea to republish the bulletin not be dropped but should be pursued at this point.

6. If the bulletin is to be republished, it should probably be reorganized along the lines proposed by Committee 2 for the southern bulletin (ie around soil/physiographic regions such as individual or groups of MLRA's rather than around the soil orders of Soil Taxonomy).

7. The executive committee of NEC-50 (outgoing chairman Bill Wright, incoming chairman Ray Bryant, and chairman elect unselected) will begin to coordinate an effort to proceed toward a rewriting and republication of the bulletin. As the general coordinating (editorial) committee, they will:

   a. Develop an outline and format for the bulletin to ensure completeness and consistency.

   b. Consider and evaluate possible means to acquire financial support for publication of the bulletin including 1) developing a proposal to submit to the NE CES directors at their meeting in July; 2) contacting commercial publishers.

c. Select authors for each chapter.

a. Develop a workable timetable for completion and publication of the bulletin.

e. Obtain from the SCS a draft copy of the map to be printed in association with the bulletin, and provide this to the chapter authors.

8. Because Sharon **Waltman** (Lincoln NE) is already working on **1:1** million and a **1:5** million compilation of **STATSGO** for the US beginning with the NE region, it was concluded that this would be an appropriate map (perhaps with some modifications) for use in this project. Darlene Monds will head up a NE SCS task force to coordinate this effort, and will serve as the SCS contact for the NEC-50 coordinating/editorial committee. SCS will go forward with the map publication with or without the text.

RESPONSES TO PARTICULAR CHARGES

Charge 1. The committee was agreed that any publication a new map should be based on some form **or** combination of the **STATSGO** maps.

Charge 2. The responsibilities of this charge have been delegated to the coordinating/editorial committee of NEC-50 under 7a above.

Charge 3. The responsibilities of this charge have been delegated to the coordinating/editorial committee of NEC-50 under **7c** above.

Charge 4. It was concluded that any republication of the bulletin should not provide interpretations for the map units.

Charge 5. The responsibilities of this charge have been delegated to the coordinating/editorial committee of NEC-50. They will pursue this as indicated under 7b above.

RECOMMENDATIONS

1) We recommend that Committee1 be dissolved.

2) We recommend that the NEC 50 group and the SCS group report progress at the next Northeast work planning conference in two years. If substantial progress is not made, this subject should be dropped.

COMMITTEE 2 - SOILS OF THE SOUTHERN STATES AND PUERTO RICO

Charges:

1. Determine the format for an updated general soil map publication for the Southern States and Puerto Rico

2. Determine the scale and type of map to be in the publication.

3. Recommend National Cooperative Soil Survey (NCSS) personnel to complete the various sections of the publication and suggest a timetable for completing the project.

Southern Cooperative Series Bulletin No. 174, "Soils of the Southern States and Puerto Rico", was published in 1973 and reprinted without revision in 1983. A limited number of copies are still available. Additional information gained through mapping, field study, and research of soils since publication of this bulletin has substantially increased our knowledge of properties, genesis, and distribution of soils in the region. In addition, the computer age and geographic information systems (GIS) have revolutionized compilation, display, and distribution of soils information. Thus, Soils of the Southern States and Puerto Rico needs to be revised to incorporate new knowledge and techniques of disseminating soils information.

Charge **1: Determine the format for an updated general soil map publication for the Soutbem States and Puerto Rico**

Objective of the publication:

To present information, at a regional level, concerning properties, distribution, and genesis of soils in the southern U.S. including Puerto Rico and the Virgin Islands.

Audience:

The major audience for a map and accompanying text describing properties, distribution, and genesis of the soils at a regional level would likely be natural science teachers, geographers, ecologists, etc. looking for a reference from which to base a lecture or some other similar project requiring general soil information. As such, the text should be written at a level that can be understood by individuals with a science background but not a high level of training in Soil Science. The publication may also be useful as a regional planning tool, but this use should be considered secondary. Similarly, Pedologists and other Soil Scientists both within this region and in other parts of the world may find such a publication useful as a reference but should not be considered as the primary audience.

Format:

Other than two introductory chapters describing the publication and the physiography of the area, the original publication was organized by chapters describing properties of each soil order and much of the text was devoted to explanation of the "new" system of soil classification. The classification system is no longer new, and the publication would be more useful if it was devoted to discussions of the soils in the region in terms of their distribution, genesis, properties, and use. A proposed format for the revision Soils of the Southern Region and Puerto Rico is outlined below.

1. Introduction

A. Definition of soil
B. Relation of soils to man - after "Soil and Society", C.E. Kellogg, '38 Yearbook of Agriculture
C. Explanation of Soil Taxonomy
D. Purpose and organization of the publication

II. Geology and Landforms of Southern States, Puerto Rico, and the Virgin Islands

A. Discussion of geology and landforms of Soil Regions or groups of Soil Regions
1. Where they occur - separation from adjoining regions
2. Depositional environment or other factors of geologic nature
3. Nature and composition of parent materials
4. Topography and landforms
5. Other?

III. Climate of the Southern States, Puerto Rico, and the Virgin Islands

A. Temperature
B Precipitation
C. Evapotranspiration
D. Other climatic factors

IV. How the Map was Made (another title may be more suitable)

A. State of GIS at the time the map was compiled
B. Description of data base (STATSGO) from which map was generated including contacts for digital STATSGO data.
C. Other digital soils data bases
D. Description of methodology used to derive map units (Taxonomic or other base, composition considerations, etc.)

V. Chapter for each Soil Region (or groupings of Soil Regions)

A. Soil properties
1. Morphological
2. General physical, chemical, mineralogical, and biological
3. Data for selected **soils**
3. Relation to soil behavior and use

B. Soil distribution
1. General relationships of major soils among and **within** map units in Soil Region - need to include block diagrams and other illustrations.

C. Soil Genesis - handle in terms of state factors

D. **Other** information or concepts left to individual authors (but not too much)

Division of **the** area of interest into Soil Regions will be critical. Too many Soil Regions may lead to redundancy (similar soils discussed in more than one chapter). Too few, and the soils in the Region may be so diverse that their properties, distribution, and genesis cannot be described in a meaningful manner. Final decision concerning Soil Regions will not be made until decisions have been made as to map unit design and a draft of the Regional Soil Map has been prepared.

Interpretations of soils for specific uses **will** not be included. Such interpretations are beyond the scope and intent of this publication. The soil map will be much too general for specific interpretations of soil use for any area, and other larger scale maps are readily available for soil use interpretations. General suitability of soils in a region for general uses may be included by the authors of each chapter if they desire.

Charge 2. Determine **the** scale **and type of map to be in the publication.**

The map will be derived from the **STATSGO** data base. This is probably **the** best information available at this time and can be modified to generate a paper map at the scale needed for the publication. No digital map or attribute data will be included with the publication. Tbe scale of the map will be too small for any meaningful interpretations. Sources of digital soils data at other scales will **be** included in the publication (likely in more than one location), and users interested in obtaining these data can do so.

The scale of the map in tbe edition published in 1974 was **1:5,000,000.** Most state Soil Association Maps are **1:500,000** to 1: **1,000,000.** The scale of the bard copy of the map included in the publication will be determined, to some extent, by a convenient physical size of tbe map. Most users would not want a map **too** large to unfold and read at a desk or in the front seat of an automobile which restricts the dimensions to about 36 to 40 inches square. At a scale of **1:3,000,000,** the southern states would require a paper map 38” wide without margins. A map paper map at a scale of **1:5,000,000** would be smaller, easier to use, and may retain sufficient detail for a regional publication. Test data sets for selected areas in the region will be evaluated by selected individuals at both scales to determine the amount of detail and map unit purity at each scale. These evaluations will be used to make a final decision on map scale. Because the N-S dimension of the region is less than the E-W dimension, ample room would be available

Chapters on Soil Regions and Groups of Soil Regions
(Soil Region names subject to change)

Region

1. Southern High Plains and **Trans-Pecos** - B.L. Allen/Earl **Blakley/Bill** Harris
2. Rolling Red Plains and Prairies - Richard **Drees/Gaylon** Lane
3. Edwards Plateau, Texas Central Basin, and Rio **Grande** Plain - Tom **Hallmark/Clyde Stahnke/Charles Batte**
4. Cross Timbers, Grand Prairie, and Cherokee Prairies - Brian Carter/Mike Golden
5. Texas Blackland Prairie and **Claypan** Area - Larry **Wilding/Dewayne** Williams
6. [illegible]
7.
8.
9.

July 1, 1994	Chapter reviews completed and chapter revision initiated.
Oct. I, 1994	Final copy of manuscripts completed; final version of map completed; map and manuscript to publisher.

Recommendations:

1. Approval for revision of Bulletin 174 be obtained from Southern Region Experiment Station Directors, Soil Conservation Service, and other appropriate agencies.

2. Title be changed to "Soils of the Southern States, Puerto Rico, and the Virgin Islands".

3. A small standing committee be established to initiate manuscript preparation and oversee editorial handling of publication.

Committee members:

J.T. Ammons	C.T. Hallmark	A.D. Karatbanasis	E.M. Rutledge
Frederick Beinroth	R.B. Hinton	David McMillen	C.A. Steers
E.R. Blakley	Wayne Hudnall	Hem-y Mount	L.T. West, Chair
S.W. Buol	G.W. Hurt	Javier Ruiz	

REPORT OF COMMITTEE 3

CLASSIFYING, MAPPING AND INTERPRETING DISTURBED LANDS

BACKGROUND

Current practices within the National Cooperative Soil Survey (NCSS) do not allow soil properties to be recorded on the soil interpretations record for disturbed soils. Interpretations are not developed for taxa above the series level. There is a need for computer-generated interpretations for taxa above the series level. There is also a need to look at the classification and mapping concepts for disturbed lands.

CHARGES

1. Evaluate the way these soils are classified and recommend any needed changes.

2. Examine map unit design and mapping conventions for these soils and recommend needed changes.

3. Recommend methods to improve interpretations for these soils.

COMMITTEE MEMBERS

John T. Ammons, Chair (South) - Classification and mapping

F. Dale Childs, Vice Chair (Northeast) - Interpretations

Classification and mapping	Interpretations
John Davis	Larry Brow"
Del Fanning	Lewis Daniels
Louie Frost	Bob Eigel
John Sencindiver	Glenn Hickman
John Short	John Kelley
Nelson Thruman	George Martin
David McMillen	Dewayne Hays
Darwin Newton	James Patterson
Everett Stuart	Daryl Lund

INTRODUCTION

The 1992 South-Northeast Soil Survey Work Planning Conference met in Asheville, North Carolina on June 14-19, Committee 3, Classification, napping and Interpreting disturbed lands began at the 1988 Southern Soil Survey Conference in Knoxville, Tennessee. During the 1990 meeting in San Juan, Puerto Rico, the committee decided to split into two groups. One group would concentrate on classification and mapping and the other group interpretations.

Classification and Mapping Committee

CHARGES

1. Evaluate the way these soils are classified and recommend any needed changes.

After much discussion, the committee agreed that we need a taxonomic system to "tag" or inventory disturbed or man influenced soils. Additionally, the present use of soil series and the taxon Typic Udorthent does not readily identify these soils as disturbed or man influenced. Moreover, the committee felt that a taxonomic system be developed at the order, suborder, and/or subgroup level of Soil Taxonomy.
Properties of disturbed soils need to be reviewed to consider those properties common to a broad class of land disturbances. With these criteria identified, diagnostic criterion can then be established for classification purposes.

2. Examine map unit design and mapping conventions for these soils and recommend needed changes.

Present mapping unit is based on the series classification (Typic Udorthents). Design of mapping units was briefly discussed but the committee concentrated on classification which will be the basis for mapping unit design. (NCSS is developing an interpretive computer data base program based en measured soil properties.)

DISCUSSION

Classification andmapping committee discussed properties that were common across all disturbed soils. Citing Sencindiver (1977), Ammons and Sencindiver (1990). and Fanning (1992) we outlined four properties common to all disturbed soils.

1. Color mottling not related to drainage.
2. Disordered coarse fragments (when present) in soil profiles.
3. Pockets of dissimilar material that are randomly oriented in the profile.
4. Irregular distribution of oxidized carbon not associated with fluvial processes.

Where in the soil taxonomic system should these taxon be placed?

Option 1 - The criteria at the great group Udorthents would be modified to include disturbed soils. A subgroup modifier such as "Spolic" or "Urbic" (Fanning, 1992) would be used to "tag" or identify disturbed soils.

Option 2 - New suborders in the Entisol and Inceptisol orders would be developed and defined to identify man influenced soil. These may include proposed suborders as Spolents (Sencindiver, 1977). Spolepts, Urbents, or Urbepts.

The committee discussed three possible suborders based on past and present research. The Urbents (Urbepts) are urban associated soils with specific criteria (Fanning, 1992). The Spolents (Spolepts) are related to drastic disturbances such as surface mining for coal or large civil works projects (Sencindiver, 1977). Garbents (Garbepts) (Fanning, 1992) are associated with sanitary landfills with potential methane gas problems such as fires or failure of vegetation due to methane toxicity (or displacement of oxygen by methane gas within the root zone). The committee feels that some revision of the names for the subgroup or whatever level of taxonomy is chosen is needed to prevent prejudices on part of the readers or from blocking the concept Of the proposed taxonomic unit.

Specific criteria for each division of disturbed soils will be established and presented to NCSS. Additionally, we propose that once the system is refined, that an international committee on disturbed soils be established to test and review the proposed criteron.

Interpretations committee

Disturbed'soils should be interpretated using the same procedures applied to natural (undisturbed) soils. However, specific rating criteria should be developed for specific uses. The soils should be classified to the lowest category possible based on consistency of soil properties in the map units. A reliability statement should be ascribed to each data element and this information should accompany the soil interpretations.

Disturbed soils may present safety hazards not necessarily associated with undisturbed soils such as the presence of heavy metals, toxic materials, unstable soils, and etc. Field soil scientists working with ouch soils should be aware of the potential safety hazards and they should inform others of such potential hazards.

RECOMMENDATIONS

1. That this committee continue as a core group and that they get together within the next year to view field study sites. Additionally, a detailed study of available characterization data should be completed. A proposed classification system with interpretative guides should be developed before the 1993 national soil survey conference.

2. The committee should maintain two separate subcommittees; one for classification and one for interpretations.

3. A list of past and present literature directly related to disturbed soil properties and interpretations should be compiled and distributed to all interested soil scientists for review and additions.

4. Once criteria for identifying disturbed lands are established, an international committee should be formed to further develop the system worldwide.

5. Complete development of two options for soil taxonomy and decide which would be the best to "tag" or inventory disturbed soils.

6. Disturbed soils should be interpreted using the same procedures applies to undisturbed soils but develop specific criteria for specific uses.

7. Special safety precautions should be recognized when investigating these soils for soil interpretations.

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COMMITTEE 4
NATIONAL COOPERATIVE BOIL SURVEY (NCSS) AND PRIVATE SECTOR COOPERATION

COMMITTEE MEMBERS:

John C. Meetze, Chair (South)
Russell J. Kelsea, Vice Chair (Northeast)

South

Samuel J. Dunn
Charles L. Fultz
B.L. Harris
David L. Jones
William H. Craddock
Joe Kleiss
Kevin Martin
Dennis Osborne
Carroll Pierce
Jerry Ragus
Ray P. Sims
J.M. Soileau
Frankie Wheeler

Northeast

Edward P. Ealy, Jr.
Lee Daniels
David E. Hill
Kip kolesinskas
Charles Krueger
Garland Lipscomb
Laurel Mueller
Donald Owens
Raymond F. Shipp
Karl Langlois, Jr.

NHQ & National Soil Survev Center

Richard W. Arnold
Ray Sinclair

FORSWORD: I would like to thank the members of this committee for their responses and cooperation in working on this committee. I especially want to thank Russ Kelsea, Vice Chair of the Committee, for taking notes during the committee sessions and in preparation of this report. I also want to think Kip Kolesinskas for his assistance in keeping the flip chart during the Committee Meetings and for his assistance in the preparation of this report.

The Committee instructed the chair to send a cody of this report to the National Leader of the National Cooperative Soil Survev with a request that he take steps to initiate action on these recommendations. The Committee recommends that this committee remain active if needed to aid in resolving issues that could occur from the actions taken on these recommendations.

The Charges assigned to the Committee and the Committee's Recommendations to each Charge are given on the following pages.

BACKGROUND :

There is a need for more cooperation between NCSS and private sector soil scientists. NCSS has information such as manuals, guides, and handbooks that are of interest and use to private sector soil scientists. Private sector soil scientists develop interpretations and other products that are of interest to NCSS. It is desirable to establish working protocols that will enhance the professionalism in soil science.

CHARGE 1:

Investigate the need to develop Hemorandums of Understanding between NCSS and private sector soil scientists. Should a Memorandum of Understanding be developed between an individual, groups, or organizations?

COMMITTEE'S RECOMMENDATIONS:

1. Develop a National MOU between SCS, as lead agency for NCSS, and "National" professional organizations of private soil scientists.
2. The National MOU developed between SCS and professional organizations should be general in nature and may serve as a model for state or regional MOU's.

CHARGE 2:

If a Memorandum of Understanding is developed, suggest potential responsibilities of NCSS and private sector soil scientists.

COMMITTEE'S RECOMMENDATIONS:

The MOU should include as a minimum:

1. Specific guidance for both SCS and private sector regarding roles and responsibilities. The kind and extent of services provided by SCS relative to Title 42 should be clearly stated in the MOU so that both SCS and the private sector understand the roles and responsibilities. scs field staffs must be made aware of these roles and responsibilities.

3. Development of protocols specifying quality coordination and quality control relative to mapping and data collection using NCSS standards.

4. Methods to address ethics and complaints.

CHARGE 3:

As cooperation between NCSS and private sector soil scientists develops, how should ethics and professionalism be addressed?

COMMITTEE'S RECOMMENDATIONS:

1. Any national organization should have a strong codes of ethics and method of enforcement.

2. The public should be protected by strongly encouraging state legislation for licensing or certification.

CHARGE 4:

Clarify the definition of "Cooperators" and type of NCSS assistance provided to cooperators and non-cooperators.

COMMITTEE'S RECOMMENDATIONS:

1. Committee 4 is not aware of any restriction on the inclusion of non-federal parties as NCSS cooperators.

2. Two kinds of cooperators are identified. First, conservation district cooperators and second, NCSS cooperators.

   a. Generally NCSS cooperators work together to produce and document soil surveys.

   b. Services to conservation district cooperators are in line with SCS program responsibilities.

3. In addition, SCS services are available to non-cooperators to the extent described in Title 42 and as described in charge 2.

CHARGE 5:

As an NCSS cooperator, please expound (positive or negative) on your experience with private sector soil scientists. If you have worked as a soil scientist in the private sector, please give your experience (positive or negative) in working with the NCSS.

COMMITTEE'S RECOMMENDATIONS:

1. Generally, comments received by committee 4 indicate positive experiences with public/private cooperation. Some of the negative experiences have been addressed in charges 1 through 4. However, a negative aspect not addressed in charges 1 through 4 relates to a misunderstanding by contracting officers, state agencies, and others of the requirements for education and experience necessary for individuals who provide soil science services.

2. Contracts for services should specify education and experience requirements of the soil scientist and technical standards necessary to complete the contract.

Submitted By:

John C. Meetze,
Chair, Committee 4

1992 S-NECSSC TECHNICAL COMMITTEE 5

REPRESENTATIVE TAXA FOR MODELING

Committee Members

Ray Bryant, Chair (Northeast)
Earl R. Blakley, Vice Chair (South)

South

Charles Batte
Marcella Callahan
Mary E. Collins
William H. Craddock
Jerry Daigle
R.T. Fielder
Jimmy G. Ford
Michael Golden
R.H. Griffin
Betty McQuaid
Gerald Sample
B.R. Smith
Clyde R. Stahnke
B.N. Stuckey

Northeast

John Bellemore
William D. Cowherd
Richard L. Hall
Harvey Luce
William Moriarity
Al Roberts
Chris Smith
Richard Weismiller
Karl Langlois, Jr.

National Soil Survey Center

Benny P. Brasher
Warren Lynn
Rex Mapes
Larry F. Ratcliff

Background

There is a growing need from other disciplines to use representative soil data for models. The National Cooperative Soil Survey can assist in these efforts by assuring quality control and representativeness. Needs for this information exist at several levels of generalization. There is a need to have this data readily available to all users.

Charges

1. Review the benchmark soil concept and determine if this concept is applicable for modem inventorying and modeling needs.

2. Determine how to use benchmark data in representative larger cell areas.

3. Determine how to aggregate pedon data to represent higher category taxa.

4. Determine how to interpolate information for non-benchmark soils from benchmark soils data.

5. Determine how to place confidence limits on soils data at various levels of generalization.

General

Committee 5 was a continuation of the 1990 Southern Regional CSSC Technical Committee 3, which addressed soils data for modeling. The 1990 Committee Report is a thorough evaluation of the adequacy of soil survey data as the soil data base for environmental and agricultural models and knowledge-based systems. The committee recommended continuance in 1992 with emphasis on "spatial variability and modeling."

Prior to the 1992 conference, two mailings were sent to all committee 5 members to provide the background information contained in the 1990 Committee 3 report and to generate discussion between committee members and modelers in advance of the meetings in North Carolina. The charges and topics that were addressed are stated below, followed by a synopsis of the responses.

Summary of Discussion

1. Review of the "benchmark soil" concept and its applicability to modeling.

   There was a strong consensus among the members of the committee that the "benchmark soil" concept was not applicable for modem inventorying and modeling needs. The term means too many different things. Depending on the objectives and the modeling approach, the user may need g-referenced point data from as many locations as possible, even though the number of properties observed at each site may be limited. However, it may be useful to flag some characterization data that are most complete (eg - the WEPP sites).

2. Determine how to extrapolate and aggregate soil data for modeling.

   Charges 2, 3 and 4 are similar and were covered in the following general discussion. Committee members were in agreement that the aggregation and extrapolation of soil data is a function of the model and its objectives. Therefore, the modelers should be the ones to perform these operations. The SSURGO, STATSGO, and NATSGO data sets do provide valuable aggregations of soils that will suffice for many purposes. Of these, the STATSGO database will probably be in greater demand for aggregating soils information. A report on the status of STATSGO, given at the CSSC, showed the project nearing completion.

3. Access to soil databases.

Following the previous discussion of modelers aggregating and extrapolating data according to the purpose and objectives of the model, the committee discussed user access to soil databases. We anticipate (and have already had) requests for access to soil databases of all kinds, including the pedon data base, the soil interpretation records, and the map unit interpretations records. There was general agreement that the public should have direct access to soil databases. Some format such as exists at Iowa State University is needed. Today, libraries at the Land Grant Universities (ie - Cornell and perhaps others) actively seek to maintain and promote user access to large public databases. With electronic networks, the distribution of data is virtually unlimited.

4. A useable database format for modeling.

The committee concluded that the present database structure is inadequate for many modeling efforts. Of most concern was the use of ranges for soil properties and the lack of a mean or single representative value.

The SCS is currently developing a National Soils Information System (NASIS). The system includes the three soil geographic databases: SSURGO, STATSGO, and NATSGO. The SCS has developed interface computer programs that link the map data with the relational attribute data. These programs allow easy, menu driven access to both the map data and tabular data. At the soil survey level, single representative values for soil characteristics will be provided. These will be generalized at the state and regional or national level to include representative values with ranges. Georeferenced point data will also accompany this database.

The committee felt that the NASIS database structure would deliver the soils information most requested by modelers in a format that facilitates aggregation and extrapolation. NASIS also addresses charge 5 of this committee (How to place confidence limits. ..).

5. Soils database user education.

In view of the consensus for providing direct access to the database and allowing modelers to aggregate and extrapolate soils data as desired, the committee discussed the need for user education. Basically, our soils data model should be defined. The concepts of soil series, phases, map units, inclusions, etc. as they are used in our free style survey should be communicated to the user. The user should be aware that sites selected for sampling are usually not selected randomly, but are usually meant to be representative of a class or map unit concept. A technical information bulletin should be developed and released by the National Soils Center upon implementation of NASIS.

6. Soil variability.

The committee addressed the defined charges and further developed discussion and recommendations beyond the scope of the charges but within the original intent and purpose for establishing the committee. However, several members felt that we have not fully answered the recommendation of the Southern Regional CSSC Committee 3 to have a committee address ‘soil variability.” Whether or not this issue can be addressed by a committee with well defined charges beyond those given to committee 5 was not addressed.

Recommendation

1. Benchmark soils is **not** a concept we want to use in modeling.

2. Aggregation and extrapolation of data should be done by the modeler.

3. Modelers should have direct access to soil databases, perhaps through the land grant university libraries.

4. NASIS should be sent out for review by **cooperators,** who in turn should seek comments from modelers. NASIS should then be completed and implemented as soon as possible.

5. An information bulletin that describes our ‘soil data model” and the structure of **NASIS** should be written and released concurrently with NASIS.

6. This committee should be discontinued.

COMMITTEE 6 - EXTRAPEDONAL INVESTIGATIONS FINAL REPORT

1992 SOUTH-NORTHEAST COOPERATIVE SOIL SURVEY CONFERENCE

Asheville, North Carolina
June 14-19, 1992

COMMITTEE MEMBERS

Chair - W. J. Edmonds, Va Tech, Blacksburg, VA
Vice Chair - W. E. Puckett, SCS, Stillwater, OK

G. Acevedo, SCS, San Juan, Puerto Rico
B. L. Allen, Texas Tech Univ., Lubbock, TX
J. C. Baker, Va Tech, Blacksburg, VA
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C. A. Ditzler, SCS, Lincoln, NE
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T. R. Dyar, USGS, Atlanta, GA
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T. Goddard, SCS, Syracuse, NY
R. B. Grossman, SCS, Lincoln, NE
B. F. Hajek, Auburn Univ., Auburn, AL
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E. A. White, SCS, Harrisburg, PA

BACKGROUND

National Cooperative Soil Survey (NCSS) soil scientists currently describe and classify soils to a maximum depth of 2 m. This is only a part of the earthy materials affecting recharge water. Soil scientists are in a good position to evaluate earthy material (regolith) between 2 m and hard bedrock.

The *regolith* is defined as the unconsolidated material overlying rocks and includes the soil (Brady, N. C., 1990. The nature and properties of soils. 10th edition. New York: MacMillan Publ. Co.). Therefore, the term *nonsoil regolith* is used to describe materials between the bottom of the soil and hard bedrock in this report.

Not all water flow is vertical through the regolith, especially on slopes. Evaluation of through-flow (lateral flow) water is needed to properly evaluation sites for waste disposal and other uses. How can these needs be addressed in soil survey operations?

CHARGES

1. Determine how lateral water flow information should be collected. What information should be collected? How should the information be presented?

2. Examine the efforts of the Saprolite-Taxonomy Network. Evaluate the feasibility of this effort for future NCSS work.

3. Review Committee Report Number 4 from the 1990 Northeast Soil Survey Conference; and, in light of Charge 2 above, are there further recommendations?

4. Suggest ways to collect and incorporate this data into soil survey reports.

INTRODUCTION

Prior to the South-Northeast Cooperative Soil Survey Conference, copies (i) of Circular Letter No. 7 of the Saprolite-Taxonomic Network, (ii) of the Final Report of Committee 4 (1990 Northeast Cooperative Soil Survey Conference, Morgantown, WV, June 3-8, 1990), (iii) of papers and materials received from Bob Grossman and (iv) of a questionnaire pertaining to the above charges were mailed to each committee member for comments. A list of comments and recommendations based on the above materials were presented and discussed by conference participants.

XEY POINTS OF DISCUSSION:

1. The NCSS needs to decide whether or not it is interested in expanding observations and/or mapping into the nonsoil regolith including seasonal variations in the water table surface.

The conference participants considered the approach used by NCSS to describe and characterize soils to have a high potential for describing and characterizing the nonsoil regolith. The following properties were considered to be important attributes that could be used as a first approximation.

Potential properties for describing nonsoil layers of the regolith

- designations for layers

  Designations for layers below the soil have not been developed. The conference felt that this work should be done in concert with participants from other disciplines, such as engineers, hydrologists, and geologists.

- depth to and thickness of layers

  Depth to and thickness of layers are site specific. The practical lower limit for depth of observations should be defined, because depths to hard rock in the Atlantic Coastal Plain can be hundreds or thousands of feet. Committee 4 of the 1990 Northeast Cooperative Soil Survey Conference suggested 2 to 5 m, 5 to 20 m, and >20 m.

  Practical methods of observing the nonsoil regolith are suggested; i.e., use the hand auger for the 2 to 5 m zone, use coring for the 5 to 10 m zone, and use drilling for the zone >20 m.

  Practical density of observations in a mapping context could also be developed for the 2 to 5 m, 5 to 10 m, and >20 m zones.

- matrix color
- USDA-particle-size distribution
- mottle color(s)
- structure

  Guidelines for describing structure should be developed in concert with other disciplines.

- consistence (dry, moist, wet)

  Guidelines for describing consistence should be developed in concert with other disciplines and should include strength of materials.

- roots

  Should include root casts, including those that are calcified and silicified.

- pores

  Guidelines for describing macropores in the field should be used to the level of a 10x hand lens. Description of pores using water retention curves could be used below the level of the 10% hand lens.

Percent pore space estimated using bulk density and particle density should be considered.

- plinthite
- pressure surfaces with or without shear failure
- relict-rock fissures filled with iron, aluminum, or manganese oxides; organic matter; salts; carbonates; quartz; etc.
- concentrations
- mica

  Expansive classes of mica could be needed.

- rock fragments
- brittleness

  Brittleness should be quantified.

- selected chemical properties
  - salinity
  - sodicity
  - gypsum
  - sulfides
  - reaction (pH)
- boundary of layers

Potential properties for characterizing **nonsoil** layers of the regolith

- free water occurrence; i.e, variations in watertable surface
- particle-size distribution
  - USDA-particle-size class
  - fraction >250 mm, 250-75 mm
  - percent passing sieve numbers 4, 10, 40, and 200
  - clay
  - particle-size-superseding characteristics (sapric material, coprogenous earth, cinders, marl, muck, etc.)
- fabric-related analyses
  - moist-bulk density
  - shrink-swell potential
  - saturated-hydraulic conductivity (K_{SAT})
  - unsaturated flow $\Theta(h)$ and $K(\Theta)$
- engineering properties
  - liquid limit
  - plastic limit
  - unconfined compression strength

- engineering classification
    - unified
    - AASHTO
- chemical properties
    - $CaCO_3$ equivalent
    - cation-exchange capacity
    - gypsum
    - organic matter
    - reaction (pH)
    - salinity
    - sodium adsorption ratio
    - sulfur content
    - total Fe_2O_3 and Al_2O_3 content as a measure of ore potential

2. The NCSS needs to identify potential uses and potential users of information generated by describing and characterizing the nonsoil regolith.

Potential uses of the information identified by the conference participants are primarily related to water quality as it is influenced by

- solute transport and fate
- waste disposal

Potential benefactors of the use of the information for proper disposal of waste materials include every livina thinq on this planet.

RECOMMENDATIONS:

1. Committee 6 recommends that the steering committee of the 1993 NCSS Conference form an interdisciplinary committee composed of:

- soil scientists
- engineers (civil and geotechnical)
- groundwater hydrologists
- geologists (USGS)
- EPA scientists

2. Committee 6 recommends that the newly formed committee be charged to:

- determine which properties of the nonsoil regolith generate pertinent information for users

- determine what should be characterized

    - detailed soil map units as defined by NSH
    - general soil map units as defined by NSH
    - specific sites

- evaluate current procedures and terminology for describing and characterizing the **nonsoil** reqolith used by

    - soil scientists
    - engineers
    - hydrologists
    - geologists
    - others

- evaluate the extent and usefulness of currently available data generated by:

    - SCS engineers
    - civil engineers
    - stratiqraphers, geologists
    - hydrologists
    - state highway and transportation departments

  for characterizing the **nonsoil** reqolith in a mapping and taxonomic context

- determine practical limits of observation
- determine data structure

3. Committee 6 recommends that the efforts of the Saprolite-Taxonomy Network be used as an approach for developing a scheme for classifying the **nonsoil** reqolith and that this classification be kept separate from the classification of the soil by *Soil Taxonomy.*

4. Bob Dyar (a USGS hydrologists formally trained as a civil engineer and a member of Committee 6) stated, "Move methodically ahead on the committee's agenda; i.e., do not be affected by worries such as *who leads, who* gets credit, or *who funds the work at* this time. The fact remains that everyone recognizes that the committee charges address important earth science needs and that the work should be done. The point is that unless someone is further ahead, why not proceed"? The other members of committee agreed with Bob's statement; i.e., **let's doit!**

5. Committee 6 recommends that it not be continued.

SOUTH-NORTHEAST COOPERATIVE SOIL SURVEY CONFERENCE

CLOSING COMMENTS

KARL H. LANGLOIS, JR.

The Conference this week was excellent. We had several speakers during the week that brought us up to date about many items that affect our work as soil scientists. Individuals on the two panels, 1) Requirements and Hiring Procedures for Soil Scientist, and 2) GIS Support for Soil Survey and Resource Inventories, did a great job of informing us about these items.

The subjects of the 6 committees and 2 task forces were pertinent to today's soil survey. The committees, especially the committee chairs, are to be commended for the work they did prior to and during the Conference. We are looking forward to receiving the conwnittee's recommendations so they can be considered for implementation or further study.

We were able to see the variety of soils in this area, and their use, during the field tour on Wednesday. The Banquet on Thursday evening was enjoyable and it was great having Dr. McCracken as the guest speaker.

This week could not have been the great success it was without the hard work of Horace Smith and his staff. They paid attention to the small details which helped everything go so smoothly. Let's give Horace and his staff a hand for a job well done!

The Regional meetings in 1994 will be in Arkansas for the South, and in Maryland for the Northeast. Have a safe trip home.

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South Taxonomy committee **Members**

Elected at *the* 1992 Southern Regional Work Planning Conference

Term Expires at **the Work Planning Conf.** or in June of alternate Years	**State Representatives**	Federal **Representatives**
1993 (term began in 1990)	Dr. Frederick Beinroth	Barry C. Davis
1994 (term began in 1991)	Dr. **B.** L. **Allen**	**Benjamin Stuckey**

Elected at the 1992 Southern Regional work Planning *Conference*

Term Expires at the *Work* Planning **Conf.** or in June of Alternate Years	state **Representatives**	Federal **Representatives**
1995 (term begins in 1992)	Dr. David Petry	Larry Ward
1996 (term begins in 1993)	Dr. Bill **Smith**	**Ken Murphy**

JOE D. NICHOLS

June 10, 1992

Report of the Soil Taxonomy Committee of the Southern Regional Work Planning Conference of the National cooperative Soil Survey

May 25, 1990 - Letter to South Taxonomy Committee on a proposal to eliminate micro families. The proposal was from the West Committee. The South Committee was to comment directly to John Witty. Micro families were deleted in NSTH Issue No. 15.

September 18, 1990 - Comments to Richard CKEehWi

March 17, 1992 - Comments to John Witty on proposed changes in the draft National Soil Taxonomy Handbook Issue NO. 16. There were numerous comments.

April 10, 1992 - A letter to Richard Babcock informing him that the South Committee had approved a proposed amendment on soils with gypsum, if the soil scientists on John's staff and the National Soil Survey Laboratory could work out problems on analysis and interpretation of the data. This is still in process.

JOE D. NICHOLS

SOUTH-NORTHEAST COOPERATIVE SOIL SURVEY CONFERENCE
ASHEVILLE, NORTH CAROLINA

MINUTES OF THE NORTHEAST BUSINESS MEETING
JUNE 18, 1992

The business meeting was called to order at 1:00 p.m. by Chair John Sencindiver. The minutes of the 1990 meeting were read and approved as read.

Bill Wright presented the Silver Spade Award. This year's 1992 recipient was Del Fanning. Previous year recipients are as follows:

1984 Edward J. Ciolkosz, Pennsylvania State University
1986 Edward H. Sautter, State Soil Scientist, CT
1988 Sidney A. L. Pilgrim, State Soil Scientist, NH
1990 William R. Wright, University of Rhode Island
1992 Del Fanning, University of Maryland

Marty Rabenhorst announced the next Northeast Cooperative Soil Survey Conference will be in Maryland in 1994. As per the Northeast Cooperative Soil Survey By-laws, Steve Hundley will serve as Chair. Marty Rabenhorst will serve as Vice-Chair in charge of local arrangements.

Karl Langlois discussed the 1993 National Cooperative Soil Survey Conference. This conference will be held in Burlington, Vermont. There will be a state soil scientist, selected by Karl, who will be asked to participate in the conference. The NEC-50 group will select two experiment station representatives to attend the conference. These names should be provided to Karl in the near future to be submitted to National Headquarters.

Karl Langlois discussed the makeup of the Soil Taxonomy Committee. Karl mentioned that since the inception of the National Soil Survey Center his responsibilities as permanent Chair of the Northeast Taxonomy Committee have been minimal. Karl suggested two options:

1. Keep the committee makeup as it is currently.

2. Recommend the NSSC Supervisory Soil Scientist for the East be the permanent chair of the committee.

Ed Ciolkosz made a motion that the by-laws be amended to read: "The membership of the Northeast Soil Taxonomy Committee will be comprised of all experiment station representatives and scs state office representatives in the Northeast."

Dale Child made a motion to amend the current motion to add the following: "The National Soil Survey Center Supervisory Soil Scientist in charge of the Northeast will serve as permanent Chair of the Northeast Soil Taxonomy Committee, and the head of the Northeast Interpretations Staff serve as a permanent member on the committee.

After considerable discussion and confusion, the motion and the amendment to the motion were withdrawn.

John Sencindiver called for a straw vote to assess the interest in the group to turn over the Chair of the Northeast Soil Taxonomy Committee to the NSSC Supervisory Soil Scientist for the Northeast. A show of hands indicated 10 were not in favor: 25 were. Based on this straw vote, Karl will submit to John Witty the recommendation that the Chair come from the National Soil Survey Center. If other regions also agree to this structure then the Steering Committee will revise the By-laws for a vote at the 1994 Northeast Conference.

Karl mentioned that the Steering Committee attempts to take action on recommendations made by active committees at the conference. However, action for some committees is sometimes not as timely as it could be. Karl suggested that if anyone has any concerns over the timeliness of actions taken to contact him with specifics.

There was no further business. The meeting adjourned at 1:58 p.m.

Respectfully submitted,

Steven J. Hundley
State Soil Scientist

SILVER SPADE AWARD

The Silver Spade Award is presented to a member of the Northeast Cooperative Soil Survey who has contributed outstanding regional and/or national service to soil survey. Recipients of the Silver Spade Award are:

1984 Edward J. Ciolkosz, Pennsylvania State University
1986 Edward H. Sautter, State Soil Scientist, CT
1988 Sidney A.L. Pilgrim, State Soil Scientist, NH
1990 William R. Wright, University of Rhode Island
1992 Delvin, Fanny, University of Maryland

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

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 ot the committee's communications will be in writing. Copies ot 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 conterence participants. but final approval or disapproval of changes in policy is by consensus ot 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

A” 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 tind 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 atter the conference is over. This material will be included in the conference’s proceedings.

7. Preside over the conference.

8. Provide tor appropriate publicity for the conference.

9. Preside at the business meeting ot 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 tollowing:

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 ot 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 Technial 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 ot each participant on the mailing list.

One copy to each state conservationist, SCS, and Experiment Station Director ot 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 ot 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 "one of the members of the Steering Committee can attend s 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 pest conterence chairman. His responsibility will be to assist in gathering information for the journal. es 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 tor 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 s 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

FOREWORD

In 7 985 soil surveys were accelerated and a comprehensive study of soils on mountain landscapes in the Southern Blue Ridge of North Carolina [Major Land Resource Area 130) was initiated by Soil Survey Cooperators. During the seven-year period since these activities began, nearly 50 new soil series have been recognized and proposed. In July 1990 a Mountain Soils Tour and Seminar was held to examine some of these soils in the field and to present laboratory data for selected pedons.

The sites that will be examined on this tour include soils that represent a cross-section of soil classification and correlation concerns, challenges and opportunities in MLRA 130. Some of these concerns include:

(1) Particle-size Classification

The particle-size class of many of these soils is difficult to define because it straddles the line between fine-loamy and coarse-loamy;

(2) Mineralogy Classification

Proper mineralogy placement continues to provide challenges for several soil series in the Southern Blue Ridge. Depending upon the laboratory, laboratory methods, and the individual interpretating the data, many of these soils could be placed in any of three mineralogy classes--mixed, micaceous, or oxidic; and

(3) Presence or Absence of Andisols and Andic Subgroups

The question of Andisols and Andic subgroups in MLRA 130 has generated several spirited discussions. This classification concern has developed due to the high organic matter content resulting in extremely low bulk densities in the Umbric epipedons in some of these soils.

INTERESTING FACTS ABOUT NORTH CAROLINA

The first silver mine discovered in the United States was the Silver Hill Mine in 1838 near Lexington. N.C.

The first gold nugget found in the United States was found a, Reed Mine in Cabarrus County. N.C. in 1799.

The University of North Carolina. which opened in 1795, is the oldest state university in the United Slates.

Bechtler Mint in Rutherford County. N.C., was the first mint in the United States to coin a gold dollar.

Albemarle Sound in North Carolina is the largest freshwater sound in the world.

Murphy. North Carolina's westermost county, is closer to six other state capitals than it is to Raleigh. North Carolina's capital.

Richard Jordan Galling. inventor of the gatling gun. was born in Hertford County in 1818.

The Tryon Daily Bulletin of Tryon, North Carolina. claims to be the world's smallest daily newspaper.

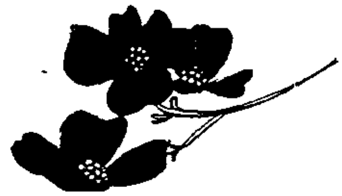
There are 43 mountain peaks in North Carolina that exceed 6,000 feet in elevation. and 62 peaks that exceed 5,000 lee,.

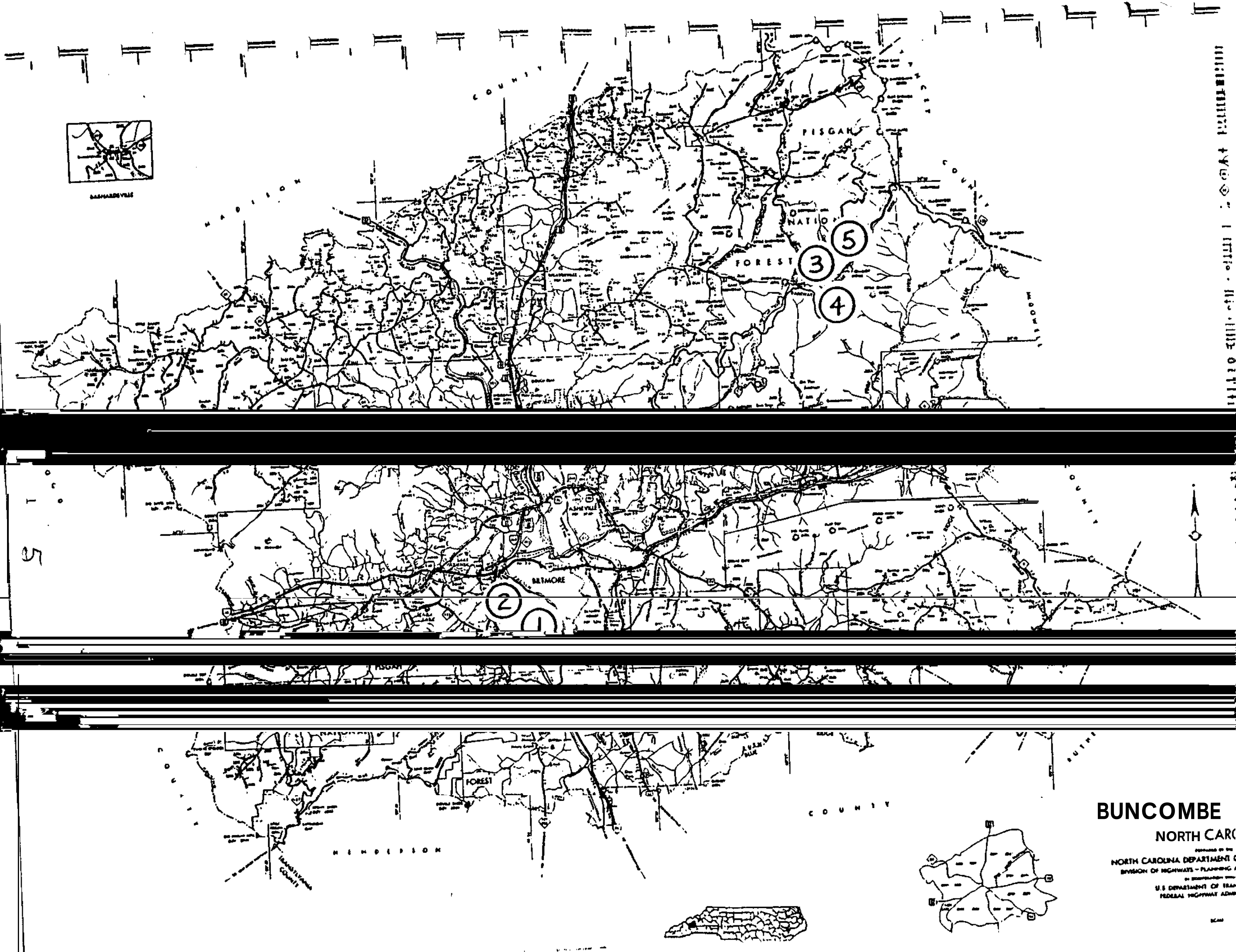
Snow has been recorded on Mount Mitchell. the highest peak in eastern America. in every month of the year.

In addition to the Blue Ridge. there are five other mountain ranges in North Carolina: Stack Mountains. Balsam Mountains. Pisgah Mountains. New Found Mountains. and the Great Smoky Mountains.

32 of North Carolina's 100 counties were organized before the Revolutionary

Capital—Raleigh (established 1792)
Name Origin—from Latin "Carolus" in honor of King Charles I
Nickname—Tar Heel State
Motto—"Esse Quam Videri" ("To Be, Rather Than To Seem")
Song—"The Old North State" by Judge William Gaston




BUNCOMBE
PISGAH
NATIO
FOREST
5
3
4
BILTMORE
2
1
FOREST
COUNTY
MADISON
HENDERSON
5

STOP 1 - HAYESVILLE SERIES

Classification: clayey, kaolinitic, mesic Typic Kanhapludults

Hayesville is the only soil with a kandic horizon that is presently being correlated in soil surveys in the North Carolina mountains (MLRA 130). It formed in residuum weathered from high grade metamorphic and igneous rocks on intermountain hills.

peds; many very fine and fine vesicular, and few medium and coarse tubular pores: many faint red (2.5YR

y

le, slig

fine

*** P R I M A R Y C H A R A C T E R I Z A T I O N 0 A T A ***

S91NC- 21-001 PRINT DATE 03/23/92
SAYPLEO AS : HAYESVILLE ; CLAYEY, KAOLINITIC, MESIC TYPIC KANHAPLUDULT
NATIONAL SOIL SURVEY LABORATORY ; PEDON 92P 81, SAMPLE 92P 580- 589

	-1--	-2--	-3--	-4--	-5--	-6--	-7--	-8--	-9--	-10-	-11-	-12-	-13-	-14-	-15-	-16-	-17-	-18-	-19-	-20-
	(- NH40AC EXTRACTABLE BASES -)					ACID-	EXTR	(- - - - C E C	- - -)		A L	-BASE SAT-		CO3 AS	RES.		CONO.(-		- - -PH	- - -)
	CA	MG	NA	K	SUM	ITY	AL	SUM	NH4-	BASES	SAT	SUN	NH4	CAC03	OHMS		MMHOS	K C L	CACL2	H20
DEPTH	5B5a	5B5a	5B5a	5B5a	B A S E S			CATS	OAC	+ AL			O A C	<2MM	/CM		/CM	IN	.01M	
(CM)	6N2e	6 0 2 d	6P2b	6Q2b		6H5a	6 0 9 6	5A3a	5A8b	5A3b	5G1	5C3	5C1	6 E I g	8E1		8I	8C1g	8C1f	8C1f
	<- - - - - - - - - - - - -				-MEQ /	100 G	- - - - - - - - -			- - ->	<- - - - -PCT		- - - ->						1:2	1:1
0- 17									5.9		3	43	47						4.9	5.5
17- 30									5.4			61	63						5.6	6.1
30-									6.3			53	63						6.7	7.6
									6.2			44	60						6.2	7.1
									4.8			26	37							
									4.7			100	28							
									6.7			10	4						5.4	
			---						5.5			10	7						5.2	
			0.1						6.3			14	6						5.4	

*** PRIMARY CHARACTERIZATION DATA ***

S91NC- 21-001 PRINT DATE 03/23/92
SAMPLED AS : HAYESVILLE ; CLAYEY, KAOLINITIC,MESIC TYPIC KANHAPLUDULT
NATIONAL SOIL SURVEY LABORATORY ; PEOON 92P 81, SAMPLE 92P 580- 589

CLAY MINERALOGY (<.002mm): FRACTION (-1-); X-RAY 7A2i peak size (-2- to -6-); THERMAL: DTA 7A6 percent (-7- to -8-), TGA 7A4b percent (-9- to -10-); ELEMENTAL 7C3 percent: SiO2, AL2O3, Fe2O3, MgO, CaO, K2O, Na2O (-11- to -17-); EGME RETN 7D2 mg/g (-19-); INTERPRETATION (-20-)

SAMPLE NUMBER	-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-	-9-	-10-	-11-	-12-	-13-	-14-	-15-	-16-	-17-	-18-	-19-	-20-
92p 580	TCLV	GI 4	KK 3	VR 2	GE 2	HE 1			KK33	GI24		27.0	11.2			0.3			9	CMIX
92P 581	TCLY	GI 5	KY 3	VR 2	GE 2	HE 2						34.0	14.3			0.3			18	CMIX
92P 582	TCLV	GI 4	KK 3	VR 2	GE 2	HE 2			KK32	GI30		34.8	14.3			0.2			22	CMIX
92p 583	TCLY	GI 4	KK 3	VR 2	GE 2	HE 2			KK27	GI29		35.8	15.7			0.2			22	CMIX
92P 584	TCLY	GI 3	KK 2	GE 2	VR 1	HE 1			KK28	GI29		35.0	17.2			0.4			14	CMIX
92P 585	TCLV																		11	
92p 586	TCLY																		9	
92P 587	TCLV	GI 2	KK 1						KK19	GI21		24.0	14.3			8.2			7	CMIX
92P 588	TCLY																		9	

SAND - SILT MINERALOGY (2.0-0.002mm): FRACTION; X-RAY 7A2i Peak Size; THERMAL: DTA 7A3b, TGA 7A4b Percent; OPTICAL ->TOT RE GRAIN COUNT 7B1a Percent; INTERPRETATION

SAMPLE NUMBER	FRACTION	-10-	-11-	-12-	-13-	-14-	-15-	-16-	INTERPRETATION
92p 587	FS	51	QZ50	BT36	OT 9	MS 4	OP 1	CATR	SMIX

FRACTION INTERPRETATION:

TCLV Total Clay,<0.002mm FS Fine Send. 0.1-0.25mm

MINERAL INTERPRETATION:

CI gibbsite KK kaolinite VR vermiculite GE goethite HE hematite QZ quartz
et biotite DT other MS muscovite OP opaques CA calcite

RELATIVE PEAK SIZE: 5 very Large 4 Large 3 Medium 2 Small 1 Very Small 6 No Peaks

INTERPRETATION (BY HORIZON):
CMIX= MIXED CLAYS; SMIX=MIXED SANDS

PEDON MINERALOGY
BASED ON SAND/SILT: MIXED
BASED ON CLAY: NIXED
FAMILY MINERALOGY: OXIDIC
COMMENTS:

*** SUPPLEMENTARY CHARACTERIZATION 0ATA •**

S91NC- 21-001 PRINT DATE 03/23/92
SAMPLED AS : HAYESVILLE ; CLAYEY, KAOLINITIC,MESIC TYPIC KANHAPLUDULT
NATIONAL SOIL SURVEY LABORATORY ; PEDON 92P al, SAMPLE 92P 580-589

(V O L U M E F R A C T I O N S)(C/)(R A T I O S to C L A Y)(LINEAR EXTENSIBILITY)(W R 0)
----W H O L E S O I L (mm) a t 1/3 B A R---(/N) --------<2 mm FRACTION------- WHOLE SOIL --<2 mm-- WHOLE <2
<---------------PCT of WHOLE SOIL----------------> <-1/3 BAR to (PCT)---> SOIL mm <--In/In->

DEPTH (In.)	>2	250 -UP	250 -75	75 -2	15 -20	20 -5	5 -2	<2	2-.05	.05-.002	LT .002	PORES D	PORES F	RAT -10	FINE CLAY	C E C SUN CATS	C E C NH4-OAC	15 BAR H2O	1:: BAR	15 BAR	OVEN -DRY	15 BAR	OVEN -DRY	WHOLE SOIL	<2 mm
	51 5	52	53	54 5	55	56 4	57	58	59	60	61	62	63	64	65	66	67	68	69	10	71	12	73	14	15
0- 7	TR	--	--	--	--	--	2	95	31	14	ii	16	24	12	0.38	0.34	0.31	0.43	0.047	0.4	0.8	0.4	0.9	0.12	0.12
1- 12		--	--		--		TR	100	25	10	22	13	30	10	8.45	0.14	0.14	0.36	0.023	0.8	1.8	0.2	0.9	0.09	8.09
12- 11	TR	--	--	--	--	TR	TR	100	20	a	22	14	37	10	0.49	0.17	0.14	0.40	0.040	0.8	2.1	0.8	1.8	0.13	0.13
17- 28	--	__	__	__	__	__	--	100	21	6	21	15	37	10	0.51	0.19	0.14	0.43	0.048		-..	0.8	2.1	0.13	0.13
28- 35	TR	__	__	__	--	5	TR	100	35	a	18	15	25		0.58	0.30	0.21	8.57	0.017	0.2	0.4	0.2	0.4	0.14	0.14
35- 45	6	--	__	6	__	TR	1	94	36	9	2	20	18		8.56	0.08	0.30	0.68						0.10	0.11
45- 73	1	--	--	,	--		1	99	50	9					8.64	8.74	1.72	1.23						0.11	0.11
73- 80	10	--	--	10	--	11	7	a2	46	a	4	15	10		8.56	8.66	0.86	0.84						8.02	0.02
80-100	14	--	--	14	10	2	2	86	33	9	3	22	19		0.54	0.42	0.94	1.07						0.11	0.12

(W E I G H T F R A C T I O N S - C L A Y F R E E)(-TEXTURE--)(--P S D A(mm)---)(PH)(-ELECTRICAL)(CUMULT. AMOUNTS)
(--W H O L E S O I L--) (--<2 mm F R A C T I O N ----)(DETERMINED)(SAND SILT CLAY) CA- R E S - CON- SALT Inch of H2O
PCT of >2mm+SAND+SILT > <------PCT of SAND+SILT-------><---<2 mm--><---PCT of 2mm---><--------- <2 mm -------><WholeSoil>

DEPTH (In.)	>2	15 -2	20 -2	2-.05	.05-.002	LT .002	"A~"" VC	C	;-----	VF	SILTS C	SILTS F	CL AY	IN FIELD	BY PSDA	SAND 2-.05	SILT .05-.002	CLAY LT .002	CA-CL2 .01M	RES- IST. OHMS	CON-DUCT. MMHOS	SALT MG/ K C	1/3 BAR to 15BR	AIRDRY
	76	77	78	79	a0	81	a2	a3	a4	a5	a6	a7	88	a9	90	91	92	93	94	95	96	97	98	99	100
0- 7	11	11	11	61	28	21	1	2	11		20	11	20	24	FSL	VFSL	55.7	25.1	19.2	4.9					
7- 12				71	29	64	1	2	13		17	a	21	64	CL	CL	43.1	11.9	39.0	5.6					
ii- ii				72	28	80	2	2	12		18	10	18	80	C	c	39.8	15.7	44.5	6.7					
ii- 28				76	24	77		4	15		17	10	14	77	C	C	43.1	13.5	43.4	6.2					
28- 35				a2	18	30	T1	1	16	-.-	22	9	9	30	CL	SCL	62.8	13.9	23.3	5.6					
35- 45	12	12	12	71	18	16	2	25	17 13	44	21	11	9	19	SL	FSL	67.4	16.9	15.1	5.6					
45- 73	1	1	1	84	15	4				40	21	8	8	4	SL	LFS	81.2	14.9	3.9	5.4					
73- 80	25	25	25	64	11	5	5	10	18	34	19	7	7	7	SL	LS	80.3	13.3	6.4	5.2					
ao-100	24	24	6	59	ii	5	6	10	15	26	20	11	11	7		FSL	72.5	20.8	6.7	5.4					
45- 13																									

peds and in pores; many insect and worm krotovina; few tine plate like mica flakes; slightly acid (pH 6.5); clear wavy boundary.

C1--71 to 132 cm, 92P0594; red (2.5YR 4/6) loam; common coarse distinct red (2.5YR 5/8), dark reddish brown (2.5YR 3/4), and yellow (10YR 7/8) mottles; massive; non sticky, non plastic; few very fine and fine roots in cracks; few medium discontinuous tubular pores; few fine plate like mica flakes, and few very coarse plate like iron-manganese concretions; moderately acid (pH 6.0); gradual wavy boundary.

C2--132 to 209 cm, 92P0595; tine sandy loam; many coarse faint dark yellowish brown (10YR 4/6) mottles: massive; non sticky, non plastic; few very tine discontinuous tubular pores; multicolored saprolite; few fine plate like mica flakes, and many very coarse plate like iron-manganese concretions; strongly acid (pH 5.5); gradual wavy boundary.

CT-209 to 250 cm, 92P0596 pale red (10R 6/3) loam; many coarse prominent very dark gray (2.5YR 3/0), yellowish red (.YR 5/6), and brownish yellow (1 0YR 6/8) mottles; massive; non sticky, non plastic: few fine plate like mica flakes, and many very coarse plate like iron-manganese concretions.

*** PRIMARY CHARACTERIZATION DATA ***

S91NC- 21-002 PRINT DATE 03/23/92
SAMPLED AS : HAYESVILLE ; CLAYEY,KAOLINITIC,MESIC TYPIC KANHAPLUDULT
NATIONAL SOIL SURVEY LABORATORY ; PEDON 92P 82, SAMPLE 92P 590- 596

	-1--	-2--	-3--	-4--	-5--	-6--	-7--	-8--	-9--	-10-	-11-	-12-	-13-	-14-	-15-	-16-	-17-	-18-	-19-	-20-
	(- NH4OAC EXTRACTABLE BASES -)					ACID-	EXTR													
	CA	MG	NA	K	SUM	ITY	AL													
								CATS	OAC	+ AL										
																	81			
			TR																	
			0.1																	
			TR																	

15

19

*** PRIMARY CHARACTERIZATION DATA ***

S91NC- 21-002 **PRINT** DATE **03/23/92**
SAMPLED AS : **HAYESVILLE** **;** CLAYEY, KAOLINITIC, **MESIC** TYPIC KANHAPLUDULT
NATIONAL SOIL SURVEY LABORATORY ; PEOON 92P **82,** SAMPLE 92P **590-** 596

SAMPLE NUMBER	FRACTION (-1--)	CLAY MINERALOGY (<.002mm): X-RAY 7A2I peak size (-2-- to -6--)	THERMAL: DTA 7A6 (-7-- -8--)	THERMAL: TGA 7A4B (-9-- -10-)	ELEMENTAL 7C3 Percent: SiO2 (-11-)	AL203 (-12-)	Fe203 (-13-)	MgO (-14-)	KCaO (-15-)	Na2O (-16-)	(-17-)	EGME RETN 7D2 mg/g (-18- -19-)	INTERPRETATION (-20-)
92P 598	TCLV	KK 5 GI 2 VR 2 GE 2		KK53 GI 7		24.e	10.9			0.6		9	KAOL
92P 591	TCLV	KK 5 GI 3 GE 2 VR 2 HE 1		KK46 GI 4		29.8	13.4			0.5		17	KAOL
92P 593	TCLV	KK 5 GI 3 GE 2 VR 2 HE 2		KK53 GI 6		30.0	14.3			0.5		20	KAOL
92P 594	TCLV	KK 5 GI 2 GE 2 VR 2 HE 2		KK56 GI 6		29.8	15.7			0.7		18	KAOL
	TCLV											9	
92P 595	TCLY	KK 3 GE 2 GI 1 VR 1		KK47 GI 4		16.8	13.7			0.6		5	CMIX
92P 596	TCLY											3	

FRACTION INTERPRETATION:

TCLV Total Clay. **<0.002mm**

MINERAL INTERPRETATION:

K K **kaolinite** **GI** **gibbsite** V R **vermiculite** G E **goethite** H E **hematite**

RELATIVE PEAK SIZE: 5 very **Large** 4 **Large** 3 **Medium** 2 small 1 Very Small 6 No Peaks

INTERPRETATION (BY HORIZON):
KAOL = KAOLINITIC; **CMIX=** MIXED CLAYS

PEDON **MINERALOGY**
BASED **ON** SAND/SILT:
BASED ON CLAY: **KAOLINITIC**
FAMILY YINERALDGV: KAOLINITIC
COMMENTS:

* * SUPPLEMENTARY CHARACTERIZATION DATA ***

S91NC- 21-002 PRINT DATE 03/23/92
SAMPLED AS : HAYESVILLE ; CLAYEY, KAOLINITIC,MESIC TYPIC KANHAPLUDULT
NATIONAL SOIL SURVEY LABORATORY ; PEDON 92P 82, SAMPLE 92P 590- 596

DEPTH (In.)	(VOLUME FRACTIONS) ----WHOLE SOIL (mm) >2 -UP	250 -UP	250 -75	75 -2	75 -20	20 -5	5 -2	at 1/3 BAR <2	2- .05	.05- .002	LT .002	PORES D	PORES F	(C/)(/N) RAT -10	(RATIOS to CLAY) <2 mm FRACTION FINE CLAY	---CEC--- SUM CATS	NH4- OAC	15 BAR H2O	LE 1/3 BAR	(LINEAR EXTENSIBILITY) WHOLE SOIL <-1/3 BAR to 15 BAR	WHOLE SOIL OVEN -DRY	--<2 mm-- (PCT)---> 15 BAR	<2 mm OVEN -DRY	(WRD) WHOLE SOIL <--In/In->	<2 mm
	<---PCT of	WHOLE SOIL										-->													
	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
				2	1																	0.4			
0- 5	2	--	--	--	--	1	1	98	37	15	14	5	27	12	8.39	0.28	0.28	0.48	0.053	0.4	1.9	0.4	1.1	0.10	0.10
5- 9	TR	--	--			TR	--	100	24	12	24	5	35	8	0.45	0.16	0.14	0.45	0.048	0.4	2.2	...	1.9	0.06	0.06
9- 18	--	--	--	--	--	--	--	loe	19	11	26			10	0.48	0.19	0.16	0.46	0.048		-.-	0.4	2.2	0.06	0.06
18- 28	--	--	--	--	--	--	--	100	21	13	20	6	37	8	0.50	0.15	0.14	0.52	0.057	0.7	1.1	0.7	2.1	0.15	0.15
28- 52	--	--	--	--	--	--	--	100	33	14	7	18	48		0.53	0.33	0.18	0.76	0.081	0.7	0.5	0.2	1.1	0.21	0.21
52- 82	TR	--	--	--	--	TR	--	100	36	11	3	22	27		0.48	8.31	8.26	1.07	0.093	0.2		0.2	0.5	0.19	0.19
82- 98	--	--	--	--	--	--	--	100	43	11	1	19	26		8.71	2.35	0.82	2.82	0.118	0.2	0.2		0.2	0.19	0.19

DEPTH (In.)	(WEIGHT FRACTIONS-CLAY FREE) (--WHOLE SOIL--) >2	75 -2	20 -2	2- .05	.05- .002	LT .002	(--<2 mm FRACTION----) ------SANDS------- VC	C	M	F	VF	SILTS C	F	(-TEXTURE--) (DETERMINED) CLAY	IN FIELD	BY PSDA	(--PSDA(mm)---) (SAND SILT CLAY) 2- .05	.05- .002	LT .002	(PH) CA- CL2 .01M	(-ELECTRICAL) RES- IST. OHMS	CON- DUCT. MMHOS
	PCT of	>2mm+SAND+SILT >					<------PCT of	SAND+SILT					------><---<2	mm-->	<---PCT	Of 2mm--->		<--------	<2 mm
	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94			
0- 5	4	4	3	69	28	25	1					9	20	26	FSL							
5- 9				66	34	66	TR	2	11	41	17	[illegible]				SCL CL	56.6 40.1	22.7 28.3	20.7 39.6			
9- 18				63	37	86	TR	8	29		24	12	26	86	C	C	33.8	20.1	46.1			
18- 28				61	39	59		1								CL	...					
28- 52				70	30	16		17828 30 25 32 14 16 26 14 59 16							CL	VFSL	3860.72	25.8 24.8	37.0 13.5			
52- 82				76	24	6	TR	1	11	33	31	12	12	6	FSL	FSL	71.0	22.8	5.4			
82- 98				80	20	2	TR	3	9	30	38	11	9	2	L	LFS	79.1	19.2	1.7			

The C horizon is saprolite that is sandy clay loam, loam, sandy loam. or fine sandy loam. It is variable in color.

COMPETING SERIES: This is the only other known series in this family. Bradson, Brevard, Graddock. Clifton. Evard. Fannin. and Nantahala (tentative) soils are in closely related families. Bradson and Braddock soils have water worn coarse fragments. In addition, the Braddock soils have mixed mineralogy. Brevard, Evard. and Fannin soils have less than 35 percent clay in the control section. Nantahala (tentative) and Clifton soils have mixed mineralogy.

GEOGRAPHIC SETTING: The Hayesville soils are on gently sloping to very steep ridges and side slopes in the intermountain plateaus and valleys of the southern Appalachian Mountains. Slopes range from 2 to 60 percent. Elevation ranges from 1400 to 4000 feet. The soils formed in residuum from igneous and high grade metamorphic rocks such as granite. granodiorite. mica gneiss and schist with some colluvial influence on steep or very steep slopes. Mean annual temperature is 55 degrees F.. and average annual precipitation is about 56 inches near the type location.

GEOGRAPHICALLY ASSOCIATED SOILS: In addition to the competing Braddock, Clifton. Evard. and Fannin soils these include the Brevard, Cullasaja. Saunook. Tate, Tuckasegee. and Tusquitee soils. All except Braddock and Clifton soils have less than 35 percent clay in the control section. Braddock soils are on high terraces. Clifton. Evard, and Fannin soils are on ridges and rids slopes. Brevard, Cullasaja. Saunook. Tate, Tuckasegee. and Tusquitee soils are on colluvial fans and toe slopes.

DRAINAGE ANO PERMEABILITY: Well drained; medium to rapid runoff; medium internal drainage; moderate permeability.

USE ANO VEGETATION: About one-half of the acres of this soil is in cultivation. Common trees in wooded areas are yellow- poplar, eastern white pine. northern red oak, pitch pine. shortleaf pine and Virginia pine. The understory includes flowering dogwood, rhododendron. mountain laurel and sourwood. Cleared areas are used for cultivated crops such as corn. small grain. pasture. hayland, burley tobacco, vegetable crops and Christmas trees.

DISTRIBUTION ANO EXTENT: Mountain areas of North Carolina. Virginia. South Carolina. Georgia. and perhaps Tennessee. The series is of large extent.

SERIES ESTABLISHED: Clay County. North Carolina: 1935.

REMARKS: The classification of the Hayesville series was changed in April, 1989 to clayey, kaolinitic. mesic Typic Kanhapludults. This is change is based on lab data from South Carolina, North Carolina. and Virginia that indicates presence of a kandic horizon.

Diagnostic horizons and features recognized in this pedon are:

Ochric epipedon: The zone from 0 to 5 inches (AI and A2 horizons). Kandic horizon: The zone from 5 to 48 inches (BA, Bt, and BC horizons).

Argillic horizon: The zone from 5 to 48 inches (GA. Bt, and BC horizons).

AODITIONAL DATA: A Southern Cooperative Series Bulletin No. 157. April 1971, "Soils of the Hayesville. Cecil, and Pacolet series in the Southern Appalachian and Piedmont Regions of the United States."

MLRA: 130 SIR'S: NC0013. NC0151 (STONY)

National Cooperative Soil Survey
U.S.A.

Soil Series: Biltmore
Soil Survey No.: S91-NC-021-003 (SSL Pedon No.: 92130083)
Classification: mixed, mesic Typic Udipsamment

Location: Buncombe County, NC; about 5 km S of Asheville on Biltmore Estate; about 80 m SSW of French Broad River.
Latitude: 35-32-39-N Longitude: 082-34-23-W
MLRA: 130

Physiography: River Valley in Blue Ridge Mountains
Geomorphic Position: Flood Plain
Slope Characteristics: 1% plane
Elevation: 652 m MSL
Parent Material: alluvium from metamorphic material

Precipitation: 124 cm udic moisture regime
Water Table Depth: 154 cm apparent
Hydraulic Conductivity: very high
Dramage Class: well drained
Land Use: cropland
Stoniness: 0
Erosion: none
Particle Size Control Section: 25 to 100 cm
Runoff: slow
Vegetation Code(s): CROPS, TOMATO
Diagnostic Horizons: 0 to 43 cm ochric
Described By: Milton Martinez, John Allison, Mark Hudson
Date: 10/91
Notes

Apl--0 to 18 cm, 92P0597; dark yellowish brown (10YR 4/4) loamy sand; weak fine granular structure; loose, non sticky, non plastic; many very fine and fine roots throughout; many very fine discontinuous tubular pores; common very fine and fine plate like mica flakes; slightly acid (pH 6.5); clear smooth boundary.

Ap2--18 to 43 cm, 92P0598; yellowish brown (10YR 5/4) loamy sand; single gram; loose, non sticky, non plastic; common very fine and fine roots throughout; few very fine discontinuous tubular pores; common very fine and fine plate like mica flakes; slightly acid (pH 6.5); clear wavy boundary.

Cl-43 to 71 cm, 92P0599; brownish yellow (10YR 6/6) sand; single grain; loose, non sticky, non plastic; few very fine and fine roots throughout; few very fine disconrmuous tubular pores; common very fine and fine plate like mica flakes; slightly acid (pH 6.5); clear wavy boundary.

C2--71 to 89 cm, 92P0600; brownish yellow (10YR 6/8) sand; single grain;loose, non sticky, non plastic; few very fine roots throughout; few very fine discontinuous tubular pores; few very fine and fine plate like mica flakes; moderately acid (pH 6.0); clear wavy boundary.

C3--89 to 107 cm, 92P0601; light yellowish brown (10YR 6/4) sand; single grain; loose, non sticky, non plastic; few very fine roots throughout; few very fine discontinuous tubular pores: few very fine and fme plate like mica flakes; slightly acid (pH 6.5); gradual wavy boundary.

*** PRIMARY CHARACTERIZATION DATA ***

S91NC- 21-003 (BUNCONBE COUNTY, NORTH CAROLINA)

PRINT DATE 03/23/92

SAYPLEO AS : BILTMORE ; MIXED, MESIC TYPIC UDIPSAMMENT
REVISED TO :

NSSL - PROJECT 92P 13, NCMTN-BUNCOMBE CO.
- PEOON 92P 83, SAMPLES 92P 597-609
- GENERAL METHODS 1B1A, 2A1, 2B

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
NATIONAL SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA 68508-3866

SANPLE NO.	DEPTH (CM)	HORIZON	-1-- CLAY LT .002	-2-- SILT .002 -.05	-3-- SAND .05 -2	-4-- FINE LT .0002	-5-- CO3 LT .002	-6-- FINE .002 -.02	-7-- COARSE .02 -.05	-8-- VF .05 -.10	-9-- F .10 -.25	-10- M .25 -.50	-11- C .5 -1	-12- VC 1 -2	-13- 2 -5	-14- 5 -20	-15- 20 -75	-16- .1-75	-17- WT PCT OF WHOLE SOIL
		Ap1	4.2	13.0	82.8								3.6						
		Ap2	3.3	6.7	88.0								9.2						
		C1	0.5	2.4	97.1														
		C2	1.0	3.6	95.4			2.5	1.1	11.6	40.1	39.5	4.1	0.1	--	TR	--	82	--
		C3	1.0	4.3	94.7			2.8	2.3	12.6	48.0	30.0	4.0	0.1	--		--	80	--
		C4																	
		C5	0.9 0.8	2.1 5.4	93.7 96.5			2.3 1.6	3.1 1.1	13.2 7.4	42.8 38.4	34.8 45.9	3.6	0.1 0.1	--	--	--	89	--
		C6											4.7					75	--
		C6	2.3 0.4	6.1 2.0	91.6 96.6			2.4 1.2	3.7 1.6	16.4 4.1	34.2 16.8	34.5 65.4	10.4 6.3	0.2 0.1	--	--	--	93	--
		C6		6.1	91.9			2.1											
		C6	2.8 8.6	2.0	97.4			0.6	4.0	12.7 3 8									
		C7							1.4										
		C6		17.2 5.2				7.8 1.7	9.4 3.5										

PI
4F

0.2	0.9
0.3	0.9
0.9	
0.8	
0.3	
9.6	2.2
0.5	0.6
3.1	1.7
0.1	0.8
17.8	3.9
	0.8

S91NC- 21-003 • ** PRIMARY CHARACTERIZATION DATA • **

(BUNCOMBE COUNTY, NORTH CAROLINA)

PRINT DATE 03/23/92

SAMPLED AS : BILTMORE ; MIXED, MESIC TYPIC UDIPSAMMENT

NSSL - PROJECT 92P 13, NCMTN-BUNCOMBE CO.
- PEDON 92P 83, SAMPLES 92P 597- 609
- GENERAL METHODS 1B1A, 2A1, 2B

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
NATIONAL SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA 68508-3866

SAMPLE NO.	HZ NO	-1-- ACID OXALATE EXTRACTION OPT DEN 8J	-2-- FE 6C9a	-3-- SI 6V2	-4-- AL 6612	-5-- PHOSPHOUS RET 6S4	-6-- CIT-ACID 6S5	-7-- KCL MN 6D3	-8-- TOTAL C 6A2d	-9-- (--WATER CONTENT--) 0.06 BAR 4B1c	-10- 1- BAR 4B1a	-11- 2- BAR 4B1a	-12- 15 BAR 4B2b	-13- (---- WATER DISPERSIBLE ----) <--PIPETTE--> CLAY 3A1c	-14- SILT	-15- SAND	-16- <-- HYDROMETER --> CLAY	-17- SILT SHL	-18- SAND	-19- MIN SOIL CONT 8F1	-20- AGGRT STABL <5mm 4G1
		<- PCT of <2mm			->	<- PPM		-><				PERCENT of <2mm									>< PCT>
92P 597	1											6.5									
92P 598	2							8.3				4.3									
92P 600	4							8.1				1.3									
92P 601	5											2.6 1.6									
92P 603	7											2.4									
92P 604	8											3.5 1.8									
92P 605	9											1.4									
92P 606	10											2.9									
92P 607	11											1.1									
92P 608	12											6.1									
92P 609	13											2.8									

-1-- -2-- -3-- -4-- -5-- -6-- -7-- -8-- -9-- -10- -11- -12- -13- -14- -15- -16- -17- -18- -19- -20-

S91NC- 21-003

*** SUPPLEMENTARY CHARACTERIZATION DATA ***
(BUNCOMBE COUNTY, NORTH CAROLINA)

PRINT DATE 03/23/92

SAMPLED AS : BILTMORE ; NIXED, MESIC TYPIC UDIPSAMMENT
REVISED TO : ;

NSSL - PROJECT 92P 13,
- PEOON 92P 83, SAWPLES 92P 597- 609
- GENERAL METHODS (ENGINEERING FRACTIONS ARE CALCULATED FROM USDA FRACTION SIZES)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
NATIONAL SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA 68508-3866

SAMPLE No.	DEPTH (In.)	HORIZON	ENGINEERING PERCENTAGE PASSING SIEVE: 3 (INCHES)	2	3/2	1	3/4	3/a	4 (NUMBER)	10	40	200	PSDA USDA: 20 (MICRONS)	5	2	CUMULATIVE CURVE FRACTIONS(<75mm) LESS THAN DIAMETERS(mm): ..1 (MILLIMETER)	.5	.25	.10	.05	AT PERCENTILE: 60	50	10	ATTERBERG (PCT): LL	PI	GRADATION UNIFMTY CU	CURVTUR CC
			1	2	3	4	5	6	1	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
92P 597s	0- 7	Ap1	100	100	100	100	100	100	100	100	89	25	8		4	99	96	70	33	17	0.20	0.153	0.012			15.8	3.1
92P 598S	7- 17	Ap2	100	100	100	100	100	100	100	100	81	19	12	5	3	98	89	58	25	12	8.26	0.199	0.032			8.2	1.6
92P 599S	17- 28	C1	100	100	100	100	100	100	100	100	70	6		1	1	99	84	27	B	3	0.37	0.329	8.112			3.3	1.6
92P 600S	28- 35	C2	100	100	100	100	100	100	100	100	86	11	3	2	1	100	96	56	16	5	0.27	0.216	0.069			3.9	1.0
92P 601S	35- 42	C3	100	100	100	100	100	100	lee	100	88	12	3	22	1	100	96	66	18	5	0.22	0.185	0.065			3.5	1.1
92P 602S	42- 56	c4	100	100	100	100	100	100	100	100	88	14	2	1	1	100	96	62	20	6	0.24	0.195	0.061			4.0	1.1
92P 603S	56- 61	C5	100	100	100	100	100	100	100	100	84	a	5	3	21	100	95	49	11	3	0.29	0.253	0.092			3.2	0.9
92P 604S	61- 66	C6	100	100	100	100	100	100	100	100	85	17				100	93	59	25	s	0.26	0.196	0.054			4.8	1.0
92P 605S	66- 12	C6	100	100	100	100	100	100	100	100	73	6	2	1	TR	100	89	24	7	3	0.37	0.329	0.116			3.2	1.7
92P 606S	72- 74	C6	100	100	100	100	100	we	100	100	80	15	4	3	2	100	91	49	21	a	0.30	0.256	0.055			5.4	1.1
92P 607S	74- a1	C6	100	100	100	100	100	100	100	100	63	5	1	1	1	lee	78	19	6	3	0.40	0.359	8.129			3.1	1.5
92P 608S	el- 99	C7	100	100	100	100	100	100	100	100	95	34	9	4	1	100	98	84	46	18	0.14	0.110	0.022			6.3	1.5
92P 609S	61- 81	C6	FRACTIONS NOT DETERIMINE0																								

DEPTH (In.)	(WEIGHT FRACTIONS) PCT of WHOLE SOIL: >2-250 -UP	250 -75	E75 -2	SOIL (mm): 75 -20	20 -5	5 -2	<2	<75 mm FRACTION (PCT OF <75 mm): 75 -2	75 -20	20 -5	5 -2	<2		(WEIGHT PER UNIT VOLUME g/cc) WHOLE SOIL, SOIL SURVEY: 1/3 BAR	OVEN -DRY	ENGINEERING: MOIST	SATURATED	<2 mm FRACTION, SOIL SURVEY: 1/3 BAR	15 BAR	OVEN -DRY	ENGINEERING: MOIST	SATURATED	VOID RATIOS AT 1/3 SAR: WHOLE SOIL	<2 mm
	26	27	28	29	36	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
0- 7	TR	—	—	—	--	--				--	--														
7- 17	TR	--	--	--	--	--				--	--														
17- 28	TR	--	--	--	--	--				--	--														
28- 35	--	--	--	--	--	--				--	--														
35- 42	--	--	--	--	--	--				--	--														
42- 56	--	--	--	--	--	--				--	--														
56- 61	--	--	--		--	--				--	--														
61- 66	--	--	--	--	--	--				--	--														
66- 72		--	--	--	--	--				--	--														
72- 74	II	--	--	--	--	--				--	--														
74- 81		—	—	—	--	--				--	--														
81- 99					--	--				--	--														
					--	--				--	--														

Soil Series: Biltmore
Soil Survey No.: S91NC-021-004 (SSL No.: 92P0084)
Classification: mixed, mesic Typic Udipsamment

Location: Buncombe County, NC; about 5 km S of Asheville on Biltmore Estate; about 80 m ENE of French Broad River
Latitude: 35-31-49-N Longitude: 082-33-31-W
MLRA: 130

Physiography: River Valley in Blue Ridge Mountains
Geomorphic Position: Flood Plain
Slope Characteristics: 1% plane
Elevation: 652 m MSL
Parent Material: alluvium from metamorphic material

Precipitation: 124 cm udic moisture regime
Water Table Depth: 175 cm apparent
Hydraulic Conductivity: very high
Drainage Class: well drained
Runoff: slow
Land Use: cropland
Stoniness: 0
Erosion: none
Particle Size Control Section: 25 to 100 cm
Vegetation Code(s): CROPS, CORN
Diagnostic Horizons: 0 to 20 cm ochric
Described By: Milton Martinez, Chip Smith, Mark Hudson
Date: 10/91

Ap--0 to 20 cm, 92P0610; dark yellowish brown (10YR 4/4) loamy sand; few medium distinct brownish yellow (10YR 6/6) mottles; weak fine granularstructure; very friable, non sticky, non plastic; many very fine and fine roots throughout, and *many* medium *roots* throughout; few fine interstitial pores; common very fine and fine plate like mica flakes; neutral (pH 7.0); abrupt smooth boundary.

Cl-20 to 40 cm, 92P0611; brownish yellow (10YR 6/6) sand; few medium distinct very pale brown (10YR 7/3) mottles; single gram; loose, non sticky, non plastic; few fine interstitial and tubular pores; charcoal stains; few very fine and fine plate like mica Bakes; slightly acid (pH 6.5); clear smooth boundary.

C2--40 to 58 cm, 92P0612; yellowish brown (10YR 5/6) sand: few medium distinct yellowish brown (10YR 5/6) mottles; single grain; loose, non sticky, non plastic; few fine interstitial and tubular pores: charcoal stains; few very fine and fine plate like mica flakes; slightly acid (pH 6.5); clear smooth boundary.

C3--58 to 65 cm, 92P0613; light yellowish brown (10YR 6/4) sand; single grain; loose, non sticky, non plastic; few fine interstitial and tubular pores; few very tine and fine plate like mica flakes; moderately acid (pH 6.0); abrupt smooth boundary.

C4--65 to 105 cm, 92P0614; yellowish brown (10YR 5/6), dark yellowish brown (10YR 4/4), and light yellowish brown (10YR 6/4) sand; few fine faint brown (10YR 5/3) mottles: single grain; loose, non sticky, non plastic; few very

*** PRIMARY CHARACTERIZATION OATA ***

S91NC- 21-004 (BUNCOMBE COUNTY, NORTH CAROLINA)

PRINT DATE 03/23/92

SAMPLED AS : BILTMORE ; MIXED, MESIC TYPIC UDIPSAMMENT
REVISED TO : ;

NSSL - PROJECT 92P13, NCWTN-BUNCORBE CO.
- PEOON 92P 84, SAMPLES 92P 610- 617
- GENERAL *METHODS* 1B1A, 2A1, 2B

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
NATIONAL SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA 68508-3866

SAMPLE NO.	DEPTH (CM)	HORIZON	-1-- (--TOTAL--) CLAY LT .002	-2-- SILT .002 -.05	-3-- SAND .05 -2	-4-- (--CLAY--) FINE LT .0002	-5-- CO3 LT .002	-6-- (--SILT--) FINE .002 -.02	-7-m COARSE .02 -.05	-8-- (--SAND--) VF .05 -.10	-9-- F .10 -.25	-10- M .25 -.50	-11- C .5 -1	-12- VC 1 -2	-13- (-COARSE FRACTIONS(MM)-) WEIGHT 2 -5	-14- 5 -20	-15- 20 -75	-16- .1- 75	-17- (>2MM) WT PCT OF WHOLE SOIL
			<-- PCT OF <2MM (3A1) -->												<- PCT OF <75MM(3B1)->				
92P 610S	B- 20	Ap	--	8.9	91'.1			4.0					1.9	TR		TR	--	77	TR
92P 611S	20- 40	CI	--	6.1	93.9			2.5	4.9	14.3 14.2	46.4 48.2	28.5 29.8	1.7	TR	....	--	--	80	--
92P 612S	40- 58	C2	--	4.3	95.7			1:s	3.6	9.9	99.9	42.8	2.9	8.1	--	--	--	86	--
92P 613S	58- 65	C3	--	5.5	94.5			1.7	3.8	11.6	47.5	32.4	2.6	0.l	--	--	--	83	--
92P 614S	65-105	C4	--	5.1	94.9			1.9	3.2	10.0	51.1	30.4		TR	--	--	--	84	—
92P 6155	105-120	C5	0.4	5.2	94.4			2.3	2.9	15.7	52.8	24.4	2.3	TR	--	--	--	79	--
92P 616S	128-135	C6	1.1	7.5	91.4			2.7	4.8	16.4	49.6	23.3	2.1	TR	--	--	--	75	—
92P 617S	135-175	C7	2.1	5.9	92.8			1.0	4.1	15.4	52.9	22.2	1.4	0.1	--	--	--	77	--

DEPTH (CR)	ORGN C 6A1c PCT	TOTAL N 6B3a <2MM	EXTR P 6S3 PPM	TOTAL S 6R3a	(--DITH-CIT--) EXTRACTABLE FE 6C2b	AL 6G7a	MN 6D2a <- PERCENT OF <2MM -->	(RATIO/CLAY) CEC 8D1	15 BAR 8D1	(ATTERBERG) -- LIMITS - LL 4F1 PCT	PI 4F	(- BULK DENSITY -) FIELD MOIST 4A3a <0.4MM <--	1/3 BAR 4A1d G/CC	OVEN DRY 4A1h --->	COLE WHOLE SOIL 4D1 CM/CM	(- --WATER CONTENT - -) FIELD MOIST 4B4 <-- -PCT	1/10 BAR 4B1c OF	1/3 BAR 4B1c <2MM	15 BAR 4B2a -->	WRD WHOLE SOIL 4C1 CM/CM
G- 20	0.41	8.826											1.63	1.63	0.073	8.4	16.9	7.6	1.8	8.09
20- 40	0.14	0.010										1.32				0.3			1.3	
40- 58	8.12	0.008										1.14				0.3			1.2	
58- 65	8.14	8.141																	1.3	
65-105	0.19											1.27				1.0			1.4	
105-120	0.22											1.15				8.4			1.8	
120-135	0.20							1.02	1.64			1.34				19.2			1.8	
135- 175	8.16							1.14	8.98			1.30				16.0			1.9	

AVERAGES, DEPTH 25-100: PCT CLAY 0 PCT .1-75MM 84

*** PRIMARY CHARACTERIZATION 0ATA ***

S91NC- 21-004 PRINT DATE 03/23/92
SAMPLED AS : BILTMORE ; MIXED,MESIC TYPIC UDIPSAMMENT
NATIONAL SOIL SURVEY LABORATORY ; PEDON 92P 84, SAMPLE 92P 610- 617

-1-- -2-- -3-- -4-- -5-- -6-- -7-- -8-- -9-- -10- -11- -12- -13- -14- -15- -16- -17- -18- -19- -20-

< - - - SAND - SILT MINERALOGY (2.0-0.002mm) - - - >

FRACT < - - X-RA Y - - >< - - THERMAL - - >< - - OPTICAL - - >< > INTER
ION < >< - DTA - >< - TGA - ->TOT RE< - - GRAIN COUNT - - >< > PRETA
< - - 7A2i - - >< - 7A3b - >< - 7A4b - >< - - 7B1a - - >< > TION
< - ->< - - Peak Size - - >< - - Percent - - >< - - Percent - - >< - - >< - >

SAMPLE NUMBER	FRACTION	TOT RE	GRAIN COUNT	INTERPRETATION
92P 610	FS	66	QZ65 FK16 BT 7 MS 6 PR 2 OT 2	SMIX
92P 610	FS		OP 1 RN 1 GNtr ZRtr CAtr TMtr	
92P 611	FS	62	QZ61 FK21 MS 7 Bt 7 PR 2 OT 1	SMIX
92P 611	FS		OP 1 ZRtr CAtr HNtr	
92P 612	FS	57	QZ55 FK20 Bt12 MS 6 PR 3 OT 2	SMIX
92P 612	FS		ZR 1 OP 1 HNtr CAtr GNtr CLtr	
92P 612	FS		TNTR	
92P 614	FS	64	QZ61 FK19 MS 8 BT 6 OP 2 PR 2	SMIX
92P 614	FS		OT 1 HN 1 ZR 1 TMTR CATR CNTR	
92P 617	FS	56	QZ56 FK19 BT13 MS 9 PR 1 HN 1	SMIX
92P 617	FS		OT 1 ZRtr OPtr TMtr CAtr GNtr	

FRACTION INTERPRETATION:

FS Fine Sand, 0.1-0.25mm

MINERAL INTERPRETATION:

QZ quartz FK potas-feld Bt biotite MS ● uscovlt.3 PA pyroxene OT other
OP opaques NH hornblende GN garnet ZR zircon CA calcite TM tourmaline
CL chlorite

RELATIVE PEAK SIZE: 5 very Large 4 Large 3 Medium 2 Small 1 Very Small 6 No Peaks

INTERPRETATION (BY HORIZON):
SMIX= MIXED SANDS

PEDON MINERALOGY
BASED ON SAND/SILT: MIXED
BASED ON CLAY:
FAMILY MINERALOGY: MIXED
COMMENTS:

*** SUPPLEMENTARY CHARACTERIZATION DATA ***

S91NC- 21-004 PRINT DATE 03/23/92
SAMPLED AS : BILTMORE ; MIXED, MESIC TYPIC UDIPSAMMENT
NATIONAL SOIL SURVEY LABORATORY ; PEDON 92P84, SAUPLE 92P610- 617

(V O L U M E F R A C T I O N S)(C/)(R A T I O S to C L A Y)(LINEAR EXTENSIBILITY)(WR 0)
----WHOL'E SOIL 5 (mm) 2- t.05-BLT R---(/N) --------<2 mm FRACTI 15 -- LE-- WHOLE SOIL --<2 mm-- WHOLE <2
<---------------PCT of WHOLE SOIL-----------------> <--In/In->

DEPTH (In.)	>2 (51)	250 -UP (52)	250 -75 (53)	75 -2 (54)	75 -20 (55)	20 -5 (56)	-2 (57)	<2 (58)	.05 (59)	.002 (60)	.002 (61)	PORES D (62)	F (63)	RAT -10 (64)	FINE CLAY (65)	CEC SUN CATS (66)	CEC NH4-OAC (67)	BAR 1120 (68)	1/3 BAR (69)	WHOLE SOIL 1/3 BAR to 15 BAR (70)	OVEN -DRY (71)	<2 mm (PCT) 15 BAR (72)	OVEN -DRY (73)	SOIL (74)	mm (75)
										5															
0- 8	TR	--	--	--	--	TR	--	100	56	3		45	13	16										0.09	0.09
8- 16	--	--	--	__	__	__	--	100	51			45		14											
16- 23	--	--	--	__	__	__	--	100	52	2		45		15											
23- 26	--	--	--	__	__	__	--	100	52	3		45		1											
26- 41	--	--	--							3															
41- 47	--	--	--	__	__	__	--	100	52	4		45				6.00	5.00	4.50							
47- 53	--	--	__	__	__	__	--	100	50	3	1	45				1.02	1.82	1.64							
53- 69	—	—	—	__	__	__	--	100	50		1	45				1.19	1.14	0.90							

(W E I G H T F R A C T I O N S - C L A Y F R E E)(-TEXTURE--)(--P S D A(m)---)(PH)(-ELECTRICAL)(CUMULT. AMOUNTS)
(--WHOLE SOIL--) (--<2 mm FRACTION----)(DETERMINED)(SAND SILT CLAY) SALT Inch of "20
PCT of >2mm+SAND+SILT > <------PCT of SAND+SILT-------><---<2 mm--><---PCT of 2mm---><-------- <2 mm -------><WholeSoil>

DEPTH (In.)	>2 (76)	75 -2 (77)	20 -2 (78)	2- .05 (79)	.05- .002 (80)	LT .002 (81)	SANDS VC (82)	C (83)	M (84)	F (85)	VF (86)	SILTS C (87)	F (88)	CLAY (89)	IN FIELD (90)	BY PSDA (91)	SAND 2- .05 (92)	SILT .05- .002 (93)	CLAY LT .002 (94)	CA-CL2 .01M (95)	RES-IST. OHMS (96)	CON-DUCT. MMHOS (97)	MG/ KG (98)	1/3 BAR to 15BR (99)	AIRDRY (100)
												5				S									
0- 8				91	9			2	28	46	14	4	4		LS	S	91.1	8.9	--	5.6					
8- 16				94	6		TR	2	30	40	14	3	2		S		93.9	6.1	--	5.4					
16- 23				96	4		TR	3	43	40	10	4	1		S	S	95.7	4.3	--	5.4					
23- 26				94	5			3	32	47	12		2		S	S	94.5	5.5	--	5.4					
26- 41				95	5	TR		3	30	51	11	3	2		S	FS	94.9	5.1	--	5.5					
41- 47				95				2	24	52	16	3	2	TR	LS	FS	94.4	5.2	0.4	5.6					
47- 53				92	8	1		2	24	50	17	5	3	1	LS	S	91.4	7.5	1.1	5.5					
53- 69				94	6	2	TR	1	23	54	16	4	2	2	LS	FS	92.0	5.9	2.1	5.7					

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GEOGRAPHICALLY ASSOCIATED SOILS: These include the Braddock, Brevard, Colvard, Elsinboro. Hatboro. Iotla, Rosman, late, Toxaway, and Transylvania series. Graddock. Brevard, Elsinboro. and Tate soils have an argillic

Soil Series: Wayah
Soil Survey No.: S91-NC-021-005 (SSL Pedon No.: 92P0085)
Classification: coarse-loamy, mixed, frigid Typic Haplumbrept

Location: Buncombe County, NC, NE of Asheville on Blue Ridge Parkway, 0.85 miles NE of Blue Ridge Parkway on Craggey Gardens picnic area road in sharp curve, 50' E of road.
Latitude: 35-42-05-N   Longitude: 082-23-23-W
MLRA: 130

Physiography: Blue Ridge Mountains
Geomorphic Position: on upper third of sideslope
Slope Characteristics: 35% north facing undulating, 340° azimuth
Elevation: 1692 m MSL
Parent Material: local colluvium from metamorphic material

Precipitation: 160 cm udic moisture regime
Water Table Depth: > 200 cm
Hydraulic Conductivity: high
Drainage Class: well drained
Runoff: moderate
Land Use: forest land not grazed
Stoniness: 1
Erosion: slight
Particle Size Control Section: 25 to 100 cm
Diagnostic Horizons: 0 to 39 cm umbric, 64 to 117 cm cambic
Described By: Mark S. Hudson, Milton Martinez, John B. Allison
Date: 10/91
Notes: Vegetation: sugar maple, yellow birch. About 20 m N and 2 m lower in elevation than Wayah S92NC-21-6.

Oi-5 to 2 cm; no sample.

Oe--2 to 0 cm; 92P0618.

Al--O to 8 cm, 92P0619 (O-4 cm) and 92P0620 (4-8 cm); black (10YR 2/1) loam; weak fine granular structure; very friable! non sticky, non plastic; many very fine and fine roots throughout, and common medium and coarse roots throughout; many very *fine* and fine interstitial and tubular pores; few very fine and tine plate like mica fla *f*

*** PRIMARY CHARACTERIZATION DATA ***

S91NC- 21-005 (BUNCOMBE COUNTY, NORTH CAROLINA)

PRINT DATE 03/23/92

SAMPLED AS : “AYAH ; COARSE-LOAMY, MIXED, FRIGID TYPIC HAPLUMBREPT
REVISED TO : ; COARSE-LOAMY. OXIDIC, FRIGID ANDIC HAPLORTHOD

NSSL - PROJECT 92P 13, NCWTN-BUNCOMBE CO.
- PEOON 92P 85, SAMPLES 92P 618- 627
- GENERAL METHODS 1B1A, 2A1, 2B

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
NATIONAL SOIL SURVEY LAOORATORY
LINCOLN, NEBRASKA 68508-3866

(- - -TOTAL - - -)(- -CLAY- -)(- -SILT- -)(- - - - - -SAND- - - - - -)(-COARSE FRACTIONS(MM)-)(>2MM)

SAMPLE	DEPTH	“OR IZON	-1- CLAY LT .002	-2- SILT .002 .05	-3- SAND .05 LT	-4- FINE LT .002	-5- CO3 LT .002	-6- FINE .002 .02	-7- COARSE .02 .05	-8- VF .05 10	-9- F	-10- M	-11- C	-12- VC	-13-	-14-	-15-	-16-	-17- WEIGHT	-18-	-19-	-20- WT
																			1			2
													11.7			14.6			4		56	12
													10.8			7.7			1		42	7
													11.1			9.3			1		44	8
													14.9			10.1			1		59	16
													12.2			9.2			1		55	26
													12.8			10.2			7		60	26
													11.6			10.1			5			
													11.9			13.1			9			
													11.7			13.4			9			

-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-	-9-	-10-	-11-	-12-	-13-	-14-	-15-	-16-	-17-	-18-	-19-	-20-
				1.0	0.3	TR						0.80							
				2.5	0.6	TR						0.90							
				3.1	0.8	TR						1.10							
				3.2	1.0	TR						0.82	1.00	0.066					
				3.3	1.5	TR						0.95	1.06	0.035					
				2.4	1.4	TR						1.11	1.17	0.015					
				1.9	0.9	TR						1.19	1.24	0.012					
				1.5	0.6	TR						1.20	1.23	0.006					
				1.2	0.4	TR						1.16	1.21	0.011					
				1.1	0.3	TR													

1	11.5	
2	0.5	44.9
3	0.2	31.4
4	0.1	24.9
5	0.1	21.6
6	0.0	20.7
7		
8		
9		
10		

S91NC- 21-005

*** SUPPLEYENTARV CHARACTERIZATION DATA ***
(BUNCOHBE COUNTY, NORTH CAROLINA)

PRINT DATE 03/23/92

SAMPLED AS : WAVAH ; COARSE-LOAMY, MIXED. FRIGID TYPIC HAPLUHBREPT
REVISED TO : ; COARSE-LOAM'. OXODIC, FRIGID ANDIC HAPLORTHOD

NSSL - PROJECT 92P 13,
- PEDON 92P 85. SAMPLES 92P 618- 627
- GENERAL METHODS (ENGINEERING FRACTIONS ARE CALCULATED FROM USDA FRACTION SIZES)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
NATIONAL SOIL SURVEY LABORATORY
LINCOLN. NEBRASKA 68508-3866

SAMPLE NO.	DEPTH (In.)	HORIZON	ENGINEERING PSDA PERCENTAGE PASSING SIEVE 3	2	3/2	1	3/4	3/8	4	10	40	200	20	5	2	CUMULATIVE CURVE FRACTIONS(<75mm) USDA LESS THAN DIAMETERS(mm) 1.	.5	.25	.10	.05	AT PERCENTILE 60	50	10	ATTER-BERG LL	PI	GRADATION UNI-FYTV CU	CUR-VTUR C
			<-----, INCHES----->						<-NUMBER->				<-MICRONS->			<--- MILLIMETER --->					<--PERCENTILE-->			<-PCT>		CU	C
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
92P 618S	1- 0	Oe	FRACTIONS NOT DETERIMINED																								
92P 619S	0- 2	Oa	100	100	100	100	100	98	96	93	69	39	24	15	8	86	72	58	44	33	0.28	0.151	0.003			>100	1.9
92P 620S	2- 3	A1	100	100	100	99	99	99	98	97	83	53	39	28	20	94	86	73	58	47	0.12	0.060	0.001			>100	0.6
92P 621s	3- 7	A2	lee	99	99	98	97	97	96	95	79	51	36	22	12	92	83	70	56	45	0.13	0.068	0.001			97.7	0.7
92P 6225	7- 15	A3	100	97	95	92	90	90	89	88	71	35	19	10	4	84	75	61	41	28	0.24	0.153	0.005			40.6	2.6
92P 623.3	15- 25	BA	100	98	97	94	93	93	92	90	74	40	26	14	6	85	77	65	45	34	0.20	0.125	0.003			66.7	1.6
92P 624S	25- 35	Bw1	100	98	97	95	94	91	87	83	67	36	23	13	7	78	70	57	40	30	0.30	0.171	0.003			96.8	2.8
92P 6255	35- 46	Bw2	100	96	93	89	86	84	81	77	62	32	20	12	6	73	66	52	36	27	0.37	0.220	0.004			>100	3.1
92P 6265	46- 59	BC	100	97	95	91	89	85	80	73	55	24	14	8	4	68	58	44	28	19	0.57	0.332	0.008			70.2	2.8
92P 627S	59- 79	C	100	98	96	94	92	88	83	75	56	23	12	8	5	70	59	46	26	18	0.52	0.311	0.010			52.3	2.7

DEPTH (In.)	(WEIGHT FRACT,0NS) ---WHOLE SOIL (mm)- >2	250 -UP	250 -75	75 -2	75 -20	20 -5	5 -2	<2	-<75 mm FRAC SON-- 75 -2	75 -20	20 -5	-2 <2			(WEIGHT PER UNIT VOLUME G/CC) ------WHOLE SOIL------ SOIL SURVEY 1/3 BAR	OVEN -DRY	ENGINEERING MOIST	SATUR -ATED	-------<2 mm FRACTION------- --SOIL SURVEY-- 1/3 BAR	15 BAR	OVEN -DRY	ENGINEERING MOIST	SATUR -ATED	)(VOID) --RATIOS-- AT 1/3 BAR WHOLE SOIL	<2 mm
	<------PCT of "HOLE SOIL----->								<--PCT OF <75 mm->																
	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
B- 2	13	3	3	7	--	4	3	07	7	--	4	3	93		0.98										
2- 3	7	2	2	3	1	1	1	93	3	1	1	1	97												
3- 1	8	--	3	5	3	1	1	92	5	3	1	1	95		0.87 1.15	1.05	1.35	1.54	0.82	0.96	1.00	1.31			
7- 15	16	2	2	12	10	1																			
15- 25	26	4	14	8	6	1	21	8474	12 10	10	11	21	8890		1.07 1.31	1.18 1.37	1.58 1.66	1.67 1.82	0.95 1.11	1.03 1.15	1.06 1.17	1.41 1.52	1.51 1.69	2.05 1.02	2.23 1.39
25- 35	27	6	6	15	5	6	4	73	17	6	7	4	83		1.40	1.45	1.74	1.87	1.19	1.23	1.24	1.58	1.59 1.74	0.48 89	1.179 23
35- 46	41	7	17	17	11	7	3	59	23	14	5	4	77		1.55	1.58	1.00	1.97	1.20	1.22	1.23	1.53	1.75	0.71	1.21
46- 59	42	3	17	22	9	8	6	58	27	11	9	7	73		1.52	1.57	1.78	1.95	1.16	1.20	1.21	1.50	1.72	0.74	1.28
59- 79	31	--	8	23	7		7	69	25	8	9	8	75		1.70										

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Soil Series: Wayah
Soil Survey No.: S91-NC-021-006 (SSL Pedon No.: 92P0086)
Classification: coarse-loamy, mixed, frigid Typic Haplumbrept

Location: Buncombe County; NC; NE of Asheville on Blue Ridge Parkway, 0.85 miles NE of Blue Ridge Parkway on Craggey Gardens picnic grounds road in sharp curve, 50 E of road.
Latitude: 35-42-05-N Longitude: 082-23-23-W
MLRA: 130

Physiography: Blue Ridge Mountains
Geomorphic Position: on upper third of side slope
Slope Characteristics: 43% NNE facing at 340° azimuth, undulating
Elevation: 1694 m MSL
Parent Material: local colluvium from metamorphic material over residuum from metamorphic material

Precipitation: 162 cm udic moisture regime
Water Table Depth: > 180 cm
Hydraulic Conductivity: high
Drainage Class: well drained
Land Use: forest land not grazed
Stoniness: 1
Erosion: slight
Particle Size Control Section: 25 to 100 cm
Diagnostic Horizons: 0 to 30 cm umbric, 30 to 105 cm cambic
Described By: John B. Allison, Mark S. Hudson, Milton Martinez
Date: 10/91
Notes: Vegetation: sugar maple, Am. beech, yellow birch. Site is about 20 m S and 2 m higher in elevation than Wayah S92NC-21-5.

Oi--5 to 2 cm; no sample.

Oe--2 to 0 cm; 92P0628.

Oa--0 to 7 cm, 92P0629; black (2.5Y 2/0) loam; moderate medium granular structure; friable, non sticky, non plastic; many very fine and fine roots throughout, and many medium and coarse roots throughout; many very fine and tine interstitial and tubular pores; few very fine and fine plate like mica flakes; extremely acid (pH 4.0); abrupt wavy boundary.

Al-7 to 15 cm, 92P0630; very dark brown (10YR 2/2) loam; weak fine and medium subangular blocky structure; friable, non sticky, non plastic; few very fine and tine roots between peds, and common medium roots between peds, and few coarse roots between peds; common very fine and fine vesicular and tubular, and few medium vesicular and tubular pores; few very fine and fine plate like mica flakes; extremely acid

*** PRIMARY **CHARACTERIZATION** DATA ***

S91NC- 21-006 (BUNCOHOE COUNTY, NORTH CAROLINA)

SAMPLED AS : **WAYAH** ; COARSE-LOAMY, MIXED, **FRIGID** TYPIC NAPLUMBREPT
REVISED TO : ; COARSE-LOAMY, MIXED. FRIGID **ANDIC** HAPLDRTHOD

NSSL - PROJECT 92P 13, **NCMTN-BUNCOMBE**
- PEDON 92P 86,
- GENERAL METHODS

-1-- -2--

			2	3	14V
9.2	16.9	10.0	2	3	2V
11.0	15.4	9.7	2	1	4V
10.7	24.5	8.8	2		
10.4	22.7	10.7	4		
5.2	22.1	12.7	5		
4.5	23.6	13.8	8		
5.6	27.2	12.3	9		

1.5	0.3	
1.6	0.4	..
2.6	1.1	TR
2.2	1.3	TR
1.6	1.1	TR
1.3	0.5	TR
1.7	0.4	0.1
2.0	0.4	0.1

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S91NC- 21-006 *** PRIMARY CHARACTERIZATION DATA ***
(SUNCOMSE COUNTY, NORTH CAROLINA)

PRINT DATE 03/23/92

SAMPLED AS : WAYAH ; COARSE-LOAMY, MIXED. FRIGID TYPIC HAPLUMSREPT

NSSL - PROJECT 92P 13, NCMTN-BUNCOMBE CO.
- PEDON 92P 86, SAMPLES 92P 628- 635
- GENERAL METHODS 1B1A, 2A1, 2B

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
NATIONAL SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA 68508-3866

-1-- -2-- -3-- -4-- -5-- -6-- -7-- -8-- -9-- -10- -11- -12- -13- -14-

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*** SUPPLEMENTARY CHARACTERIZATION DATA ***

S92NC- 21-006 (BUNCOMBE COUNTY, NORTH CAROLINA)

PRINT DATE 03/23/92

SAMPLED AS : WAYAH ; COARSE-LOAMY, MIXED, FRIGID TYPIC HAPLUMBREPT
REVISED TO : ; COARSE-LOAMY, MIXED, FRIGID ANDIC HAPLORTHOD

NSSL - PROJECT 92P 13,
- PEDON 92P 86, SAMPLES 92P 628- 635
- GENERAL METHODS (ENGINEERING FRACTIONS ARE CALCULATED FROM USDA FRACTION SIZES)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
NATIONAL SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA 68508-3866

SAMPLE	DEPTH	HORIZON	ENGINEERING PERCENTAGE PASSING SIEVE 3	2		PSDA SIEVE USDA			CUMULATIVE CURVE FRACTIONS(<75mm) LESS THAN DIAMETERS(mm)		ATTER-BERG	GRADATION UNI- CUR-
			TIONS									
			99	98	98				63	48		
			98	97	96				68	53		
			98	97	96							
			98	96	95							
			91	85	81							
			88	81	76	55	38	14				
			87	79	74	54	41	15				

LOCATION UAYAH NC

Established Series
Rev. DJT:SAB:AG
12/91

WAYAH SERIES

The Wayah series consists of very deep, well drained. moderately rapidly permeable soils on ridges and side slopes at high elevations in the Southern Appalachian Mountains. They formed in residuum that is affected in the upper part by soil creep. It is weathered from felsic to mafic igneous and hlgh grade metamorphic rocks such as mica gneiss. hornblende gneiss, high grade metagraywacke, and granite. Near the type location, mean annual temperature is about 40 degrees F.. and mean annual precipitation is 100 inches. Slope ranges from 2 to 95 percent.

TAXONOMIC CLASS: Coarse-loamy, mixed. frigid Typic Haplumbrepts

TYPICAL PEDON: Uayah sandy loam on a 20 percent southwest-facing side slope at an elevation of 6023 feet--forested. (Colors are for moist soil unless otherwise stated.)

Oi--4 to 2 inches; slightly decomposed leaves and twigs.

Oe--2 to 0 inches; partially decomposed organic litter and root mat.

Al--0 to 10 inches; black (10YR 2/1) sandy loam. very dark gray (10YR 3/1) dry; weak fine granular structure: very friable; common fine and medium roots; 2 percent gravel by volume; few fine flakes of mica; 18 percent organic matter; extremely acid; clear wavy boundary.

A2--10 to 14 inches; very dark grayish brown (10YR 3/2) sandy loam, dark grayish brown (10YR 4/2) dry; weak medium granular structure: very friable; common fine and medium roots; 2 percent gravel by volume; few fine flakes of mica; very strongly acid: clear wavy boundary. (Combined thickness of the A horizon is 10 to 20 inches.)

Br-14 to 40 inches: dark yellowish brown (10YR 4/6) gravelly sandy loam; weak medium subangular blocky structure; very friable; few fine roots: 33 percent gravel; few fine flakes of mica; very strongly acid; gradual wavy boundary. (12 to 30 inches thick.1

Cl--40 to 46 inches; pale brown (10YR 6/3) gneiss saprolite that is gravelly sandy loam; few medium faint light gray (10YR 7/2) and white (10YR 8/2) mottles; massive rack controlled structure; very friable: 16 percent gravel; few fine flakes of mica; very strongly acid; gradual wavy boundary.

C2--46 to 65 inches: mottled yellowish brown (10YR 5/8), yellowish red (5YR 5/6), white (10YR 8/2) and pale brown

STOP 4 - BURTON SERIES

Classification: coarse-loamy, mixed, frigid Typic Haplumbrepts

Burton soils are moderately deep, coarse-loamy soils in the high mountains (>4,500 feet) that formed in residuum weathered from high-grade metamorphic or igneous rocks, and may be affected in the upper part by soil creep. The Burton series is classified in Typic Haplumbrepts although NSSL data for the pedons sampled for the tour (pedon 7) supports classification in coarse-loamy, oxidic, frigid Andic Haplorthods (using present criteria for a spodic horizon, Spodosols, andic soil properties, and Andic subgroups). NSSL data supports coarse-loamy, oxidic, frigid Andic Haplumbrepts for pedon 8.

Changes in Soil Taxonomy are being developed (oxidic) or have been proposed (Andic and Spodic Amendments) that will allow classification of Burton as a Typic Iiaplumbrept.

NOTES:

*** PRIMARY CHARACTERIZATION DATA
(BUNCOMBE COUNTY, NORTH CAROLINA)

S91NC- 21-007

PRINT DATE 03/23/92

SAMPLED AS : BURTON ; COARSE-LOAYY, MIXED, FRIGID TYPIC HAPLUMSREPT
REVISED TO : ; COARSE-LOAMY, OXIDIC, FRIGID ANDIC HAPLORTHOD

NSSL - PROJECT 92P 13, NCMTN-BUNCOMBE CO.
- PEDON 92P 87, SAMPLES 92P 636- 639
- GENERAL METHODS 1B1A, 2A1, 2B

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
NATIONAL SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA 68508-3866

-1-- -2-- -3-- -4-- -5-- -6-- -7-s -8-- -9-- -10- -11- -12- -13- -14- -15- -16- -17- - l a - -19- -20-

SAMPLE NO.	DEPTH (CM)	HORIZON	(- - -TOTAL CLAY LT .002	SILT .002 -.05	SAND .05 - 2	)(- -CLAY- FIN LT .0002	CO3 LT .002	)(- -SILT- FINE .002 -.02	COARSE .02 -.05	)(- - - -SAND- - - VF .05 -.10	F .10 -.25	M .25 -.50	C .5 -1	VC 1 -2 - -)	(-COARSE FRACTIONS(MM)-) WEIGHT 2 -5	5 -20	20 -75	.1- 75	(>2MM) WT PCT OF WHOLE SOIL
			<- - - - - - - - - - - - PCT OF <2MM (3A1) - - - - - - - - - - - - - ->												<- PCT OF <75MM(3B1)->				
92P 6365	0- 7	Oa	le.6	24.4	65.0	1.8		16.6	7.8	lo.4	22.6	18.5	9.8	3.7	TR	TR	--	55	TR
92P 6375	7- 23	A1	.13.3	25.8	61.7	2.8		17.4	7.6	11.1	19.8	la.4	8.9	3.5	1	1	1	52	3
														5.4	2	1	2	54	5
92P 6385	38- 88	Bw	10.4	28.5	62.2	1.1		18.4	8.9	10.0	28.8	16.8	10.8	6.1	5	3	7V	62	15
													11.2						

ORGN TOTAL EXTR TOTAL (- -DITH-CIT -
P S

PI
4F

*** PRIMARY CHARACTERIZATION DATA ***

S91NC- 21-007 (BUNCOMBE COUNTY, NORTH CAROLINA)

PRINT DATE 03/23/92

SAMPLED AS : BURTON ; COARSE-LOAMY, MIXED, FRIGID TYPIC HAPLUMBREPT

NSSL - PROJECT 92P 13, NCMTN-BUNCOMBE CO.
- PEDON 92P 87, SAMPLES 92P 636- 639
- METHODS 1B1A, 2A1, 2B

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
NATIONAL SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA 68508-3866

SAMPLE	-1-- ACID OXALATE OPT DEN 6C9a	-2-- FE 6X2	-3-- SI 6G12	-4-- AL 6S4	-5-- PHOSPHOUS RET 6S5	-6-- CIT- ACID 6D3	-7-- KCL MN 6A2d	-8-- TOTAL C 4B1c	-9-- (- -WATER CONTENT- -) 0.06 BAR 4B1a	-10- 1- BAR 4B1a	-11- 2- BAR 4B2b	-12- 15 BAR	-13- (---- WATER DISPERSIBLE ----) <--PIPETTE--> CLAY 3A1c	-14- SILT	-15- SAND	-16- <- HYDROMETER -> CLAY	-17- SILT	-18- SAND	-19- MIN SOIL CONT	-20- AGGRT STABL <5mm
							10.2													
							1.0													
					87		0.6													
					79		0.0													

*** SUPPLEMENTARY CHARACTERIZATION DATA ***

S91NC- 21-007 (BUNCOMBE COUNTY, NORTH CAROLINA)

PRINT DATE 03/23/92

SAMPLED AS : BURTON ; COARSE-LOAMY, MIXED, FRIGID TYPIC HAPLUWBREPT
REVISED TO : ; COARSE-LOAMY, OXIDIC, FRIGID ANDIC HAPLORTHOO

NSSL - PROJECT 92P13,
- PEDON 92P 87, SAMPLES 92P 636- 639
- GENERAL METHODS (ENGINEERING FRACTIONS ARE CALCULATED FRO" USDA FRACTION SIZES]

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
NATIONAL SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA 68508-3866

SAMPLE NO.	DEPTH (In.)	HORIZON	ENGINEERING PERCENTAGE PASSING <-----INCHES-----> 3	2	3/2	1	3/4	3/a	<-NUMBER-> 4	10	40	208	PSDA SIEVE <-MICRONS-> 20	5	2	CUMULATIVE CURVE USDA LESS THAN <--- MILLIMETER ---> 1.	.5	.25	.10	.05	FRACTIONS(<75mm) DIAMETERS(mm) AT6050 <--PERCENTILE-->			ATTER-BERG <-PCT> LL	PI	GRADATION UNI-FMTY C "	CUR-VTUR C C
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
92P 636S	0- 3	A1	100	100	100	100	lee	100	lee	100	82	41	27	17	11	96	86	68	45	35	0.18	8.121	0.002			>100	2.4
92P 637S	3- 9	A2	100	100	100	99	99	99	98	97	80	43	30	20	13	94	85	67	48	37	0.18	0.110	0.001			>100	2.8
92P 638S	9- 15		lee	99	99	98	98	98	97	95	76	41	28	la	11	90	80	64	46	36	0.21	8.124	0.002			> 100	1.7
92P 639S	15- 25	Bw	100	98	97	94	93	92	90	85	67	34	23	14	9	80	70	56	3a	29	0.31	0.186	8.002			>100	4.1

(WEIGHT FRACTIONS) (WEIGHT PER UNIT VOLUME G/CC)(VOID)

DEPTH (In.)	---WHOLE SOIL (mm)- >2 -UP	250 -75	250 -2	75 -20	75 -5	20 -2	5 <2		--<75 mm FRACTION-- 75 -2	75 -20	20 -5	5 -2	'2		_-___-"HOLE SOIL------ SOIL SURVEY 1/3 BAR	OVEN -DRY	ENGINEERING MOIST	SATUR -ATED	-------<2 mm FRACTION------- --SOIL SURVEY-- 1/3 BAR	15 BAR	OVEN -DRY	ENGINEERING HOIST	SATUR -ATED	--RATIOS-- AT 1/3 OAR WHOLE SOIL	<2 mm
	<------PCT of WHOLE SOIL-----> 26	27	28	29	30	31	32	33	<--PCT OF <75 mm-> 34	35	36	37	38	39	40	41	42	43	44	45	46	47	4a	49	50
e- 3	TR3	--	—	—	1	--	TR	100	3	--	1	TR	lee		1.45										
3- 9	5	--	_--	53	2	1	21	95 97	5	1	1	21	95 97		0.92 0.92	1.16 1.67	1.38 1.46	1.57 1.57	0.900.88	1.071.00	1.13 1.03	1.44 1.34	1.56 1.55	1.88 1.88	2.81 1.94
9- 15						1				2															
15- 25	15	--	--	15	7	3	5	85	15	7	3	5	85		1.16	1.24	1.58	1.72	1.06	1.12	1.13	1.51	1.66	1.28	1.50

Soil Series: Burton
Soil Survey No.: S91-NC-021-008 (SSL Pedon No.: 92130088)
Classification: coarse-loamy, mixed, frigid Typic Haplumbrept

Location: Buncombe County, NC; 18 miles NE of Asheville on Blue Ridge Parkway, 0.25 miles W of Craggey Garden overlook to shelter, 600' S of shelter along trail.
Iatitude: 35-41-45-N Longitude: 082-22-00-W
MLRA: 130

Physiography: Blue Ridge Mountains
Geomorphic Position: ndge crest
Slope Characteristics: 10% convex
Elevation: 1856 m MSL
Parent Material: residuum from metamorphic material

Precipitation: 162 cm udic moisture regime
Water Table Depth: > 68 cm
Hydraulic Conductivity: high
Drainage Class: well drained
Runoff: moderate
Land Use: forest land not grazed
Stoniness: 2
Erosion: slight
Particle Size Control Section: 25 to 68 cm
Diagnostic Horizons: 0 to 38 cm umbric, 60 cm paralithic contact; 68 cm lithic contact
Described By: John Allison, Milton Martinez, Mark Hudson
Date: 10/91
Notes: Area is not forested; vegetation consists of catawba rhododendron, mountain laurel, blueberry, thornless blackberry(grasses called heath balds); trees in area are stunted due to climate and windswept: non commercial. About 15 m E of Burton S92NC-21-7.

Oe--5 to 0 cm; 92P0640; partially decomposed grass roots.

Al-0 *to* 18 cm, 92130641; very dark brown

*** P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A ***

S91NC- 21-008 PRINT DATE 03/23/92
SAMPLED AS : BURTON ; COARSE-LOAMY, NIXED, FRIGID TYPIC HAPLUHBREPT
NATIONAL SOIL SURVEY LABORATORY ; PEDON 92P 88, SANPLE 92P 640- 643

DEPTH (CM)	-1--	-2--	-3--	-4--	-5--	-6--	-7--	-8--	_g_	-10-	-11-	-12-	-13-	-14-	-15-	-16-	-17-	-18-	-19-	-20-
	(- NH4OAC EXTRACTABLE BASES -)					ACID-	EXTR	(- - - -CEC	- - -)		AL	-BASE SAT-		CDS AS	RES.		CDND.(-	- - -PH - -		-)
	CA	MG	NA	K	SUM	ITY	AL	SUM	NH4-	BASES	SAT	SUM	NH4	CAC03	OHMS		MMHOS	KCL	CACL2	H20
	5B5a	5B5a	5B5a	5B5a	BASES			CATS	OaC	+ AL			OaC	<2MM	/CM		/CM	IN	.01M	
	6N2e	602d	6P2b	6Q2b		6H5a	6G9b	5A3a	5ABb	5A3b	5G1	5C3	5C1	6Elg	BE1		8I	8C1g	8C1f	8C1f
	<- - - - - - - -				-MEQ	, 100 G - - -				- - ->	<- - - -	-PCT	- - - ->						1:2	1:1
5- 0	1.0	0.8	8.2	0.8	3.6	55.4	6.1	59.0	36.9	9.7	63	6	10					3.8	4.0	4.5
0- 18	8.2	0.1	TR	0.1	e.4	39.9	5.8	40.3	26.6	5.4	93	1	2					4.0	4.1	4.5
18- 38	--	0.1	8.1	0.1	0.3	35.3	4.2	35.6	21.7	4.5	93	1	1					4.1	4.2	4.6
38- 60	—	—	0.1	TR	0.1	16.8	1.8	16.9	12.0	1.9	95	1	1					4.3	4.5	4.9

(- - - -SPODIC HORIZON		CRITERIA			- - - - -)	(- - - - -STATE OF DECOMPOSITION- - - - -)		
(- -NA PYROPHOSPHATE		EXTRACTABLE-		-)	INDEX			PH
C	FE	AL	FE		OF			
	1.7	0.9	0.6	0.1				
	1.4	0.2	0.4	0.1				
	0.9	0.2	0.3	0.1				

*** PRIMARY CHARACTERIZATION DATA ***

S91NC- 21-008
SAUPLEO AS : BURTON ; COARSE-LOAMY, MIXED, FRIGID TYPIC HAPLUMBREPT
NATIONAL SOIL SURVEY LABORATORY ; PEDON 92P 88, SAMPLE 92P 640- 643

PRINT DATE 03/23/92

SAMPLE NUMBER	-1--	-2--	-3--	-4--	-5--	-6--	-7--	-8--	-9--	-10-	-11-	-12-	-13-	-14-	-15-	-16-	-17-	-18-	-19-	-20-
	< - CLAY MINERALOGY (<.002mm) - >																			
	FRACTION	< - - - - - X-RAY - - - - - - ->< - - - - THERMAL - - - - ->< - - - - - - - - ELEMENTAL - - - - - - - - ->< - ->																EGME	INTER	
		< - - - - - - 7A2I - - - - - - ->< - 7A6 - ><- DTA -																		
	<- - >< - - - - peak size - - - - - >< - - - -																			
92P 640	TCLY																			
92P 641	TCLY																			
92P 642	TCLY	MI 2	KK 2	VM 1	VR 1				KK34	GI21										
92P 643	TCLY	GI 3	KK 2	VR 1	VM 1	MI 1			KK27	GI32										

*** S U P P L E M E N T A R Y   C H A R A C T E R I Z A T I O N   D A T A ***

S91NC- 21-008
SAMPLED As : BURTON ; COARSE-LGAYY, MIXED, FRIGID TYPIC HAPLUHBREPT
NATIONAL SOIL SURVEY LABORATORY ; PEDON 92P 88, SAMPLE 92P 640- 643

(V O L U M E F R A C T I O N S)(C/)(R A T I O S to C L A Y)(LINEAR EXTENSIBILITY)(W R D)

DEPTH (In.)	WHOLE SOIL >2 (PCT)	WHOLE SOIL 250-UP (PCT)	WHOLE SOIL 250-75 (PCT)	WHOLE SOIL 75-2 (PCT)	WHOLE SOIL 75-20 (PCT)					LINEAR EXTENSIBILITY WHOLE SOIL <-1/3 BAR to 15 BAR (PCT)	LINEAR EXTENSIBILITY WHOLE SOIL <-1/3 BAR to OVEN-DRY (PCT)	LINEAR EXTENSIBILITY <2 mm <-1/3 BAR to 15 BAR (PCT)	LINEAR EXTENSIBILITY <2 mm <-1/3 BAR to OVEN-DRY (PCT)	WRD WHOLE SOIL (In/In)	WRD <2 mm (In/In)
	51	52	53	54	55					70	71	72	73	74	75
	11	3			3										
e - 15	10	--	4	5	3	8	23	22	FSL						
15- 24	11	--	:	9	3	8	17	15	SL						

The C horizon is saprolite that is commonly fine sandy loam, sandy loam. loam, loamy sand. or loamy fine sand in the fine-earth fraction. It is multicolored or similar in color to the Bw and BC horizons.

The R horizon is hard felsic to mafic, igneous or high grade metamorphic bedrock such as granite. gneiss. mica gneiss, hornblende gneiss, high grade metagraywacke, or amphibolite. Some pedons have a thin Cr horizon of soft bedrock above the R horizon.

COMPETING SERIES: These are the Oconaluftee. Tanasee and Uayah series. These soils are all deeper than 60 inches to bedrock. Oconaluftee soils formed from low grade metasedimentary rocks such as

Soil Series: Craggey
Soil Survey No.: S91-NC-021-009 (SSL Pedon No.: 92P0089)
Classification: loamy, mixed, frigid Lithic Haplumbrept

Location: Buncombe County, NC; 18.5 miles NE of Asheville on Blue Ridge Parkway, 0.25 miles W of overlook on Craggey Pinnacle Trail, 50' W of trail in grassy area.
Latitude: 35-14-42-N Longitude: 082-2240-W
MLRA: 130

Physiography: Blue Ridge Mountains
Geomorphic Position: on crest of spur ridge running NNW from Craggy Pinnacle
Slope Characteristics: 18% convex
Elevation: 1918 m MSL
Parent Material: residuum from metamorphic material

Precipitation: 162 cm udic moisture regime
Water Table Depth: >35 cm
Hydraulic Conductivity: high
Drainage Class: somewhat excessively drained
Runoff: rapid
Land Use: forest land not grazed
Stoniness: 2
Erosion: slight
Particle Size Control Section: 0 to 32 cm
Diagnostic Horizons: 0 to 32 cm umbric, 32 cm lithic contact
Described By: Milton Martinez, Mark Hudson
Date: 10/91
Notes: Vegetation: catawba rhododendron, mountain laurel, blueberry grass. About 10 m SSW of Craggy S91NC-21-10.

Oe--3 to 0 cm; 92P0644; partially decomposed OM, abundant grass, roots, and charcoal.

Al--O to 17 cm, 92P0645; very dark brown (10YR 2/2) loam; weak fine granular structure; very friable, slightly sticky, non plastic; many very fine roots throughout, and few medium roots throughout; few very fine and fine interstitial pores; common very fine and fine plate like mica flakes; extremely acid (pH 4.5); clear smooth boundary.

A2--17 to 32 cm, 92P0646; very dark grayish brown (10YR 3/2) sandy loam; weak medium granular structure; very friable, non sticky, non plastic; few very fine and fine roots between peds; few very fine and fine interstitial pores; 2-3 spots of decomposed rock fragments; common very tine and fine plate like mica flakes; very strongly acid (pH 5.0); clear wavy boundary.

R--32 cm.

1.4
2.0

*** PRIMARY CHARACTERIZATION DATA ***

S91NC- 21-009 PRINT DATE 03/23/92

SAMPLED AS : CRAGGY ; LOAMY. MIXED, FRIGID LITHIC NAPLUMBREPT

NATIONAL SOIL SURVEY LABORATORY ; PEDON 92P 89, SAMPLE 92P 644- 646

CLAY MINERALOGY (<.002mm): FRACTION; X-RAY (7A2i, peak size); THERMAL (DTA ,A6 / TGA 7A4b, Percent); ELEMENTAL (SiO2 AL2O3 Fe2O3 MgO CaO K2O Na2O, 7C3, Percent); EGME RETN 7O2 (mg/g); INTERPRETATION

SAMPLE NUMBER	-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-	-9-	-10-	-11-	-12-	-13-	-14-	-15-	-16-	-17-	-18-	-19-	-20-
92P 644	TCLY																		55	
92P 645																				
92P 646	TCLY TCLY	KK 1	VR 1						KK31	GI21		6.5	5.1						27 19	CMIX

SAND - SILT MINERALOGY (2.0-0.002mm): FRACTION; X-RAY (7A2i, Peak Size); THERMAL (DTA 7A3B / TGA 7A4B, Percent); OPTICAL GRAIN COUNT (TOT RE, 7B1A, Percent); INTERPRETATION

SAMPLE NUMBER	-1-	...	-10-	-11-	-12-	-13-	-14-	-15-	-16-	...	-20-
92P 646	FS		11	Bt76	MS 9	QZ 9	PR 2	OT 2	OP 1		MICA
92P 646	FS			GN 1							

FRACTION INTERPRETATION:

TCLY Total Clay, <0.002mm FS Fine Sand, 0.1-0.25mm

MINERAL INTERPRETATION:

KK kaolinite VR vermiculite Bt biotite MS muscovite QZ quartz PR pyroxene
OT other OP opaques GN garnet

RELATIVE PEAK SIZE: 5 very Large 4 Large 3 Medium 2 Small 1 Very Small 6 No Peaks

INTERPRETATION (BY HORIZON):
MICA = MICACEOUS; CMIX = MIXED CLAYS

PEDON MINERALOGY
BASED ON SAND/SILT: MICACEOUS?
BASED ON CLAY: MIXED
FAMILY YINERALOGY: OXIDIC
COMMENTS: MICACEOUS DEPENDS ON MICA IN OTHER FRACTIONS

81

85

*** **SUPPLEMENTARY** CHARACTERIZATION **D**ATA **

S91NC- 21-009 PRINT DATE **03/23/92**
SAMPLED AS : CRAGGY ; LOAMY, **MIXED,** FRIGID **LITHIC HAPLUMBREPT**
NATIONAL SOIL SURVEY LABORATORY ; PEDON 92P 89, SAMPLE 92P **644-** 646

(V O L U M E F R A C T I O N S)(C/)(R A T I O S to C L A Y)(LINEAR EXTENSIBILITY)(WR 0)
---W H O L E S O I L (mm) a t 1/3 B A R---(/N) ----------C E C---ACT15 -------- WHOLE SOIL --<2 mm-- WHOLE <2
>2 250 250 75 75 20 5 2- .05- LT PORES RAT FINE SUM NH4- BAR 1:: <-1/3 BAR to (PCT)---> SOIL mm
-UP -75 -2 -20 -5 -2 <2 .05 .002 .002 D F -10 CLAY 15 OVEN 15 OVEN
<---------------PCT of WHOLE SOIL----------------> CATS OaC H20 BAR BAR -DRY BAR -DRY <--In/In->

DEPTH (In.)	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
0-7- 13 7	21	__	__	21	--_	TR 1	11	98 99	25 17	6 5	3	38 17	36 50	19 17	8.14	la.64 3.78	14.50 5.58	6.93 1.86	0.6103.786	4.6 4.4	7.1 5.1	4.6 4.6	7.2 5.3	0.21 0.43	0.21 0.43

(W E I G H T F R A C T I O N S - C L A Y **FREE**)(-TEXTURE--)(--P S 0 A(mm)---)(PH)(-ELECTRICAL)(CUMULT. AMOUNTS)
(--W H O L E S O I L--)(--<2 mm F R A C T I O N ----)(DETERMINED)(SAND SILT CLAY) C A RES RES-ON- SALT SALT Inch of H20
>2 75 20 2- .05- LT ------SANDS------- SILTS CL IN BY 2- .05- LT CL2 IST. DUCT. MG/ 1/3 BAR to
-2 -2 .05 .002 .002 VC C N F VF C F AY FIELD PSDA .05 .002 .002 .01M OHMS MMHOS K G 15BR AIRDRY
P C T of >2mm+SAND+SILT > <-------PCT of SAND+SILT-------><---<2 mm--><---PCT of 2mm---><--------- <2 mm -------><WholeSoil>

DEPTH (In.)	76	77	78	79	80	81	a2	83	a4	85	a6	a7	88	a9	90	91	92	93	94	95	96	97	98	99	100
1- 0																									
o- 7	2	2	2	73	24	13	9	15	19	20	12	9	16	1.3	L	SL	66..1	22..1	11.8	4.2					
7- 13	6	6	6	77	16	1	10	18	20	23	ii	7	10	1	SL	LCOS	81.3	17.3	1.4	4.4					

83

CRITERIA FOR **MOLLIC** SUBGROUPS: CONTROL SECTION CENTIMETERS SAND TO CLAY RATIO ORGANIC CARBON PERCENT

87

PRIMARY CHARACTERIZATION DATA ***

S91NC- 21-010 (BUNCOMBE COUNTY, NORTH CAROLINA)

PRINT DATE 03/23/92

SAMPLED AS : CRAGGY ;LOAMY,MIXED,FRIGIDLITHIC HAPLUWBREPT
REVISED TO : ; COARSE-LOAMY, MIXED, FRIGID ANDIC HAPLORTHOD

NSSL - PROJECT 92P 19, NCMTN-BUNCOWBE CO.
- PEDON 92P 90, SANPLES 92P 647-650
- GENERAL METHODS 1B1A,2A1,2B

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
NATIONAL SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA :8508-3866

SAMPLE NO.	DEPTH (CM)	HORIZON	-1- CLAY LT .002	-2- SILT .002 -.05	-3- SAND .05 -2	-4- CLAY FINE LT .0002	-5- CO3 LT .002	-6- SILT FINE .002 -.02	-7- SILT COARSE .02 -.05	-8- SAND VF .05 -.10	-9- SAND F .10 -.25	-10- SAND M .25 -.50	-11- SAND C .5 -1	-12- SAND VC 1 -2	-13- COARSE FRACTIONS WEIGHT 2 -5	-14- 5 -20	-15- 20 -75	-16- .1- 75 PCT	-17- (>2MM) WT PCT OF WHOLE SOIL
92P 647H	8- B	Oe												1	—		—		
92P 648S	0- B	A1	10.5	19.6	69.9	2.3	12.9	6.7		12.6	19.9	19.0	13.0	1 5.4	12V	TR		69	2:
92P 6495	8- 28	A2	7.4	17.7	74.9	0.3		11.1	6.6	10.5	17.9	19.9	19.4	7.2		TR	BV	69	21
92P 650S	28- 38	CR	--	9.2	90.8	__		4.1	5.1	11.1	25.1	24.5	20.1	10.0	14		8	a7	95

<PCT OF <2MM (3A1)> <PCT OF <75MM(3B1)>

ORGN C | TOTAL N | EXTR P | TOTAL S | (- -DITH-CIT--) EXTRACTABLE | (RATIO/CLAY) 15 - | (ATTERBERG) PI 4F | (- BULK DENSITY -) | COLE | (- --WATER CONTENT--) 1/10 1/3 | WRD

	0.7
1.5	0.6
1.0	
0.6	

697

*** PRIMARY CHARACTER12 AT I ON DATA ***

S91NC- 21-010 (BUNCOMBE COUNTY, NORTH CAROLINA)

PRINT DATE 03/23/92

SAMPLED AS : CRAGGY ; LOAMY, MIXED, FRIGID LITHIC HAPLUYBREPT

NSSL - PROJECT 92p 13, NCMTN-BUNCOMBE CO.
- PEDON 92P 90, SAMPLES 92P 647-650
- GENERAL METHODS 1B1A,2A1, 2B

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
NATIONAL SOIL SURVEY LABORATORY
LINCOLN, NEBRASKA 68508-3866

SAMPLE NO.	HZ	-1--	-2--	-3--	-4--	-5--	-6--	-7--	-8--	-9--	-10-	-11-	-12-	-13-	-14-	-15-	-16-	-17-	-18-	-19-	-20-
		ACID OXALATE OPT DEN BJ	EXTRACTION FE 6C9a	SI 6V2	AL 6G12	PHOSPHOUS RET	CIT- ACID	K C L MN	TOTAL C	(- -WATER CONTENT- -) 0.06 BAR	1-1- BAR	2- BAR	15 BAR	(- - -- WATER DISPERSIBLE ----) <-- PIPETTE --> CLAY	SILT	SAND	<- HYDROMETER -> CLAY	SILT	SAND	NIN SOIL CONT	AGGRT STABL <5mm
												45.6									
												28.0									
												19.7									
												6.2									

*** S U P P L E M E N T A R Y   C H A R A C T E R I Z A T I O N   D A T A ***

S91NC- 21-010 (BUNCOMBE COUNTY, NORTH CAROLINA)

PRINT DATE 03/23/92

SAMPLED AS : CRAGGY ; LOAMY, NIXED, FRIGID LITHIC HAPLUNSREPT
REVISED TO : ; COARSE-LOAMY, NIXED, FRIGID ANDIC HAPLORTHOD

NSSL - PROJECT 92P 13,
- PEOON 92P 90, SAMPLES 92P 647-650
- GENERAL METHODS (ENGINEERING FRACTIONS ARE CALCULATED FROM USDA FRACTION SIZES)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
NATIONAL SOIL SURVEY LABORATORY
LINCOLN. NEBRASKA 68508-3866

			E N G I N E E R I N G P S D A										CUMULATIVE CURVE FRACTIONS(<75mm)				ATTER-	GRADATION
			P E R C E N T A G E P A S S I N G S I E V E										USDA LESS THAN				BERG	UNI- CUR-
SAMPLE	DEPTH	HORIZON	a	2	3/2	1	3/4	3/8	4	Ie	40	200	20	5	2	1.	.5	

LOCATION CRAGGEY NC

Established Series
Rev. HJ8:DLN:AG
12/91

CRAGGEY SERIES

The Craggey series consists of somewhat excessively drained. shallow. loamy soils on ridges and side slopes at high elevations in the Southern Appalachian Mountains. They formed in residuum that is affected by soil creep and is weathered from felsic to mafic igneous and high grade metamorphic rocks such as granite. mica gneiss, mica schist. hornblende gneiss. gneiss. amphibolite. and high grade metagraywacke. Near the type location, mean annual precipitation is 52 inches and mean annual air temperature Is 45 degrees F. Slopes range from 8 to 95 percent.

TAXONOMIC CLASS: Loamy, mixed. frigid Lithic Haplumbrepts

TYPICAL PEDON: Craggey loam on a 70 percent side slope--forested. (Colors are for moist soil unless otherwise stated.)

A--0 to 12 inches; black (5YR 2/1)

BUNCOMBE COUNTY, NORTH CAROLINA
(PROJECT CP92-NC019) ANDIC = 1+2+3 (SG = 1+2)
1. Al+.5Fe >= 2.0% (SG >=

st	series	lab_id	lab_class	pm	ox_si
WA	Newbell	84P 176	Frigid Andic Xerochrepts	volcanic ash	.24 .58 .70
WA	Newbell	84P 177	Frigid Andic Xerochrepts	volcanic ash	.47 .77 .78
WA	Ramparter	87P 759	Thermic Typic Vitrandepts	volcanic ash or igneous residuum	.11 .45 .97 1.29
WA	Raught	84P 919	Mesic Andic Haploxerults	Not given	.46
WA	Raught Tuff	84P 910	Mesic Ultic Haploxeralfs	Not given	.28 .30 .38 .40
WA	Resner	84P 169	nixed Entic Cryandepts	eolian over glacial till	.60 1.16 1.32 .98
WA	Satus	87P 62	Frigid Andic Haploxeralfs	volcanic ash	.34 .45
WA	Wedge	87P 755	Cindery Typic Cryorthods	volcanic ash	.03 .43 1.02 1.83 1.33

Summary of oxalate silica data by state:

North Carolina: Average high value is .085%

Oregon: Average high value is .624%

Washington: Average high value is .633X

Data Definitions:

st = State
series = Series Name
lab_id = NSSL Lab ID#
lab_class = Assigned NSSL Lab Classification
pm = Parent Material
ox_si = Measured Oxalate Silica Values (%) by NSSL
ox_si_h = Higest Measured Oxalate Silica Value (%) by NSSL
glass = Whether any layer had at least 5 percent volcanic glass (Y = Yes & N = No).

ICOMOD CIRCULAR 10

MARCH 25, 1991

TENTATIVE DEFINITION
SPODIC MATERIAL MORPHOLOGY

Spodic materials are in an illuvial

CAE. Other Aquods that have a cemented layer. whii does not slake in water after drying, in 90 percent or more Of each pedon with its upper boundary within 100 cm of the mineral soil surface.
Duraquods

CAF. Other Aquods ma have endosaturation.
Endoaquods

CAG. Other Aquods.
Epiaquods

Alaquods

Key tc subgroups

CABA. Alaquods that have a lithic contact within 50 cm of the mineral soil surface.
Lithic Alaquods

CABB. Other Alaquods that *have a* cemented layer. which does not slake in water after drying, in 90 percent or more of each pedon with its upper boundary within 100 cm cf the mineral soil surface.
Duric Alaquods

CABC. Other Alaquods that have a histic epipedo".
Histic Alaquods

CABD. Other Alaquods that:

1. Have an argillic or kandic horizon underlying the spodic materials and have base saturation cf 35 percent or more (by sum cf cations) in some part of the argillic a, kandic horizon: and

2 Have a layer starting at the mineral soil surface that has a sandy particle-size class throughout and extends to at least the upper boundary of the spodic materials, and the upper boundary of the spodic materials is between 75 and 125 cm below the soil surface.
Arenic Ultic Alaquods

CABF. Other Alaquods that have a layer starting at the mineral soil surface that has a sandy particle-size class throughout and extends to at least the upper boundary of the spodic materials, and the upper boundary of the spodic materials is between 75 and 125 cm below the soil surface.

CABK. Other Alaquods.

Cryaquods

CACD. Other Fragiaquods.

Typic Fragiaquods

Placaquods

Key to subgroups

CADA. Placaquods that have andic soil properties throughout horizons which have a cumulative thickness of 25 cm or more within 75 cm Of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties. *whichever is* shallower.

Andic Placaquods

CADB. Other Placaquods.

Typic Placaquods

Cryods

KEY TO GREAT GROUPS

CBA. Cryods that have a placic horizon within 100 cm of the soil surface in 50 percent or more of each pedon.

Placocryods

CBB. Other Cryods that have the upper boundary of a cemented layer, which does not slake in water after drying, that is present in 90 percent or more of each pedon, within 100 cm of the mineral soil surface

[redacted]

CBC. Other Cryods that have 6 percent or more organic carbon throughout a layer 10 cm or more thick within the spodic materials.

Humicryods

CBD. Other Cryods.

Haplocryods

Duricryods

Key to subgroups

CBBA. Duricryods that have andic soil properties throughout horizons which have a cumulative thickness of 25 cm or more within 75 cm of the mineral soil surface or upper boundary of an organic layer that meets andic soil properties, whichever is shallower.

Andic Duricryods

CBBB. Other Duricryods that have 6 percent or more organic carbon in a layer 10 cm or more thick within the spodic materials.

Humic Duricryods

CBBC. Other Duricryods.

Typic Duricryods

Haplocryods

Key to subgroups

CBDA. Haplocryods that have a lithic contact within 50 cm of the mineral soil surface.

Lithic Haplocryods

CBDB. Other Haplocryods mat have a mean annual soil temperature of 0°C or less.

Pergelic Haplocryods

CBDC. Other Haplocryods that have andic soil properties throughout horizons which have a cumulative thickness of 25 cm or more within 75 cm of the mineral soil surface or upper boundary of an organic lay-a, that meets andic soil properties, whichever

Humicryods

Key to subgroups

CBCD. Other Humicryods.

Orthods

KM TO GREAT GROUPS

CDA. Orthods that have a placic horizon within 100 cm of the soil surface in 50 percent or more of each pedon.

Placorthods

CDB. Other Orthods mat have a cemented layer, which does not slake in water after drying, in 90 percent or more of each pedon with its upper boundary within 100 cm of me mineral soil surface.

Durorthods

CDC. Other Orthods that have a fragipan.

Fragiorthods

CDD. Other Orthods that have an OWE of *0.25* or more *and* Fe_o of less than 0.10 throughout me spodic materials.

Alorthods

CDE. Other Orthods.

Haplorthods

Alorthods

Key to subgroups

CDDA. Alorthods that:

1. Have a layer starting at the mineral soil surface mat has a sandy particle-size class throughout and extends to at least me upper boundary of the spodic materials, and ma upper boundary of the spodic materials is between 75 and 125 cm below the soil surface; *and*

2. Have an argillic or kandic horizon below the spodic materials.

Arenic Ultic Alorthods

CDDB. Other Alorthods that have a layer starting at the mineral soil surface that has a sandy particle-size class throughout and extends to at least the upper boundary of the spodic materials, and the upper boundary of the spodic materials is between 75 and 125 cm below the soil surface.

Arenic Alorthods

CDDC. Other Alorthods that:

1. Have a layer starting at the mineral soil surface that has a sandy particle-size class throughout and extends to at least the upper boundary of the spodic materials, and the upper boundary of the spodic materials is more than 125 cm below the soil surface; *and*

2. Have both:

a. A weighted average of less than 0.6 percent organic carbon in the matrix of the upper 30 cm of the Spodic materials or throughout the spodic materials if less than 30 cm thick; *and*

b. Less than 3 percent organic carbon in the upper 2 cm of the spodic materials in 10 percent or more of each pedon.

Grossarenic Entic Alorthods

CDDD. Other Alorthods that have both:

a. A weighted average of less than 0.6 percent organic carbon in the matrix of the upper 30 cm of the Spodic materials or throughout the spodic materials if less than 30 cm thick; *and*

b. Less than 3 percent organic carbon in the upper 2 cm of the spodic materials in 10 percent or more of each pedon.

Entic Alorthods

CDDE. Other Alorthods that have a layer starting at the mineral soil surface that has a sandy particle-size class throughout and extends to at least the upper boundary of the spodic materials, and the upper boundary of the spodic materials is more than 125 cm below the soil surface.

Grossarenic Alorthods

CDDF. Other Alorthods mat have a surface horizon more than 30 cm thick mat meets all requirements of a plaggen epipedon except thickness.

Plaggeptic Alorthods

CDDG. Other Alorthods ma, have an argillic or kandic horizon underlying me spodic materials and have base saturation of 35 percent or more (by sum of cations) in some part of me argillic or kandic horizon.

Alfic Alorthods

2. Have a lithic contact within 50 cm of the mineral soil surface.

Entic Lithic Haplorthods

CDEB. Other Haplorthods mat have a lithic contact within 50 cm of the mineral soil surface.

Lithic Haplorthods

CDEC. Other Haplorthods that have andic soil properties throughout horizons which have a cumulative thickness of 25 a or more within 75 cm of the mineral soil surface or upper boundary of a" organic layer that meets andic soil properties, whichever is shallower.

Andic Haplorthods

CDED. Other Haplorthods that have a horizon 15 cm or more thick below the spodic materials end within 100 cm of the soil surface that has a brittle matrix when wet

Aqualfic Haplorthods

Suborders
- Aquods
- Cryods
- Humods
- Orthods

Great Groups
- Cryaquods
- Alaquods
- Fragiaquods
- Placaquods
- Duraquods
- Endoaquods
- Epiaquods

Alaquods
- Lithic Alaquods
- Histic Alaquods
- Alfic Arenic Alaquods
- Arenic Ultic Alaquods
- Arenic Alaquods
- Grossarenic Alaquods
- Alfic Alaquods
- Ultic Alaquods
- Aeric Alaquods
- Typic Alaquods

Cryaquods
- Lithic Cryaquods
- Pergelic Cryaquods
- Andic Cryaquods
- Typic Cryaquods

Duraquods
- Histic Duraquods
- Andic Duraquods
- Aeric Duraquods
- Typic Duraquods

Endoaquods
- Histic Endoaquods
- Andic Endoaquods
- Aeric Endoaquods
- Typic Endoaquods

Epiaquods
- Lithic Epiaquods
- Histic Epiaquods
- Andic Epiaquods
- Alfic Epiaquods
- Ultic Epiaquods
- Aeric Epiaquods
- Typic Epiaquods

Fragiaquods
- Histic Fragiaquods
- Plaggeptic Fragiaquods
- Alfic Fragiaquods
- Typic Fragiaquods

Placaquods
- Andic Placaquods
- Typic Placaquods

Cryods
- Placocryods
- Duricryods
- Humicryods
- Haplocryods

Duricryods
- Andic Duricryods
- Humic Duricryods
- Typic Duricryods

Haplocryods
- Lithic Haplocryods
- Pergelic Haplocryods
- Andic Haplocryods
- Typic Haplocryods

Humicryods
- Lithic Humicryods
- Pergelic Humicryods
- Andic Humicryods
- Typic Humicryods

Placocryods
- Andic Placocryods
- Humic Placocryods
- Typic Placocryods

Humods
- Placohumods
- Durihumods
- Fragihumods
- Haplohumods

Durihumods
- Andic Durihumods
- Typic Durihumods

Fragihumcds
- Typic Fragihumods

Haplohumods
- Lithic Haplohumods

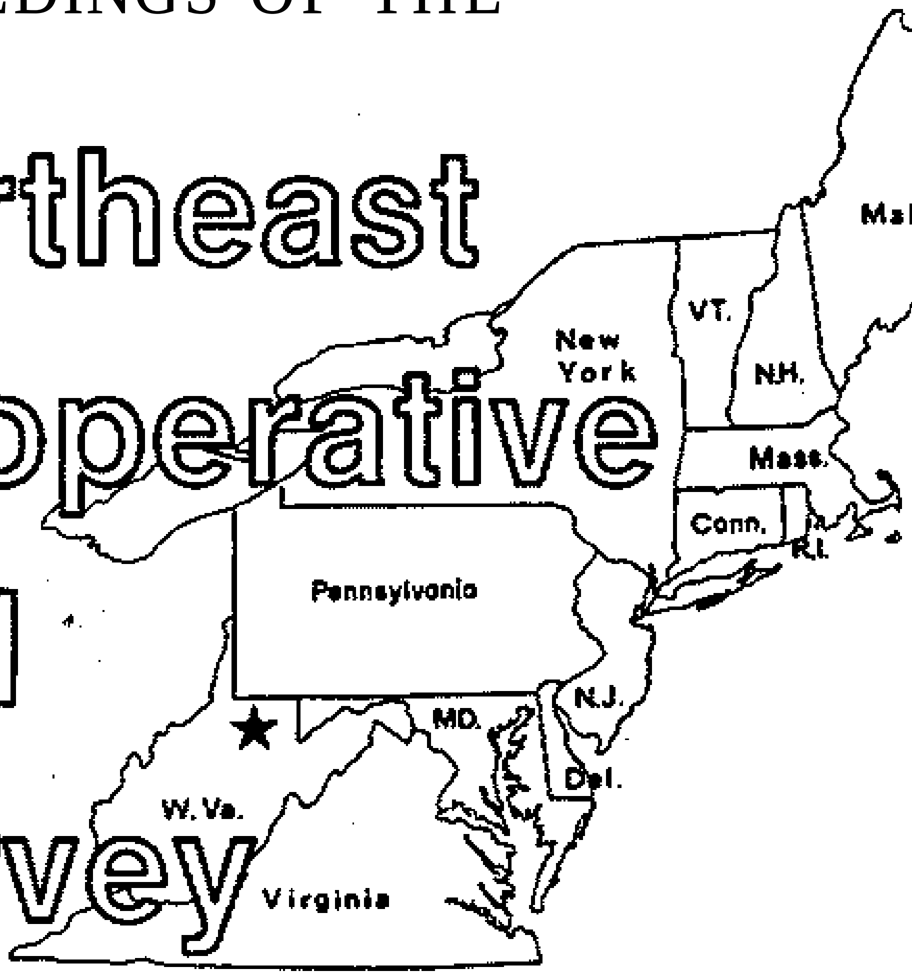
NATIONAL COOPERATIVE SOIL SURVEY

Northeast Regional Conference Proceedings

Morgantown, West Virginia
June 3-8, 1990

PROCEEDINGS OF THE

Northeast Cooperative Soil Survey Conference



West Virginia University
Morgantown, West Virginia

June 3-8, 1990

Proceedings of the

1990 **NORTHEAST COOPERATIVE SOIL SURVEY CONFERENCE**

held June 3-8, 1990 at

West Virginia University
Morgantown, West Virginia

Ass&led by:

John C. **Sencindiver**
Division of Plant and Soil Sciences
West Virginia University
P.O. Box 6108
Morgantown, WV 26506-6108

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Experiment Station - Peter L. M. Veneman

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6. New Hampshire

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7. New Jersey

SCS - Ronnie L. Taylor

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Experiment Station - Ray R. Bryant

9 Pennsylvania

Experiment Station - R.L. Cunningham

SCS - Garland H. Lipscomb

10. Rhode Island

Experiment Station - William R. Wright

11. Vermont

Experiment Station - William Jokela

SCS - David G. VanHouten

12. Virginia

Experiment Station - James C. Baker

SCS - Dean D. Rector

13. West Virginia

Experiment Station - John C. Sencindiver

D. Committee Reports

1. Drainage Class, No- R. Kalloch - Chair.
2. Soil-Water Contamination, Peter L. M. Veneman - Chair.
3. Geographic Information Systems, William Wright - Chair.
4. Should Soil Survey Be Involved In Describing The Earthy Material Between Soil And Bedrock? Steve Hundley - Chair.

A. CONFERENCE AGENDA

AGENDA
NORTHEAST COOPERATIVE SOIL SURVEY CONFERENCE
Morgantown, West Virginia
June 3-8, 1990

Sunday - June 3

5:00 - 7:00 pm Registration - Main Lobby, Towers Dormitory.

5:00 - 7:30 pm Social - Eagles Nest, Towers Dormitory.

Monday - June 4; Room 1001, Agricultural Sciences Building (AS)

Morning Moderator - John Sencindiver

8:00 - 8:15 am Opening Remarks - John Sencindiver, Vice Chairman

8:15 - 8:30 am Welcome to West Virginia - Rollin Swank - SCS, West Virginia State Conservationist

8:30 - 8:45 am Welcome to WVU - Robert Maxwell - Dean, WVU College of Agriculture & Forestry

8:45 -

3:30 - 5:00 pm Committee Meetings:
1. Drainage Classes - Room 1001 AS
2. Soil-Water Contamination - Room 1011 AS
3. Geographic Information Systems - Room G101 AS

5:00 - 7:30 pm Social - Eagle's Nest

8:00 - 9:30 pm NEC-50 Meeting - Room 1011 AS

Tuesday - June 5; Room 1001 AS

7:00 - 8:45 am Breakfast Breakout. Towers Cafeteria - NEC-50/SCS

8:45 - 9:00 am BREAK

Morning Moderator - Bill Wright

9:00 - 9:20 am Rhode Island Report

9:20 - 9:40 am New Hampshire Report

9:40 - 10:00 am Delaware Report

10:00 - 10:30 am COFFEE BREAK

10:30 - 10:50 am Mined Land Reclamation in West Virginia - Jeff Skousen - Assistant Professor and Extension Specialist, Land Reclamation

10:50 - 11:10 am Soils Field Procedures - Bob Grossman

11:10 - 11:30 am World Soil Resources - Ben Smallwood

11:30 - 12:00 am NASA's Role in Monitoring Changes in the Environment - Elissa Levine

12:00 - 1:30 pm LUNCH

1:30 - 3:00 pm Committee Meetings:
4. Earthy Materials Between Base of the Soil and Bedrock - Room 1001 AS
5. Including Private and Public Sector Soil Scientists in NCSS - Room G101 AS
6. How to Attract Students into Soil Survey - Room 1007 AS

3:00 - 3:30 pm COFFEE BREAK

Afternoon Moderator - Alex Topalanchik

3:30 - 3:50 pm Maine Report

3:50 - 4:10 pm Massachusetts Report

4:10 - 4:30 pm Using GRASS and SEEPAGE to Reference and Display Site Potentials for Groundwater Pollution - Steve Carpenter

4:30 - 5:00 pm Field Trip Information - John Sencindiver 6 Robert Behling

Wednesday - June 6

7:30 am - 5:30 pm Field Trip - Meet at Towers Dormitory

6:30 - 8:30 pm Barbecue at Cooper's Rock State Forest

Thursday - June 7; Room 1001 AS

Morning Moderator - Fred Gilbert

8:00 - 10:15 am Wetland Panel Discussion

Robert Franzen - USDA, SCS
Thomas Pluto - U.S. Army, Corps of Engineers
Ralph Tiner - U.S. Fish and Wildlife Service

10:15 - 10:45 am COFFEE BREAK

10:45 - 11:05 am Connecticut Report

11:05 - 11:25 am New Jersey Report

11:25 - 11:45 am New York Report

11:45 - 12:00 pm Northeast SCS Activities - Art Holland

12:00 - 1:30 pm LUNCH

Afternoon Moderator - Dale Childs

1:30 - 1:50 pm Pennsylvania Report

1:50 - 2:10 pm Vermont Report

2:10 - 2:30 pm Virginia Report

2:30 - 2:50 pm Maryland Report

2:50 - 3:10 pm West Virginia Report

3:10 - 3:30

3:45 - 5:00 pm Committee Meetings:

1. Drainage Classes-Room 1001 AS
2. Soil-Water Contamination - Room 1011 AS
3. Geographic Information Systems - Room 1007 AS
4. Earthy Material between Soil and Bedrock - Room 1147 AS
5. Including Private and Public Sector Soil Scientists into NCSS - Room G101 AS
6. How to Attract Students into Soil Survey - Room 2055 AS

5:00 - 7:30 pm Social - Eagle's Nest

Friday - June 8; Room 1001 AS

Morning Moderator - Ron Taylor

8:00 - 8:15 am NEC-50 Report - John Sencindiver

8:15 - 8:30 am NESCS Report - Karl Langlois

8:30 - 9:00 am NE Soil Temperature and Moisture Regimes - Ed Ciolkosz

9:00 - 9:15 am Committee 1 Report

9:15 - 9:30 am Committee 2 Report

9:30 - 9:45 am Committee 3 Report

9:45 - 10:15 am COFFEE BREAK

10:15 - 10:30 am Committee 4 Report

10:30 - 10:45 am Committee 5 Report

10:45 - 11:00 am Committee 6 Report

11:00 - 12:00 am Business Meeting

B, GENERAL PRESENTATIONS

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 Northeast. In the next few minutes I am going to talk about staffing changes, the Northeast Cooperative Soil Survey program activities, and program emphasis.

The Soil Interpretations Staff in the Northeast assists the National Soil Interpretations Staff with the development of new interpretations and is responsible for the development of regional interpretations.

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

The staff reviews and evaluates the adequacy of soils information in various reports and studies, such as soil potentials, water quality, and watershed plans. The staff coordinates soils data with other disciplines such as agronomy, biology, and forestry. It also maintains a liaison with regional National Cooperative Soil Survey cooperators.

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

Activities and Program Emphasis in the Northeast

With the many changes of personnel we have experienced in the NTC and state offices, and the excellent caliber of the soil survey program in the Universities of the Northeast, I anticipate a strong and exciting program for many years to come.

The Food Security Act (FSA) has made an impact on soil survey activities in the Northeast. In the past two years it has been the most time consuming activity of the soil survey program. State Soil Scientists have done an excellent job managing their programs to make sure the job was completed. Soil scientists in the field have performed outstanding work to help complete the mapping of all cropland in the Northeast. In addition to completing the mapping in the Northeast, soil scientists in several states were detailed to other regions to help complete their FSA mapping.

During the 1988 conference, I stated that there has been a tremendous opportunity for soil scientists in SCS to advance with promotions. During the past two years there continued to be advancement as is reflected in the many changes in state office personnel in the Northeast. This is great. I do have a concern though, 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. To help address this issue we have set up a committee for this conference entitled "How to Attract Students into Soil Survey." I am sure many good ideas will come from this committee. I also 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.

Water quality continues to be an important issue in the country and especially in the Northeast, Soils data is 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 date for completeness of information. There are many water quality questions that need complex answers. Water quality poses a challenge to all soil scientists for years to come.

This past year SCS placed renewed emphasis on revising and updating the Field Office Technical Guide. This important document is the basic source of information for all field office technical assistance. SCS soil scientists need to spend time in the next few months to check and update all Field Office Technical Guides. The majority of the updating for Section II should be done in the State Soil Survey Database and transferred to the Field Office through CAMPS.

Soil scientists at the NTC, are spending more time working with other disciplines. We are trying to more fully integrate soil survey into as many disciplines as we can. Also we are trying to transfer as much technology as we can between Universities and SCS offices.

I have attended many meetings at the national and regional level during the past two years. It seems to me that there has been constant emphasis for more and accurate soils data. We see this in the need of information for water quality, Field Office Technical Guide, urban interpretations, and eventually global warming. The huge amount of data we have in soil survey requires constant checking and updating. The importance of a Soils Data Manager in each state, to keep data accurate and current, cannot be overemphasized.

Emphasis will continue on the distribution, training, and use of the State Soil Survey Database (SSSD), the Computer Assisted Planing and Management System (CAMPS), and the Field Soil Survey Information System (FSSIS). It is important that these programs are utilized to the fullest so we can continue to expand our database.

During the past two Regional Conferences I stated that we need to have a computer on the desk of every soil scientist in the region. Have we done that yet?

There has been increasing activity on the use of Geographic Information Systems (GIS) by SCS and Universities in the Northeast. SCS is using GRASS and in the past two years there have been important developments in GRASS that has made it a very useful GIS. Some of these developments include LTPlus, a digitizing package: MAPGEN, used for plotter printing: and the ability to easily import data. Darlene Monds is the GIS specialist for the NTC. She is responsible for keeping up to date with the latest developments in GIS, keeping states informed of these GIS developments, and training SCS personnel in the states. In the near future we will place more emphasis on developing innovative ways to use GIS in the Northeast.

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 you had to place on the FSA has prevented you from seriously pursuing GPR. I encourage you to take another look at GPR and how it can help with the collection of data and map unit design. 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 used for interpretations.

Perhaps one of the most important items we need to place program emphasis on is training of soil scientists. Changes continue to take place that affect all soil scientists. As we finish the mapping phase of soil survey in the Northeast, soil scientists will spend more time on the use of soil surveys. Soil interpretations will be their number one workload. Computers are playing a big role in the daily activities of soil scientists. We must be sure they are fully-trained to meet these challenges. We must identify all training needs of soil scientists and make sure they receive the best training we can provide.

1988 Northeast Cooperative Soil Survey Conference

In 1988 we had an excellent conference in Orono, Maine. During that conference we had 3 committees and 2 task forces. I want to briefly review some of the actions taken on recommendations made in these reports.

Committee 1 - The Impact of the Food Security Act on the Soil Survey Program in the Northeast. The purpose of this committee was to provide a forum to discuss FSA and the implications to the soil survey program. No further action was recommended. Committee 1 was discontinued.

Committee 2 - Soil-Water Contamination. The committee had several recommendations relating to the rating criteria for interpretations. The National Soil Interpretations Staff is currently assessing all rating criteria to determine what data elements are needed to produce the best possible ratings. The recommendations from the committee will be considered during that assessment. The committee was continued and is Committee 2, Soil-Water Contamination, at this year's conference.

Committee 3 - T Factor. One of the recommendations was that a computer program be developed that would locate inconsistencies. Currently a computer program is being developed and tested that will generate the T Factor from physical soil properties. Not all properties recommended by the committee are used because some of them are not in a database, such as soil structure. Committee 3 was discontinued.

Task Force 1. Soil of the Northeastern States. This task force was set up to discuss whether Bulletin 848, of the Pennsylvania Agricultural Experiment Station, Soils of the Northeastern United States, should be reprinted. The recommendation was that the bulletin should be reprinted. Also it was recommended that the soil map should be compared with the digitized STATSGO map and be revised only if there are major discrepancies. The STATSGO maps for the Northeast are not completed therefore a comparison of the maps was not done. The bulletin has not yet been republished.

Task Force 2. State Soil Survey Database (3SD). Several issues were addressed. Some members suggested storing various types of data such as soil characterization, climate, experiment station crop yields and Land Evaluation and Site Assessment data. Some of this data will be part of 3SD and others such as soil characterization, will be put on a compact disk probably within the next year. All data needs to be shared with cooperating agencies and made available to the public. It was suggested that access to the 3B2 would not be desirable. Data would be provided by the use of hard copies, tapes, or compact disks.

Personnel Changes in SCS in the Northeast

In the past two years there have been several changes on the Soil Interpretations Staff at the Northeast NTC. Oliver Rice retired in December 1989 and has remained in West Chester, PA. Chris Smith joined the staff in August 1988 from the New Jersey state office. In January 1989, Darlene Monds joined the staff as Geographic Information Specialist and as remote sensing specialist. Darlene was a soil scientist in Worth Carolina. The soil scientist position in the NTC. to replace Oliver, will be advertised in the next few weeks.

Many changes have occurred on soils staffs in SCS state offices in the past two years. In the past two years Dennis Lytle was promoted from Assistant State Soil Scientist to State Soil Scientist in Maine. He then transferred with a promotion to the National Soil Survey Center as National Coordinator for Soil Geography on the Soil Interpretations Staff. Norman Kalloch transferred to the Maine state office as Assistant State Soil Scientist. The State Soil Scientist position in Maine is currently vacant.

Sid Pilgrim, State Soil Scientist in New Hampshire retired. Steve Hundley transferred from State Soil Scientist in Massachusetts to State Soil Scientist in New Hampshire. The State Soil Scientist position in Massachusetts is currently vacant.

Jon Vrana transferred to the New York state office soils staff as a soil scientist for technology transfer. Recently, Jon transferred with promotion to the National Soil Survey Data Base Staff at the National Soil Survey Center. Gregg Schellentrager, Assistant State Soil Scientist in Vermont, will transfer to Iowa in July as State Soil Scientist. George Martin, Assistant State Soil Scientist, Pennsylvania, transferred to a soil conservationist position in Pennsylvania. Travis Neely from Indiana replaced George Martin.

Bill Broderson, State Soil Scientist, New Jersey transferred to the National Soil Interpretations Staff at the National Soil Survey Center. Ron Taylor, Assistant State Soil Scientist in New Jersey, was promoted to State Soil Scientist in New Jersey. Daryl Lund was promoted to Assistant State Soil Scientist in New Jersey from Project Leader in Montana. Maxine Levin was promoted to Soil Correlator in New Jersey from Project Leader in Baltimore, Maryland.

Carol Wettstein, State Soil Scientist in Maryland, transferred to the Resources Inventory Division in Washington for a year and is now State Soil Scientist in Colorado. Jim Brown, Assistant State Soil Scientist in Maryland was promoted to State Soil Scientist in Maryland. Dean Cowherd was promoted to Assistant State Soil Scientist in Maryland from Project Leader in Florida.

Cameron Loerch, Soil Specialist in West Virginia, transferred to Nebraska as Assistant State Soil Scientist. Alex Topalanchik was promoted to Soil Specialist in West Virginia from Project Leader in West Virginia. Edward Ealy was promoted to Soil Specialist in Virginia from Project Leader in Virginia. Hof Owen transferred from Soil Scientist with VPI&SU to Soil Scientist with SCS at the Virginia state office.

These changes affected 14 positions in 10 states.

NATIONAL COOPERATIVE SOIL SURVEY STATUS REPORT

Lawson D. Spivey, Jr.
SCS, Washington DC

The following is a composite picture of the total land area in the U. S. and the total acreage of soil surveys (projected though FY-90).

1.	Total Acres in the United States	2,281,717,165
	Total Acres mapped at the end of FY-90	1,625,545,146

Approximately 70% of the U.S. is covered by soils maps. Mapping is progressing at a rate of about 40,000,000 acres per year.

2.	Total Acres of Private lands in the U.S.	1,570,934,614
	Total Acres mapped at the end of FY-90	1,362,382,794
	Acres remaining to be mapped	208,551,820

Approximately 87% of the private land in the U.S. is covered by soil maps. Mapping is progressing at a rate of about 31,000,000 acres per year. Straight-line extrapolation of this annual rate would give a completion date about 1997.

3.	Total Acres of Federal Lands in the U.S.	644,774,495
	Total Acres mapped at the end of FY-90	376,492,047
	Acres remaining to be mapped	268,282,448

Approximately 58% of the Federal Land in the U.S. is covered by soil maps. Mapping is progressing at a rate of about 6,367,000 acres per year.

4.	Total Acres of Cropland in the U.S.	431,198,338
	Total Acres mapped at the end of FY-86	372,701,539
	Acres remaining to map at the end of FY-86	58,496,892
	Acres mapped in FY-87	17,821,979
	Acres mapped in FY-88	21,085,225
	Acres mapped in FY-89	18,864,151
	Acres mapped in FY-90	1,379,864

(Totals for FY87 through FY90 includes 654,227 acres added after FY-86)

5. Total Acres mapped by SCS per year:

1984	42.7 million
1985	40.7 million
1986	41.3 million
1987	37.0 million
1988	38.8 million
1989	36.0 million
1990	39.3 million

Beginning in 1986, SCS shifted soil survey emphasis to the mapping of cropland. The following figures show the percentage of the acres mapped by SCS that were cropland:

1986	27%
1987	48%
1988	54%
1989	52%
1990	4%

The decrease in numbers of acres mapped during the 1987-1989 period reflect the inefficiency of preferentially mapping cropland. The lack of efficiency is due pimarily to suspension of block mapping and to detailing soil scientists into areas where they had no previous mapping experience.

6. SCS Soil Survey Funding:

1984	$53.4 million	A 1.6% increase over a three year period with inflation at about 3% per year = 7.4% loss
1985	54.8 million	
1986	54.3 million	
1987	58.1 million	A 25% increase over a 4 year period with inflation at about 3% per year = gain of 13%
1988	67.7 million	
1989	68.0 million	
1990	68.0 million	

The 9 million increase in 1988 was provided for meeting the cropland mapping needs of the 1985 Food Security Act. This funding was used to hire additional soil scientists, contract for mapping, and pay for detailing of soil scientists into states with high cropland mapping workloads.

7. The numbers of SCS soil scientists reflect the status of the soil survey budget. During years 1984-1987 the numbers of soil scientists in SCS declined from 1,341 to 1,155. With the increases in funding for the 1985 Food Security Act the numbers have increased to 1,359. The total number of soil scientists is about the same as 1984; however, the number of soil scientists at the field level has increased.

8. The drop in numbers of soil scientists from 1984 to 1987 was reflected in the drop in the number of acres mapped per year. This trend was accelerated by the emphasis placed on mapping of croplands. The trends for the number of acres mapped per individual soil scientist, however actually began to increase prior to the Food Security Act cropland mapping initiative. This increase in efficiency by individual soil scientists reflected the implementation of productivity improvement initiatives such as better management of soil survey projects, providing word processing equipment for manuscripts, better availability of field equipment, and a better understanding of the soil mapping process by the individual soil scientists. This trend is expected to continue now that the emphasis is again being placed on project mapping with the croplands completed.

9. The number of soil survey reports published each year increased from 61 in 1984 to 78 in 1986 and 1987. In 1988 the amount of funding for publication was reduced and diverted to cropland mapping. This was reflected in a decline in the number of publications to 70. In 1989 the funding was restored and publications rose to 79. During the period of 1987, 1988, and 1989 manuscript development processes have been improved and desk top publishing equipment has reduced the time and the cost associated with manuscript editing and formatting. At the same time more flexibility in manuscript formatting, color covers, color plates inside the publications, and improvements in paper quality have been achieved. The cost savings are reflected in the number of publications that can be published. Presently we are anticipating about 110 publications this year.

10. The Status of Soil Surveys Map (February 1990) reflects the extensive coverage of NCSS soil surveys in the U. S. A new status map is due at the end of FY-90. It will be generated through the Soil Survey Scheduling System.

As we approach complete coverage of the U. S. with soil surveys, we are faced with significant changes in the National Cooperative Soil Survey. The NCSS focus is shifting from production of hard copy soil survey reports to implementing and supporting a dynamic soils information system. The SCS Soil Survey Division has a 5 year plan to carry out this change of focus through 4 categories of activities as follows.

1. Improve methods and products to meet expanding user needs by providing new kinds of information, improving quality of existing information, and improving accessibility (SOIL INFORMATION SYSTEMS).

2. Conduct research and development to provide new knowledge, procedures, concepts, data sets, and relationships to support the use of soil information (SOIL SURVEY TECHNOLOGY).

3. Promote technology transfer to provide technical soil services and train users of soil information (SOIL INTERPRETATIONS).

4. Implement, support, and maintain soil survey activities.

These categories of activities were addressed by 10 Task Forces during the 1989 National Cooperative Soil Survey Conference (Lincoln, Nebraska). There were 4 Task Force Reports dealing with Soil Information Systems; 3 dealing with Soil Survey Technology, and 3 dealing with Soil Interpretations. All reports were accepted and acted upon favorably by the NCSS Steering Comittee. They are included in the Conference Proceedings of which copies are distributed for use during the Northeast Cooperative Soil Survey Conference.

National Soil Survey Investigations
Ellis G. Knox, SCS, Lincoln, Nebraska

I never took a course.from John Sencindiver, but I have inside information that he is a good teacher because my son took several courses from him. John didn't make a soil scientist out of Brian but he did help him become a forester who knows that trees have roots and that soils have many interesting and important properties that relate to forest growth and composition and that need to be taken into account for successful logging. Thank you, John.

Two years ago the National Soil Survey Center was just getting started. It was set up with the Soil Survey Laboratory, one of five staffs, a6 its investigations arm. First Ron Yeck and then Benny Brasher were acting head of the Laboratory before I moved to Lincoln from NHQ in October, 1988. Since then, we have formed a Field Investigations Staff within the Laboratory with Carolyn Olson as Staff Leader. That gives us a three-part structure with many interconnections and joint activities. The Field Investigations Staff has work in soil-landscape relationships, geomorphology, stratigraphy, soil climate, ground-penetrating radar, and 80 on. A *new* research soil scientist, Phil Schoeneberger from NCSS, will join that group in September. The Soil Characterization Staff with Larry Brown as Staff Leader concentrates on the analytical load of the Laboratory. The Research and Development Staff looks after the data base, use of the data base for study of soil relationships and estimations of soil properties, new characterization methods, study of temporal properties, leadership in our training courses, laboratory aspects of the international work of the soil survey, and special projects. We are now recruiting to fill a a Research Soil Scientist vacancy at the GS-11 level in the data systems section of the Laboratory. It is open to all sources, including applicants outside of the federal government, through the Office of Personnel Management.

We have tried to work closely with the Quality Assurance Staff in their assignments by MLRA, but we have so far retained the practice of having one main contact or liaison in the NSSL for each state. Larry Brown has just agreed to be liaison for the six New England sates; Bob Grossman continues as liaison for the other Northeastern states.

Last year, the analytical group received about 8,600 samples and performed about 190,000 separate analyses. For all of the current, routine methods, the Characterization Staff has written new, detailed methods descriptions. These are complete except for some final technical review. We can provide a draft document to NCSS cooperators. We plan for it to replace Soil Survey Investigations Report No. 1. The Characterization Staff also has been working toward a

Laboratory Information Management System or LIMS. This is a computer system that facilitates the linkage of analytical instruments to the final data record, facilitates the scheduling of analyses and tracking samples through the laboratory, and provides for a level of quality control not currently possible.

Recruitment for the data systems section is intended to help with the management and accessibility of the NSSL data base. We know that accessibility to the data base is not fully satisfactory now. Some states access it by telecommunications through the INTERACT program. We have sent tapes of data for states or regions. But easier access is needed. We have a committee of SCS and AES people to establish and maintain a National Soil Characterization Data Base (NSCDB). Each Agricultural Experiment Station regional soil survey committee was invited to select a committee member. Ed Ciolkosz is the northeastern representative. Wayne Hudnall, Louisiana State University, Tom Fenton, Iowa State University, and Bill Allardice, University of California at Davis are the other AES members. These members serve two-year terms starting in even-numbered years for the South and West and odd-numbered years in the North Central States and Northeast. Ellis Benham, about to complete PhD requirements at Auburn University with Ben Hajek, is working full-time on the NSCDB at the Laboratory. If progress with time is describe by an S-shaped curve, then I hope that we are at the bottom of the S where things are happening but the results haven't begun to show yet. The aim is to get a tangible prototype product out this calendar year. Distribution of the NSCDB including both field pedon descriptions and laboratory analytical data by CD ROM seems fully feasible.

WORLD SOIL RESOURCES (WSR) STAFF AND ACTIVITIES

Benjamin F. Smallwood - SCS, Washington, DC

Staff: Hari Eswaran, National Leader
Lorraine Jamison, Secretary
John M. Ximble Soil Chemist, NSSL
Terry D. Cook, Soil Scientist
David L. Yost, Soil Scientist
Benjamin F. Smallwood, Soil Scientist

The World Soil Resources is out growth of the Soil Management Support Services (SMSS). Since the SMSS project will be completed (10 years life span for USAID projects) this coming September 30, 1990. Hopefully, the WSR will fill some of the voids created by completion of SMSS.

Goal: The goal of WSR is to assist in providing soil resource information to achieve sustainable agriculture through soil evaluation and conservation.

Mission: The mission of WSR is to collaborate with all National and International agencies to:

1. Develop and maintain a repository of world soils and soil survey information.

2. Develop linkage with National and International institutions to enable the transfer of experience and information between the U.S. and foreign countries and their experiences with the U.S.

3. Assist less developed countries (LDCs) in the application of SCS standards and quality control methods in national soil survey programs.

4. Provide the leadership in the multipurpose utilization of soil survey information.

Functions: 1. Act as the link between the SCS National Soil Survey Center (NSSC) and National and International soil survey organizations worldwide.

2. Development and maintain a data base on world soils and related information on sustainable agriculture.

3. Assist LDCs in developing soil survey programs or components of these programs including the utilization of soil survey information.

4. Develop training program in LDCs to meet their needs in the areas of soil survey, soil classification, and soil management activities.

Activities

GLASOD - Global Assessment of Soil Degradation is international collaboration with United Nations Environmental Programme (UNEP) and the International Soil Reference and Information Centre (ISRIC) is coordinating the effort producing soil degradation map of the world scale 1:10,000,000. Another activity of the WSR corrdinated by Ben Smallwood is the soil temperature regimes (STR) and soil moisture regimes (SMR) maps of U.S. The first product will be a STR/SMR of western region, which a poster will be given at American Society Agronomy meeting San Antonio, Texas.

David Yost, presently working on (SOTER) soil terrain project. This pilot project is international in scope and it is coordinated by (ISRIC). The focus of this project is to prepare a world soil map 1:1,000,000 to replace FAO/UNESCO 1:5,000,000. Methodology in making this different from standard procedure of map making. Soil attribute data, expert systems will be part of the procedure used in preparing this map.

If you need to know more about SOTER, feel free to give Dave Yost a call.

SOIL SURVEY QUALITY ASSURANCE - STATUS REPORT

Berman D. Hudson
Supervisory Soil Scientist
Soil Conservation Service
National Soil Survey Quality
Assurance Staff
Lincoln, Nebraska

06/25/90

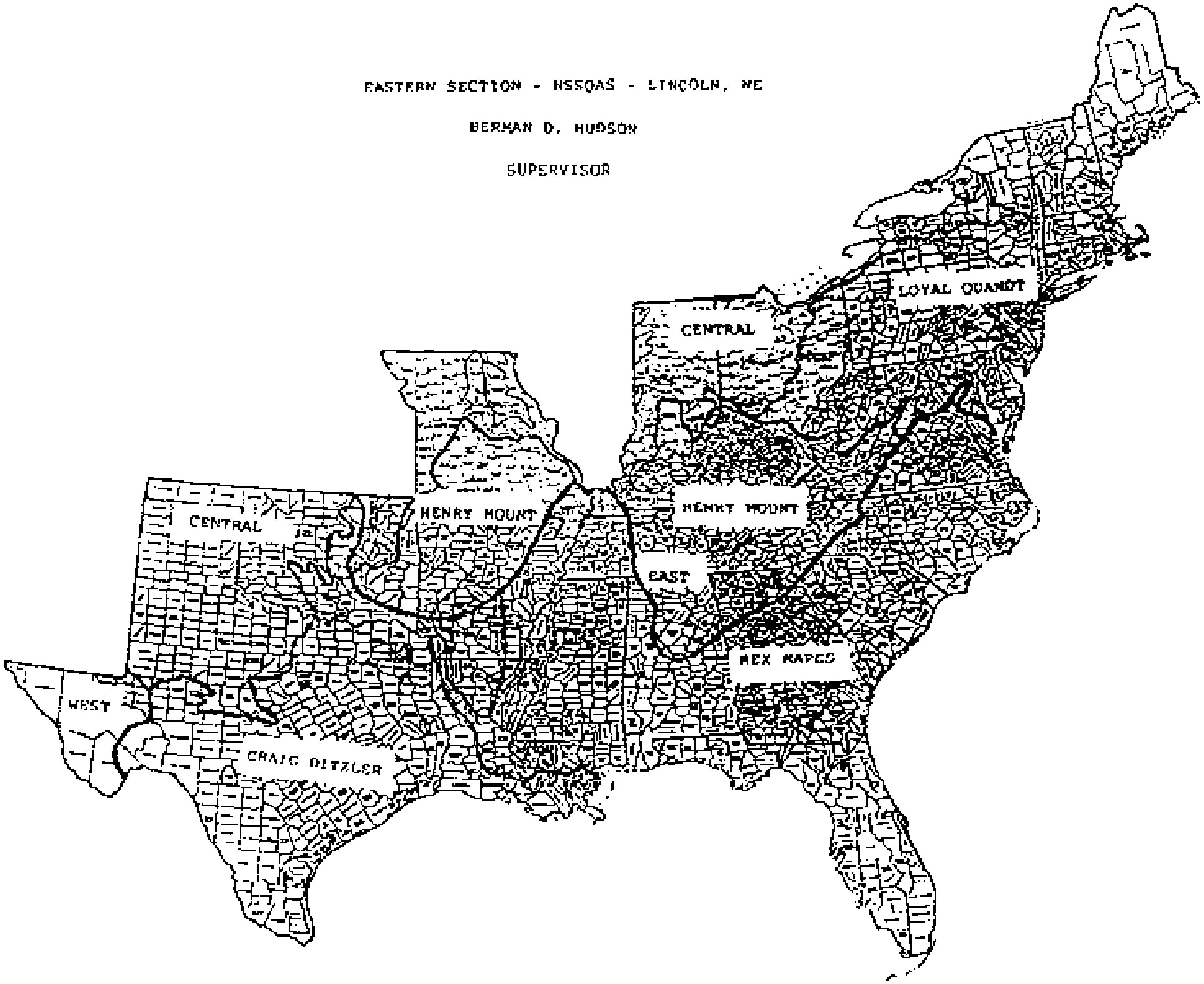
The attached handouts show the status of the northeastern states in a variety of areas, including manuscript review, number of on-going soil surveys, acres mapped, number of series in OSED, and status of published soil surveys. These handouts are self-explanatory. This information was taken from a number of databases. The numbers were not verified. Therefore, there undoubtedly are some errors in these data. However, the information was meant only to give an overall picture of the situation in the northeast. I believe it is sufficiently accurate to serve that purpose.

QUALITY ASSURANCE RESPONSIBILITY

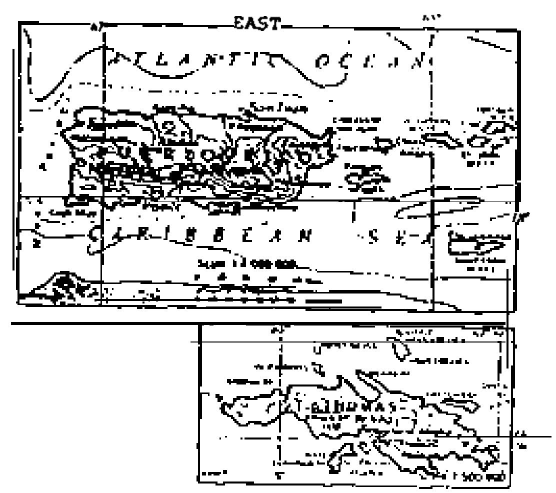
EASTERN SECTION - NSSQAS - LINCOLN, NE

HERMAN D. HUDSON

SUPERVISOR



GULF AND CARIBBEAN LANDS



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NATIONAL SOIL SURVEY QUALITY ASSURANCE STAFF
Soil Survey Manuscript Technical Reviews
Progress for Fiscal Year 1990

Technical Reviews completed:

East Staff	26
Central Staff	10
West Staff	9
Total	45

Manuscripts awaiting Technical Review:

East Staff	2
Central Staff	4
West Staff	8
Total	14

State	Survey_area	Recv_techrev	return_SO	Recv_edit	Maps_NCC	Edit_compl	SO_review_compl	maps_rdy	Publ_date
MA	Barnstable LQ	01x89	03x89	07x89	10x86				
MA	Ham & Ham	02x86	10x86	03x87	01x86	10x87	06x88	ready	04x89
MA	Nor. & Suffolk	05x87	10x87	12x87	12x87	04x88	10x88	ready	09w89
ME	Oxford LQ	02x89	03x89	10x89					
NH	Rockingham	01x88	06x88	11x89	07x88				
NY	Albany	10x87	06x88	11x88	01x90				
NY	Chautauqua LQ	02x90							
NY	Columbia	01x87	03x87	10x87	07x87	12x87	09x88	ready	06x89
NY	Greene	12x87	03x88	10x88		03x90			
NY	Put.-West. RH	02x89	03x89	05x89					
NY	Rockland	02x88	05x88	09x88	06x88	07x89	09x89	ready	04x90
NY	Sullivan	04x86	07x86	10x86	07x87	01x87	11x88	ready	07x89
PA	Bedford LO	05x90							
PA	Cameron & Elk	10x87	06x88		01x89				
VA	Greensville	12x86	02x87	05x87	02x87	01x88	07x88	ready	06x89
VA	Northampton	x	x	x	11x87	x	x	ready	08x89
VA	Prince William	x	x	x	03x89	x	x	ready	oaxa9
VA	Shenandoah LQ	12x88	02x89	05x89	03x89				
VA	Wythe La	09x89	x	03x90					
VT	Rutland LQ	05x89	07x89						
WV	Boone HM	10x89	11x89	12x89					
WV	Nicholas	07x88	09x88	02x89					
WV	Pendleton RH	06x89	07x89	10x89	08x88				

Ongoing **Soil** Surveys-NE **Region** 1990*
From Soil Survey Schedule

State	Survey Area	Percent Complete	FFR Scheduled
ME	PISCATAQUIS CO AREA, SOU. PT.	59	1991
ME	SOMERSET, PTS. FRANKLIN AND OXFORD	54	1992
ME	WASHINGTON CO AREA	24	1993
	Total 3		
NH	COOS CO AREA	65	1994
NH	MERRIMACK AND BELNAP COS	9	1995
	Total 2		
NY	CATTARAUGUS CO	46	1996
NY	CLINTON CO	57	1991
NY	DELAWARE CO	32	1994
NY	ESSEX CO	41	1994
NY	FULTON CO	29	1993
NY	HAMILTON ACO	72	1991
NY	ONEIDA CO	91	1990
NY	OTSEGO	91	1991
NY	ST. LAWRENCE CO	96	1989
	Total 9		
VA	ALLEGHENY CO	8	1993
VA	AMELIA CO	93	1989
VA	APPOMATOX CO	95	1989
VA	BEDFORD CO	9	1993
VA	BRUNSWICK CO	12	1991
VA	CAROLINE CO	25	1992
VA	CUMBERLAND CO	2	1994
VA	FLOYD CO	10	1993
VA	FRANKLIN CO	14	1994
VA	HENRY CO	51	
VA	JEFFERSON NF,N.PT.	94	1990
VA	JEFFERSON NF, S. PT.	39	
VA	KING AND QUEEN CO	52	1989
VA	PAGE CO	75	1990
VA	PATRICK CO	37	1991
VA	SMYTH CO	77	1990
VA	SOUTHAMPTON CO	39	1990
VA	SURRY CO	20	
VA	SUSSEX CO	17	1993
VA	TAZEWELL CO	25	1992
VA	WASHINGTON CO	64	1990
	Total 21		
VT	CALEDONIA CO	8	1995
VT	ORLEANS CO	20	1993
VT	WASHINGTON CO	80	1990
VT	WINDSOR CO	30	1992
	Total 4		
WV	CALHOUN AND ROANE COS	22	1992
WV	MCDOWELL CO	62	1991
WV	POCAHONTAS CO	86	1990
WV	WAYNE CO	50	1992
WV	WEBSTER CO	49	1991
	Total 4		

*Grand Total 43

ACRES MAPPED - NORTHEAST 06/90

State	Total_acres	Total-mapped	Pct_mapped
CT	3211700	3211700	100
DE	1236704	1236704	100
MA	5301800	5301800	100
MD	7062160	7062160	100
ME	21289606	14633310	68
NH	6850700	5946607	86
NJ	5015040	4964889	99
NY	31429100	27868250	89
PA	39380417	39380417	100
RI	775900	775900	100
VA	26090600	18580171	71
VT	6152861	4442785	72
WV	15437809	13008205	84
Totals	169.2 million	146.4 million	87

NORTHEAST STATES SERIES INFORMATION

Series within the Northeast MNTC Region:
-Result: 1197 SERIES

Number of OSEDS updated since October 1989 - Result: 141

Number of Established series in Northeast1 - Result: 895
Number of Tentative series in Northeast: - Result: 121
Number of Inactive series in Northeast - Result: 181

New Hampshire - Result: 41 SERIES
SERIES NOT IN OSEDSt 2 series

Maine

West Virginia - Result: 55 SERIES
SERIES NOT IN OSEDSt 3 series

Virginia - Result: 224 SERIES
SERIES NOT IN OSEDS: 4 series

Maryland - Result: 88 SERIES
SERIES NOT IN OSEDS: 4 series

Delaware - Result: 7 SERIES
SERIES NOT IN OSEDS: 2 series

New Jersey - Result: 87 SERIES
SERIES NOT IN OSEDS: 1 series

NE- 25 Series Not in OSED's

@ 2%

NSSL DATABASE PEDON COUNTS - NORTHEAST STATES 01/May/90

STATE	TOTAL	PRE1978	1978-UP	* W/TAX	*NOTAX	DESCRIPTION	CORRELATED
CONNECTICUT	23	8	15	15	0	11	15
DELAWARE	24	15	9	0	9	3	0
MASSACHUSETTS	89	69	20	4	16	5	4
MARYLAND	150	17	158	0	133	96	0
MAINE	121	63	37	14	44	18	7
NEW HAMPSHIRE	107	70		2	35	30	2
NEW JERSEY	86	54	32	29	3	26	29
NEW YORK	279	75	204	46	158	84	19
PENNSYLVANIA	57	40	17	2	15	0	2
VIRGINIA	76	13	63	0	63	19	0
VERMONT	175	73	102	39	63	67	39
WEST VIRGINIA	159	59	100	51	49	71	51
	1346	556	790	202	588	430	168
		41%	59%	15%	85%		

TOTAL .... All of the pedons in the NSSL Database.

PRE1978....... Pedons sampled prior to 1978 by the NSSL and it's predecessor laboratories.

1978-UP ...... Pedons sampled by NSSL beginning in 1978.

W/TAX . ... Pedons classified by states or TSC's on NSSL Soil-8 forms returned to NSSL.* Refers $0 1978-UP Data

NO TAX .... Pedons not classified by states or TSC's.* Refers to 1978-UP Data

DESCRIPTION .. Profile descriptions currently stored in the NSSL Database.

CORRELATED ... Pedons with a correlated series name shown on NSSL Soil-8 form returned to NSSL.

Soils in Northeast with more than 400,000 acres mapped
and correlated BDH 05/23/90

SOIL SERIES ACRES

BUCHANAN
CALVIN
CAVODE
CHARLTON
CHESTER
COOKPORT
DEKALB
EVESBORO
[illegible]

STATUS OF PUBLISHED SOIL SURVEYS - NORTHEAST 06/90*

DATE OF SURVEY	NUMBER SURVEYS	PCT OF TOTAL
Before 1960	21	8
1960 - 1970	47	20
1970 - 1980	84	34
1980 - 1990	94	38
	246	100

By Year 2000:

1/3 of surveys in Northeast will be more than 30 years old.

2/3 of surveys in Northeast will be more than 20 years old.

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* From List of Published Soil Surveys, USDA-SCS, January 1989. Only surveys still in print were counted

OVERVIEW OF CERTAIN SOIL CHARACTERIZATION METHODS
WITH EMPHASIS ON USE DEPENDANT TEMPORAL PROPERTIES

R. B. Grossman
Soil Scientist
National Soil Survey Laboratory
National Soil Survey Center
Midwest National Technical Center

To follow are brief generic descriptions. The writer should be contacted for further details. Several of the field methods and class sets are in the new Soil Survey Manual under preparation. Some of the methods are described briefly in Grossman and Pringle(1987). Brand names and manufacturers are given for convenience of the reader and do not imply endorsement.

Aggregate Size Distribution Method GO01 2/90

The determination is made on relatively loose near-surface soil which is air dried and passed through a nest of sieves using a vigorous hand rocking motion. To the extent feasible, the specimen is subject to 100 oscillations in 1 minute in a 20 cm diameter sieve. The weight of soil material in a sieve is kept to less than 500 g. Commonly sieves with the following screens are used (in mm): 75, 20, 5, 2, 1, 0.8, 0.5, and 0.25.

Aggregate Stability Method G002 2/90

Sample preparation may be done two ways. All of the air dried soil material may be passed though a 2 mm sieve using the minimum necessary force. Alternatively, the soil material is gently sieved through a 2 mm sieve. The latter is referred to as natural 2-l mm.

Wet Sieve Retention, Air Dry (G002a): The sieve is 12.7 cm (5 inch) diameter and has 0.5 mm mesh. Place 3 g of the airdry 2-l mm material uniformly in a sieve that is submerged in about 500 ml of distilled water. The l-O.5 mm may be used in place of the 2-l mm. The mesh should be 2 cm below the top of the water. Let stand overnight. Raise and lower the sieve 20 times in 40 seconds. On the upward stroke the sieve should drain but not be raised far enough that air enters beneath. After the wet sieving, the sieve and contents is dried and the weight retained determined. Provision should be made to retain soil that drops through the screen on air drying. If discrete Z-0.5 mm grains are present, a dispersing treatment is employed. The measurement is not considered valid if half or more of the sample after dispersion consists of mineral material that does not pass 0.5 mm.

Wet Sieve Retention, Prewet (G002b): A 3 g sample is wetted overnight against 5 cm suction using independent small tension tables made from small beakers and toweling as wick. The wetted sample is transferred to the sieve that is submerged in distilled water as described under the air dry method and the same determination of percent retention is made. The transfer is done by inverting the toweling and lowering to the water surface rapidly.

Reconstitution On Submergence (G002c): This is a qualitative morphological test. The soil is placed in classes determined by the reconstitution of the air dry soil on rapid submergence in distilled water. Cells 25 mm diameter are constructed that have 0.5 mm screen in the base. About 6 ml of air dry 2-l mm material is placed in the cell. The soil is inundated by lowering the cell rapidly into 40 ml of distilled water held in a beaker. The cell is allowed to stand in the beaker overnight after which it is removed, drained, and the specimen air dried in place at room temperature. The air dry soil is then placed in the classes to follow:

Class	Criteria
1	Complete or nearly complete reconstitution from the original organization as viewed on a broken face. Aggregates of 2 to 1 mm not observable. Broken face appears massive.
2	Ten to forty percent of the fabric volume as viewed on a broken face consists of or is relatable to original 2-l mm aggregates. A broken face shows undulations which are interpretable as having been determined by original 2 to 1 mm aggregates.
3	Not loose and either or both: 40 to 80 percent of fabric volume as viewed on a broken face consists of or is relatable to the original 2 to 1 mm aggregates; after gentle breakdown through a 2 mm sieve, 40-70 percent by volume is 2-1 mm or >50 percent is >0.25 mm.
4	Either: Loose and after gentle breakdown more than 10 percent by volume passes 1 mm; not loose, and after gentle breakdown, 70 to 90 percent by volume 2 to 1 mm.
5	Loose and ≥ 90 percent by volume is 2-l mm.

A variation of the test involves prewetting to low suction followed by inundation. Absorbent paper is placed over the end of a rubber stopper, which is inserted into the base of the cell. A small quantity of fine sand is placed in the cell to fill the screen. The aggregates are wet against 5 cm suction through the absorbent paper. The assembly is then submerged and the procedure as described previously is followed.

Gravimetric Water Content — Method G003 2/90

Water Removal by Beating (G003a): Cooking bags (Reynolds or equivalent) pass water readily, do not melt at elevated temperature, and are durable. If used directly to collect samples, the filled bags should be placed in another kind of plastic bag that acts as a barrier to vapor loss of water. Soil in the regular siee Reynolds oven bags may be placed on top of an electric food warmer (other sources of heat may be substituted) and the water removed by heating at a setting such that the temperature between bag and heater is about 105°C. Aluminum foil may be used to form an oven to hasten drying. A 1 kg sample can be dried overnight with the assembly described.

Reaction with CaC (G003b): The Speedy Moisture Meter employs the reaction of calcium carbide with water to produce acetylene, a gas, the pressure of which is measured. The balance and method of weighing the sample provided with the instrument by the manufacturer is questionable. A 50 g Pesola spring balance is employed. Samples are Weighed in a polycon Container to which a bale has been attached and the assembly adjusted with tape to Weigh exactly 10.0 g. The weighing may be done in a large clear plastic bag to reduce water loss.

(NOTE: Method to be added under G004)

Bulk Density Measurement by Excavation Method GO05 2/90

Compliant Cavity Method (G005a): For soil zones which are too thin or are insufficiently consolidated to obtain clods, the bulk density may be measured by a variation of the excavation procedure. A compliant cavity is made by placing a ring of resilient foam plastic on the ground surface. This compliant ring is covered by a rigid ring 13 cm inside diameter which is mounted on the ground surface by driving threaded rods into the ground through holes in the ring and then tightening down the ring with wing nuts. The cavity is lined with 1/2 mil plastic film and a bar with a hook gauge attached is placed across the cavity. Water is placed in the cavity up to the tip of the hook gauge. The volume of water is a measure of the cavity volume prior to excavation. The soil is then excavated to the desired depth and the volume of water necessary to fill the resulting cavity to the tip of the hook gauge is again determined. The increase in volume of the water measures the excavation volume. The oven dry weight of the soil excavated is determined, a correction is made for weight and volume of >2 mm in the sample if necessary, and the bulk density is computed. The weight of macroscopic vegetal material per 100 cc may be reported.

Rigid Frame Method (G005b): Rings as described under GO23 are placed on the ground surface or inserted. Two small cylinders are mounted on the rings. A bar with a hook gauge with two holes is mounted on the ring. Excavation is carried out, as described for the compliant cavity method, to within 2-3 cm of the edge of the ring. The area of the excavation is obtained by tracing the periphery on a clear plastic overlay. To be developed is the mounting of the core on a pedestal of material that transmits water by capillarity at low suction and the determination of the air-filled porsity at a known absorption suction, perhaps 2 kPa, which should provide a water content close to 10 kPa desorption.

Subfabric and Whole Bulk Density for Cloddy Fabric (G005c): The percent clods that withstand a standardized sieving operation may be measured. From this percentage, the bulk density of the subfabric for the soil material smaller than the lower limit of the clod size may be calculated. Additionally, the Weight percent clods in a sample large enough to obtain a reasonable estimate of the larger clods may be obtained. From this percentage the bulk density inclusive of the larger clods may be computed.

Equations follow for the computation of the subfabric and whole fabric bulk densities:

Subfabric

$$\frac{100 - W_>}{\frac{100 - W_>}{Dbu} \quad Db_>}$$

Whole fabric

$$\frac{100}{\frac{W_>}{Db_>} + \frac{W_<}{Db_<}}$$

W> and W< are the weight percentages greater than and less than 5 or 2 mm. Db> and Db< are the parallel bulk densities. Dbu is the measured bulk density.

Bulk Density of <20 mm after Reconstitution following Submergence Method G006 2/90

The test is designed to evaluate the bulk density of previously mechanically bulked soil material after it has been taken through a standard wet-dry-wet cycle. A cylinder 13 cm inside diameter and 15 cm high is attached to conducting insulation brick. A known weight of air dry <20 mm soil material is placed in the cylinder and wetted against 10 cm suction at the base of the soil. Volume is determined by lining the cavity above the soil with thin plastic and using a hook gauge as described for method G005. Bulk density is calculated from the weight and volume of the soil. The soil is then inundated from beneath, left overnight, drained, air dried, and then remoistened against 10 cm suction. The volume is again measured.

Bulk density inclusive of the peripheral contraction space may be calculated directly. Bulk density exclusive of the peripheral contraction space is computed from the volume decrement resulting from the water cycle. The assumption is made that the linear extensibility along the horizontal axes is the same as along the vertical. Linear extensibility is equal to the volume decrease divided by the product of the area of the cylinder and the height of the soil. This linear extensibility is set equal to the computational relationship for extensibility from clod bulk densities in method 4D Soil Survey Staff, (1984). The dry bulk density in the relationship is the bulk density after the water cycle previously described exclusive of the peripheral crack space and the moist bulk density is the initial bulk density after the first moistening. The relationship is solved for the dry bulk density, which is the bulk density exclusive of the peripheral crack space.

Cover Method G007 2/90

Point count or line intercept measurements are made (Hartwig and Laflen, 1978). The total transect length should be 50-100 times the 90 percent diameter, defined as the upper size limit that accounts for 90 percent of the total area of the surface cover features. Three measurement tapes are used: a 90-m tape with 30-cm intervals; a 30-m tape with 15-cm intervals, and a 2-m retractable ruler with l-cm intervals and marks at 1 mm. Larger features that require longer transect lengths by the above guidelines are excluded from shorter transect measurements and then added back by computation to obtain the total cover.

The ground surface may be divided into components that differ in cover. Examples of components would be within the drip line of trees, within the drip line of shrubs and outside that of trees, and outside of the drip line of either trees or shrubs. Canopy effectiveness should be estimated. Rock fragment size distribution may be evaluated. The cover characteristics for the components may be used to compute soil-loss ratios of the Universal Soil Loss Equation (Wischmeier and Smith, 1978) for each component as well as a weighted average soil-loss ratio for the area overall. An integrated color value may be computed for the ground surface components and for the area as a whole. Experience has bee" obtained with the Minolta CR-200 Chroma Meter.

<u>Dry Crust Evaluation</u> Method GO08 2/90

Both thickness (in millimeters) and rupture resistance are evaluated. The thickness of the cruet is taken as the thickness of the reconstituted zone only. Adhering weakly reconstituted soil is not included. The table to follow gives the classes of rupture resistance proposed for the new soil survey manual. The specimen is rectangular, 1 to 1 1/2 cm on edge (along in-place horizontal axes) and 1/2 cm thick. The thickness of the specimen may be inclusive of adhering noncrusted zone material if the reconstituted zone is less than 1/2 cm thick. Specimens are crushed between thumb and forefinger along a" in place horizontal axis. Evaluation commonly would be done in the field using a tactile sense of the classes. A top loading balance may be used to evaluate the force applied. A bar 5 mm wide is placed on the balance to simulate the crust specimen. The specimen is crushed between the forefinger and thumb of one hand while simultaneously applying the same apparent pressure to the balance with the forefinger of the other hand through the 5 mm bar. The balance is read when the crushed specimen ruptures. Direct measurement by pressing down on the specimen as it rests on the balance is a" alternative. If used, it should be indicated. Values tend to be lower because the contact area between the specimen and the balance may be low. If the specimens cannot be broken in the hand, the force necessary to rupture may be measured with the penetrometer described in method GO10.

Class Name	Force at Rupture N
Fragile	<3
Extremely Weak (WE)	Present, but not removable
Very Weak (WV)	Removable; <1
Weak (W)	1-3
Medial	3-20
Moderate (M)	3-8
Moderately Strong (SM)	8-20
Resistive	≥ 20
Strong (S)	20-40
Very Strong (SV)	40-80
Extremely Strong (SE)	≥ 80

<u>Modulus of Rupture after Reconstitution</u> Method G009 2/90

Soil material that has been ground to pass 0.5 mm with the Z-0.5 mm returned is placed in cells as described in method G002c which have been modified to provide a means of wetting by capillarity. This is accomplished as described for the prewetting option for method G002c. After wetting against 5 cm suction at the base, the soil material is inundated from beneath. The soil material is then drained, air dried, and sections 25 mm long cut as measured from the bottom. Modulus of rupture along the vertical longitudinal midplane of the soil cylinders is determined. The force application may be made with a proving ring assembly under a constant rate of compression. by placing the specimens on a top-loading balance and applying force by hand, or with a hand penetrometer with a flat-end tip 25 mm diameter (see method GO10).

Penetration Resistance Method GO10 2/90

Field Exposure Evaluation (GO10a): The standard field test for penetration resistance involves insertion of a flat end rod a distance of 6.4 mm (1/4 inch) in about 1 second (Bradford, 1986). Commonly the pocket penetrometer is used. The "Geotester" looks very promising. Usually, the diameter of the rod is 6.4 mm, but other diameters may be used. 30' cones with 1.3 cm^2 and 3.2 cm^2 bases may be used and a 20' cone inserted 10 mm is under examination for pieces of soil. For class placement, measurements for all tips should be adjusted to the expected measured strength for the standard determination using the flat-end rod as described previously. The water state should be specified; this usually requires water contents (methods G003, GO14). Orientation should be indicated and the weight of the penetrometer treated as a surcharge if insertion is vertical. The set of classes to follow has been proposed for the revised Soil Survey Manual based on insertion of the flat end rod 6 mm (nominal) diameter a distance of 6 mm. Five or more determination6 should be made 5 cm or more apart. Median or average values with a standard deviation should be reported. The limit at 1 MPa is about where root restriction may be expected. Restriction should be quite pronounced at 2 MPa unless the macroscopic organization facilitates root ramification.

Classes	Penetration Resistance MPa
Small	<0.1
Extremely low	<0.01
Very Low	0.01-0.1
Intermediate	0.1-2
Low	0.1-l
Moderate	l-2
Large	≥2
High	2-4
Very high	4-g
Extremely high	≥8

Specified Absorption Suction (GO10b): This method is under development. The method is only applied if the soil material does not have medium or coarse strong granular or fine strong blocky or subangular blocky structure. Pieces of soil roughly equidimensional and exceeding 5 cm across are removed from the soil. The clods may be coated with Saran (Method 4A1, Soil Survey Staff, 1984) or with wax (method GO24). The pieces of soil may be placed in steel shot to provide constraint. Wetting by absorption to about 2 kPa is accomplished by placing on a column of sand or a pile of insulation fire brick. After equilibration, a 20' cone is inserted 10 mm using a pocket penetrometer (method GO10a).

Specified **Desorption** Suction (GO10c). Measurements are made on bulk density clods after desorption against the suction employed to measure field capacity, usually 1/3 or 1/10 bar (4B1c in Soil Survey Staff, 1984). The penetrometer is inserted as described for method GO10a into a bare, flattened side of the clod from which the smeared soil material has been picked away. The clod is surrounded by lead shot to provide added constraint and thereby approximate in-place conditions. Usually three determinations are made on each of two clods.

(Note: Method to be added under **G011)**

One-dimensional Roughness Method **G012 2/90**

The measurement pertains to a line and vegetation is usually either excluded or restricted to dense crowns that would deflect flowing water. Slotted rods are fabricated by welding two sections of shelf standard together laterally to form an open tube rectangular as viewed end on one or more slotted rods are leveled and the distance to the ground surface is measured at regular intervals by dropping a piece of retractable ruler through the slots. A guide is provided to keep the piece of retactable ruler normal to the slotted rod. The distances are corrected for slope of the ground

Expression **Test Notes**

a/ First term applies to slightly dry and wetter water states (method G015) and the second to dryer states; the cementation terms: <80N- weakly cemented; 80-800N- moderately cemented; 800N-3J-strongly cemented; and ≥3J - indurated.

Conversion of Water Content to Matrix Suction — Method G014 2/90

Determination of the suction for a particular field water content employs a water desorption curve for the soil material. Computation of such curves is described by Baumer and Brasher (1982) and Baumer and Rice (1988). The most accurate computation requires particle size, clod bulk density (moist and dry), water retentions at 15 bar and at the suction used to estimate field capacity (1/3 or 1/10 bar usually), organic carbon (as organic matter), and the ratio to clay of cation exchange capacity at pH 7 by ammonium acetate. Methods are in Soil Survey Staff (1984). An approximate curve can be obtained using only the information on standard interpretative records.

Field Water State Class — Method GO15 2/90

The following are a set of classes of field water state. Tactile and visual tests are employed for implementation of the water state classes. In one test a ball is formed in the hands and dropped progressively greater distances onto a nonresilient hard surface. Height at which rupture occurs and manner of failure are recorded. Additionally, the maximum length of a rod or of a ribbon of specified size may be determined. Color value change from air dryness also may be useful for some soils. A field office procedure for preparation of reference soil material at standard water states has been developed that uses nylon oven cooking bags. These bags pass 1 to 10 g of water vapor per hour depending on temperature and air movement. Soil at a known water content greater than that desired is dried in the bags to a predetermined weight, which is indicative of a water content that is a water state class limit. The gravimetric water contents at various matrix suctions may be computed as discussed in method G014.

Class	Criteria a/
Dry (D)	>1500 kPa suction
Very Dry (DV)	<(0.35 x 1500 kPa retention)
Moderately Dry (DM)	≥(0.35 x 1500 kPa retention) to (0.8 x 1500 kPa retention)
Slightly Dry (DS)	≥(0.8 x 1500 kPa retention) to 1500 kPa suction
Moist (M)	1500 kPa > Moist ≥1 or 0.5 kPa b/
Slightly Moist (MS)	1500 kPa to midpoint water retention difference (MWR) c/
Moderately Moist (MM)	MWR to upper water retention (UWR)
Very Moist (MV)	UWR to 1 or 0.5 kPa suction
Wet (W)	<1 kPa or <0.5 kPa suction
Not Satiated (WN)	No free water
Satiated (WA)	Free water present

a/ Matrix suction, not total.

b/ 0.5 kPa for coarse soil materials.

c/ The Midpoint Water Retention is midway between the 1500 **kPa** retention and the upper water retention, which is the water retention at 5 or 10 **kPa.** The choice of 5 or 10 **kPa** is dependent on the composition of the soil material.

Optical Sand Examination After Intermediate Dispersion Method GO16 **2/90**

The purpose is to have a procedure that can be run in a field office to evaluate the resistance of soil material to dispersion with sodium hexametaphosphate and mild mechanical agitation. The procedure differs from the standard particle **size** procedure in that organic matter and salts are not removed and the mechanical agitation is much less vigorous.

A 2.0 g sample of **<2 mm** is placed in a 250 **Ehrlenmeyer** flask. 250 ml of sodium hexametaphosphate solution is placed in the flask, which is stoppered and left to stand overnight. The concentration of sodium hexsmetaphosphate is the same as in the Fleaker during the mechanical dispersing step in method **3A1** (Soil Survey Staff, 1984). This concentration is roughly 0.05 that of the reagent concentration. After standing overnight, the soil material is loosened with a rubber policeman if necessary. The flask is then grasped by the top and turned by hand back and forth through 180" 50 times in 1 minute. The sample is then passed through a sieve with 0.1 sun openings **(140 mesh) using** tap **water to wash.** The material retained on the sieve is allowed to dry and then sieved again. The 2-1.0 **mm** sand is then examined optically for the percentage of grains that are aggregates and the proportion of the surface of the mineral grains that is coated.

Bulk Density after Water **Consolidation** on **<2 mm** Method **GO17 2/90**

The objective is to have index bulk densities for the **tillage zone** that would be descriptive of the soil as prepared by conventional means for planting and then brought from dry to wet and back to near field capacity. The **<2 mm** soil is placed in cells about 5 cm in diameter and 5 cm long. The base of the cell consists of 1 bar ceramic plate. The soil is moistened against 5 cm suction at the base of the soil. In one test. the sample is equilibrated against **1/3** bar and a known volume is struck off. In another test, the soil is surrounded by a hair net in the cell. Soil material is placed in a cell and after capillary wetting, the water level is raised to above the top of the soil. The soil remains inundated **overnight** after which it is drained and air dried. The soil material is removed intact as a clod and the procedure then follows method **4A1** in Soil Survey Staff (1984).

Low Suction Water Retention, Variable Bulk Density Method **GO18 2/90**

Water retention at **1/3** or 1110 bar is obtained on clods formed by water consolidation (method 6017) and on cores formed with a static **molding device.** The **<2 mm** is employed to form the clods. The cores have an initial diameter of 3.5 cm and are 3.8 cm long. The soil material that is to be consolidated is adjusted to a water content halfway between 15 and 2 bar retention. The amount of soil employed is determined by the bulk density desired. The objective is to have a bulk density similar to the maximum expected by mechanical compaction and one that is intermediate between the expected maximum and the water compaction value (method **GO17).** In other respects, the measurement follows 4Blc in Soil Survey Staff (1984).

Surficial Soil Vegetal Material Method GO19 2/90

The main purpose is to measure the weight of macroscopic vegetal material in the O-3 and possibly 3-10 cm zones after removal of attached above ground vegetation and litter. A second purpose is to measure the areal percent of attached crowns and stems. A measurement area at least about 10 cm wide and 1 m long is selected. Litter is closely clipped and removed from the measurement area which is cut around the periphery to 2.5 cm (1 inch) depth. The areal percent of attached crowns and stems within the outline of the sample area is measured by point or line-intercept methods. The soil material is then removed to the desired depth. The sample is placed in a solution of Calgon and allowed to stand overnight. Macroscopic vegetal material is removed by successive suspension and decantation through 1 mm or 0.8 mm screen. The material on the sieve may be washed with tap water under pressure. The vegetal material is air dried, weighed, and reported as kilograms/hectare or pounds/acre. Estimates by size classes may be made.

Single Drop Entry Time Method GO20 2/90

The purpose is to measure the time it takes for a single drop of water placed on the surface of air dry soil to be absorbed. Savage et al. (1969) describe the method. Distilled water is used and the drop size should be about 0.05 g. The time from application until the drop disappears is recorded. At least 5 drops should be observed for each component of the soil surface and the median and range or the mean and standard deviation reported. The soil surface should be subdivided on the basis of color and/or other features if cryptogams are suspected. Minute cracks in the soil surface that underlie the water drop lead to a large decrease in the absorption time for components of the surface affected by cryptogams.

(**NOTE:** Method to be added under GO31)

Resistance of Ground Surface to Moving Air Method GO21 2/90

2-l mm sand with a density of approximately 2.65 g/cc is sprinkled sparsely on dry ground surface. Air is blown across the ground surface with sufficient intensity to just move some of the sand grains. The air may be delivered from a blower used to clean camera parts. The effect of this moving air on the ground surface is recorded. Three classes may be employed:

Class	Description
High	No discernible effect
Moderate	Very little movement
Low	Readily discernible movement

Resistance of the Ground Surface to Rubbing Method GO22 2/90

The first finger is moved over the ground surface while exerting a pressure through the ventral surface of the outer joint of the first finger of roughly 3 kPa. The movement should be <10 cm in 1 second. For most people the surface area of the finger in contact with the ground surface while exerting 3 kPa is about 3 cm^2. A force of 100 g is therefore applied to exert a pressure of 3 kPa. This force may be learned by passing the first finger across a top loading balance. These classes are used to describe the effect of this action:

Class	Description
High	No discernible effect
Moderate	Observable effect but little or no material moved
Low	Observable soil material moved.

Strength at Low Suction Method GO23 2/90

Field-occuring Fabric **(GO23a):** Rings 30 cm diameter and 10 to 20 cm high are fabricated from stainless steel. The ring is inserted into the soil by alternate pressing downward and cutting away. The ring must be inserted into a consolidated zone that will provide a floor for the contents. The ring is then undercut and protrubing part6 of the bottom cut away. The core is placed in a container using loose soil to cushion. The core is wetted against 0.5 kPa using 0.01M CaC12 and then inundated overnight. The $CaCl_2$ solution level is then lowered to where a suction of 0.5 kPa is applied at about the midplane of the object inserted to measure strength. The Pilcon vane shear device for the depth ranges O-2 and O-5 cm is employed. Also used is the Pocket Penetrometer, using both the 6.4 mm diameter flat-end rod inserted 6.4 mm and the 30° cone with a 1.3 cm^2 base. Multiple measurements are made and median or average values reported. The units are megapascals(MPa).

If the very near surface is extremely wet, the pocket penetrometer will sink of its own weight. The 25 mm tip may be substituted, but it may not be appropriate if a weak to moderate crust occurs over very weak soil material, as is common for the tillage relief shoulder. Under such conditions, the 25 mm tip flexes the crust which makes the penetration resistance invalid. The pocket penetrometer weighs about 200 g. A much lighter penetrometer may be constructed which permit6 using the 6.4 mm tip. The penetrometer consist6 of a light weight cylinder to which a tip is attached. Steel shot is placed in the cylinder a6 the penetrometer sinks. The penetrometer is held away from the soil surface as each increment of shot is added.

We have begun to measure the difference between the penetration resistance of the field-occuring fabric and that of the near surface soil material after disaggregation, which is accomplished by first passing the soil material through a 0.5 mm (No. 35) sieve using vigorous hand trituration and then returning the 2-0.5 mm material. The difference between the two determinations is considered the penetration resistance conferred by reorganization due to raindrop impact and subsequent drying.

Reconstituted Fabric **(GO23b):** Air dry soil material is passed through a No. 4 sieve (4.6 mm). A section of 20 cm diameter plastic sewer pipe 18 cm long is attached to a pedestal made from two insulation fire brick6 placed flat-wise and fastened together with calking compound. Screen with 8 to 10 mm wide openings is placed in the bottom of the cell. The soil material is added to the cell to a height of about 15 cm. The screen is then slowly raised upward through the soil material. The soil material is then taken through the water cycle described for the field-occuring fabric. Strength with the Pilcon vane is measured for the 10 to 15 cm zone measured from the top of the soil material; suction is 0.5 kPa at the midplane of the vane.

Clod Bulk Density Using Wax Coating

Method GO24 2/90

The method follows 4A1 in Soil Survey Staff (1984). A wax is used that resists cracking on cooling. The wax is heated in a home kitchen deep fryer. An Ohaus 2610 balance may be used to obtain the volume by weighing successively in air and in water.

Excavation Difficulty

Classes	Test Description

Relief

immediately below the rod to the top of the horizon or zone of interest and again measure the distance from the rod to the new surface.

Descriptions of Ground Surface and Near Surface Method G027 2/90

Relative Position (G027a): Descriptors are given for cropland in Appendix A. Descriptors for range and forest need to be added.

Tillage Zone Parts (G027b): Descriptors are in Appendix A.

crust (G027c): Descriptors are in Appendix A (or part 1), pp. 61-63.

Cracks (G027d): Descriptions are in Appendix A.

Root Quantification Method GO28 2/90

Whatever the method, the strategy should be to select a very few plants and soils combinations, with emphasis on the root distribution at physiological maturity. The weight of roots is not the only product. Root length may be measured. The measurements may be done at standard depths or by horizon. Root washers are widely available where experimentalists work. For near surface measurements, consult method G019.

Horizonal Cross Section Examination (G028a): Use the rings described in G023a. Insert in a horizontal plane. Remove by undercutting and prying upward. Do not further alter the broken lower surface. Invert and place a 5 cm square grid over the broken surface of the soil, Count the protruding roots in each square. Sum for the squares of the grid that are contained completely within the core.

Quantity per unit Volume; Loose Sample (G028b): The sample weight and strategy depends on the size of the roots and the distribution withing the horizon. In some instances it may be necessary to remove 10 to 100 kg of soil, mix. and obtain a representative 1 kg subsample. For mechanical root washing, the sample weight should be about 1 kg. If the root determination is associated with standard characterization sampling, the bulk density and rock fragment percent for the horizons would be used to compute the measured root quantity to a volume basis in the same manner that other determinations, such as water retention difference (method 4c; Soil Survey Staff, 1984) is reported. In many instances, a subsample of the standard field sample may be used for the root determination. Root quantities may be obtained for excavation bulk density samples (G005).

If row crops are sampled, the excavation should be at right angles to the direction of the rows. Further. the location and width of the exposure sampled should be such that the vertical edges coincide with the midplane between rows.

If fine. alive roots are to be measured, the field sample should not be air-dried. Further, the subsample should be kept refrigerated if stored for more than a very few days.

Crowns and associated large roots may pose a sampling problem. They should be removed separately and not subdivided. Additionally, a large whole sample should be taken that encompasses several crowns and associated large roots. This large sample, exclusive of the crown and associated directly attached roots, would be subdivided in the field and about a 1 kg sample taken for analyses. The weight of crowns and associated roots should be reduced proportional to the subdivision of the associated sample. In some instances, to avoid the problem posed by crowns and associated large roots, a surficial thin zone, perhaps O-5 cm, would not be sampled.

Quantity per Unit Volume, Cores (G028c): The cores described under G023a are inserted, broken out, and the soil volume retained in total or in part for root determinations as discussed under G028b. If the ring is only partially filled, the empty space may be evaluated by dropping normals from a slotted bar and determining the distance, as described under G012. Cores may be collected using standard soil probe equipment. Cores collected during the mapping season may be held in a deep freeze and the root measurments made during the non-mapping season.

Bulk Desity Estimation from Particle Size and Consistence — Method GO29 2/90

This method is described in Grossman et al. (undated internal report). Consult H. R. Mount, Soil Scientist, NSSC, about computer implementation. The method assigns a consolidation class based on moist consistence. Bulk density of soil materials with <35 percent clay is estimated for combinations of consolidation class, family texture class (>2 mm excluded), and for loamy and sandy materials, whether well graded or not. For materials with ≥35 percent clay, consolidation class, and water retention difference estimates for the <2 mm are employed. Further adjustments may be made for the effect of extractable iron and ash of rhyolitic composition on particle density. The effect of organic carbon is an important factor. The computation follows Adams (1973):

$$\text{Db corrected} = \frac{100}{\frac{OM}{0.23} + \frac{100 - OM}{Db}}$$

Where OM is organic matter (OC x 1.7). A set of second order rules are employed for adjustment based on structure , composition and mineralogy, cementation, high rock fragment content, and taxonomic placement.

Rock Fragment Volume and Unified — Method GO30 2/90

The method is described in Grossman et al. (1988). Consult H. R. Mount, Soil Scientist, NSSC, about computer implementation. The ,250, 250-25, and 75-20 are usually estimated by volume but may be measured gravimetrically. The 20-5 and 5-2 mm are measured gravimetrically on the <20 mm. For interpretive records, the volumetric estimates are converted to weight estimates by calculation and the values expressed on the proper composition base (whole material and <75 mm). For placement in the Unified System, the textural class is evaluated and the pass 200 mesh for the <2 mm estimated. This pass 200 mesh is then computed to a <75 mm base. **The pass 200 mesh on a <75 mm base is the primary criteria for Unified System placement. Secondary criteria are constructed using the percent that the 75-5 mm is of the 75-0.074 mm.**

<u>**Linear Extensibility** by the Pin Method</u> Method GO32 **2/90**

Insert pairs of pins 2-4 cm apart in soil fabric that is near field capacity. Measure the distance moist **(Lm)** between the pins to the nearest **1/2** millimeter with calipers. Allow the moist fabric to air dry. Measure the distance between the pins while air dry **(Ld).** Divide the difference between **Lm** and Ld by the distance while air dry **(Ld):**

Coefficient Linear Extensibility (COLE) $= \frac{Lm - Ld}{Ld}$

Linear Extensibility percent (LEP) $= \frac{Lm - Ld}{Ld} \times 100$

Average for at least three pairs of pins. Discard pairs in which large desiccation cracks develop on drying between the pins. Pins may be inserted along the vertical axis of cores.

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Appendix A

Relative Position Description

Relative position of the measurement site in the tillage-determined configuration and associated traffic pattern may have a large influence on cer-

Table 6-1. Descriptors for relative position in the tillage-determined configuration.

Feature	Reference lines	Components	Ground surface shape
			Convex
Plant row	Longitudinal axis (axes)	Backslope	Apical
Planting compaction row	Traffic edge in interrow	Footslope	Nonapical
Bed		Shoulder	Hyperbolic concave
Interrow		Summit	Concave
Traffic		Toeslope	Linear
Nontraffic			
Furrow			
Ridge			

Examples

1. *Shoulder* of the *ridge* 15 cm from the *longitudinal axis* of the *plant row*.
2. *Ridge* 15 cm from the *plant row longitudinal axis*, ground surface, *nonapical convex, linear*
3. Halfway between the *longitudinal axes* of the *interrow* and the plant *row*; ground surface, *hyperbolic concave, linear*.
4. Inclusive of the *planting compaction row*; ground surface, *concave, linear*

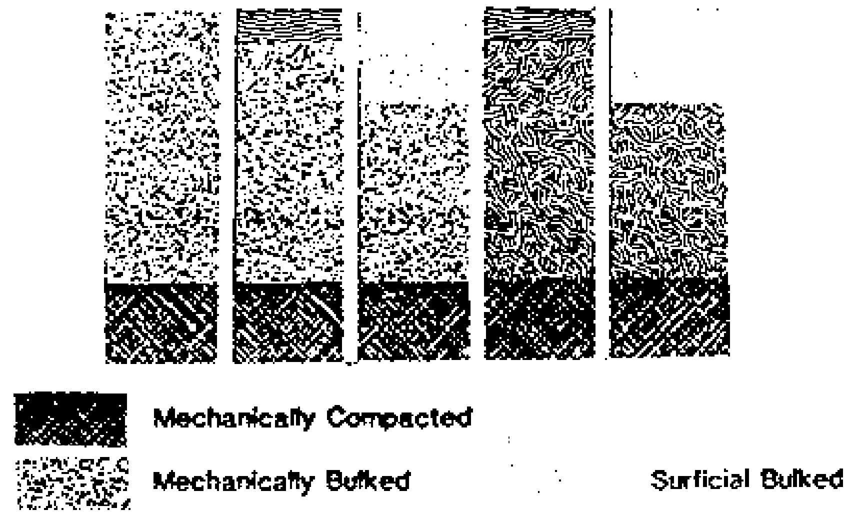

Fig. 6-1. Idealized sequences of tillage zone subzones

The distinction between water-compacted and mechanically bulked subzones is subjective. Generally, the water-compacted subzone has weaker structure, higher bulk density, and greater resistance to rupture. Furthermore, long-distance strain propagation to form cracks is stronger if extensibility is appreciable.

Crust is a kind of surficial subzone with well-expressed mechanical continuity of the fabric. Crust is recognized by the increase in mechanical continuity relative Io the soil material immediately beneath. Raindrop impact and possibly freeze-thaw cycles lead to fabric reconstitution and crust formation. *Raindrop-impact* crusts are usually thinner than *freeze-thaw* crusts. In southeast Nebraska, freeze-thaw crusts reach 20 Io 30 mm in Ihicknciss. Raindrop impact crust, in contrast, rarely exceeds 5 mm. A third kind of surficial material is formed in locally transported sediment and is referred to as a *fluventic zone*. Mechanical continuity is less than in crust and probably the zone should not be considered crust. A fluventic zone for the same thickness appears io offer less resistance Io seedling emergence and may have higher infiltration rates than the kinds of crusts observed.

Cracks

Four kinds of cracks are recognized: Surface-initiated reversible: surface-initiated irreversible; subsurface-initiated reversible; and subsurface-initiated irreversible. *Surface-initiated reversible cracks form as* drying proceeds from the soil surface downward through a crust. Such cracks close after about IO mm of rain and have little influence on infiltration. The distance between these cracks may be helpful in assessing difficulty of seedling emergence. If the cracks arc closely spaced. seedling emergence should be less limited because the plates of crust are smaller. *Surface-initiated irreversible cracks* apparently arc formed by Ihc sequence of alternate freeze-thaw cycles under conditions where free water is present followed by thaw and subsequent reduction in water content. The process of freeze-thaw appears 10 enhance the maximum water-holding capacity and the mechanical continuity of the fabric. These cracks do not close on rewetting. Theexplanation offered is that fabric reorganization during the dewatering io low suction reduces the maximum water-holding capacity irreversibly from what it was before the water loss. Along with this, mechanical continuity of the fabric is increased by successive freeze-thaw cycles Io where strain propagation is sufficient for crack formarion. These cracks extend through the freeze-Ihaw crust and should increase the infiltration rate during the immediate post-thaw period, a time when runoff may be expected.

Under favorable weather conditions in late winter in southeast Nebraska, silt loam and silty clay loam tillage zones may display surface-initiated irreversible cracks that are 20 Io SO mm deep, 5 to 20 mm wide. and occupy up to 5% of the ground surface. For soils in a given landscape with similar tillage zone properties, the cracks are stronger on flatter slopes where water excess during thaw is greater. The cracks become filled with soil material under intense rainfall unless protected by vegetation; winter wheat (*Triticum aestivum* L.) offers such protection and the irreversible cracks may be present at harvest in wheat fields even though the soil has been *very moist* for several days (water state classes in Table 6-5)

Irreversible cracks also may be round in fresh deposits of eroded soil material. As with thaw-related cracks, the origin is thought Io be related io irreversible fabric reorganization on the initial dewatering after deposition.

Subsurface-initiated reversible cracks may *form* within the soil if potential extensibility and reduction in water content from field capacity are both sufficient. Their occurrence at the ground surface depends sensitively on compaction of the near surface. Commonly, such cracks do not appear al the ground surface if the mechanically bulked subzone is over 10 10 15 cm thick and the extensibility of the horizon immediately beneath does not exceed moderate (COLE < 0.060; Grossman et al.. 1968). If the extensibility of the horizon immediately beneath exceeds moderate, then the mechanically bulked subzone must exceed about 15 cm io prevent the appearance Of subsurface-initiated cracks on the ground surface. Such subsurface-initiated cracks do nor close rapidly on wetting and may be present for several days after the soil is brought to field capacity. They do. however. close in a matter of days and this distinguishes them from the *permanent* corks of the USDA soil taxonomy system (Soil Survey Staff, 1975. p. 389), which in the terminology here would bc *subsurface-initiated irreversible.* For intertilled crops, as drying progresses the subsurface-initiated reversible cracks generally first appear transverse to the row within the middle half of the interrow; next they appear at the outer edge of the wheel tracks or the traffic interrow and parallel to the row; finally they appear along Ihc longitudinal axis of the interrow and the transverse cracks that appeared earlier extend from the middle half of the interrow 10 the plant row.

The foregoing genetic definition of cracks does not directly predict the influence of cracks on infiltration. For this purpose *surface-connected penetrant cracks* are defined. These are cracks that (i) open at the ground surface or immediately beneath a mechanically bulked subzone < 10 to IS cm thick, and (ii) are > I5 cm deep as measured by insertion of a 2-mm-diameter wire (common flag wire). *Prominent surface-connected penetrant cracking may* be defined on the basis of the meters of surface-connected penetrant cracks per square meter of ground surface. The minimum length of crack space is presumed

USING GEOGRAPHIC RESOURCES ANALYSIS AND SUPPORT SYSTEM (GRASS) AND A SYSTEM FOR THE EARLY EVALUATION OF THE POLLUTION POTENTIAL OF AGRICULTURAL GROUND-WATER ENVIRONMENTS (SEEPPAGE) TO REFERENCE AND DISPLAY POLLUTION POTENTIAL RATINGS FOR CONSERVATION PLANNING.

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Soil Scientist/GIS Specialist, USDA, SCS
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ABSTRACT

Several computer models and methodologies exist for the evaluation of ground water pollution potential using geographic information systems. Most models used to assess pollution potential on a site to site basis are far too complex for use at a Soil Conservation Service (SCS) field office level. This paper describes the integration and use of an accepted manual rating system (SEEPPAGE) for site assessment of ground water pollution potential in GIS using a weighting and rating technique.

C. EXPERIMENT STATION AND SCS STATE SOIL SCIENTIST REPORTS

Connecticut (New Maven) Agricultural Experiment Station Report

Dr. Abigail A. Maynard

Disposal of animal manures in an environmentally sound manner is an increasingly important problem in Connecticut. The potential for contamination of ground water with nitrate increases as the land available for application of raw manure decreases. One alternative is application of composted manure. During composting, the nitrogen in manure is converted to more stable organic forms and must be decomposed by soil microorganisms before it is available to crops. This microbial release of nitrogen is relatively slow, reducing potential losses to leaching as crops readily utilize the nitrogen as it becomes available. Higher application rates of composts are therefore possible when compared to raw manure. In addition, use of compost could reduce the need for commercial nitrogen fertilizers. Composting also reduces the odor problems traditionally associated with manure. The long-term impact of yearly applications of composts on nitrate leaching and crop yields has yet to be determined.

To determine the potential benefits of compost, Dr. A.A. Maynard is comparing yields of vegetables grown in compost-amended soils with yields from soils receiving conventional fertilizer. The experiment is being conducted at two locations: Lockwood Farm, Mt. Carmel, on Cheshire fine sandy loam, a loamy upland soil with a moderate moisture holding capacity; and Valley Laboratory, Windsor, on Merrimac sandy loam, a sandy terrace soil with somewhat limited moisture holding capacity. In addition, test wells are installed at Windsor to monitor nitrate concentrations in the ground water.

Two composts produced by Earthgro (Lebanon, CT.) are being utilized: spent mushroom compost (SMC) and chicken manure compost (CMC). The composts were applied in the falls of 1988 and 1989 at rates of 0, 25, or 50 T/A or 0, 56, or 112 metric tons/ha. These rates were equivalent to about 1/2 inch and 1 inch of compost. The compost was incorporated into the soil by rototilling in the spring. No inorganic fertilizer was added to plots receiving compost. Control plots received the conventional rate of 10-10-10 fertilizer (1300 lbs/A), but no compost was applied. The vegetables include spring and fall broccoli and cauliflower, eggplant, peppers, tomatoes, and spinach.

Nitrate concentrations in the ground water beneath 'the control plot (optimum fertilizer with no compost) increased to 14.7 ppm in June 1989, well above the 10 ppm drinking water standard, while the plots receiving compost remained well below 10 ppm. Plots receiving 60 T/A SMC increased to 6.3 ppm while the plots receiving 50 T/A CMC reached only 6.6 ppm, both in June 1989. Since that time, the nitrate levels have remained well below those levels.

Yields from the 1989 growing season showed that many vegetables can be grown successfully on compost-amended soils.

For spring broccoli and peppers, yields in all compost-amended plots equalled or exceeded yields in control plots. The yields of eggplant on all of the compost-amended plots equalled or exceeded the control plots at Mt. Carmel. Only the CHC-amended plots exceeded the control plots at Windsor. The SMC supplied enough nitrogen to sustain yields equal to the control only at Mt. Carmel, where soil tests revealed there was a greater nitrogen reserve already present in the soil.

Tomatoes growing in the CMC-amended plots had the greatest yields at both Mt. Carmel and Windsor, and the SMC-amended plots had the lowest compared to the fertilized controls. Tomatoes have higher nutrient requirements than the other crops and it appears that the SMC provided insufficient nutrients even at Mt. Carmel.

The control plots had the greatest fall broccoli yields, surpassing the CMC plots by 850 lbs/A. Fall cauliflower in the CMC-amended plots had the greatest yields at both sites while the SMC-amended plots had the lowest compared to the fertilized controls. The yields of fall spinach on all compost-amended' plots exceeded the control plots at both sites.

The composts will be reapplied yearly to determine the effect of cumulative additions of composts on nitrate leaching and vegetable yields, but the preliminary results are encouraging. It appears that many vegetables can be grown successsfully on compost-amended soils with no additional fertilizer. More importantly, composts retain nitrogen in the soil so it does not leach as readily to the underlying ground water.

Summary of Soil Survey Related Activities of The University of Connecticut, Agricultural Experiment Station At Storrs

Harvey Luce

Research work is continuing on the Pre-Sidedress Soil Nitrate Test (PSSNT), also known as the June Nitrate Test; As would be expected, PSSNT levels were found to be correlated with the amount of N fertilizer applied at planting time. There was a general relationship between PSSNT levels and rainfall. Plots that received higher amounts of rainfall between the time of N application and the time of the PSSNT determinations contained lower levels of nitrates. Corn yield response to N applied as a sidedress was greatest when PSSNT levels were below 20 mg N/kg. In 1989, corn yield response was more highly correlated with the PSSNT levels of the 0-60 cm soil layer than with the 0-30 cm soil layer. This is believed to be due to higher than normal rainfall in 1989.

Over 800 soil samples, from 66 different farmers, were tested for pre-sidedress soil nitrogen during the past summer. Samples were picked up by a courier, placed on ice, and transported to Storrs for next day analysis. Results and recommendations were phoned to the growers on the day they were tested.

While not extensive, somewhat poorly to poorly drained soils that qualify as Spodosols (Podzols) by both "existing" and "purposed" criteria have been identified in the eastern-most part of Connecticut. These soils are formed in sandy non-compact tills derived from specific rock formations (granitic gneisses). Associated better drained and less well drained soils are Inceptisols. Proposed changes in Spodosol criteria may result in additional Connecticut soils qualifying as Spodosols. The criteria for identifying hydric soils is not the same for Spodosols and Inceptisols. Continued studies of Connecticut Spodosols is planned.

Acid sulfate soils and acid drainage from weathering sulfur bearing rocks are of concern in a number of locations. Dredge spoils from brackish waters are the source of most of the acid sulfate soils in Connecticut. Soil pH levels of the dredgings are initially near neutral. After exposure to air, they typically test between three and four in pH. Sulfur bearing rocks may be exposed by construction activities, including road construction, and by mining of the rock for aggregate. Once exposed, these rocks weather rapidly resulting in tne production of acid sulfates. Funding is being sought for research on these soils.

Other activities include participation in a joint effort to prepare a BMP manual for farmers operating within water supply watersheds and participation in various other state, regional and national professional activities.

CONNECTICUT SOIL CONSERVATION SERVICE REPORT

Edward H. Sautter, State Soil Scientist

June 1990

current scs soils staff:

- state Soil scientist - also responsible for program leadership for Rhode Island
- Soil Scientist/Projects and Services
- Soil Scientist/Technology
- Three Soil Scientists assigned to the Connecticut statewide soil survey project
- Nationwide vacancy announcement out for Assistant State Soil Scientist/Field Operations

Note: Connecticut's long-range plan includes a Cartographer and a Cartographic Technician for needed cartographic and GIS support

Modern soil surveys were completed in 1979 (8 counties, 169 towns)

Two broad categories of ongoing activities are:(A) Technical soil services and (B) New generation soil survey activities

A. Technical soil services include:

- Assisting users of soil survey data
- Selected onsite investigations
- Selected high intensity mapping
- Environmental review team studies
- Information and education activities
- Extensive training functions
- SC.5 planning assistance
- Subdivision reviews
- Purchase of development rights soil evaluations
- Land evaluation and site assessment studies
- Soil potential studies and ratings
- Developing and maintaining SCS technical guides
- Servicing special requests for soils data
- Investigating areas of disputed wetlands
- Research and program assistance
- Assistance with CAMPS

B. New generation soil survey activities include:

- Updating/remapping older soil surveys
- Preparing statewide correlation with "super" legend

- Soil map recompilation (statewide) on **a** scale-accurate **orthophotoquad** base
- Digitizing **maps** and encoding text for GIS and computer applications
- Preparing and maintaining official series descriptions
- Preparing and maintaining soil interpretations records
- Preparing map unit description8
- Preparing statewide manuscript for publication
- Preparing hard copy quadrangle soil maps for open file
- Developing and maintaining the state soil survey **database**
- Developing **STATSGO** and implementing **use** for selected projects

Cooperative efforts with agencies, institutions and units of government are actively encouraged and employed wherever and whenever possible. Connecticut has two bonafide agricultural experiment **stations.**

About 55 private consulting soil **scientists** are currently practicing in Connecticut. The big demand for professional soil **scientists'** expertise relates mainly to land development concerns, state and federal regulations for protecting wetlands, and other environmental **issues.**

Delaware Agricultural Experiment Station Report
Richard L. Hall

State of Delaware 1,236,704 acres land area

Soil Staff - Richard L. Hall. State Soil Scientist, Dover. DE
Charles D. Parker, Project Leader, GIS, SSSD, Georgetown, DE
James D. Luzader, Soil Scientist, Georgetown, DE

Goal - Update the Delaware Soil Survey on scale-accurate base maps for the entire state. Develop a statewide legend and a soil geographic database.

Activities to Date:

--190,000 acres of the soil survey update have been completed.
--163,000 acres on the eastern side of Sussex County have been digitized. This work was partially financed by the Delaware Department of Natural Resources & Environmental Control and is known as the Inland Bay project. The information is placed in a GIS system called Multimedia Advanced Identification System for Delaware's Inland Bays. The digitized soil information is also in the CIS system for SCS in Delaware and will give SCS employees a chance to work with State data during training exercises.
--At this time during the update of the soil survey, five new soil series have been developed with the potential for several more.

Photography - The State of Delaware was photographed in 1989. The three conservation districts purchased coverage of their counties in black and white at a scale of 1:7920 or 1" = 660 ft. The State will also have coverage in Color IR and black and white at a scale of 1:24000 for the survey update. This flight will be used as the base for the orthophotoquads upon which the survey is compiled.

Delaware Agricultural Experiment Station Report
Department of Plant and Soil Sciences
Newark and Georgetown, Delaware

20 Faculty - 5 Professors; 8 Associate Professors: and 7 Assistant Professors
8 Research Associates
3 Adjunct Faculty
15 Graduate Students - 4 Ph.D.; 11 H.S.
3 Post Doctoral
90 Undergraduates

Faculty in Soil Science:

D.L. Sparks - Professor and Chair. Soil Physical Chemistry
J.T. Sims - Associate Professor, Soil Chemistry/Nutrient Management
B.L. Vasilas - Associate Professor, Soil and Crop Management
J.J. Fuhrmann - Assistant Professor, Soil Microbiology
M. Ghodrsti - Assistant Professor, Soil Physics
R.W. Taylor - Extension Specialist, Soil Fertility

Goal : Reduce the impact of agriculture inputs on ground and surface water quality by:

1. Developing improved management practices for nutrients;
2. Increasing the ability to predict pesticide fate in soils;
3. Determining the fate of organic contaminants in the soil environment;
4. Determining the interactive role of soil physical conditions and management practices on transport of agricultural chemicals in soil;
5. Determining the kinetic reactions on soils and soil constituents;
6. Evaluating the leaching, sorption, and biodegradation of herbicides in subsoils: and
7. Assessing the contribution of soybeans to nitrate contamination of ground water.

Maine Agricultural Experiment Station
Orono, Maine 04469

Characterization of Maine soils continues using soil mapping units as the sampling basis. Two soil mapping units are selected each year to be characterized as to soil texture, moisture retention, bulk density, organic carbon, reaction, coarse fragment volume, and cation content. The sites are separated by at least one mile and site selection is the result of a cooperative effort by soil scientists from the Soil Conservation Service and the Maine Agricultural Experiment Station. The results of these investigations are reported in Technical Bulletins published by the Maine Agricultural Experiment Station and as reports to the Maine Cooperative Soil Survey.

Work has continued to find a definition of the spodic horizon that will separate andic materials from spodic materials as well as keep soils with podzolic morphology in the order Spodosols. A proposed definition has been reached but further testing in the field is needed. The proposal will be presented at national meetings so that others may have an opportunity to comment and react. It is the Intent of this activity that the spodlc definition will be adopted for use in Soil Taxonomy within two years. This work has been furthered by the Soil Management Support Services group within the Soil Conservation Service who have gathered and analyzed soil samples from many regions of the United States and around the world. Data that have been used to develop the revised definition are the result of analyses of these samples at the Lincoln Laboratory of the Soil Conservation Service

MAINE SOIL SURVEY REPORT

Norman R. Xalloch, Jr., Acting State Soil Scientist

Report presented by Kenneth J. LaFlamme, Soil Scientist

Maine currently has 11 field soil scientists mapping in four active soil surveys as well as two soil scientists involved in basic soil services. The State Office staff includes an assistant state soil scientist and a soil correlator. Presently, the state soil scientist position is vacant. Dennis Lytle, former State Soil Scientist, accepted a position in Lincoln, Nebraska about January 1, 1990. This past year we lost two experienced field soil scientists. One retired from SCS and another accepted a position as a soil resource specialist. Budgetary restrictions have prevented us from hiring replacements. Increased funding from national, state and local entities is needed if we are to complete the soil survey by the year 2000.

Currently about 68 percent of the state is mapped. The demand for soil survey information remains high. Mandatory comprehensive planning for all Maine towns has added to the need to finish the mapping in Maine. Towns look to the SCS to provide them with data needed to help with growth management planning.

We continue to have interest from several large landowners in Maine for soil surveys. Scott Paper Company is in the last year of a long-term agreement to map their holdings, about 600,000 acres. This continuing agreement with Scott has allowed us to plan on long-term reimbursables. We have also entered into an agreement with Georgia-Pacific Paper Company, formally Great Northern Paper, to begin mapping their holdings (about 2.5 million acres).

The State Office recently installed a GIS. Our objective is to begin digitizing all our ongoing soil surveys within the next few months. The state of Maine has made a sizeable financial commitment to GIS for digitizing natural resource data. A special division within the Maine Department of Conservation has the mandate to coordinate and encourage GIS activities within the state. We are working closely with them to ensure our soil surveys become an important part of the Maine GIS.

The big question is how do we find the funding to digitize our published soil surveys? Most people believe the answer lies in state financial assistance. But with our state's current financial shortfall that does not appear to be forthcoming. Another possibility is a significant funding initiative by SCS.

This also does not seem likely at the present time. However, this type of funding distributed on a cost-share basis would stimulate many local dollars to get the job done.

We are currently finalizing an agreement to digitize a 600,000 acre soil survey by utilizing experimental GIS cost- share funds from Washington. These funds were used to stimulate county government funds and funds from an environmental group called the Frenchman Bay Conservancy. This type of cooperative funding is an excellent method to get digitized soil survey information in the hands of local and regional planners.

Maryland Agricultural Experiment Station Report

Martin C. Rabenhorst

During the last two years, a number of research activities have been underway in Maryland, many of which are pedologically related. Brief summaries of the findings of several of these projects are provided below.

Formation of Fe "sulfide" phases in a Chesapeake Bay tidal marsh soil.
M. C. Rabenhorst and B. R. James
Sulfate reduction processes in organic-rich tidal marsh soils of the Chesapeake Bay may result in free aqueous HS^-. In these systems, Fe is thought to be limiting to the formation of solid Fe "sulfide" phases, such as pyrite. In this study, a time sequence approach was used in an attempt to determine the rate at which various phases formed. Two contrasting soil materials containing oxidized forms of Fe were buried within a marsh in Dorchester Co., Maryland and were extracted at specified intervals for micro-morphological, mineralogical and chemical examination. Redox potentials were monitored in the marsh soil and within the buried materials. Iron "sulfide" phases were identified or inferred based on morphological habit, XRD, and chemical extraction procedures. Poorly crystalline Fe monosulfides formed within a few weeks, and pyrite developed surprisingly quickly.

Mineralogy and V Distribution in a SWAN-gypsum, an Industrial Waste.
0. Offiah and D. S. Fanning
SWAN-gypsum is an acronym for secondary-waste-acid-neutralization gypsum produced by the SCM Corporation in Baltimore, MD, as a waste product in manufacture of titanium oxide pigments from ores. About 600 tons per day are produced as a result of environmental-regulations to prevent the dumping of waste sulfuric acid into the Chesapeake Bay. The acid is neutralized with aragonite ($CaCO_3$). Gypsum ($CaSO_4 \cdot 2H_2O$), goethite, and other minerals are precipitated as the acidity is neutralized. SWAN-gypsum also contains low levels of Ti, Al, Cr and Mn, but a rather high level of vanadium is of possible environmental concern. The level of V is more than 2000 mg/kg in SWAN-gypsum, while V content of soils in the United States ranges from traces to about 500 mg/kg based on information from the U.S. Geological Survey and other sources. Mineralogical analyses of one sample of SWAN-gypsum show that SWAN-gypsum is a composite of 61% gypsum, 13% aragonite, 17% goethite with residue (9%) of mainly quartz and titanium oxide minerals (rutile and anatase). It was shown that there is a very good correlation (r>90) between the extractable iron of the goethite and vanadium in the same extractants. Almost all the vanadium appears to be extracted with the iron oxides.

Colors of Acid Sulfate Soils, D. S. Fanning* and M. C. Rabenhorst
Acid sulfate soils have unique colors and color patterns. Some sulfidic materials thetcontainmonosulfides (e.g. some dredgedmaterials) have black (N2) colors that quickly and irreversibly fade to light gray (e.g. 5Y 6/2) upon drying and remain dark gray (e.g. 5Y 3/2) upon remoistening. Upland sulfidic materials with pyrite but with no monosulfides and low in organic matter commonly are dark gray (e.g. 10YR to 5Y 3/1) and do not display irreversible color change upon drying. Ped faces or channels (e.g. from where Rhizophora that have decomposed) away) of sulfuric horizons in which Fe^{3+} is stable are decorated with pale olive (e.g. 5Y 6/4) to yellow (e.g. 5Y 7/6) jarosite and reddish (e.g. 2.5YR 3/6 to 7.5YR 5/8) iron "oxides". In older acid sulfate soils, in which sulfuricization

processes are no longer, or only minimally, active in the upper part, jarosite is usually not present in upper B horizons, apparently having been converted to iron "oxides" by hydrolysis or other processes (perhaps by Fe reduction and subsequent re-oxidation). Other horizons with the pH of sulfuric horizons (<3.5 in H_2O as presently defined), and proposed to be sulfuric horizons, lack jarosite (presently diagnostic for sulfuric horizons), probably because Fe^{3+} is not stable in them.

Hydrology, Morphology, and Mineralogy of Soils in the Triassic Basin of Maryland. H.P. Elless and M.C. Rabenhorst

Soils were examined along a topohydrosequence in the Triassic Basin of Maryland to determine the relationship between hydrology, morphology, and mineralogy. The dusky red shales, the dominant rock type of this basin, are mono-mineralic with respect to Fe oxides, with only hematite being present. This provides an opportunity to study Fe "oxide" transformations in these soils. Heights of the seasonal zero tension groundwater were measured biweekly in both unlined boreholes and slotted pipes at various depths along the topohydrosequence. Chemical extractions (sodium dithionite and acid ammonium oxalate) and XRD were used to analyze the Fe "oxides". The iron oxides in both matrices and mottles appeared to be crystalline (i.e. Fe_o/Fe_d = 0.06) in both matrices and mottles. Hematite was present in the soil matrix and in mottles of 5YR hue or redder. Iron-manganese nodules, which formed in the wetter soils, had a higher proportion of oxalate-extractable iron (Fe_o/Fe_d = 0.28). While these nodules contained approximately 100 g kg^{-1} Fe_d and 30 g kg^{-1} Mn_d, goethite was the only free oxide identified by XRD within the nodules.

Spodic Characteristics in Soils along a Toposequence in Eastern Maryland. M. A. Condron and M. C. Rabenhorst

Spodic characteristics were examined in soils along two hydrosequences in the lower Eastern Shore of Maryland. Soils were classified according to Soil Taxonomy as siliceous, mesic Typic Quartzipsamment, Spodic Quartzipsamment, Aeric Haplaquod, and Typic Haplaquod. Organic C, pyrophosphate extractable C and extractable Al were greatest in the spodic horizons. Some of the spodic horizons in the very poorly drained positions were >100 cm thick and had no extractable Fe. Structural Al and K were present in smaller amounts in the surface horizons. This suggests that feldspar weathering in the surface horizons provides the source for Al in the spodic horizons.

Anthropic Epipedons in Soils Affected by Oyster Shell Middens in

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
ANNAPOLIS, MARYLAND

Summary of Soil Survey Progress (FY 1989 and FY 1990)

State of Maryland (6,733,660 - 23 counties)

District of Columbia (44,160)

Soils Staff

James H. Brown, State Soil Scientist, Annapolis, MD
W. Dean Cowherd, Assistant State Soil Scientist, Annapolis, MD
Carl E. Robinette, Area Soil Scientist, Cumberland, MD
James E. Brewer, Project Leader, Cambridge, MD
George P. Demas, Soil Scientist, LaPlata, MD
David Verdone, Soil Scientist, Frederick, MD

Soil Survey updates were completed for Montgomery and Dorchester Counties. Baltimore City detailed mapping was completed and an interim report was prepared.

NEW SERIES IN STATE OF MARYLAND

Series Name	Classification
Bestpitch	Clayey, mixed, euic, mesic Tecric Sulfihemists
Blocktown	Loamy-skeletal, mixed, mesic, shallow Typic Hapludults
Brinklow	Fine-loamy, mixed, mesic Ochreptic Hapludults
Chicone	Coarse-silty, mixed, acid mesic Thapto-histic Fluvaquents
Hambrook	Fine-loamy, siliceous, mesic Typic Hapludults
Honga	Loamy, mixed, euic, mesic Terric Sulfihemists
Hurlock	Coarse-loamy, siliceous, mesic Typic Ochraquults
Hyattstown	Loamy-skeletal, mixed, mesic shallow Typic Hapludalfs
Ingleside	Coarse-loamy, siliceous, mesic Typic Hapludults
Kentuck	Fine-silty, mixed, mesic Typic Umbraquults
Nanticoke	Fine-silty, mixed, non-acid, mesic Typic Hydcaquents
Pone	Coarse-loamy, siliceous, mesic Typic Umbraquults
Puckum	Dysic, mesic 'Typic Medisaprists
Runclint	Mesic, coated, Typic Quartzipsamments
Sunken	Fine-silty, mixed, mesic Typic Ochraqualfs
Transquaking	Euic, mesic Typic Sulfihemists
Travilah	Fine-silty, mixed, mesic Aquic Hapludalfs
Wheaton	Fine-loamy, mixed, acid, mesic Typic Udorthents

Provided 192 field investigations with site write-ups and 384 field investigations for on-site comments.

Field investigations for updating purposes has been completed in the following counties:

Anne Arundel
Charles
Frederick
Wasnington
Howard

Special

2. Panchromatic and multispectral data from the sensors on board the SPOT satellite have been obtained. The panchromatic digital data have 10m x 10m spatial resolution, the multispectral data have 20m x 20m resolution

Otnee Digital Data Being Used in The Study

1. Scanning soil sheets for each quad from appropriate county soil survey

2. Vector data sets of each quad's transportation and hydrology network

3. NWI vector data of non-tidal wetlands found witnin each quad

Image Processing System Being Used to do the Imagery Analysis Work:

Map and Image Processing System (MIPS)
- -PC based system with color monitor attached
- -Menu based screens

Analysis Work Done to Date:

-All of tne NAPP CIR photography have been scanned and are being rectified to produce digital mosaics of each quad sheet area

-SPOT pancnromatic data have been obtained for each quad (the data was collected by the SPOT sensors at approximately the same time the NAPP photography were flown). SPOT multispectral data have been obtained for three of the six quads (no decision nas been made concerning the other three quads)

-Soil overlays are currently being scanned and rectified to produce quad coverage

-Field work nas been done for most quad areas by SCS personnel

NAPP digital imagery for two quad areas have been analyzed to produce an image map showing areas of farm wetlands - comparisons with field work is currently being done.

Further Efforts Planned:

1. Finish image analysis work for each quad area for both the NAPP and SPOT image data

2. Assess the accuracy of each image map produced from each data type

3. Try combining soil data and imagery to enhance accuracy of delineating farm wetlands

4. Write up results of the study - preliminary report due by the end of June

MASSACHUSETTS AGRICULTURAL EXPERIMENT STATION

Peter L.M. Veneman
Department of Plant and Soil Sciences
University of Massachusetts
Amherst, MA 01003

Soil Characterization Laboratory

Soil characterization activities in support of the once-over survey have been completed and we are now gearing up for the new surveys in Plymouth and Franklin Counties which will be done at a scale of 1:12,000, hence require more detailed soils information. Besides regular soil characterization studies we are also planning a number of morphology/soil water studies. During the coming year, we anticipate to enter all our soils data in a computer data base to facilitate information retrieval and manipulation.

Morphology/Soil Water Studies

This past year a new Hatch project was initiated focussing on the relationship between soil morphology and soil moisture regimes. We are monitoring some 20 sites in the Connecticut River floodplain to evaluate the frequency and duration of flooding in respect to soil morphological properties. Poorly and very poorly drained floodplain soils meet taxonomic criteria for the aquic moisture regime 3 years after the last major flooding (=depositional) event. Cause of the rapid rate of soil formation is the abundance of organic matter, long to very long periods of saturation or near-saturation, and temperatures above biological minimum for most of the year. On-going measurements include water table elevations, redox potentials, temperatures, dissolved oxygen content, and microbial activity.

The U.S Geological Survey for many, sometimes up to 50, years has measured water table elevations throughout New England. This summer we plan to describe 25 profiles adjacent to selected USGS wells to evaluate morphological characteristics and to relate these to long-term groundwater elevation fluctuations. This work is partly supported by the Massachusetts Department of Environmental Protection to provide a scientific basis for improved site suitability assessment procedures for onsite sewage disposal.

Vegetation/Hydric Soils Study

A study in the Connecticut River Valley to evaluate the relationship between hydric soils and hydrophytic vegetation was completed. In this fluvial environment hydric soils usually supported hydrophytic vegetation and nonhydric soils did not support this kind of vegetation.

Soils at higher positions in the landscape commonly were flooded for periods less than a week, and these soils did not appear anaerobic as indicated by escaping air bubbles and a very rapid fall of the water table after inundation. Study results indicated the need to better define series characteristics to more effectively separate hydric from nonhydric soils.

Fragipans

A study of fragipan formation in New England (i.e. Massachusetts and New Hampshire) soils was completed. David Lindbo's study encompassed bulk density, particle size, macromorpholocal and micromorphological observations, clay mineralogy, heavy metal distribution, and orientation of coarse fragments. Fragipans appear to be quite common in the study area, particularly in the so-called older till. The New England pans typically are formed in the upper part of dense basal tills and are characterized by polygons. bleached prism faces, higher bulk densities than in horizons above and below the pan, presence of argillans (most of tho pans qualified as "argillic" based on micromorphological counts), clay bridging, and general weathering of the soil material. The non-fragipan dense basal tills (Cd horizons) have little or no oriented secondary clay in the matrix although some stress cutans can be observed possibly due to depositional stresses. Clay mineralogically the fragipans exhibited intermediate development between the Ap and the Cd horizon with kaolinite in the lower horizons and gibbsite in the upper part. Micas dominated the Cd horizons. Heavy mineral analyses indicated that the overlying sediments (Bw and Ap horizons) differed from the dense basal tills reflecting the aeolian origin of the upper soil. Weathering is evident in the fragipan horizons shown by seration, pitting, etching, and iron staining. The Cd horizons show some weathering, however, not as strong as the fragipan horizons.

Organic Matter Distribution

Geostatistical analysis was used to evaluate the spatial variability of organic matter content within selected mapping units in short and long transects (50 or 80 m; and 1200 m respectively) at 0.5. 1, and 15 m sampling intervals. The results showed strong trends with distance. Results indicated that variability of organic matter content within mapping units should be assessed using classical statistical analysis such as t- and F-tests. When larger units are considered or the soils within the mapping unit show considerable variation, geostatistical

Phosphorus Sorption

A phosphorus sorption study in relation to wastewater renovation was completed. Sorption was directly related to Fe and Al soil contents, and cation exchange capacity. Results showed that soils can be effective in wastewater treatment. however, the presumption that soil interaction will result in total P removal is unrealistic. Depending on which sorption model is being used, some degree of P leaching always will occur; the greater the amount sorped, the greater the amount being leached. The study also indicated that sorption sites can be reactivated upon "aging" of the system.

Waste Water Treatment using Peat Technology

Peatmoss and reed canary treatment beds were operated in batch and flow modes to evaluate the reaction order and rate constants for landfill leachate degradation using COD and TOC as modelling parameters. Mean hydraulic retention times of 3-10 days resulted in a 99+% reduction in COD and TOC concentrations. Similar reductions were realized for heavy metals and total nitrogen. Data indicates that this method can be effective for treating landfill leachate if unsaturated conditions arc maintained. Continuing studies evaluate the suitability of peat for nitrate removal for onsite sewage disposal. Preliminary data indicate substantial nitrogen removal probably due to denitrification.

Hydric Soils and Soil Series

A study of soil series currently in use in southern New England revealed that a number of official series descriptions are incomplete and may possibly be confusing for inexperienced users. Inappropriate application of morphological soils data in hydric soil identification may result in classification of moderately well, well-drained and even an excessively drained soil as being hydric. It is strongly recommended that each state review the range of characteristics of its soils particularly in respect to hydric soil criteria. It also is recommended that the official "Hydric Soils of the United States" listing be amended to include the following groupings: hydric (99% hydric), mostly hydrir (66-99%), possibly hydric (1-66%), and nonhydric (1%).

United States Department of Agriculture

Soil Conservation Service

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SUMMARY AND PROGRESS OF SOIL SURVEYS FOR MASSACHUSETTS

Thanks to the efforts of Steve Hundley, the soil survey of Massachusetts was completed at the end of 1988. Four soil survey areas were completed at that time. These survey areas will all be digitized, at a scale of 1:25000, and will be published within 2 to 3 *ears.

Massachusetts is presently working on updating two soil survey areas. Plymouth County, in the Eastern part of Massachusetts, and Franklin County, in the Western part of Massachusetts. These soil survey areas are expected to have the field work completed by the years 1995 and 1996 respectively. The survey areas will be digitized and the published reports will contain: Soil Potential Interpretations, Computer Generated Diagrams, Color Photos, and they will be published at a scale of 1:12000 vs 1:25000 that most reports are published at now.

One of our soil scientists, Peter Fletcher, is also working with the Army Corps of Engineers. Pete spends about one third of his time training their field people in the identification of Hydric Soils. Pete has been all over New England, with the Army Corps, looking at different soils and making Hydric Soil determinations with them.

Massachusetts' digitizing program is just getting underway. We have been using a 3b2 for the digitization work, and it wasn't too long before we realized that the 3b2 could not handle this process. We at-e currently awaiting the arrival of an AT&T 6386E with the LTPlus package. This set-up should be able to handle our digitizing needs nicely.

Massachusetts is one of the few states fortunate enough to have a Ground Penetrating Radar Unit (GPR) to work with. We have been using it mostly for determining map unit composition. By pulling the unit over the ground surface, we are able to receive and record a graphical readout of the material below the ground surface. By interpreting these printouts we are able to make determinations of depth to bedrock, depth to water tables, differences in soil textures and presence of a "hardpan". We have also used the GPR with the Vermont Archaeological Society, to help locate artifacts for them. The GPR may also prove to be a valuable tool for promoting our Water Quality Initiative. We think we can locate "Preferential Flow Paths" in certain types of soils. This may prove to be a valuable asset in determining the location of monitoring wells for ground water pollution.

The University of Massachusetts is interested in digitizing the Natural Resource Inventory (NRI) PSU's in Massachusetts. We are currently working with them on an agreement for having this done. This should prove to be a valuable tool to the both of us. We will have a more permanent record of the PSU locations plus they will be more readily accessible and easier to work with if the need arises.

Massachusetts and New Hampshire will be experimenting with a Global Positioning System (GPS) this summer. We will be using the GPS to find out if this could be means of accurately locating ourselves or sites more precisely in remote areas. This system may also be helpful in drawing soil boundaries in these remote areas. A signal will be "beamed" up to a satellite and then to a base station, located in Boston, to be recorded. This information will then be sent to the field off ice, either faxed or electronically, to be recorded on our maps. The sites will have latitude and longitude locations that are supposed to be accurate to within 10 meters.

6/21/90

NEW HAMPSHIRE REPORT

The State of New Hampshire is very active in digitizing soils information into the GRANIT State-wide GIS. (GRANIT: Geographically Referenced ANalysis and Information Transfer). Currently four survey areas have been digitized into the QRANIT GIS with three additional survey areas scheduled to have digitization completed by 1992. The update of the Merrimack and Belknap County Soil Survey will be digitizing soils data during the compilation process.

The SCS has recently acquired a GRASS GIS and

Respectfully

Steve Hundley
State Soil Scientist

New Jersey Soil Survey Report

Ronnie L. Taylor
SCS, Somerset, NJ

The soils department at Cook College, Rutgers University, is now part of the Department of Environmental Resources and has moved into a new building. Although there is no active Soil Survey mapping in New Jersey, we do cooperate with Cook College Short course teaching, remote sensing, etc.

Our current soils staff in New Jersey consists of seven Soil Scientists:

Ronnie L. Taylor	State Soil Scientist, Somerset, NJ
Daryl D. Lund	Assist State Soil Scientist, Somerset, NJ
Maxine J. Levin	Soils Correlator, Somerset, NJ
Seymour D. Goodman	Soils Specialist, Somerset, NJ
Thornton T. F. Hole	Soils Specialist, Hammonton, NJ
David H. Kingsbury	Soil Scientist, Somerset, NJ
Lenore J. Matula	Soil Scientist, Hammonton, NJ

Only one of these people have been in their current position for more than than 1.5 years. We have a young, but very good staff with a broad range of experiences. Two of our people, Daryl and Maxine, have international soils experience.

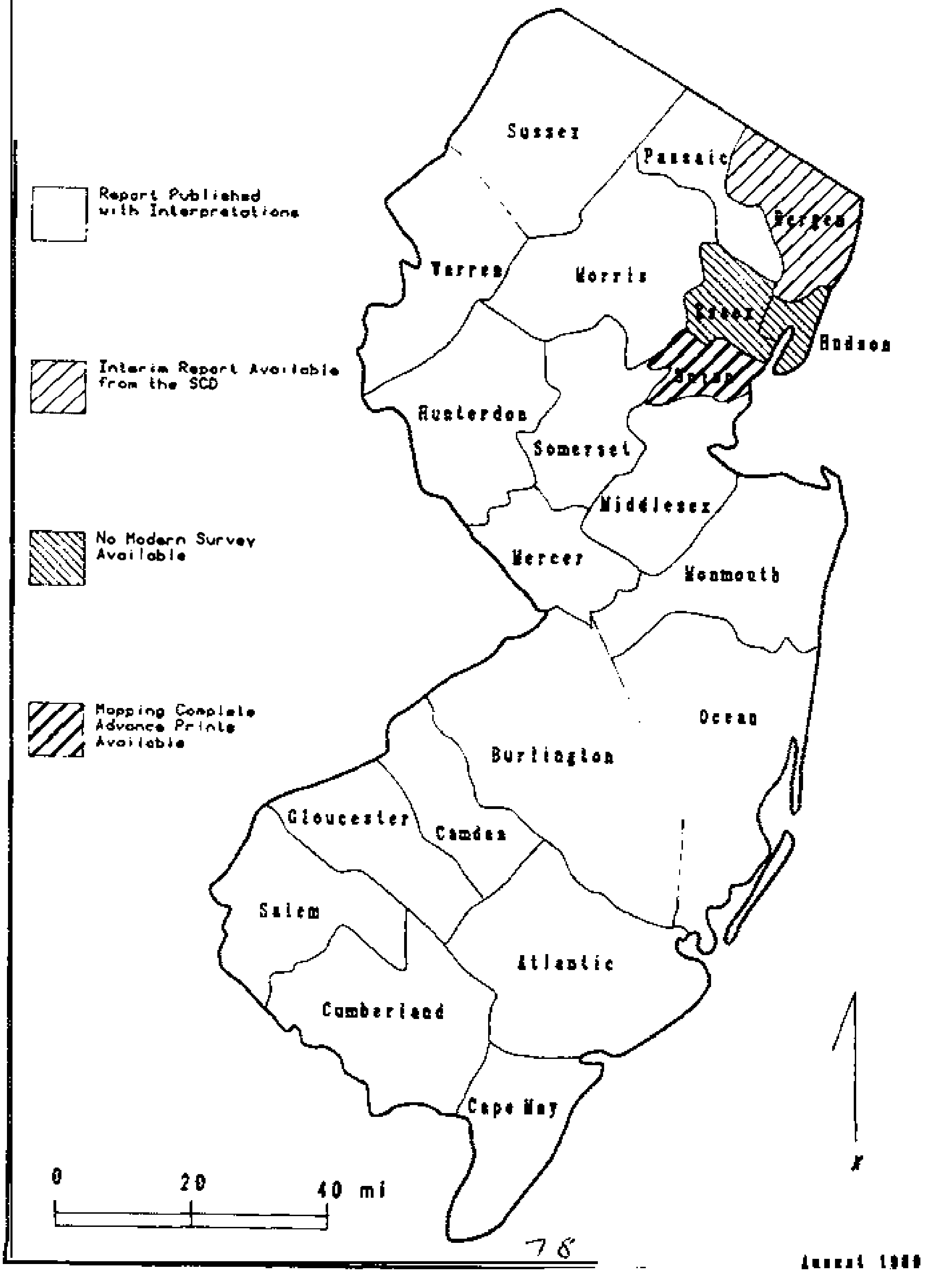
All but four of New Jersey's 21 counties have modern published Soil Surveys (see attachment 1). The Bergen County Soil Survey Report is in the English Edit phase with the Soils Atlas Sheets scribed on 1:24000 orthophoto quads. The Union County Soil Survey Report is in the English Edit phase with plans to compile the soils onto 1:24000 orthophoto quads. There are currently no plans to map Hudson or Essex Counties because they are more than 80 percent urban. The 17 published Soil Survey Reports vary in age from 1962 to 1989 and in scale from 1:15840 to 1:20000 (see attachment 2 for more details).

We are planning to start updating some of our inadequate soil surveys. We are ready to request update permission on three southern counties (Cape May, Cumberland, and Salem). We intend to do other update studies in FY-91.

There is a lot of local pressures to have digital soils information. None of our 17 published Soil Survey Reports are on stable base photography. They are, therefore, not suitable for digitizing without first recompiling the information onto a stable base. We have 1986 orthophoto quad coverage for the entire state. Funding for compilation and digitizing is very hard to obtain at this time. We are working with the Hunterdon County Soil Conservation District (SCD) and the County Planning Board on a joint project to recompile the Hunterdon County Soil Survey onto the 1986 orthophoto quads and digitize the information. This is being accomplished on a 50/50 cost share basis with the local input being personnel to recompile the soil survey. SCS is providing quality control and contract digitizing. This will be the first county in New Jersey to have a County Soil Survey digitized to meet our National Cartographic Center standards. It is also thought that this project will stimulate other counties to find ways to finance projects in their areas.

In addition to these projects, we are also working on a "State Wide Legend", are in the process of cleaning our State Soil Survey Database, and doing several reimbursable projects each year.

SOIL SURVEY PROGRESS -- NEW JERSEY



ATTACHMENT 2

TABLE 1 - ANNUAL STATUS OF SOIL SURVEYS
NEW JERSEY FY-90

No.	Survey Area Name	Kind of Survey	Acres	Acres Mapped	Percent Mapped	Publication Scale	Year Mapping Completed	Date Survey Published	Projected Publication Date
	Atlantic County	391 order 2	391,600	391,600	100	1:20,000	1973	4/78	
	Bergen County	order	158,000	158,000	100	1:24,000	1980	-	1991
	Burlington County	order 2	524,300	524300	100	1:15,840	1966	10/71	
	Camden County	order 2	145,600	145,600	100	1:15,840	1961	4/66	
	[illegible]	order 2	[illegible]7,500	[illegible]7,500	100	1:24,000	[illegible]	-	1991
	[illegible] County	order [illegible]	[illegible]	[illegible]	[illegible]	1:15,840	[illegible]	[illegible]	-

Cornell University Agricultural Experiment Station Report

Ray B. Bryant

Since the last meeting of the NE-SSWPC, the Jefferson, Sullivan, Warren, and Columbia county soil surveys have been published. Currently, there are 20 field soil scientists, 2 area resource specialists, and 3 soil scientists in the NY State office. One vacancy in the state office staff was recently created when Jon Vrana was promoted to the National Soil Survey Center in Lincoln, Nebraska.

In February 1989, a Memorandum of Understanding between the USDA Soil Conservation Service, Cornell University Agricultural Experiment Station and Cornell University Cooperative Extension Service established the Soil Information Systems Laboratory (SISL) at Cornell University. The purpose of the laboratory is to serve as a focal point for soil survey digitizing. The SISL laboratory is a component of Dr. Bryant's faculty program in soil genesis, classification and survey. Ms. Sharon Waltman, SCS Soil Scientist, was assigned to the lab where she serves as supervisor of lab activities. The SISL lab is currently digitizing the STATSGO map of New York and the pipeline corridor in support of Bill Waltman's project.

Dr. William Waltman assumed the position of Sr. Extension Associate and has initiated a research and extension program in soil interpretations and soil resource information systems. Current projects include GIS-based analysis of (1) potential pesticide leaching in soils of the Fingerlakes Region of New York, (2) soil impact assessment and amelioration of pipeline constructionfor the Niagara-Mohawk corridor from Canada to Long Island, and (3) site assessment for landfill sighting in Tompkins County.

Mr. John Galbraith assumed the position of Assistant Soil Survey Leader for the CUAES. John is a former SCS party leader from Havre, Montana and is on educational leave. He will being work on a Ph.D. in soil genesis under the employee degree program.

Research on P-retention in soils of Central America conducted by Ray Bryant while on sabbatical leave relates P-retention to taxonomic groups of soils. This work is currently being summarized for publication.

Work on iron oxides in Brazilian Oxisols has been summarized and published. Data from this study support the hypothesis that Al substitution increases the stability of an iron oxide mineral in a reducing environment. Yellow colors in some Oxisols are the result of the preferential reductive dissolution of hematite while Al-substituted goethite is metastable in the reducing environment.

Two years of soil temperature data in New York are currently being summarized as part of Tom Macfie's Master's thesis. A model to estimate daily soil temperature is being developed. Soil temperature and soil characterization data were used to characterize soils in frigid temperature regimes having argillic horizons and low base status. A proposal to amend Soil Taxonomy to allow frigid classes of Ultisols has been submitted.

Publications:

Parlange, M. B., Steenhuis, T. S., Timlin, D. J., Stagnitti, F., and Bryant, R. B. 1989. Subsurface flow above a fragipan horizon. Soil Sci. 148:77-86.

Macedo, J. and Bryant, R. B. 1989. Preferential reduction of hematite over goethite in some Oxisols in Brazil. SSSAJ 53:1114-1118.

Bryant, R. B. 1989. Physical processes of fragipan formation. p. 141-150. In N.E. Smeck and E.J. Ciolkosz (ed.) Fragipans: Their occurrence, classification and genesis. SSSA Spec. Publ. 24, ASA, CSSA, and SSSA, Madison, WI.

Inman, B. L., Bryant, R. B., and Hudnall, W. H. 1989. Strength analysis of fragipans in some loess-derived soils in Louisiana. SSSAJ 53:890-897.

Bryant, R. B. and Waltman, W. J. 1990. Rationale for allowing taxonomic classes of frigid ultisols. Soil Survey Horizons 30:113-116.

Bryant, R. B. and Macedo, J. 1990. Differential chemoreductive dissolution of iron oxides in a Brazilian Oxisol. SSSAJ 54:

Hoosbeek, M. R. and Bryant, R. B. 1989. (Abs.) Physical processes and strength development in fragipans of loessial soils in Louisiana. American Society of Agronomy Annual Meeting. p. 265.

Gilbert, F. L., Bryant, R. B., Perritt, R. G. and Waltman, W. J. 1989. (Abs.) Institutional arrangements for delivery of digital soils information in New York State. American Society of Agronomy Annual Meeting. p. 263.

Macfie, T. G., Bryant, R. B., and Waltman, W. J. 1988. (Abs.) Comparative iron mineralogy of red and brown till-derived soils in the Catskill Mountains, New York. American Society of Agronomy Annual Meeting. p. 261.

Waltman, W. J., Macfie, T. G., and Bryant, R. B. 1988. (Abs.) Soil temperature regimes of the Catskill Mountains and the Southern Tier of New York State. American Society of Agronomy Annual Meeting. p. 268.

Asfaw, N., Bryant, R. B., and DeGloria, S. D. 1988. (Abs.) Characterization of soil-land use interactions using a soil information system. American Society of Agronomy Annual Meeting. p. 253.

The Pennsylvania State University

Experiment Station Report

Northeast Soil Survey Work Planning Conference

June 4-8, 1990

R. L. Cunningham

I. Land Analysis Laboratory: An activity in the Agronomy Department that conducts research on soil landscapes and hydrology to improve the understanding of soil-water relationships, to discover new information about soils, and implement new techniques that utilize soil information in land-use planning and management.

Educational Objectives: Fourteen graduate students have interacted in our soil survey program during the last academic year. Several soils courses now include an introduction to the laboratory and landscape analysis. A new soil science major has been approved for undergraduates. Courses emphasizing soil science are now identified as SOILS courses rather than the previously used Agro designation. A graduate studies program in Hydropedology is being proposed by the Soils faculty of the Department of Agronomy. Anticipated offering would be Spring 1991.

PENNSYLVANIA SOIL SURVEY STORY

Garland H. Lipscomb, SCS, Harrisburg, Pennsylvania

The cooperators in the Pennsylvania Soil Survey Program are The Pennsylvania State University, College of Agriculture; Pennsylvania Department of Environmental Resources, Bureau of Soil and Water Conservation; and Pennsylvania Department of Agriculture. We are recommending that the Pennsylvania Association of Conservation Districts be included as a cooperator. This will be voted on at our State Soil Survey Committee Meeting on June 15, 1990.

Our Soils Staff presently has 15 soil scientists on board. We are in the process of hiring two more soil scientists. Ed White -is the Soil Correlator and also the Soil Survey Database Manager. John Hudak, located at the Penn State Land Analysis Lab, is the Soil Scientist for technology. John is our liaison with Pennsylvania State University (PSU) and also the soils Geographic Information Specialist (GIS). Travis Neely, the new Assistant State Soil Scientist reported to Pennsylvania May 21, 1990, is in charge of manuscripts and will be our NRI Specialist. The manager of the Map Compilation Center is Dennis Bush.

We have three area soil scientist. There are four project teams consisting of seven soil scientists updating soil surveys. We have two cartographic technicians (one vacant) at the Map Compilation Center.

The initial mapping of the state was completed in October 1988. Thirteen counties in Pennsylvania have been approved for updating. Field work has been completed for two counties. Updating for the most part is being done by MLRAs; however, publications will be by individual counties. Updating is being done at a uniform scale of 1:24000 on

Soil maps for three counties have been sent through CART0 to **REDCON,** private contractors, to be digitized - Bedford, Warren and Forest. One other county is Presently at CART0 to go to **REDCON.** Bedford County **will** be published with digitized maps. We are working with **NHQ** on a pilot project to scan **Montour** county and two topoquads in Juniata County. Scanning looks like it may be the route to take in digitizing.

The **STATSGO** map for Pennsylvania is complete. It is in ARC-INFO and GRASS. We are in the process of preparing interpretation maps.

In another pilot project with NHQ, we are digitizing 2400 **PSUs** for NRI in the lower parts of the Chesapeake Bay drainage area in Southeast Pennsylvania and Northern Maryland. The **PSUs** have been geo-referenced and transferred from aerial photos to topoquads.

We are compiling maps for SCS in New York and Yates County New York at our Map Compilation Center.

We are working with NHQ on a pilot project updating all sections of the Technical Guide. The goal is to have Section II (soils part) completely automated to be included in CAMPS in all field **offices.**

To date we have completed editing and downloaded State Soil Survey databases in CAMPS for about one half of the counties in Pennsylvania.

We had three soil scientists on detail in the **midwest** doing FSA mapping last year. One was in Illinois and two were in Wisconsin. This winter we had one soil scientist detailed to Florida.

Last year we completed mapping over 40,000 acres and sampled 96 soil profiles for EPA as part of the stream survey of their Acid Precipitation Study.

Edgar White, Soil Correlator provided soil training at several workshops on Water Quality Interpretation and **Hydric** Soil Identification.

John Hudak recently testified at the Milk Producers Association on-why it cost more to produce a 100 weight **of** milk in Western Pennsylvania than in Eastern Pennsylvania. It was determined that the difference is related to soil productivity.

There have been 850 soil profiles sampled in Pennsylvania that were computerized by the soils lab at the Pennsylvania State University. We are now assisting with classifying the soils that were sampled.

Rhode Island Agricultural Experiment Station Report

William R. Wright

1. Relationship Among Hydrology, Vegetation, snd Soils in Forest@ Wetlands. F. Golet, W. Wright and A. Gold

Various hydrologic properties (water tables, degree of saturation, etc.) percentage cover of hydrophytic vegetation, and various physical, chemical, and morphological properties of soils were measured over a 3-year period along 9 upland-wetland transects in southern Rhode Island. Using stepwise discriminant analysis, the percentage of the growing season during which air-filled porosities within 30 cm of the ground surface were 15% or less was selected as the most important hydrologic feature distinguishing between wetland and upland.

The wetland/upland boundary based on hydrology was lowest on the transects; only very poorly drained soils and some of the poorly drained soils were classified wetland. The vegetation-based boundary was highest on the transects; all stations except for moderately well drained soils were classified wetland. The boundary based on hydric soil status was generally located between these two extremes; all of the very poorly and poorly drained soils and a single somewhat poorly drained soil were classified wetland. This study suggested that the extent of hydric soils appeared to most reasonably define wetland boundary for regulatory purposes.

Twenty-three soil properties were examined to determine which bore significant predictive relationships to average high water tables. When data from all sites were pooled and analyzed, four soil properties were found to account for 79% of the variability in high water levels. These features were depth to chromas of 3 or less with values of 4 or more, the thickness of the epipedon meeting umbric color and chemical criteria, and the thicknesses of the B and Oi horizons.

2. Evaluation of On-site Septic Systems. A. Gold and C. McKiel

The development of a "clogging mat" in on-site sewage disposal systems is considered essential for adequate waste water treatment. Lack of continuous operation of septic systems in seasonally-used vacation homes may inhibit the formation of a "clogging mat" at the soil/trench interface. Examination of three seasonally used homes located on coarse-textured glacial outwash deposits confirmed that a "clogging mat" did not develop/occur. Rapid fingering of effluent to groundwater was evident. Nitrate-N concentrations of 30 to 40 mg/l were frequently observed 6 m away from the drainfield. Fecal coliform and Clostridium perfringens counts were dramatically reduced within the vadose zone and first 2 m of groundwater; however, further reduction was minimal et 6 m and counts remained in excess of the drinking water standard et all sites for most of the occupied season. Concentrations of phosphorus reached 3.88 mg/l directly adjacent to the drainfield, but decreased rapidly with distance.

A field laboratory was constructed with nine one-fifth scale on-site sewage disposal systems to evaluate several potential nitrogen removal systems. Three replicates of each of the following systems were crested: a recirculating sand filter (RSF) system; a RUCK multimedia filter system; and a conventional system. The RSF system utilized septic tank effluent and methanol es the carbon source for denitrification, whereas the RUCK system used greywater. The RUCK and RSF systems achieved 70% and 66% nitrification on en annual basis. Nitrification in both systems were limited by temperature during the winter months, dropping to 44% and 24% for the RUCK and RSF systems, respectively.

The extent of denitrification and total nitrogen removal was also dependent upon system design and carbon source. The RSF system averaged 25% denitrification with septic tank effluent as the carbon source and 97% denitrification with methanol. Using greywater, the RUCK system achieved en average of 51% denitrification. Total nitrogen removal was 1-6% for the conventional system, 50% for the RUCK system, 21% for the RSF with sewage effluent, and 84% for the RSF using methanol es the carbon source.

3. Spatial Association Between Hydric Soils and Wetland Vegetation. P. August and C. Stone

The goal of this study was to determine the degree of spatial correlation between wetland habitat defined by soil characteristics and those defined by vegetation. Using Geographic Information System (GIS) overlay capabilities the relationships between two digital data sets (i.e.. hydric soils and wetland vegetation) were analyzed. Across a study site of 105 square kilometers, 60-70% of the wetland vegetation occurred on hydric soils. Between 40-60% of the total area covered by hydric soils did not contain wetland vegetation. When the effects of sliver polygons and non-standard minimum map unit sizes were removed, 93% of all wetland vegetation occurred on hydric soils. Field investigations of large areas of hydric soils without wetland vegetation indicated that these consisted largely of somewhat poorly drained soils.

VERMONT SOIL CONSERVATION SERVICE REPORT
DAVID G. VAN AOUTEN, STATE SOIL SCIENTIST

The soils staff consists of 11 soil scientists: two in the state office, three project leaders, 5 project member soil scientists, and one soil resource specialist.

We have completed about 73 percent of the mapping in the state. About 1,500,000 acres remain to be mapped.

There are three Project Soil Surveys in progress: Washington, Windsor and Orleans counties. Because Washington county was set back two years due to FSA mapping requirements, we are concentrating on completing the final 90,000 acres this fiscal year. Two counties, Caledonia and Essex remain to be mapped.

To satisfy user needs in unpublished areas, we have been completing Interim Reports. The Soil Conservation Districts sell these reports for the cost of the materials.

A soil survey users workshop was conducted in December. This workshop was held specifically to educate state employees who use the soil survey in their work. The rapid turnover in some of the departments require that a workshop such as this be conducted periodically. Other users were also invited, among them consulting engineers, environmentalists and consulting soil scientists.

The Geographical Information System has been a driving force in our goal to complete the 'once over' in Vermont. A Vermont Office of Geographical Information System (OGIS) was established in the past two years. Their goal is to digitize the soils for all counties. We will have all of the published Soil Surveys digitized by August 31 this year. The University of Vermont School of Natural Resources was contracted to digitize the last 4 counties over a two-year period. the Vermont SCS was provided reimbursement to provide the quality control of the digitizing of these surveys during this period.

A memorandum of Understanding was developed with the Vermont OGIS and SCS in order to provide the necessary safeguards for both agencies. We will provide a copy of the State Soil Survey Database attributes convertible to the ARC INFO software in return for a copy of the spacial attributes. We also have stated that the data cannot be copywrited by the State of Vermont.

A Soil Potential Study on timber production is near to completion for the State of Vermont. The indicator species include the sugar maple for upland soils and the white pine for outwash soils.

VERMONT AGRICULTURAL EXPERIMENT STATION REPORT
DR. WILLIAM JOKELA, ASSOCIATE PROFESSOR
(report **presented by DAVID VAN HOUTEN)**

Dr. Bill Jokela has conducted research on the best management practices that would decrease the runoff and leaching of nutrients. The best management practices included the proper spreading of manure along with the prudent use of nitrogen fertilizer through nitrogen testing and timely application.

Efforts torefinethe Vermont nitrogen soil test are continuing, including evaluation of the test in different tillage and cropping systems and examining the effect of sampling time.

A USDA-Water Quality study has been initiated that is evaluating the leaching of nitrates through the soil and into the ground water in different silage corn management systems.

Other studies on nitrate leaching:

- The use of different cover crops and seeding times
- Various tillage and residue management
- Various tillage, manure and fertility management
- Pesticide and nutrient runoff on conventional tillaae vs. conservation tillage was studied on corn grown on paired watersheds in a cooperative project with the School of Natural Resources and the Soil Conservation Service

Bill will be working with SCS and other agencies on the Lower Missisquoi River Hydrologic Unit. The projects' overall goal is to improve the quality of surface and groundwaters. The objectives of the project are to:

- Improve management of crops, soils, nutrients, pesticides, and agricultural wastes
- Evaluate selected nutrient and pest management practices in terms of agronomic effectiveness
- Develop a public information and education program to maintain public awareness
- Survey groundwater and surface water quality within the project area

VIRGINIA NATIONAL COOPERATIVE SOIL SURVEY REPORT

James C. Baker
Dean D. Rector

The Virginia National Cooperative Soil Survey Report includes the Virginia Experiment Station Report, the Soil Conservation Service Report, and the National Forest Service Report.

The Virginia soil survey is a cooperative effort involving The Soil Conservation Service, united States Department of Agriculture1 the Division of Soil and Water Conservation, Virginia Department of Conservation And Recreation; the College of Agriculture and Life Sciences, Virginia Polytechnic Institute and State University; Agricultural and Geological sciences Department@, Virginia State University; United Staten Forest Service, United States Department of Agriculture; Virginia Cooperative Extension Service; and local units of government, counties, cities and soil and water conservation districts.

The original master plan for completing the statewide inventory of Virginia's soil resources was prepared by the Virginia Soil and Water Conservation Commission in 1971 as Directed by the 1970 Virginia General Assembly. Updates to that plan were prepared in 1983 end 1989. The 1989 update, completes the inventory in 1996 and gives guidelines for the ongoing objectives that extend beyond the inventory through the year of 2000.

As of March 31, 1990, 18,616,489 acres or 71 percent of the state's 26 million acres have been inventoried; 7,474,111 acres or 29 percent of the state remains.

A. CURRENT VIRGINIA COOPERATIVE SOIL SURVEY STAFF:

1. 20 Soil Conservation Service and 13 Virginia Tech soil scientists are assigned to the state wide inventory.

2. The Soil Conservation Service maintains four area staff positions to provide technical assistance to the Soil Conservation Service administrative area program.

3. Virginia Tech has 2 interpretive soil scientist in 2 counties and 4 soil scientist in regional offices of the Virginia State Health Department.

4. The Soil Conservation Service maintains five positions on state staff in Richmond and Virginia Tech maintains two positions in Blacksburg for program management, supervision, field coordination, quality control and training.

5. The Forest Service maintains one position in the George Washington National Forest and two positions in the Jefferson National Forest devoted to soil survey.

B. THE STATUS OF VIRGINIA SOIL SURVEYS AS OF JUNE 30, 1990:

40 localities have completed modern soil surveys
11 localities have older published soil survey'
14 localities have the inventory field work completed and are awaiting publication
21 surveys ara currently in progress
11 localities remain to begin survey projects
2 localities are updating the inventory with county funds

Laboratory Characterization Program

Virginia Tech provides laboratory support for all soil surveys in Virginia. This accounts for approximately 150 pedons a year plus other special 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 characterizationa are run routinely as well as petrographic and clay analyses an selected samples.

VIRGINIA TECH RESEARCH ACTIVITIES SINCE 1988 MEETING

A. Cooperative Correlation and Characterization Project:

1. The study of granitic soils of Blue Ridga and Western Piedmont provinces is underway.
2. The study of flood plain soils with the Ridge and Valley province (completed).
3. Characterization of flood and river terrace soils in Virginia Coartal Plain (completed).

B. Activities in the Soils and Landuse Program:

1. Work continues on a project to incorporate water quality indexes (leaching index, soil pesticide interaction ratings) and new soil productivity indexer into soil teat recommendations.
2. Completed feasibility study (H.D. 34) state wide yard waste composting program and began pilot programs for yard waste composting.
3. Joint publication with policy economists on trend policy (aspects on non-tidal wetlands).
4. New three year contract signed with Virginia State Department of Health to fund four interpretative soil scientists. To provide training for all H.D. sanitarians and serve as expert witness during appeals.
5. County interpretative positions are in various stages of implementing G.I.S. systems.

C. Graduate Degrees Completed:

Mark H. Stolt, 1990. Ph.D. 'An Approach to Studying Soil-landscape Relationships in Virginia*. He focused on soil reconstruction techniques and analysis of the nature of underlying saprolite. Blue Ridge and Piedmont Provinces.

Steven Feldman, 1989. W.S. *Taxonomy, Genesis, and Parent Material Distribution of High Elevation Forest Soils in the Southern Appalachians".

Ibrahim A. M. Al-Hawes, 1989. M.S. "Clay Mineralogy and Soil Classification of Alluvial and Upland Soils Associated with Blackwater and Nottoway Rivers in Southeastern Virginia".

Paul Gassman, 1989. H.S. 'The Influence of Particle Size on the Chemistry of Mica Clays".

West Virginia Agricultural and Forestry Experiment Station

John C. Sencindiver

Land Application of Municipal Wastewater Sludges.
C.G. Clinger and J.G. Skousen

Research has been ongoing at West Virginia University concerning method of application and rates of sludges suitable for improving soil fertility. Large demonstration projects with various slopes, soils, and treatments have been established and monitored for three years. Research has also been conducted in the laboratory concerning the effect of sludge on soil physical properties, especially in relation to water holding capacity. Continuation of this project is expected with more sites receiving treatment with sludge across the state and wastewater treatment plants taking more responsibility for correct application and monitoring. A strong extension program in training of wastewater treatment plant personnel, extension agents, and farmers along with application guidelines is also continuing.

Natural Reclamation of Abandoned Mine Lands(AML).
C.D. Johnson and J.G. Skousen

Research has been undertaken at WVU to sample the vegetation and soils on 15 AML sites to assess the limiting factors on the site and evaluate each site's potential for reclamation. Some sites may have few or no limiting factors and therefore require little reclamation. Some other sites may have limiting factors that may be ameliorated with the application of certain materials or products. Other sites may require full scale reclamation techniques (special handling, toxic material burial, mine sealing, etc.) through expensive AML reclamation or remining of the site. Remining offers good potential for reclamation of sites to current reclamation standards where coal extraction is available and profitable.

Reclamation of Coal Refuse.
H.E. Clark and J.C. Sencindiver

A study to evaluate the reclamation potential of different thicknesses of topsoil and different chemical treatments on the coal refuse has been established. After two growing seasons almost no vegetation was growing on the plots with no topsoil regardless of the chemical treatment. Yields and ground cover of vegetation increased linearly with three, six and 12 inches of topsoil cover.

Mineralogy, Genesis and Classification of Extremely Acid Minesoils.
D.V. McCloy and J.C. Sencindiver

Minesoils in northern West Virginia have been characterized to study processes of soil genesis and to develop a basis of soil classification. Minesoils in this study have been separated into three categories: (1) those with pH < 3.5 and observable jarosite mottles, (2) those with pH <3.5

and no jarosite mottles, and (3) those with pH 3.5-4.2 and observable jarosite mottles.

A Model for Revegetating Abandoned Mine Land Using Industrial Wastes.

R.F. Keefer, R.N. Singh, J.C. Sencindiver
D.W. Patterson, D.J. Horvath, J.M. Gorman

Greenhouse and field experiments have been conducted to determine the feasibility of using fly ash with combinations of sawdust and wood chips to reclaim abandoned mine lands. In one experiment flv. ash and sawdust with and without a wood chip cover was applied as a minesoil cover and vegetated. The growth and quality of vegetation as well as temporal changes in the chemical and physical properties of the minesoil will be evaluated. Effects of the different treatments on minesoil erodibility have also been monitored. Without a good vegetative cover, the fly ash highly erodible. However, it improves the minesoil physical properties decreasing bulk density, increasing total porosity, and increasing the water holding capacity515.52 ãdÀ8ÿ ð i Àðt39.28 T•Ž 539.28 Tm (minesoil)Tj -0tSðand i1

D. COMMITTEE REPORTS

1990 NCSSC WORKING COMMITTEE 1

DRAINAGE CLASS

Committee Members:

William Broderson - USDA-SCS, NE
James H. Brown - USDA-SCS, MD
Ray Bryant - Dept. of Agronomy, Cornell University, NY, Vice Chairman
William J. Edmonds - Dept. of Agronomy, VA Polytech. Inst. & State Univ., VA
Delvin S. Fanning - Dept. of Agronomy, University of MD
Robert B. Grossman - USDA-SCS, NE
Richard L. Hall - USDA-SCS, DE
Willis E. Hanna - USDA-SCS, NY
Norman R. Kalloch, Jr. - USDA-SCS, ME, Chairman
Garland Lipscomb - USDA-SCS, PA
Gregg Schellentrager - USDA-SCS, VT
Ron Taylor - USDA-SCS, NJ

Other Contributors:

Kenneth LaFlamme - USDA-SCS, ME
Peter Veneman - Univ. of MA, MA
Dennis Lytle - USDA-SCS, NE
Peter Fletcher- USDA-SCS, MA

Committee Charges

1. Inventory specific criteria being used to define agricultural drainage classes for all states in the Northeast.

2. Determine whether uniform criteria can be developed for agricultural drainage class definitions.

3. Determine whether there is a continued need for agricultural drainage classes.

4. Make recommendations of alternatives for agricultural drainage class definitions.

5. Are there data elements in the soils data base that might be used to derive a substitute interpretation that could be used in place of agricultural drainage classes?

Background

Charles Kellogg asked Marlin Cline to unify the definitions of soil drainage classes used by states. After studying the definitions, Cline concluded that he couldn't come up with a national definition more specific than that in the old Soil Survey Manual (Agriculture Handbook No. 18). The current national definition of drainage class was designed for agriculture and is general to allow states flexibility for agricultural interpretations.

The recent published National Wetland Manual uses hydric soils, along with hydrophytic vegetation and wetland hydrology as criteria for identifying wetlands. The manual adopted the SCS definition of hydric soils, which includes soil drainage class, as part of the criteria for defining a hydric soil.

In an attempt to have measurable limits and consistency in applying soil drainage classes, several state soil scientist associations have developed specific criteria for drainage classes. These criteria do not agree across state lines, with the result being that a soil with the same morphology may be hydric in one state and nonhydric in another. The problem is especially acute on somewhat poorly and poorly drained soils.

Committee

poorly or poorly drained. Also, some states do not recognize somewhat poorly drained soils. In some cases there are differences within the same state when comparing state SCS drainage class definitions with other groups such as soil judging teams and the private soil consulting sector.

Charge 2. Determine whether uniform criteria can be developed for agricultural drainage definitions.

Not all members responded to this charge. Of those who did respond there was a consensus that uniform criteria for drainage classes are needed but it will be difficult to get states to modify long standing definitions. One approach would be to have criteria for drainage class definitions be developed on regional basis such as by soil temperature regime or MLRA.

Charae

General Discussion

The common theme from most respondents suggests that there is a need for common drainage class definitions. Historically, agricultural drainage classes have been used by SCS soil scientists, the private soil consultants and users of soil surveys. It is reasonable to expect they will remain as the preferred method of expressing soil wetness. The lack of measurable limits and consistency in applying drainage classes have created particular problems across state lines since wetlands (hydric soils) have become an issue.

The latest indication from Dennis Lytle is that drainage classes are not going to be dropped from the National Hydric Soil Criteria. Since it appears no alternative to soil drainage class is forth coning, states need to deal with inconsistences in the drainage classes definitions.

CURRENT EFFORTS TO DEVELOP CRITERIA

Several state soil scientist associations have developed or are developing their own specific criteria for drainage classes. Among them are Society of Soil Scientists of Southern New England and Society of Soil Scientists of Northern New England. These groups are developing a publication entitled, "A Field Guide for Evaluating Soil Hydrologic Conditions" (Attachment B). They have prepared a preliminary criteria for soil wetness classes to be used in place of natural soil drainage classes. The New Hampshire High Intensity Soil Mapping Standards as well as a Drainage Key developed by the Maine Association of Professional Soil Scientists are attempts by soil scientist associations to develop soil drainage class criteria (Attachments C and D, respectively). The U.S. Army Corps of Engineers is also working to define soil drainage classes on a regional basis so to provide continuity among hydric soil identifiers.

THE FOLLOWING WERE ITEMS DISCUSSED AT THE DRAINAGE CLASS WORKING COMMITTEE MEETING.

1. The overwhelming consensus of the committee was that drainage classes should be retained as an interpretation, but a regional approach to drainage class criteria is needed. It was decided that the definitions of soil drainage classes based on depth and duration of free water occurrence as given in the draft of the new Soil Survey Manual (attachment E) should be narrowed to create non-overlapping definitions of drainage classes applicable to the Northeast Region. Soil groupings based on temperature regime, similar MLRA's, or taxononic class should be made in order to narrow the range of morphological features that reflect depth and duration of free water occurrence. Soil drainage classes for each group of soils should then be defined in terms of morphological features. The materials in attachments, B, C, and D should

be of some value to this effort. Other states should be asked to provide similar input. The NE Regional Technical Center should take the leadership in coordinating this effort with the individual states.

2. Additional water table data is needed to confirm the relationship between morphological features and depth to seasonal high water table. A substantial amount of data have been collected but are not readily available. The committee agreed that a central depository for soil wetness data should be created and members are encouraged to supply information regarding the location of these data. This action is in accord with action taken by the NEC-50 committee of Agricultural Experiment Station representatives. Dr. Peter Veneman volunteered to serve as data collection center.

3. Considerable discussion focused on the use of soil drainage classes in the definition of hydric soils. In general, committee members felt that it is inappropriate to use one soil interpretation (ie - drainage class) in the definition of another interpretation (ie - hydric soils). Soil interpretations should be based directly on soil properties, such as depth and duration of free water occurrence. However, the committee realizes that until suitable replacement criteria can be developed, drainage class does serve to relate the hydric soil definition to observable morphological characteristics in the field. This emphasizes the need to align criteria for drainage class definitions across state boundaries.

4. The committee discussed potential impacts of actions taken by the ICOMAQ committee on aguic moisture regimes, which will meet in Louisiana and Texas in October, 1990. Dr. Del Fanning will be attending the ICOMAQ meetings. Although current and future actions relating to soil wetness and drainage classes may have relevance to actions taken by Committee 1 - Soil Drainage Class at this NESSWPS, the charges of this committee have been fully addressed at this time.

SUMMARY OF RECOMMENDATIONS.

1. The Northeast Regional Technical Center in cooperation with independent states be charged with aligning criteria for drainage classes in the NE.

2. A central depository for soil wetness data (water table data) be created.

3. A general sentiment that drainage class be dropped from the definition of hydric soils be conveyed to the hydric soils committee.

4. Del Fanning represent the NE at the ICOMAQ meeting in Louisiana and Texas prior to National ASA meetings and report on continuing developments at the next NESSWPC.

5. Committee 1 be discontinued.

ATTACHMENT A

Depth to High Water Table vs. Drainage Class Among 7 States

DRAINAGE CLASS		DEPTH TO HIGH WATER TABLE (INCHES)
Excessively Well Drained		
State	1.	>60"
	2.	>60
	3.	>72
	4.	None given
	5.	None given
	6.	None given
	7.	>40
Somewhat Excessively		**Deoth to Watertable**
State	1.	>60
	2.	40-60
	3.	>72
	4.	None given
	5.	None given
	6.	None given
	7.	>40
Well Drained		**Depth to Watertable**
State	1.	40-60
	2.	>24
	3.	>40; >72 (very well drained)
	4.	>40
	5.	>40
	6.	>40
	7.	>40
Moderately Well Drained		**Depth to Watertable**
Star-2	1.	18-40
	2.	18-24
	3.	18-40
	4.	20-40
	5.	18-36
	6.	16-40
	7.	15-40

Somewhat Poorly Drained		Depth to Watertable
State	1.	10-18
	2.	12-18
	3.	No SWPD Class
	4.	10-20
	5.	8-18
	6.	7-16
	7.	12-15

Poorly Drained		Depth to Watertable
State	1.	0-10"
	2.	o-12
	3.	<18
	4.	0-10
	5.	o-a
	6.	0-7
	7.	<12

Very Poorly Drained		Depth to Watertable
State	1.	0
	2.	i-6 to -6
	3.	O or ponded
	4.	Ponded
	5.	0
	6.	0
	7.	0

ATTACHMENT B

A FIELD GUIDE FOR EVALUATING
SOIL HYDROLOGIC CONDITIONS.

PRELIMINARY

Sponsored by
The Society of Soil Scientists of Southerrt New England
The Society of Soil Scientists of Northern New England
1990

ATTACHMENT 2

SOIL WETNESS CLASSES

CLASS 6: Soils that have en aquic moisture regime or are artificially drained end

1) Have organic materials that extend from the surface to a depth of 16 inches or more; or
2) Have a mineral or organic histic epipedon; or
3) Have an epipedon with an "n" value greater then 0.7. (HISTOSOLS)

CLASS 5:

1) Mineral soils with textures within 20 inches of the soil surface of finer than very fine sand, that have common distinct or prominent mottles present within 12 inches of the soil surface, and there is a subsurface horizon that has dominant, moist colors, in the matrix of chroma 2 or less within 20 inches of the soil surface (Aquepts); or
2) Mineral soils with textures within 20 inches of the soil surface of loamy fine sand or coarser, that have common distinct or prominent mottles present within 12 inches of the soil surface, and there is a subsurface horizon within 20 inohes of the soil surface that has dominant, moist colors, in the matrix of chroma 3 or less within 20 inches of the soil surface (Aquents); or
3) Mineral soils that have an organic-rich spodic horizon with matrix color value and chroma of 3 or less within 12 inches of the soil surface. The upper part of the spodic horizon has distinct or prominent high chroma mottles. In soils with an exceptionally thick elbic horizon, the spodic horizon may occur deeper than 12 inches; in such situations mottles must be present in the albic horizon.

   Note: The spodic horizon might not be cemented (orstein), but nearly continuous cementation occurring within 18 inches of the soil surface is a field indicator of hydric soils.

   (Aquods); or
4) Have any textures with no mottles present end have e subsurface within 20 inches of the soil surface that has dominant moist color, in the matrix of chroma 1 or less.
5) Have a mineral epipedon that is 12 to 20 inches in depth with a mottled subsurface horizon underlying the mineral epipedon within 20 inches of the soil surface that has dominant moist color in the matrix of 2 or less. (plowed)

PRELIMINARY

CLASS 4: Soils that do not meet criteria of CLASS 6 or 5 and have distinct or prominent, high or low chroma mottles, that are not relic mottles, in upper B horizons at a depth of less than 15 inches below the soil surface. Lou chroma matrices are restricted to horizons greater than 20 inches from the surface.

CLASS 3: Soils that do not meet criteria of CLASS 6, 5 or 4 and have distinct or prominent mottles, that are not relic mottles, between a depth of 15 to [illegible] inches below the soil surface.

CLASS 2: Soils that do not meet criteria of CLASS 6, 5. 4 or 3 and have textures in any horizons between 10 to 40 inches of very fine sand or finer and do not have mottles.

CLASS 1: All other soils (very fine sand or coarser)

Table 1. Correlation of Soil Wetness Classes and "Drainage Classes" With Existing Regulations in New England

Regulation	Soil Wetness Class 6	5	4	3	2	1
CT Wetlands (DEP Ad. Reg. Sec.22a 45)	VPD	PD				
NH Hydric Soils (DES,WSPCD Ad. Rules WS 1015.015)	TYPE A	TYPE B				
NH Subdivision Control Bylaws High Intensity Soil Maps	VPD	PD	SWP	MWD	WD	ED
NH Wetlands Local Bylaws	VPD	PD				
U.S. Army Corp of Engineers Pub. Notice 7-4-89 "Hydric Soils"	HYDRIC (1.)	HYDRIC (2.)	NON-HYDRIC---------------			

PRELIMINARY

Wetness Class	Depth to WT	Duration
		7-30 days
	45-100 cm	[illegible] days

APPENDIX A. USDA Definition of Drainage Classes

Seven drainage classes are recognized. The first two, excessively drained and somewhat excessively drained, describe soils that are dry longer than is typical for the dominant soils of an area. Well drained soils are neither unusually dry nor unusually wet. Increasing degrees of wetness limit use of moderately well drained, somewhat poorly drained, poorly drained, and very poorly drained soils.

The following definitions are purposely vague in order to provide the flexibility that is desirable for assigning drainage classes in a given area. The concept of the drainage class evolved in areas with a humid-temperate climate. The definitions, consequently, reflect a bias for these areas and may have to be modified in other parts of the world.

The seven classes are:

1. Excessively drained: These are soils have very high and high hydraulic conductivity and low water holding capacity. They are not suited for crop production unless irrigated.

2. Somewhat excessively drained: These soils have high hydraulic conductivity and low water holding capacity. Without irrigation only a narrow range of crops can be grown and yields are low.

3. Well drained: These soils have intermediate water holding capacity. They retain optimum amounts of moisture, but they are not wet close enough to the surface or long enough during the growing season to adversely affect yields.

4. Moderately well drained: These soils are wet close enough to the surface for long enough that planting or harvesting operations or yields of some field crops are adversely affected unless artificial drainage is provided. Moderately well drained soils, commonly have a layer with low hydraulic conductivity, wet state relatively high in the profile, additions of water by seepage, or some combination of these conditions.

5. Somewhat poorly drained: These soils are wet close enough to the surface or long enough that planting or harvesting operations or crop growth is markedly restricted unless artificial drainage is provided. Somewhat poorly drained soils commonly have a layer with low hydraulic conductivity, wet state high in the profile, additions of water through seepage, or a combination of these conditions.

6. Poorly drained: These soils commonly are wet at or near the surface during a considerable part of the year, so that field crops cannot be grown under natural conditions. Poorly drained conditions are caused by a saturated zone, a layer with low hydraulic conductivity, seepage, or a combination of these conditions.

7. Very poorly drained: These soils are wet to the surface most of the time. These soils are wet enough to prevent the growth of important crops (except rice) unless artificially drained.

ATTACHMENT C

APPENDIX B. New Hampshire High Intensity Soil Mapping Definition of Drainage Classes

Soil Drainage Classes (5)

Very Poorly Drained: Soils that have an aquic moisture regime or are artificially drained and 1) Have organic materials that extend from the surface to a depth of 16 inches or more; or 2) Have a mineral or organic histic epipedon; or 3) Have an epipedon with an "n" value greater than 0.7.

Poorly Drained: Soils that have an aquic moisture regime or are artificially drained and 1) Have an albic horizon that lies just above a horizon having hue 10YR or redder, value less than 5, chroma less than 4; and have faint to prominent mottles in the albic horizon less than 12 inches below the soil surface; or 2) Within 20 inches of the soil surface have textures dominantly very fine sand or finer with distinct or prominent mottles less than 12 inches below the soil surface and have a subsurface horizon less than 20 inches below the soil surface that has dominant color, moist, in the matrix of chroma 2 or less, value 4 or more; or 3) Within 20 inches of the soil surface have textures dominantly loamy fine sand or coarser with distinct or prominent mottles less than 12 inches below the soil surface and have a subsurface horizon less than 20 inches below the soil surface that has dominant color, moist, in the matrix of chroma 3 or less, value 4 or more; or 4) Have any textures with no mottles and have a subsurface horizon less than 20 inches below the soil surface that has dominant color, moist, in the matrix of chroma 1 or less, value 4 or more; or 5) Have a mineral epipedon greater than 12 inches and less than 20 inches that is underlain with a mottled subsurface horizon less than 20 inches below the soil surface that has dominant color, moist, in the matrix of chroma 2 or less, value 4 or more.

Somewhat Poorly Drained: Soils that have distinct or prominent mottles, that are not relic mottles, at a depth of less than 15 inches below the soil surface.

Moderately Well Drained: Soils that have distinct or prominent mottles, that are not relic mottles, between a depth of 15 to 40 inches below the soil surface.

Well Drained: Soils that have textures in any horizons between 10 to 40 inches of very fine sand or finer and do not have mottles.

Excessively Drained: All other soils.

1989:

ATTACHMENT D

2/28/90 MAINE ASSOCIATION OF PROFESSIONAL SOIL SCIENTISTS

KEY TO SOIL DRAINAGE CLASSES

USE THIS KEY STARTING AT THE FIRST DRAINAGE CLASS LISTED (VERY POORLY DRAINED,. IF THE SOIL IN QUESTION DOES NOT “EET THE CRITERIA FOR THAT DRAINAGE CLASS GO TO THE NEXT DRAINAGE CLASS AND COMPARE THE SOIL TO ITS CRITERIA. CONTINUE THROUGH EACH DRAINAGE OPTION UNTIL THE SOIL IN QUESTION MEETS THE CRITERIA FOR A PARTICULAR DRAINAGE CLASS.

DRAINAGE CLASS' and MOISTURE REGIME	DRAINAGE CRITERIA OPTIONS	COMMON SITE INDICATORS
VERY POORLY DRAINED AQUIC	1) HAVE ORGANIC SOIL MATERIALS THAT EXTEND FROM THE SURFACE[1/] TO A DEPTH OF 16 INCHES OR MORE. (HISTOSOLS)[2/] OR, 2) HAVE ORGANIC SOIL MATERIALS THAT EXTEND FROM THE SURFACE TO A DEPTH OF 8 TO 16 INCHES. (HISTIC EPIPEDON)[3/] OR 3) HAVE ORGANIC SOIL MATERIALS THAT EXTEND FRO” THE SURFACE TO A DEPTH OF 4 TO ❑ INCHES AND THE CAMBIC HORIZON IS QLEYEO. OR. 4) TIDAL MARSH SOILS, ALLUVIAL SOILS WIT” AN UMBRIC EPIPEDON. OR,	LEVEL OR NEARLY LEVEL, OCCUPY LOWEST POSITION TN THE LANDSCAPE. COMMONLY IN DEPRESSIONS AND ARE SEASONALLY PONOEO. COMMON PLANT SPECIES INCLUDE: RUSHES, CATTAILS, SEDGES, SPHAGNUM MOSS, TAMERACK, WILLOW, BLACK SPRUCE, NORTHERN WHITE CEDAR AND RED MAPLE.

****

POORLY DRAINED AQUIC	1) HAVE AN ALBIC HORIZON THAT “AS TEXTURE OF LOAMY FINE SAND OR COARSER THAT LIES JUST ABOVE A SPODIC HORIZON HAVING A HUE OF 10YR OR REDDER, VALUE <5, AND CHROMA <4, AND TEXTURE OF LOAMY FINE SAND OR COARSER; AND HAVE DRAINAGE “OTTLES IN THE ALBIC OR THE UPPER PART OF THE SPODIC THAT ARE WITHIN 7 INCHES OF THE MINERAL SOIL SURFACE. OR.	LEVEL TO GENTLY SLOPING; CONCAVE, SIDESLOPES, TOE SLOPES, DEPRESSIONS AND SEEPAGE AREAS. COMMON PLANT SPECIES INCLUDE: SEDGES,

DRAINAGE CLASS AND MOISTURE REGIME	DRAINAGE CRITERIA OPTIONS	COMMON SITE INDICATORS
SOMEWHAT POORLY DRAINED AQUIC OR UDIC	1) HAVE AN ALBIC HORIZON THAT HAS TEXTURE OF !	

be given to storage of the soil material for a day or two after the water content reduction to improve equilibration.

General relationships of the tests to water state, with the exception of the relationship of the rod test to 1500 kPa retention, have not been formulated and are probably not feasible. The tests may be applied to groupings of soils based on composition, and then locally applicable field criteria can be formulated. Table 3-3 is illustrative of much of the range in test results that may be expected within a soil survey in central Nebraska.

Inundation Occurrence

Table 3-4 contains classes for frequency and for duration of inundation. A record of the month(s) during which the inundation occurs may be useful. 'Maximum depth of the inundation, as well as the flow velocity, may be helpful.

Internal Free Water Occurrence

Table 3-5 contains classes for the description of free water regime in soils. The term free water occurrence is used instead of <u>satiated wet</u> in order to facilitate discussion of interpretations. Classes are provided for internal free water occurrence that describe thickness if perched, depth to the upper boundary, and the aggregate time present in a calendar ysar. The free water need be present only in some parts of the horizon or layer to be recognized. If not designated as perched, it is assumed that the zone of free water occurs in all horizons or layers from its upper boundary to below 2 meters or to the depth of observation. Furthermore, artesian effects may be noted.

Natural Drainage Classes

Natural drainage class refers to the frequency and duration of wet periods for the water regime assumed to be present under relatively undisturbed conditions similar to those under which the soil developed. Alteration of the water regime by man, either through drainage or irrigation, is not a consideration. The classes follow:

<u>Excessively drained</u>.--Water is removed very rapidly. The occurrence of internal free water commonly is very deep; annual duration is not specified, The soils are commonly very-coarse textured or rocky. All are free of the mottling that is related to wetness.

3-6 mo.

>1.5 m

Somewhat

deep or very deep;
Water is available

growing season or remains wet for long periods. The occurrence of internal free water is shallow or very shallow and common or persistent. Free water is commonly at or near the surface.

occurrence of internal free water is very shallow and persistent or permanent. Unless the soil is artificially drained, most mesophytic crops cannot be grown. The-soils are commonly level or depressed and frequently ponded. If rainfall is high or nearly continuous, slope gradients may be greater.

Water-State Annual Pattern

The water-state annual pattern is a description of field soil water over the year as applied to horizons, layers, or to standard depth zones. Using the classes of internal water states and of inundation, table 3-b contains examples. Usually the use of the soil is indicated and the time interval is at least monthly. More general records nay be constructed based on less specific soil uses and on soil concepts at a higher categorical level. Records nay be constructed for classes of relative precipitation: wet--the wettest 2 years in 10; dry--the driest 2 years in 10: and average--the conditions 6 years in 10. Unless otherwise indicated, the class placement for relative precipitation would be based on the more critical part of the growing season for the vegetation specified in the use. The frequency and duration that the soil is inundated each month may be given.

Water Movementryartflow the surfs ptruns water movement is the product of the hydraulic conductivity and the hydraulic gradient.

A distinction is made between saturated and unsaturated hydraulic conductivity. Saturated flow occurs when the soil water pressure is positive? that is, when the soil matric potential is zero (satiated wet condition). In most soils this situation takes place when about 95 percent of the total pore space is filled with water. The remaining 5 percent is filled with entrapped air. If the soil remains saturated for a long time (several month8 or longer) the percent of the total pore space filled with water may approach 100. Saturated hydraulic conductivity cannot be used to describe water movement under unsaturated conditions.

The vertical saturated hydraulic conductivity K_{sat} is of interest here; it is the factor relating soil water flow rate (flux density) to the hydraulic gradient and is a measure of the ease of water movement in soil. K_{sat} is the reciprocal of the resistance of soil to water movement. As the resistance increases, the hydraulic conductivity decreases. Resistance to water movement in saturated soil is primarily a function of the arrangement and size distribution of pores. Large, continuous pores have a lower resistance to flow (and thus a higher conductivity) than small or discontinuous pores. Soils with high clay content generally have lower hydraulic conductivities than sandy soils because the pore size distribution in sandy soil favors large pores even though sandy soils usually have higher bulk densities and lower total porosities (total pore space) than clayey soils. As illustrated by Poiseuille's law, the resistance to flow in a tube varies as the square of the radius. Thus, as a soil pore or channel doubles in size, its resistance to flow is reduced by a factor of 4; in other words its hydraulic conductivity increases 4-fold.

Hydraulic conductivity is a highly variable soil property. Measured values easily may vary by 10-fold or more for a particular soil series. Values measured on soil samples taken within centimeters of one another may vary by ten-fold or more. In addition, measured hydraulic conductivity values for a soil may vary dramatically with the method used for measurement, Laboratory determined values rarely agree with field measurements, the differences often being on the order of 100-fold or more. Field methods generally are more reliable than laboratory methods.

Because of the highly variable nature of soil hydraulic conductivity, a single measured value is an unreliable indicator of the hydraulic conductivity of a soil. An average of several values will give a reliable estimate which can be used to place the soil in a particular hydraulic conductivity class. Log averages (geometric means) should be used rather than arithmetic averages because hydraulic conductivity is a log normally distributed property. The antilog of the average of the logarithms of individual conductivity values is the log average, or geometric *mean*, and should be used to place a soil into the appropriate hydraulic conductivity class. Log averages are lower than arithmetic averages.

Hydraulic conductivity classes in this manual are defined in terms of vertical, saturated hydraulic conductivity. Table 3-7 defines the vertical, saturated hydraulic conductivity classes. The dimensions of hydraulic conductivity vary depending on whether the hydraulic gradient and flux density have mass, weight, or volume bases. Values can be converted from one basis to another with the appropriate conversion factor. Usually, the hydraulic gradient is given on a weight basis and the flux density on a volume basis and the dimensions. of K_{sat} are length per time. The *correct* SI units, thus are meters per second.[6/] Micrometers per second are also acceptable SI units and are more convenient (table 3-7). Table 3-8 gives the class limits in other commonly used units. This is convenient for class placement when values are given in these units.

The saturatsd hydraulic conductivity classes *in* this manual represent a wider range of values than the classes of either the 1951 Soil Survey Manual or the 1971 Engineering Guide. These classes reflect the natural distribution and variability of K_{sat}.

Hydraulic conductivity does not describe the capacity of soils in their natural setting to dispose of water internally. A soil placed in a very high class may contain free water because there are restricting layers below the soil or because the soil is *in* a depression where water from surrounding areas accumulates faster than it can pass through the soil. The water may actually move very slowly despite a high K_{sat}.

Guidelines for K_{sat} class placement

6/ The Soil Science Society of America prefers that all quantities be expressed on a mass basis. This results in KSAT units of kg s m-3. Other units acceptable to the society are m3 s kg-l, the result of expressing all quantities on a volume basis, and m s-l, the result of expressing the hydraulic gradient on a weight basis, and flux density on a volume basis.

Table 3-5. Internal Free Water Occurrence Classes

Classes	Criteria
Thickness if perched	
Extremely Thin (TE)	<10 cm
Very Thin (TV)	10 to 30 cm
Thin (T)	30 cm to 1 m
Thick (TK)	>1 m
Depth	
Very Shallow (SV)	< 25 cm
Shallow (S)	25 cm to 50 cm
Moderately Deep (DM)	50 cm to 1 m
Deep (D)	1.0 to 1.5 m
Very Deep (DV)	> 1.5 m
Cumulative Annual Duration	
Absent (A)	Not observed
Very Transitory (TV)	Present <1 month
Transitory (T)	Present 1 to 3 months
Common (C)	Present 3 to 6 months
Persistent (PS)	Present 6 to 12 months
Permanent (PM)	Present Continuously

SWP and WT < 15 cm one week or more

P + VP < 35 cm one week or more

Table 3-6. Illustrative water state annual pattern.

Average - 6 years in 10

Depth cm	J	F	M	A	M	J	J	A	S	O	N	D
Fine, montmorillonitic, mesic Typic Argiudoll a/												
0- 25	MM	MM	MM	MM	MM	MM	MS	DS	DS	MS	MM	MM
	F	F										F
25- 50	MM	MM	MM	MM	MM	MM	MM	MS	MS	MS	MS	MM
	F	F	F									
50-100	MS	MS	MM	MM	MM	MM	MM	MS	MS	MS	MS	MS
100-150	MM	MM	MM	MM	MM	MM	MM	MM	MM	MM	MM	MM
150-200	MM	MM	MM	MM	MM	MM	MM	MM	MM	MM	MM	MM
Fine-loamy, mixed, thermic Typic Haploxeralf b/												
0 -30	MM	MM	MS	MS	DS	DS	D1	D1	D1	D1	D1	MS
30-70	MM	MM	MM	MM	MS	DS	D1	D1	D1	DS	MS	MM
70-100	MV	MV	MM	MM	MM	MM	MS	D1	D1	D1	D1	MS
120-170	MM	MM	MM	MS	MS	MS	MS	D1	D1	D1	DS	MS

Driest 2 years in 10

Depth cm	J	F	M	A	M	J	J	A	S	O	N	D
Fine, montmorillonitic, mesic Typic Argiudoll a/												
0- 25	MM	MM	MM	MM	MM	MS	DS	DS	DS	MS	MS	MM
	F	F										F
25- 50	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS
	F	F	F									
50-100	MS	MS	MS	MM	MM	MS	MS	MS	MS	MS	MS	MS
100-150	MM	MM	MM	MM	MM	MM	MM	MM	MM	MM	MM	MM
150-200	MM	MM	MM	MM	MM	MM	MM	MM	MM	MM	MM	MM
Fine-loamy, mixed, thermic Typic Haploxeralf b/												
0 -30	MS	MM	MS	MS	DS	DS	D1	D1	D1	D1	D1	DS
30-70	MM	MM	MM	MM	MS	DS	D1	D1	D1	D1	MS	MS
70-100	MS	MM	MM	MM	MM	MM	MS	D1	D1	D1	D1	DS
120-170	MS	MM	MS	MS	MS	MS	MS	D1	D1	D1	D1	D1

Wettest 2 years in 10

Depth cm	J	F	M	A	M	J	J	A	S	O	N	D
Fine, montmorillonitic, mesic Typic Argiudoll a/												
0- 25	MM	MM	MV	MV	MV	MM	MM	MM	MM	MM	MM	MM
	F	F										F
25- 50	MM	MM	MV	MV	MM	MM	MM	MM	MM	MM	MM	MM
	F	F	F									
50-100	MM	MM	MM	MM	MM	MM	MM	MM	MM	MM	MM	MM
100-150	MM	MM	MM	MM	MM	MM	MM	MM	MM	MM	MM	MM
150-200	MM	MM	MM	MM	MM	MM	MM	MM	MM	MM	MM	MM
Fine-loamy, mixed, thermic Typic Haploxeralf b/												
0 -30	MM	MM	MM	MS	DS	DS	D1	D1	D1	DS	MS	MM
30-70	MV	MV	MM	MM	MS	DS	D1	D1	D1	DS	MM	MV
70-100	MV	MV	MM	MM	MM	MM	MS	D1	D1	D1	MS	MM
120-170	MM	MM	MS	MS	MS	MS	MS	D1	D1	D1	DS	MS

a/Otoe County, Nebraska (Sautter, 1982). Sharpsburg silty clay loam, 2-5 percent slopes. Corn (Zea Mays) following corn. Assume that contoured and terraced and retain over 20 percent residue cover. Disk twice in April. Field cultivate once. Plant May 1-15. Cultivate once or twice. Harvest November 1-15. Cattle graze after harvest. Based on a discussion with H.E. Sautter, soil scientist (retired), Syracuse, Nebraska. Monthly water states based on long-term field mapping experience and water balance computations. The Sharpsburg soil series pertains to the map unit illustrative of a consociation (Appendix).

b/San Diego Area, California (Bowman, 1973). Mean annual precipitation at Escondido is 344 mm and Thornwaite potential evaporation is 840 mm. Study area in Fallbrook sandy loam, 5 to 9 percent slopes, eroded. The study area has slightly greater slope than the upper limit of the map unit. Vegetation is annual range, fair condition. Generalizations were made originally for the 1983 National Soil Survey Conference based on field measurements in 1966 by Nettleton et al (1968), as interpreted by R.A. Dierking, soil correlator, Portland, Oregon. At the time, moderately dry and very dry were not distinguished.

1990 NCSSC WORKING COMMITTEE 1

DRAINAGE CLASS

Committee Members:

William Broderson - USDA-SCS, NE
James H. Brown - USDA-SCS, MD
Ray Bryant - Dept. of Agronomy, Cornell University, NY, Vice Chairman
William J. Edmonds - Dept. of Agronomy, VA Polytech. Inst. & State Univ., VA
Delvin S. Fanning - Dept. of Agronomy, University of MD
Robert B. Grossman - USDA-SCS, NE
Richard L. Hall - USDA-SCS, DE
Willis E. Hanna - USDA-SCS, NY
Norman R. Kalloch, Jr. - USDA-SCS, ME, Chairman
Garland Lipscomb - USDA-SCS, PA
Gregg Schellentrager - USDA-SCS, VT
Ron Taylor - USDA-SCS, NJ

Other Contributors:

Kenneth LaFlamme - USDA-SCS, ME
Peter Veneman - Univ. of MA, MA
Dennis Lytle - USDA-SCS, NE
Peter Fletcher- USDA-SCS, MA

Committee Charaes

1. Inventory specific criteria being used to define agricultural drainage classes for all states in the Northeast.

2. Determine whether uniform criteria can be developed for agricultural drainage class definitions.

3. Determine whether there is a continued need for agricultural drainage classes.

4. Make recommendations of alternatives for agricultural drainage class definitions.

5. Are there data elements in the soils data base that might be used to derive a substitute interpretation that could be used in place of agricultural drainage classes?

Backsround

Charles Kellogg asked Marlin Cline to unify the definitions of soil drainage classes used by states. After studying the definitions, Cline concluded that he couldn't come up with a national definition more specific than that in the old Soil Survey Manual (Agriculture Handbook No. 18). The current national definition of drainage class was designed for agriculture and is general to allow states flexibility for agricultural interpretations.

The recent published National Wetland Manual uses hydric soils, along with hydrophytic vegetation and wetland hydrology as criteria for identifying wetlands. The manual adopted the SCS definition of hydric soils, which includes soil drainage class, as part of the criteria for defining a hydric soil.

In an attempt to have measurable limits and consistency in applying soil drainage classes, several state soil scientist associations have developed specific criteria for drainage classes. These criteria do not agree across state lines, with the result being that a soil with the same morphology may be hydric in one state and nonhydric in another. The problem is especially acute on somewhat poorly and poorly drained soils.

Committee Report

General:

The charges of the committee were used as the basis to pole committee members as to their thoughts or needed changes in current drainage class definitions. The results of those responding were summarized and sent to the committee members for further comment. The charges are stated below. followed by a discussion.

Discussion

Charge 1.

poorly or poorly drained. Also, some states do not recognize somewhat poorly drained soils. In some cases there are differences within the same state when comparing state SCS drainage class definitions with other groups such as soil judging teams and the private soil consulting sector.

Charae 2. Determine whether uniform criteria can be developed for agricultural drainage definitions.

Not all members responded to this charge. Of those who did respond there was a consensus that uniform criteria for drainage classes are needed but it will be difficult to get states to modify long standing definitions. One approach would be to have criteria for drainage class definitions be developed on regional basis such as by soil temperature regime or MLRA.

Charae 3. Determine if there is a need for agricultural drainage classes.

Again, a wide range of response. Several committee members felt strongly about retaining drainage classes with stricter criteria for placement of soils in each class. A possible solution would be more of a regional approach to criteria for drainage class. Soil drainage classes are ingrained by users of soil surveys as well as by SCS soil scientists. It is generally considered a useful concept, but needs to be "tightened up". One committee member felt we should move towards a set of water state classes and away from drainage classes. Particularly since drainage classes do not describe various kinds of water regimes and the effect of man.

Charge 4. Make recommendations of alternatives for agricultural drainage class definitions.

The following are alternatives suggested for the agricultural drainage class definitions.

Two respondents suggested soil water states as described in the new Soil Survey Manual.

It is genThllyisTw -351.84 -14.56 Tdember fealsod in the

______

General Discussion

The common theme from most respondents suggests that there is a need for common drainage class definitions. Historically, agricultural drainage classes have been used by SCS soil scientists, the private soil consultants and users of soil surveys. It is reasonable to expect they will remain as the preferred method of expressing soil wetness. The lack of measurable limits and consistency in applying drainage classes have created particular problems across state lines since wetlands (hydric soils) have become an issue.

The latest indication from Dennis Lytle is that drainage classes are not going to be dropped from the National Hydric Soil Criteria. Since it appears no alternative to soil drainage class is forth coming, states need to deal with inconsistences in the drainage classes definitions.

CURRENT EFFORTS TO DEVELOP CRITERIA

Several state soil scientist associations have developed or are developing their own specific criteria for drainage classes. Among them are Society of Soil Scientists of Southern New England and Society of Soil Scientists of Northern New England. These groups are developing a publication entitled, "A Field Guide for Evaluating Soil Hydrologic Conditions" (Attachment B). They have prepared a preliminary criteria for soil wetness classes to be used in place of natural soil drainage classes. The New Hampshire High Intensity Soil Mapping Standards as well as a Drainage Key developed by the Maine Association of Professional Soil Scientists are attempts by soil scientist associations to develop soil drainage class criteria (Attachments C and D, respectively). The U.S. Army Corps of Engineers is also working to define soil drainage classes on a regional basis so to provide continuity among hydric soil identifiers.

THE FOLLOWING WERE ITEMS DISCUSSED

be of some value to this effort. Other states should be asked to provide similar input. The NE Regional Technical Center should take the leadership in coordinating this effort with the individual states.

2. Additional water table data is needed to confirm the relationship between morphological features and depth to seasonal high water table. A substantial amount of data have been collected but are not readily available. The committee agreed that a central depository for soil wetness data should be created and members are encouraged to supply information regarding the location of these data. This action is in accord with action taken by the NEC-50 committee of Agricultural Experiment Station representatives. Dr. Peter Veneman volunteered to serve as data collection center.

3. Considerable discussion focused on the use of soil drainage classes in the definition of hydric soils. In general, committee members felt that it is inappropriate to use one soil interpretation (ie - drainage class) in the definition of another interpretation (ie - hydric soils). Soil interpretations should be based directly on soil properties, such as depth and duration of free water occurrence. However, the committee realizes that until suitable replacement criteria can be developed, drainage class does serve to relate the hydric soil definition to observable morphological characteristics in the field. This emphasizes the need to align criteria for drainage class definitions across state boundaries.

4. The committee discussed potential impacts of actions taken by the ICOMAQ committee on aquic moisture regimes, which will meet in Louisiana and Texas in October, 1990. Dr. Del Fanning will be attending the ICOMAQ meetings. Although current and future actions relating to soil wetness and drainage classes may have relevance to actions taken by Committee 1 - Soil Drainage Class at this NESSWPS, the charges of this committee have been fully addressed at this time.

SUMMARY OF RECOMMENDATIONS.

1. The Northeast Regional Technical Center in cooperation with independent states be charged with aligning criteria for drainage classes in the NE.

2. A central depository for soil wetness data (water table data) be created.

3. A general sentiment that drainage class be dropped from the definition of hydric soils be conveyed to the hydric soils committee.

4. Del Fanning represent the NE at the ICOMAQ meeting in Louisiana and Texas prior to National ASA meetings and report on continuing developments at the next NESSWPC.

5. Committee 1 be discontinued.

ATTACHMENT A

Depth to High Water Table vs. Drainage Class Among 7 *States*

DRAINAGE CLASS		DEPTH TO HIGH WATER TABLE (INCHES)
Excessively Well Drained		
State	1.	>60"
	2.	>60
	3.	>72
	4.	None given
	5.	None given
	6.	None given
	7.	>40
Somewhat Excessively		**Depth to Watertable**
State	1.	>60
	2.	40-60
	3.	>72
	4.	None given
	5.	None given
	6.	None given
	7.	>40
Well Drained		**Depth to Watertable**
State	1.	40-60
	2.	>24
	3.	>40; >72 (very well drained)
	4.	>40
	5.	>40
	6.	>40
	7.	>40
Moderately Well Drained		**Depth to Watertable**
State	1.	18-40
	2.	18-24
	3.	18-40
	4.	20-40
	5.	18-36
	6.	16-40
	7.	15-40

Somewhat Poorly Drained		Depth to Watertable
State	1.	10-18
	2.	12-18
	3.	No SWPD Class
	4.	10-20
	5.	8-18
	6.	7-16
	7.	12-15

Poorly Drained		Depth to Watertable
Stars	1.	0-10"
	2.	o-12
	3.	<18
	4.	0-10
	5.	o-a
	6.	o-7
	7.	<12

Very Poorly Drained		Depth to Watertable
Stat2	1.	0
	2.	+6 to -6
	3.	0 or ponded
	4.	Ponded
	5.	0
	6.	0
	7.	0

ATTACHMENT B

A FIELD GUIDE FOR EVALUATING SOIL HYDROLOGIC CONDITIONS.

PRELIMINARY

Sponsored by
The Society of Soil Scientists of Southern New England
The Society of Soil Soientists of Northern New England
1880

ATTACHMENT 2

SOIL WETNESS CLASSES

CLASS 8: Soils that have an aquic moisture regime or are artificially drained and

1) Have organic materials that extend from the surface to a depth of 16 inches or more; or
2) Have a mineral or organic histic epipedon; or
3) Have an epipedon with an "n" value greater than 0.7. (HISTOSOLS)

CLASS 5:

1) Mineral soils with textures within 20 inches of the soil surface of finer than very fine sand, that have common distinct or prominent mottles present within 12 inches of the soil surface, and there is a subsurface horizon that has dominant, moist colors, in the matrix of chroma 2 or less within 20 inches of the soil surface (Aquepts); or
2) Mineral soils with textures within 20 inches of the soil surface of loamy fine sand or coarser, that have common distinct or prominent mottles present within 12 inches of the soil surface, and there is a subsurface horizon within 20 inches of the soil surface that has dominant, moist colors, in the matrix of chroma 3 or less within 20 inches of the soil surface (Aquents); or
3) Mineral soils that have an organic-rich spodic horizon with matrix color value and chroma of 3 or less within 12 inches of the soil surface. The upper part of the spodic horizon has distinct or prominent high chroma mottles. In soils with an exceptionally thick albic horizon, the spodic horizon may occur deeper than 12 inches; in such situations mottles must be present in the albic horizon.

   Note *The spodic horizon might not be cemented (orstein), but nearly continuous cementation occurring within 18 inches of the soil surface is a field indicator of hydric soils.*

   (Aquods); or
4) Have any textures with no mottles *present* and have a subsurface within 20 inches of the soil surface that has dominant moist color, in the matrix of chroma 1 or less.
5) Have a mineral epipedon that is 12 to 20 inches in depth with a mottled subsurface horizon underlying the mineral epipedon within 20 inches of the soil surface that has dominant moist color in the matrix of 2 or less. (plowed)

CLASS 4: Soils that do not meet criteria of CLASS 6 or 5 and have distinct or prominent, high or low chroma mottles, that are not relic mottles, in upper B horizons at a depth of less than 15 inches below the soil surface. Lou chroma matrices are restricted to horizons greater than 20 inches from the surface.

CLASS 3: Soils that do not meet criteria of CLASS 6, 5 or 4 and have distinct or prominent mottles, that are not relic mottles, between a depth of 15 to [illegible] inches below the soil surface.

PRELIMINARY

CLASS 2: Soils that do not meet criteria of CLASS 6, 5, 4 or 3 and have textures in any horizons between 10 to 40 inches of very fine sand or finer and do not have mottles.

CLASS 1: All other soils (very fine sand or coarser)

Table 1. Correlation of Soil Wetness Classes and "Drainage Classes" With Existing Regulations in New England

Regulation	Soil Wetness Class	
Sec.22a		
Rules		
Soil Ma		
Local Bylaws		
	(1.)	(2.)
"Hydric Soils"		

PRELIMINARY

Table 2. Water Table Relationships

Wetness Class	Depth to WT	Duration	Frequency	Period
1	> 150 cm	< 2 days		
2	100-150 cm	2-7 days		
3	45-100 cm	7-30 days	periodic**	3 mos.
3	45-100 cm	7-30 days	continuous*	6 mos.
4	25-100 cm	7-30+ days	periodic**	3-6 mo
5	25-45 cm	>30 days	periodic**	3 mos.
5	25-45 cm	>30 days	continuous*	6 mos.
6	< 25 cm	30-180 days		

APPENDIX A. USDA Definition of Drainage Classes

Seven drainage classes are recognized. The first **two,** ewcessiveiy drained and somewhat excessively drained, describe soils that are dry longer than is typical for the dominant soils of an area. Well drained soils are neither unusually dry nor unusually vet. Increasing **degrees** of wetness limit use of moderately **well** drained, somewhat poorly **drained,** poorly drained, and very poorly drained soils.

The following definitions are purposely vague in order to provide the flexibility that is desirable for **assigning drainage** classes in a given area. The concept of the drainage class evolved in areas with a humid-temperate climate. The definitions, consequently, reflect a bias for these areas and may have to be modified in other parts of the world.

The seven classes are:

1. Excessively drained: These are soils have very high and high hydraulic conductivity and low water holding capacity. They are not suited for crop production unless irrigated.

2. Somewhat excessively drained: These soils have high hydraulic conductivity and low water holding capacity. Without irrigation only a narrow **range** of crops can be **grown** bad yields are **low.**

3. Well drained: These soils have intermediate water holding capacity. They retain optimum amounts of moisture, but they are not wet close enough to the surface or long enough during the growing season to adversely affect yields.

4. Moderately well drained: These soils are wet close enough to the surface for long enough that planting or harvesting operations or yields of some field crops are adversely affected unless artificial drainage is provided. Moderately well drained soils, commonly have a layer with low hydraulic conductivity, wet state relatively high in the profile, additions of water by seepage, or some combination of these conditions.

5. Somewhat poorly drained: These soils are wet close enough to the surface or long enough that planting or harvesting operations or crop **growth** is markedly restricted unless artificial drainage is provided. Somewhat poorly drained soils commonly have **a** layer with low hydraulic conductivity, **wet** state high in the profile, additions of water through seepage, or a combination of these conditions.

6. Poorly drained: These soils commonly are wet at or near the surface during a considerable part of the year, so that field crops cannot be grown under natural conditions. Poorly drained conditions are caused by a saturated zone, a layer with low hydraulic conductivity, seepage, or a combination of these conditions.

7. Very poorly drained: These soils are wet to the surface most of the time. These soils are vet enough to prevent the growth of important crops (except rice) unless artificially drained.

ATTACHMENT C

APPENDIX B New Hampshire High Intensity Soil happing
Definition of Drainage Classes

Soil Drainage Classes (5)

Very Poorly Drained: Soils that have an aquic moisture regime or are artificially drained and 1) Have organic materials that extend from the surface to a depth of 16 inches or more; or 2) Have a mineral or organic histic epipedon ; or 3) Have an apipedon with an "n" value greater than 0.7.

Poorly Drained: Soils that have an aquic moisture regime or are artificially drained and 1) Have an albic horizon that lies just above a horizon having hue 10YR or redder, value less than 5, chrcma less than 4; and have faint to prominent mottles in the albic horizon less than 12 inches below the soil surface; or 2) Within 20 inches of the soil surface have textures dominantly very fine sand or finer with distinct or prominent mottles less than 12 inches below the soil surface and have a subsurface horizon less than 20 inches below the soil surface that has dominant color. moist, in the matrix of chroma 2 or less, value 4 or more; or 3) Within 20 inches of the soil surface have textures dominantly loamy fine sand or coarser with distinct or prominent mottles less than 12 inches below the soil surface and have a subsurface horizon less than 20 inches below the soil surface that has dominant color, moist, in the matrix of chroma 3 or less, value 4 or more; or 4) Have any textures with no mottles and have a subsurface horizon less than 20 inches below the soil surface that has dominant color, moist, in the matrix of chroma 1 or less, value 4 or more ; or 5) Have a mineral epipedon greater than 12 inches and less than 20 inches that is underlain with a mottled subsurface horizon less than 20 inches below the soil surface that has dominant color, moist, in the matrix of chroma 2 or less, value 4 or more.

Soaeahat Poorly Drained: Soils that have distinct or prominent mottles, that are not relic mottles. at a depth of less than 15 inches below the soil surface.

Hoderately Well Drained: Soils that have distinct or prominent mottles, that are not relic mottles, between a depth of 15 to 40 inches below the soil surface.

Hell Drained: Soils that have textures in any horizons between 10 to 40 inches of very fine sand or finer and do not have mottles.

Excessively Drained: All other soils.

1969:

ATTACHMENT D

2/28/90

MAINE ASSOCIATION OF PROFESSIONAL SOIL SCIENTISTS

KEY TO SOIL DRAINAGE CLASSES

USE THIS KEY STARTING AT THE FIRST DRAINAGE CLASS LISTED (VERY POORLY DRAINED). IF THE SOIL IN QUESTION DOE3 NOT MEET THE CRITERIA FOR THAT DRAINAGE CLA33 GO TO THE NEXT DRAINAGE CLASS AND COMPARE THE SOIL TO ITS CRITERIA. CONTINUE THROUGH EACH DRAINAGE OPTION UNTIL THE SOIL IN QUESTION MEET3 THE CRITERIA FOR A PARTICULAR DRAINAGE CLASS.

DRAINAGE CLASS and MOISTURE REGIME	DRAINAGE CRITERIA OPTIONS	COMMON SITE INDICATORS
VERY POORLY DRAINED AQUIC	1) HAVE ORGANIC SOIL MATERIALS THAT EXTEND FROM THE SURFACE[1] TO A DEPTH OF 16 INCHES OR MORE. (HISTOSOLS)[2] OR, 2) HAVE ORGANIC SOIL MATERIALS THAT EXTEND FROM THE SURFACE TO A DEPTH OF 3 TO 16 INCHES. (HISTIC EPIPEDON)[3] OR 3) HAVE ORGANIC SOIL MATERIALS THAT EXTEND FROM THE SURFACE TO A DEPTH OF 4 TO 8 INCHES AND THE CAMBIC HORIZON IS GLEYED. OR. 4) TIDAL MARSH SOILS; ALLUVIAL SOILS WITH AN UMBRIC EPIPEDON, OR,	LEVEL OR NEARLY LEVEL; OCCUPY LOWEST POSITION IN THE LANDSCAPE. COMMONLY IN DEPRESSIONS AND ARE SEASONALLY PONDED. COMMON PLANT SPECIES INCLUDE: RUSHES, CATTAILS, SEDGES, SPHAGNUM MOSS, TAMERACK, WILLOW, BLACK SPRUCE, NORTHERN WHITE CEDAR AND RED MAPLE.
POORLY DRAINED AQUIC	1) HAVE AN ALBIC HORIZON THAT HAS TEXTURE OF LOAMY FINE SAND OR COARSER THAT LIES JUST ABOVE A SPODIC HORIZON HAVING A HUE OF 10YR OR REDDER, VALUE <5, AND CHROMA <4, AND TEXTURE OF LOAMY FINE SAND OR COARSER; AND HAVE DRAINAGE MOTTLES IN THE ALBIC OR THE UPPER PART OF THE SPODIC THAT ARE WITHIN 7 INCHES OF THE MINERAL SOIL SURFACE. OR, 2)	LEVEL TO GENTLY SLOPING, CONCAVE, SIDESLOPES, TOE SLOPES, DEPRESSIONS AND SEEPAGE AREAS. COMMON PLANT SPECIES INCLUDE, SEDGES, ALDER. WILLOW, RED MAPLE, GRAY BIRCH, AND ASPEN.

DRAINAGE CLASS AND MOISTURE REGIME	DRAINAGE CRITERIA OPTIONS	COMMON SITE INDICATORS
SOMEWHAT POORLY DRAINED AQUIC OR UDIC	1) HAVE AN ALBIC HORIZON THAT HAS TEXTURE OF LOAMY FINE SAND OR COARSER JUST ABOVE A SPODIC HORIZON HAVING A HUE OF 10YR OR REDDER, VALUE <5, AND CHROMA <4, AND TEXTURE OF LOAMY FINE SAND OR COARSER.	

be given to storage of the soil material for a day or two after the water content reduction to improve equilibration.

General relationships of the tests to water state, with the exception of the relationship of the rod test to 1500 kPa retention, have not been fotniulated and are probably not feasible. The tests may be applied to groupings of soils based on composition, and then locally applicable field criteria can be formulated. Table 3-3 is illustrative of much of the range in test results that may be expected within a soil survey in central Nebraska.

Inundation Occurrence

Table 3-4 contains classes for frequency and for duration of inundation. A record of the month(s) during which

3-6 mo. >1.5 m

Somewhat excessively drained.--Water is removed from the soil rapidly. Internal free water occurrence commonly is very deep; annual duration is not specified. The soils are commonly sandy and rapidly pervious. All are free of the mottling that is related to wetness.

>1 m

Well drained.--Water is removed from the soil readily but not rapidly. Internal free water occurrence commonly is deep or very deep; annual duration is not specified. Water is available to plants throughout most of the growing season in humid regions. Wetness does not inhibit growth of roots for significant period6 during most growing seasons. The soils are mainly free of the mottling that is related to wetness.

Moderately well M.--Water is removed from the soil somewhat slowly during some periods of the year. Internal free water occurrence commonly is moderately deep and transitory through permanent. The soils are wet for only a short time within the rooting depth during the growing season, but long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within the upper 1 m, periodically receive high rainfall, or both.

Somewhat poorly drained.--Water is removed slowly so that the soil is wet at a shallow depth for significant periods during the growing season. The occurrence of internal free water commonly is shallow and transitory or common. Wetness markedly restricts the growth of mesophytic crops, unless artificial drainage is provided. The-soils commonly have one or more of the following characteristics: A slowly pervious layer, a high water table, additional water from seepage, or nearly continuous rainfall.

Poorly drained.--Water is removed so slowly that the soil is wet at shallow depths periodically during the growing season or remains wet for long periods. The occurrence of internal free water is shallow or very shallow and common or persistent. Free water is commonly at or near the surface long enough during the growing season so that most mesophytic crops cannot be grown, unless the soil is artificially drained. The soil, however, is not continuously wet directly below plow-depth. Free water at shallow depth is usually present. This water table is commonly the result of a slowly pervious layer of seepage, of nearly continuous rainfall, or of a combination of these.

Very poorly drained.--Water is removed from the soil so slowly that free water remains at or verv near the ground surface during much of the growing season. The

< 25

occurrence of internal free water is very shallow and persistent or permanent. Unless the soil is artificially drained, most mesophytic crops cannot be grown. The soils are commonly level or depressed and frequently ponded. If rainfall is high or nearly continuous, slope gradients may be greater.

Water-State Annual Pattern

The water-state annual pattern is a description of field soil water over the year as applied to horizons, layers, or to standard depth zones. Using the classes of internal water states and of inundation, table 3-6 contains examples. Usually the use of the soil is indicated and the time interval is at least monthly. More general records nay be constructed based on less specific soil uses and on soil concepts at a higher categorical level. Records may be constructed for classes of relative precipitation: wet--the wettest 2 years in 10; dry--the driest 2 years in 10: and average--the conditions 6 years in 10. Unless otherwise indicated, the class placement for relative precipitation would be based on the more critical part of the growing season for the vegetation specified in the use. The frequency and duration that the soil is inundated each month may be given.

Water Movement

Water movement concerns rates of flow into and within the soil and the related amount of water that runs off and does not enter the soil, Saturated hydraulic conductivity, infiltration rate, and surface runoff are part of the evaluation.

Saturated Hydraulic Conductivity

Water movement in soil is controlled by two factors: 1) the resistance of the soil matrix to water flow and 2) the forces acting on each element or unit of soil water. Darcy's law, the fundamental equation describing water movement in soil, relates the flow rate to these two factors. Mathematically, the general statement of Darcy's law for vertical, saturated flow is:

$$Q/At = -K_{sat}\, dH/dz$$

where the flow rate Q/At is what eoil physicists call the flux density, i.e., the quantity of water Q moving past an area A, perpendicular to the direction of flow, in a time t. The vertical saturated hydraulic conductivity K_{sat} is the reciprocal, or inverse, of the resistance of the soil matrix to water flow. The term dH/dz is the hydraulic gradient, the driving force causing water to move in soil, the net result of all forces acting on the soil water. Rate of water movement is the product of the hydraulic conductivity and the hydraulic gradient.

A distinction is made between saturated and unsaturated hydraulic conductivity, Saturated flow occurs when the soil water pressure is positive) that is, when the soil matric potential is zero (satiated wet condition). In most soils this situation takes place when about 95 percent of the total pore space is filled with water. The remaining 5 percent is filled with entrapped air. If the soil remains saturated for a long time (several months or *longer)* the percent of the total pore space filled with water may approach 100. Saturated hydraulic conductivity cannot be used to describe water movement under unsaturated conditions.

The vertical saturated hydraulic conductivity K_{sat} is of interest here; it is the factor relating soil water flow rate (flux density) to the hydraulic gradient and is a measure of the ease of water movement in soil. K_{sat} is the reciprocal of the resistance of soil to water movement. As the resistance increases, the hydraulic conductivity decreases. Resistance to water movement in saturated soil is primarily a function of the arrangement and size distribution of pores. Large, continuous pores have a lower resistance to flow (and thus a higher conductivity) than small or discontinuous pores. Soils with high clay content generally have lower hydraulic conductivities than sandy soils because the pore size distribution in sandy soil favors large pores even though sandy soils usually have higher bulk densities and lower total porosities (total pore space) than clayey soils. As illustrated by Poiseuille's law, the resistance to flow in a tube varies as the square of the radius. Thus, as a soil pore or channel doubles in size, its resistance to flow is reduced by a factor of 4; *in* other words its hydraulic conductivity increases 4-fold.

Hydraulic conductivity is a highly variable soil property. Measured values easily may vary by 10-fold or more for a particular soil series. Values measured on soil samples taken within centimeters of one another may vary by ten-fold or more. In addition, measured hydraulic conductivity values for a soil may vary dramatically with the method used for measurement. Laboratory determined values rarely agree with field measurements, the differences often being on the order of 100-fold or more. Field methods generally are more reliable than laboratory methods.

Because of the highly variable nature of soil hydraulic conductivity, a single measured value is an unreliable indicator of the hydraulic conductivity of a soil. An average of several values will give a reliable estimate which can be used to place the soil in a particular hydraulic conductivity class. Log averages (geometric means) should be used rather than arithmetic averages because hydraulic conductivity is a log normally distributed property. The antilog of the average of the logarithms of individual conductivity values is the log average, or geometric mean, and should be used to place a soil into the appropriate hydraulic conductivity class. Log averages are lower than arithmetic averages.

Hydraulic conductivity classes in this manual are defined in terms of vertical, saturated hydraulic conductivity. Table 3-7 defines the vertical, saturated hydraulic conductivity classes. The dimensions of hydraulic conductivity vary depending on whether the hydraulic gradient and flux density have mass, weight, or volume bases. values can be converted from one basis *to* another with the appropriate conversion factor. Usually, the hydraulic gradient is given on a weight basis and the flux density on a volume basis and the dimensions, of K_{sat} *are* length per time. The correct SI units, thus are meters per second.[6] Micrometers per second are also acceptable SI units and are *more* convenient (table 3-7). Table 3-S gives the class limits in other commonly used unite. This is

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Table 3-5. Internal Free Water Occurrence Classes

Classes	Criteria
Thickness if perched	
Extremely Thin (TE)	<10 cm
Very Thin (TV)	10 to 30 cm
Thin (T)	30 cm to 1 m
Thick (TK)	>1 m
Depth	
Very Shallow (SV)	< 25 cm
Shallow (S)	25 cm to 50 cm
Moderately Deep (DM)	50 cm to 1 m
Deep (D)	1.0 to 1.5 m
Very Deep (DV)	> 1.5 m
Cumulative Annual Duration	
Absent (A)	Not observed
Very Transitory (TV)	Present <1 month
Transitory (T)	Present 1 to 3 months
Common (C)	Present 3 to 6 months
Persistent (PS)	Present 6 to 12 months
Permanent (PM)	Present Continuously

SWP and WT < 15 cm one week or more

P + VP < 35 cm one week or more

Table 3-6. Illustrative water state annual pattern.

Average - 6 years in 10

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

Driest 2 years in 10

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

Wettest 2 years in 10

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

Fine, montmorillonitic, mesic Typic Argiudoll [a]

Average - 6 years in 10

Depth cm	J	F	M	A	M	J	J	A	S	O	N	D
0- 25	MM	MM	MM	MM	MM	MM	MS	DS	DS	MS	MM	MM
	F	F										F
25- 50	MM	MM	MM	MM	MM	MM	MM	MS	MS	MS	MS	MM
	F	F	F									
50-100	MS	MS	MM	MM	MM	MM	MM	MS	MS	MS	MS	MS
100-150	MM	MM	MM	MM	MM	MM	MM	MM	MM	MM	MM	MM
150-200	MM	MM	MM	MM	MM	MM	MM	MM	MM	MM	MM	MM

Driest 2 years in 10

Depth cm	J	F	M	A	M	J	J	A	S	O	N	D
0- 25	MM	MM	MM	MM	MM	MS	DS	DS	DS	MS	MS	MM

Wettest 2 years in 10

Depth cm	J	F	M	A	M	J	J	A	S	O	N	D
0- 25	MM	MM	MV	MV	MV	MM	MM	MM				

Depth cm	J	F	M	A	M	J	J	A	S	O	N	D
0 -30	MM	MM	MS	MS	DS	OS	01	D1	01	D1	01	MS
30-m	MM	MM	MM	MM	MS	DS	D1	D1	D1	DS	MS	MM
70-100	MN	MV	MM	MM	MM	MM	MS	01	D1	D1	01	MS
120-170	MM	MM	MM	MS	MS	MS	MS	01	D1	01	DS	MS

[a]/Otoe County, Nebraska (Sautter, 1982). Sharpsburg silty clay loam, 2-5 percent slopes. Corn (Zea Mays) following corn. Assume that contoured and terraced and retain over 20 percent residue cover. Disk twice in April. Field cultivate once. Plant May 1-15. Cultivate once or twice. Harvest November 1-15. Cattle graze after harvest. Based on a discussion with W.E. Sautter, soil scientist (retired), Syracuse, Nebraska. Monthly water states based on long-term field mapping experience and water balance computations. The Sharpsburg soil series pertains to the map unit illustrative of a consociation (Appendix).

[b]/San Diego Area, California (Bowman, 1973). Mean annual precipitation at Escondido is 366 mm and Thornwaite potential evaporation is 840 mm. Study area in Fallbrook

Generalizations were made originally for the 1983 National Soil Survey Conference based on field measurements in 1966 by Nettleton et al (1968), as interpreted by R.A. Dierking, soil correlator, Portland, Oregon. At the time, moderately dry and very dry were not distinguished.

NE Cooperative Soil Survey Conference

committee 2: Soil-Water Contamination

Background

Many uses of soil involve the additon 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. This committee was continued from the previous regional meeting.

Committee Charges

1. Which soil properties are important to the soil-water relationship, especially involving the addition of wastewater or the movement of organics through the soil?

2. Evaluate the potential of using soil-water state information in simple prediction models assessing the potential leachability of pollutants.

3. Assess available information useful in predicting the temporal variability in the soil-water state of major soil series in the Northeast region.

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Discussion

Charge 1. Which soil properties 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	Class II	Class III	Class 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	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 (K x % slope) and/or wind erodibility group.

The movement of organics, however, has not been specifically addressed by the NSH. Most exhibit non-polar properties. 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:

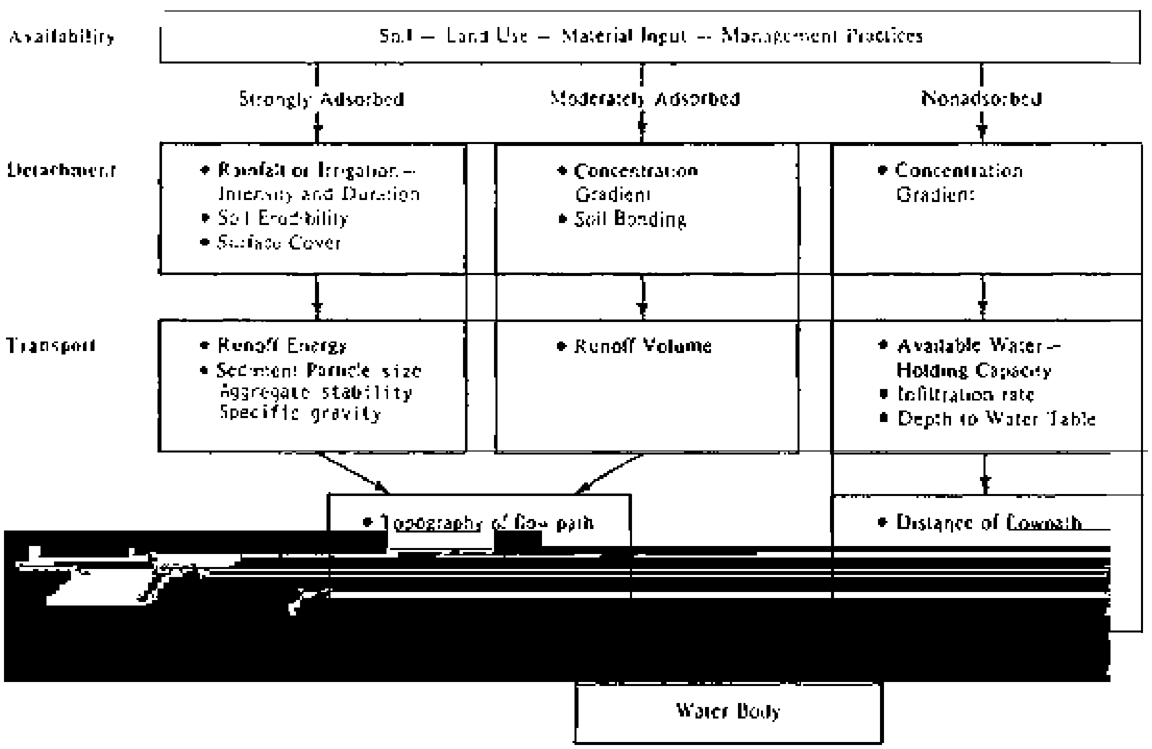
* organic matter content
* redox conditions
* porosity
* particle size
* depth to the ground water
* pH
* permeability
* pore distribution
* structure
* depth to flow restricting

layers (bedrock, cemented pans)

* coarse fragments
* bulk density
* slope
* susceptibility to erosion
* 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. When predicting the potential movement of pesticides in soils, the organic matter content, pH, and the soil-water state are probably most significant. Figure 1 provides a flow diagram of important factors affecting chemical pollutant availability, detachment, and transport.

Fig. 1 Factors affecting chemical pollutant availability, detachment, and transport.



Charge 2. Evaluate the potential of using soil-water State information in simple prediction models assessing the potential leachability of pollutants.

In trying to identify soil properties that are important to the soil-water relationship, it is clear that those identified in the various tables (see also the Committee 2 report of the 1988 NE Regional Soil Survey Conference) are significant. If we look at a more local scale and try to incorporate the water regime of the soil some general environmental factors such as soil temperature and moisture regime, as well as local weather data such as total rainfall, rainfall intensity, seasonal distribution of precipitation need to be included. The aim of such an exercise is to assess to 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.

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. Sample calculations for some representative New England soils were attached to this committee's 1988 report. 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 landuses (application of pesticides, wastewater disposal, etc.), and the general suitability of a site comprised of particular soil series for wastewater renovation.

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 assesment of the leachability of these compounds under particular environmental conditions. Soil survey information, particularly data on the soil water state, can play a major role in providing the link between the experimental results and the actual field situation.

Charge 3. Assess available information useful in predicting the temporal variability in the soil-water state of major soil series in the Northeast region.

The following literature contains information applicable to calculations of the soil-water state. Copies may be obtained from the committee chair.

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Recommendations.

Eased on the items included in this report and the deliberations during the meeting, the committee confirmed the importance of including the soil-water state in simple groundwater pollution transport models. The committe identified available sources of information to facilitate calculation of the soil-water state and recommends that the committee be discontinued.

APPENDIX A

Sanitary Facilities

Source: National Soils Handbook,
Draft of proposed tables (National Bulletin No. 430-0-6)

DRAFT

Table 603-10. Septic tank absorption fields

PROPERTY	LIMITS SLIGHT	MODERATE	SEVERE	RESTRICTIVE FEATURE
1. USDA TEXTURE	---	---	ICE	PITTING
2. TOTAL SUBSISTENCE	---	---	>24"	SUBSIDES
3. FLOODIRG	NONE	RARE	FREQ., COMMON, OCCAS	FLOODING
4. DEPM TO BEDROCK (IN)	>72	40-72	<40	THIN LAYER, SEEPAGE
5. DEPTH TO CEMENTED PAN (IN)	>72	40-72	<40	CEMENTED PAN
6. PONDING	---	---	ANY ENTRY	PONDING
7. DEPTH TO HIGH WATER TABLE (FT)	>6	4-6	<4	WETNESS (DISREGARD IF SUBJECT TO PONDING)
8. PERMEABILITY (24-60", IN/H)	2.0-6.0	0.6-2.0	<0.6	PERCS SLOWLY
8a. PERMEABILITY (IN/H) 24-60" OXISOLS OXIC SUBGROUPS; KAOLONITIC MINERALOGY	0.6-6.0	---	<0.6	PERCS SLOWLY
8b. PERMEABILITY (24-60", IN/H)	---	---	>6.0	POOR FILTER
9. SLOPE (PCT)	<8	B-15,	>15	SLOPE
10. WEIGHT PERCENT >3" (WEIGHTED AVE. TO 40")	<25	25-50	>50	TOO COBBLY
10a. WEIGHT PERCENT >10" (WEIGHTED AVE. TO 40")	<5	5-15	>15	TOO STONY
11. DOWNSLOPE MOVEMENT (SLOPE PCT)	---	---	>15	SLIPPAGE

DRAFT

Table 603-11. Sewage lagoons.

PROPERTY	LIMITS SLIGHT	MODERATE	SEVERE	RESTRICTIVE FEATURE
1. TEXTURE	---	---	ICE	PITTING
2. PERMEABILITY (IN/H)	<0.6	0.6-2.0	>2.0	SEEPAGE
2a. PERMEABILITY (IN/H) (12-60", NO LAYER >20", < 0.2" PERM)	ANY ENTRY			SEEPAGE
3. DEPTH TO BEDROCK HARD (IN)	>60	40-60	<40	DEPTH TO ROCK, SEEPAGE
3a. DEPTH TO BEDROCK SOFT (IN)	>60	40-60	<40	SEEPAGE
4. DEPTH TO CEMENTED PAN (IN)	>60	40-60	t40	CEMENTED PAN
5. FLOODING (IF NO LAYER >20" and PERM <.2"/H)	NONE, RARE	---	FREQ, COMMON, OCCAS	FLOODING (DISREGARD IF SLOW VELOCITY, <5' DEEP AND NO DAMAGE)
6. SLOPE PERCENT	<2	2-7	>7	SLOPE
7. UNIFIED (ANY DEPTH)	- -	OL, OH	PT	EXCESS HUMUS
8. PONDING	---	___	ANY ENTRY	PONDING
9. DEPTH TO HIGH WATER TABLE (FT) (IF NO LAYER >20" AND PERM. <.2"/H)	>5	3.5-S	<3/5	WETNESS (DISREGARD IF SUBJECT TO PONDING)
10. WEIGHT PERCENT >3" (WEIGHTED AVE. TO 20")	<20	20-35	>35	TOO COBBLY
10a. WEIGHT PERCENT >10" (WEIGHTED AVE. TO 20")	<5	S-15	>15	TOO STONY
11. DOWNSLOPE MOVEMENT (SLOPE PCT)	- -		>15	SLIPPAGE
12. DIFFERENTIAL SETTLING	- -		UDORTHENTS, ARENTS, USTIORTHENTS	UNSTABLE FILL

DRAFT

Table 603-12
Sanitary landfill (trench).

PROPERTY	LIMITS SLIGHT	MODERATE	SEVERE	RESTRICTIVE FEATURE
1 FLOODING	NONE	RARE	FREQ, COMMON, OCCAS	FLOODING
2. DEPTH TO BEDROCK HARD (IN)	---	---	<72	DEPTH TO ROCK SEEPAGE
2a. DEPTH TO BEDROCK SOFT (IN)	---	---	<72	SEEPAGE
3. DEPTH TO CEMENTED PAN THIN (IN)	---	<72	---	CEMENTED PAN
3a. DEPTH TO CEMENTED PAN THICK (IN)	---	---	<72	CEMENTED PAN
4. PERMEABILITY (IN/H, BOTTOM LAYER)	---	---	>2.0	SEEPAGE
4a. PERMEABILITY (IN/H, BOTTOM LAYER). IF ARIDISOL AND NOT SALORTHID OR AQUIC SUBGROUPS, ALL ARIDIC SUBGROUPS, ALL TORRIC GREAT GROUPS EXCEPT AQUIC SUBGROUPS	ANY ENTRY	---		SEEPAGE
5. PONDING	---	---	ANY ENTRY	PONDING
6. DEPTH TO HIGH WATER TABLE APPARENT (FT)	---	---	<6	WETNESS (DISREGARD IF PONDED)
6a. DEPTH TO HIGH WATER TABLE PERCHED (FT)	>4	2-4	<2	WETNESS (DISREGARD II PONDED)
7. SLOPE PERCENT	<8	8-15	>15	SLAPS
8. USDA TEXTURE	---	---	ICE	PERMAFROST
8a. TEXTURE (THICKEST LAYER 10-60")	---	CL, SC SICL	SIC, C	TOO CLAYEY
8b. TEXTURE THICKEST LAYER 10-60" OXISOLS, OXIC SUBGROUPS AND KAOLINITIC MIN.	- -	SIC, c	---	TOO CLAYEY
8c. TEXTURE (THICKEST LAYER 10-60")	---	LCOS, LS LFS, LVFS	cos, 8, FS, VFS SG	TOO SANDY
9. UNIFIED (THICKEST LAYER 10-60")	---	---	OL, 08 PI	EXCESS HUMUS
10. WEIGHT PERCENT >3" (WEIGHTED AM. TO 60")	<20	20-35	>35	TOO COBBLY
10a. WEIGHT PERCENT >10" (WEIGHTED AVE. TO 60")	<5	S-15	>15	
11. SODIUM ADSORPTION RATIO	---	---	>12	
11a. SODIUM ADSORPTION	---	---	NATRIC, HALIC	
		---	ALKALI	
		---	<3.5	

PEASE")

Table 603-12
Sanitary landfill (trench).

PROPERTY	SLIGHT	LIMITS MODERATE	SEVERE	RESTRICTIVE FEATURE
13. SALINITY (MMHOS/CM) (ANY DEPTH)	---	---	---	EXCESS SALT
14. DOWNSLOPE MOVEMENT (SLOPE PCT)	---	---	>15	SLIPPAGE
15. DIFFERENTIAL SETTLING	---	-	UDORTHENTS, ARENTS, USTIORTHENTS	UNSTABLE FILL

DRAFT

Table 603-13
Sanitary landfill (area).

PROPERTY	LIMITS SLIGHT	MODERATE	SEVERE	RESTRICTIVE FEATURE
1. USDA TEXTURE	---	---	ICE	PITTING
2. FLOODING	NONE	RARE	FREQ, COMMON OCCAS	FLOODING
3. DEPTH TO BEROCK (IN)	>40	20-40	<20	SEEPAGE
3a. DEPTH TO BEDROCK (IF ARIDISOL AND NOT SALORTHID OR AQUIC SUBGROUPS, ALL ARIDIC SUBGROUPS, ALL TORRIC GREAT CPOUPS EXCEPT AQUIC SUBGROUPS)	ANY ENTRY	---		SEEPAGE
4. DEPTH TO CEMENTED PAN (IN)	>60	40-60	<40	CEMENTED PM
4a. DEPTH TO CEMENTED PAN (IT ARIDISOL AND NOT SALORTHID OR AQUIC SUBGROUPS, ALL ARIDIC SUBGROUPS, ALL TORRIC GREAT CPOUPS EXCEPT AQUIC SUBGROUPS)	ANY ENTRY	---		CEMENTED PAN
5. PERMEABILITY (IN/H, 20-40")	---	---	>2.0	SEEPAGE
5a. PERMEABILITY (IN/H, BOTTOM LAYER) IF ARIDISOL AND ROT SALORTHID OS AQUIC SUBGROUPS, ALL ARIDIC SUBGROUPS, ALL TORRIC GREAT GROUPS EXCEPT AQUIC SUBGROUPS	ANY ENTRY	---		SEEPAGE
6. PONDING	---	---	ANY ENTRY	PONDING
7. DEPTH TO HIGH WATER TABLE APPARENT (FT)	>5	3.5-S	<3.5	WETNESS (DISREGARD IF PONDING)
7a. DEPTH TO HIGH WATER TABLE PERCHED (FT)	>3	1.5-3	Cl.5	WETNESS (DISREGARD IT PONDING)
8. WEIGHT PERCENT >3" (WEIGHTED AVE. TO 40")	<25	25-50	5 0	TOO COBBLY
8a. WEIGHT PERCENT >10" (WEIGHTED AVE. TO 40")	<5	S-15	>15	200 STONY
9. SLOPE (PCT)	<8	8-15	>15	SLOPE
10. DOWNSLOPE MOVEMENT (SLOPE PCT)	---	---	>15	SLIPPAGE
11. DIFFERENTIAL SETTLING	---	---	UDORTHENTS, ARENTS, USTIORTHENTS	UNSTABLE FILL

APPENDIX B

waste Management

Source: National Soils Handbook,
Draft of proposed tables (National Bulletin No. 430-O-6)

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Table 603-38. Manure and food processing waste.

PROPERTY	LIMITS SLIGHT	LIMITS MODERATE	LIMITS SEVERE	RESTRICTIVE FEATURE
1. USDA TEXTURE	---	---	ICE	PERMAFROST
2. PERMEABILITY (0-60". IN/H)	---	---	>6	POOR FILTER
3. DEPTH TO HIGH WATER TABLE (FT)	>4	2-4	<2	WETNESS (DISREGARD IF SUBJECT TO PONDING)
4. PONDING	---	---	ANY ENTRY	PONDING
5. SLOPE (PCT)	<8	8-15	>15	SLOPE
6. DEPTH TO BEDROCK (IN)	>40	20-40	<20	THIN LAYER
7. DEPTH TO CEMENTED PAN (IN)	>40	20-40	<20	CEMENTED PAN
8a. SODIUM ADSORPTION RATIO (GREAT GROUP, 0-20")	<4	4-13	>13 NATRIC HALIC	EXCESS SODIUM
8b. SODIUM ADSORPTION (PHASE, 0-20")			ALKALI	EXCESS SODIUM
9. SALINITY (SURFACE LAYER, MMHOS/CM)	<4	4-a	>8	EXCESS SALT
10. FLOODING	NONE	RARE	COMMON, FREQ OCCAS	FLOODING
11. CLAY ACTIVITY(ECEC, ME/100G)	>15	5-15	<5	LOW ADSORPTION
12. STONINESS CLASS	1	2	3, 4, 5	too STONY
13a. WEIGHT PERCENT >3" (SURFACE LAYER)	<15	15-35	>35	TOO COBBLY
13b. WEIGHT PERCENT >10" (SURFACE LAYER)	<5	5-15	>15	TOO STONY
14. AVAILABLE WATER (WEIGHT AVE to 60". IN)	>6	3-6	<3	DROUGHTY
15. SOIL REACTION (pH, SURFACE LAYER	>6.5	3.6-6.5	<3.6	TOO ACID
16. WIND ERODIBILITY GROUP	3, 4, 4L 5, 6, 7, 6	2	1	SOIL BLOWING

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Table 603-39. Municipal sewage sludge.

PROPERTY	LIMITS SLIGHT	MODERATE	SEVERE	RESTRICTIVE FEATURE
1. USDA TEXTURE	---	---	ICE	PERMAFROST
2. PERMEABILITY (0-60", IN/H)	---	---	>6.0	POOR FILTER
2a. PERMEABILITY (0-60". IN/H)	2.0-6.0	0.6-2.0	<0.6	PERCS SLOWLY
3. PONDING	---	---	ANY ENTRY	PONDING
4. DEPTH TO HIGH WATER TABLE (FT)	>4	2-4	<2	WETNESS (DISREGARD IF SUBJECT TO PONDING)
5. SLOPE (PCT)	<8	8-15	>15	SLOPE
6. DEPTH TO BEDROCK (IN)	>40	20-40	<20	THIN LAYER, SEEPAGE
7. DEPTH TO CEMENTED PAN (IN)	>40	20-40	<20	CEMENTED PAN
6. SODIUM ADSORPTION RATIO	<4	4-13	>13	EXCESS SODIUM
8a. SODIUM ADSORPTION RATIO (GREAT GROUP, 0-20")	---	---	NATRIC HALIC	EXCESS SODIUM
8b. SODIUM ADSORPTION (PHASE, 0-20")			ALKALI	EXCESS SODIUM
9. SALINITY (SURFACE LAYER, MMHOS/CM)	<4	4-S	>8	EXCESS SALT
10. FLOODING	NONE	RARE	OCCAS,	
11. CLAY ACTIVITY (ECEC, MEQ/100g; 0-20")	>15	5-15		
12. AVAILABLE WATER (WEIGHTED AVE to 60", IN)	>6	3-6		
13. STONINESS CLASS	1	2		
14. WEIGHT PERCENT >3" (SURFACE LAYER)	C15	15-35		
14a. WEIGHT PERCENT >10" (SURFACE LAYER)	<5	S-15		
15. SOIL REACTION (PH. SURFACE LAYER)	>6.5	3.5-6.5		
16. WIND ERODIBILITY CROUP	3, 4, 4L 5, 6, 7, 6	2		

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Part 603 - Application of Soil Information

403.03-4(b)(3)

Table 603-40. Disposal of wastewater by irrigation.

PROPERTY	LIMITS SLIGHT	MODERATE	SEVERE	RESTRICTIVE FEATURE
1. USDA TEXTURE	---	---	ICE	PERMAFROST
2. SODIUM ADSORPTION RATIO	<4	4-13	>13	RUSS SODIUM
2a. SODIUM ADSORPTION RATIO (GREAT GROUP)	---	—	NATRIC HALIC	EXCESS SODIUM
2b. SODIUM ADSORPTION RATIO (PHASE, 0-20")			ALKALI	EXCESS SODIUM
3. SALINITY (SURFACE LAYER, MMHOS/CM)	<4	4-8	>8	EXCESS SALT
4. SLOPE (SURFACE, PCT)	<3	3-8	>8	SLOPE
4a. SLOPE (SPRINKLER, PCT)	<6	6-15	>15	SLOPE
5. PONDING	---	---	ANY ENTRY	PONDING
6. DEPTH TO HIGH WATER TABLE (FT)	>4	2-4	<2	WETNESS (DISREGARD IF SUBJECT TO PONDING)
7. DEPTH TO BEDROCK (IN)	>40	20-40	<20	THIN LAYER
[redacted]	>40	20-40	<20	CEMENTED PAN
	---	---	>6.0	POOR FILTER
	0.2-2.0	0.06-0.2	<0.06	PERCS SLOWLY
	>6	3-6	<3	DROUGHTY
11. STONINESS CLASS	1	2	3, 4, 5	TOO STONY
12. WEIGHT PERCENT >3" (SURFACE LAYER)	<15	15-35	>35	TOO COBBLY
12a. WEIGHT PERCENT >10" (SURFACE LAYER)	<5	5-15	>15	TOO STONY
13. FLOODING	NONE, RARE	OCCAS	FREQ	FLOODING
14. WIND ERODIBILITY [redacted]	5, 6, 7, 8	3, 4, 4L	1, 2	SOIL BLOWING
15. SOIL REACTION (pH)	>6.5	3.5-6.5	<3.5	TOO ACID
16. CLAY ACTIVITY (ECEC, MEQ/100g)	>15	5-15	<5	LOW ADSORPTION

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

PROPERTY	LIMITS SLIGHT	MODERATE	SEVERE	RESTRICTIVE FEATURE
1. USDA TEXTURE				
2. SODIUM ADSORPTION RATIO				
2a. SODIUM ADSORPTION RATIO (GREAT GROUP)				
2b. SODIUM ADSORPTION RATIO (PHASE)				
3. SALINITY (SURFACE LAYER,				

[illegible] Treatment of wastewater [illegible] recovering [illegible] processes

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

PROPERTY	LIMITS SLIGHT	MODERATE	SEVERE	RESTRICTIVE FEATURE
1. USDA TEXTURE	---		ICE	PERMAFROST
2. SLOPE (PCT)	<4	4-8	>8	SLOPE
3. PERMEABILITY (0-72", IN/H)	>2	0.6-2.0	>0.6	PERCS SLOWLY
4. PONDING	---	---	ANY ENTRY	PONDIRG
5. DEPTH TO HIGH WATER TABLE (FT)	---	---	<6	WETNESS (DISREGARD IF SUBJECT TO PONDING)
6. FLOODING	NONE, RARE	OCCAS	FREQ, COMMON	FLOODING
7. DEPTH TO BEDROCK (IN)	- -	---	<72	THIN LAYER
8. DEPTH TO CEMENTED PAN (IN)	---		<72	CEMENTED PAN
9. STONINESS CLASS	1	2	3, 4, 5	TOO STONY
10. WEIGHT PERCENT >3" (0-40")	<15	15-35	>35	TOO COBBLY
10a. WEIGHT PERCENT >10" (0-40")	<5	5-15	>15	TOO STONY
11. SOIL REACTION (pH)	>5	3.5-5	<3.5	TOO ACID

1990 NECSSC TECHNICAL COMMITTEE 3

Geographic Information Systems

Committee Members:

W. Wright, URI - Chair
D. Monds, SCS - Vice Chair
R. Bauer, SCS, NSSC
D. Cowherd, SCS, MD
J. Hudak, SCS, PA
V. Owen. VP1 & su
G. Petersen, PSU
F. Putnam, FS, VT
R. Scanu, SCS, MA
B. Stoneman, SCS, VA
W. Waltman, Cornell U.
L. Wright, FS, WV

Background

GIS continues to be a very important topic in the Northeast. Many units of government are investigating the possibilities of using a GIS and many have installed a system: One of the major layers needed in a GIS is soil survey. A major concern of soil scientists is how to get the soils information digitized. Some states have started digitizing and some are investigating setting up a digitizing unit. This committee is set up to help investigate some of the successes and problems states are having in getting their soil maps digitized.

Committee Charges

1. Inventory the methods used to develop digitized soil surveys. Include the method of funding the digitizing. (The inventory could be national.)

2. Inventory quality control procedures being used for various layers. Address national standards for quality control.

3. Who has control and access to the data layers in a state?

4. What are the successes and problems relating to digitizing in states in the Northeast?

5. Recommend alternatives and future direction of NECSSC in the Northeast.

6. To the extent possible determine the interest that a cross section of private consulting firms, and state and federal agencies would have in partially financing a digitizing plan that included a specific completion date.

Contribution No. 2580 of the Rhode Island Agric. Exp. Sta., Univ. of Rhode Island, Kingston, RI 02881.

Committee Report

General:

A brief questionnaire was used to address the charges. The questionnaire was sent to all committee members, all state SCS offices in the northeast, all representatives of the NECSSC from lend-grant universities, and various federal agencies. Numerous questionnaires were also distributed to various state agencies, individuals, and private firms interested in using soil surveys. A total of 37 responses to the questionnaire was received which included information from 12 states, 4 federal agencies, 10 state and municipal agencies, 5 universities, and 2 private consulting firms.

The questions are stated below, followed by a synopsis of the responses.

Summary of Responses to Questions

1. What methods are you using or plan to use to develop digitized soil surveys in your State/Agency?

Connecticut

Field surveys are being updated, particularly those areas with older Soil Surveys. Soil survey information is recompiled on a scale-accurate 7.5 minute orthophoto quad base. Most of the digitizing is being done as a cooperative effort between the SCS and the Natural Resources Center of the CT Department of Environmental Protection. Both scanning and manual digitizing has been employed. Current digitizing has been done by the NRC-CTDEP in-house, CT-SCS, National-SCS, and by outside contractors. Most future digitizing will be done by contractor services.

Delaware

At this time, the Cartographic Section of the SCS is digitizing the southeastern quarter of Sussex County (163,000 acres). scs will furnish the digitized tapes to the Delaware Department of Natural Resources and Environmental Control (DNREC) so that the state can develop the Multimedia Advance Identification System (MAIS) for Delaware's Inland Bays, a Near-Coastal Waters Pilot Project. scs will have a copy of the tapes to use in the development of a GIS system using CRASS. The Delaware Department of Agriculture will share GIS information with DNREC; however, at this time, they only have a CAD system. The Delaware Department of Transportation has an INTERGRAPH system.

Maine

No digitized/automated soil surveys currently exist. Plans are to initiate this activity later this year. This will be a joint effort between SCS and the Maine Department of Conservation. They are currently seeking state and local funding for recompilation of soil surveys on to orthophoto quad base and to initiate digitizing.

Maryland

The State Planning Agency has digitized soils for the entire state, however, the information is in roster format with 90 meter cells. These data do not meet current standards and problems exist in matching layers of soil information.

There is a great deal of interest state-wide to automate soil survey data; however, at the present time only one county is being digitized. There is a need to field update some older soil surveys and all maps will be recompiled to an orthophoto quad base. Initially have tried to scan soil surveys, however, the photo base presents a problem. A pilot project is underway that will utilize MIPS (Mapping and Image Processing System) to digitize wetlands. The Cecil County Office of Planning and Zoning plans to scan base maps and manually edit on a digitizer. All state and local units of government are being encouraged to participate in automated soil survey projects. A lack of hardware in state and county SCS offices hinders use of digitized data.

Massachusetts

SCS in Massachusetts is currently using the GRASS system. SCS soil scientists are doing updated mapping and will also do the recompilation work. Cartographic staff in SCS will do the digitizing. They are hoping to develop cooperative agreements with local colleges to help with digitizing.

New Hampshire

The Soil Conservation Service in New Hampshire currently has a cooperative agreement with the New Hampshire Office of State Planning. Funding from this department provides financial support for the Complex Systems Division of the Department of Earth, Oceans and Space at the University of New Hampshire to digitize soil survey data. Digitizing is being conducted on completed soil surveys that have been compiled on an orthophoto base. Digitizing is in ARC/INFO.

New Jersey

Four counties of soil surveys have been recompiled to 1986 orthophoto quad base. Digitizing is in progress.

New York

Both Cornell University and SCS are using GRASS software. Map recompilation and digitizing are being completed on a Watershed basis through cooperative agreements with New York Soil and Water Conservation Districts. Cornell is also a beta test site for LT Plus software for digitizing.

Pennsylvania

SCS in Pennsylvania is setting up its own equipment at its map compilation center to digitize soils information. Digitizing has/will be done on a contract basis as well as in-house.

Rhode Island

A cooperative agreement has been established between URI, SCS, and various state agencies. All field sheets were recompiled to orthophoto quad base. Digitizing was accomplished both manually and also by scanning. Some digitizing was done in-house, however, most was accomplished on a contract bid. The automated soil survey is completed for the entire State of Rhode Island. Processing is being accomplished by ARC/INFO.

Vermont

The University of Vermont digitized 4 counties with the help of in-kind grants from SCS. Since then they have contracted with the newly formed Office of Geographical Info. (OGIS) to digitize 4 more counties by August 1, 1990. SCS has provided the quality control for the recompilation of the surveys. All of the published surveys will be digitized by August 1, 1990.

Virginia

SCS and Virginia Tech have a cooperative agreement to digitize the soils for one county. SCS has ordered GRASS and plans to automate soils data as progressive soil surveys are completed.

West Virginia

SCS is currently digitizing soil surveys manually using GRASS-MAP DEV and LT Plus. A number of soil surveys are suitable for digitizing as they are already on orthophoto quad base. They plan to continue manual digitizing in-house until scanners become more accurate and affordable.

Forest Service

At the end of the first quarter FY '90, the Forest Service Geometronics Service Center (GSC) in Salt Lake City had acquired about 3500 quads of 7 1/2 minute, 1:24,000 scale base map planimatric digital data. Plans are to complete this work in 5 years. In addition, work on gathering three-dimensional terrain data is progressing. GSC has an agreement with the U.S. Geological Survey to trade Digital Elevation Model (DEM) data. GSC exchanges models produced by the Forest Service for the same number produced by the Geological Survey, Under this agreement, GSC is adding about 1400 quads of DEM data each year.

One of the many items that must be considered when planning for the implementation of GIS technology is the Cartographic Feature Files (CFF). These are the seven layers of digitized data derived from a Forest Service primary digital data. The Geometronics Service Center in Salt lake City, UT is administering this program and the digitizing is being obtained by contracts. The digitizing for all GIS resource layers is a Region/Forest responsibility.

2. How is your State/Agency funding recompilation/digitizing of soil surveys?

Funding appears to be the primary deterrent to automating soils data. Recompilation to an orthophoto quad base is being done primarily by State SCS field/cartographic staff. Most digitizing is being accomplished on a cost share basis. A mixture of local, state, federal, and University funds are being used in most states. local Soil and Water Conservation Districts are funding most of the work in New York, whereas, the Solid Waste Management Corporation in Rhode Island paid for approximately 80% of the costs of recompilation and digitizing of the states soil survey.

3. What quality control/assurance procedures and standards are being used in your State/Agency for various digitized data layers?

The recompilation of soils data is being accomplished almost entirely by SCS soils staff in most states. Detailed editing and color checking are performed on each quadrangle before and after digitizing to ensure consistency, accuracy, and completeness. Soil map digitizing, whether done in-house or on contract, generally follow standards and procedures outlined by USDA, SCS, National Cartographic Center. Most other data bases follow USGS guidelines. Final plots are edited by overlaying onto the original base material to check for accuracy of line placement. Most states require approval by SCS before digitized soils data base is accepted or used.

4. What are some of the successes and problems you have encountered in digitizing and surveys in your State/agency?

A few successes were noted by various states. New York is completing a digital soil survey for three watersheds, Maine is in the process of digitizing soil surveys for one county and three towns, Rhode Island has completed the digital soil survey for the entire state.

The main problem stated by most states was the lack of funding to support map recompilation and digitizing. Most states are using a combination of federal, state, and local funding to digitize soil surveys on somewhat of a piece meal/parcel by parcel basis.

Other problems frequently cited include:

a) Equipment and software limitations. Not sufficient memory/storage for large data sets. Equipment configuration frequently a problem. All software between users/agencies not compatible.

b) Many soil surveys are old and need field updating and recorrelation prior to digitizing.

c) Most soil surveys need to be recompiled to an orthophoto quad base which is a very time consuming, expensive process which requires the services of well trained field soil scientists. Enlarging orthophoto quads to a scale that matches soil maps also has presented some problems.

d) Quality control and quality assurance was mentioned by many states as a particular concern. Specific guidelines and procedures should be followed by all contractors and agencies involved with digitizing soil surveys. It is important that all digital data layers within a survey are*, county, state, etc. meet specific quality standards, are edge matched, and can be overlayed with other data layers.

e) Some states, depending upon the GIS software used, have had some problems in registration, in that they have difficulty in converting from latitude/longitude coordinates to UTM's or state plane coordinates.

f) Essentially all GIS operations use USGS Digital Line Graphs (DLG's) as part of their data layers. Most users have encountered some error in hydrography on the DLG's; how should these errors be handled? In addition, many soil polygons share common hydrography boundaries with those from the DLG's; if they do not match, which should be changed?

g) Most states indicated a problem with the extraordinary amount of staff time needed for GIS operations. This not only included map recompilation and digitizing, but the need to review and edit digitized products produced under contract.

h) A few states mentioned that a photo background presents problems for current scanning technology, therefore, manual digitizing was necessary.

i) Many soil surveys that are at a scale of 1:12,000 or 1:15,840 have numerous, extremely small polygons. These present a problem when digital data is frequently published on 7 1/2 minutes, 1:24,000 scale quadrangle maps.

j) Edge matching of all data sets is very difficult, but exceedingly important. All data sets should match not only from photo to photo, but from county to county and state to state. This presents a problem if several different agencies are involved in the CIS activities or if digital data sets are generated on a piece-meal basis (e.g. townships, watershed, farm, etc.). There must be a state-wide or region-wide coordination of these activities.

k) GIS activities require well-trained staff. Short courses or other means of training are needed by SCS, University. State, municipal, and private consultant staff on all aspects of GIS.

5. Who has control and/or access to various digital data layers in your State/agency? Are copyrighting, licensing,-or other protection measures being considered?

It was obvious from the responses to this question, that most states/agencies have not really addressed this issue. Apparently, most control and/or access is either through a state agency (e.g. Dept. of Environmental Protection, Dept. of Conservation, etc.), or in the case of a digital soils data base, the State Soil Scientist. Rhode Island has copyrighted all digital data layers (including soil survey) through the Board of Governors of Higher Education as "Intellectual Property." Various license agreements, at a charge, are available to all federal, state and local agencies and to the private sector.

6. To what extent are private consulting firms or state and federal agencies interested or involved in funding the digitizing and automation of soil survey data bases?

There is a tremendous amount of interest in digital soil survey information and products from throughout the northeast. This interest is coming from federal agencies (SCS, FS, EPA, etc.), various state agencies, planning **commissions,** towns, counties, utility companies, and the private sector. Many of these groups want the information "immediately" and most do not have any funds to support this activity. SCS and a few states have been the primary funding sources for dlgltlelng soil surveys. Some consulting firms and local governments have funded small projects, but have not contributed to **a** state-wide effort. The **recompilation,** digitizing, and automation of Rhode Island's digital soil survey data base was funded jointly by the University, SCS, Dept. of Environmental **Management,** and the Solid Waste Management Corporation. Several states indicated that state legislation was pending to fund digitizing and other GIS activities.

7. Could you recommend alternatives or future directions of the National Cooperative Soil Survey in the Northeast7

Comments included:

a)

b)

c)

c)

d)

h) The NECSSC should educate potential users of GIS
informapromoting tSC f G6.
information (state agencies, legislatolatolatolatprofesstatal35.28 -11.791 14.4 23.7.56 6876

i)

j)

Recommendations

1.

2.

3.

4.

5.

6.

1990 NORTHEAST COOPERATIVE SOIL SURVEY CONFERENCE
MORGANTOWN, WEST VIRGINIA
JUNE 3-8, 1990

COMMITTEE 4 -- SHOULD SOIL SURVEY BE INVOLVED IN DESCRIBING THE EARTHY MATERIAL BETWEEN SOIL AND BEDROCK?

FINAL REPORT

<u>Committee Members</u>

Chair - Steve Hundley, SCS, NH
Acting Chair - Chris Smith, SCS, Chester, PA
Vice Chair - Tom Simpson, VPI&SU, VA

N. Burt, FS, VT
W. Clapham, ARS, ME
E. Ealy, SCS, VA
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INTRODUCTION

Prior to the Northeast Cooperative Soil Survey Conference, a strategy plan was developed to address the committee charges. A questionnaire was developed in March of 1990 and sent to each committee member to evaluate the comments and concerns of the members in reference to the charges, and to query what others are currently doing in the area of collecting vadose zone data. The correspondence and results of the questionnaire are attached to, and made part of this report. A list of comments and recommendations were developed from the responses received from the questionnaire and were presented to the committee members at the initial meeting during the Conference.

Due to conflicting commitments, Steve Hundley, Chairman, was unable to attend the Conference on Thursday and Friday of the Conference week. Chris Smith accepted the offer to serve as acting chair for the final two days, and submitted his report of the findings of the committee to Steve Hundley upon the completion of the conference.

KEY POINTS OF THE DISCUSSION SESSIONS:

1. Knowledge of deep layers is important. The degree to which this is important could vary considerably from area to area. The detail to which these layers should be studied must be worked out in coordination with local soil survey users.

2. Over the course of a soil survey it is generally recognized that the soil scientist have a better knowledge of these layers than most other people.

3. Historically this information has been summarized and included in the soil survey to various degrees by either narrative or by skematic diagrams or both in the soil formation section.

4. In those project areas where this information is needed by the soil survey users, the collection of data should be formally recognized for inclusion into soil survey activities. Acreage goals should be adjusted accordingly.

5. It was generally felt that without a lot of additional time and effort a summary of the lower layers could be included in the soil survey as text and block diagrams.

6. At no time do we ever want this to become a surveywide site-specfic report. We will continue to collect on-site descriptions on an "as needed" basis.

7. At no time do we want to promise a level of precision we can not deliver.

8. It is recognized that similar soils can be mapped over significantly different geologic strata. The deeper the layer the greater the possibility of this occurring as in the case of lithologic discontinuities. Interpretation may or may not be possible by map unit components or even on a single delineation. It may be that the information might be most valuable in a GIS. It is not our intention to produce a second set of delineations of the lower layers. However a variety of automated reclass or interpretative maps could be made using soil delineations or point locations from sampling points.

9. Pilot projects are the best way to test the feasibility of the whole idea.

10. The needs of each survey are different. Each pilot project should be given the freedom to develop an acceptable presentation format that is mutually agreeable to the users.

10. It is important not to get more involved than there is money to support the work. The plan of work needs to describe exactly what activities are planned rather than listing a particular loosely defined end product.

11. Methods for describing the deep layers should be developed by each pilot project. This could include the suggestions submitted by Oliver Rice or some other set of criteria. The most important point is that it be able to meet the users objectives at the conclusion of the survey.

RECOMMENDATIONS

1. It is recognized that knowledge of properties and characteristics of the deeper layers is critical to understanding soil formation and interpreting behavior of earthy materials. Use and management concerns affected by these layers may include soil genesis, water quality, trench safety, computer models, slope stability, pipeline installation and depth to sulfidic materials to mention a few. While conducting the soil survey, soil scientists often gain an understanding of the deep layers as well as upper layers of bedrock as they investigate the relationships between geology and soils. It is therefore recommended that:

A.) Whenever possible soil scientists are strongly encouraged to record observations of the earth as deep as practical. The properties and characteristics described would be similar to describing soil layers. Certain new properties would also be included such as the lithology of the parent material and the bedrock. The soil series, mapunit and latitude and longitude will be noted. This information will be recorded and filed with the soil descriptions until the presentation format is determined.

Note: The purpose of this recommendation is to make that information which is known only to the field soil scientists becomes available to all.

2) We recommend that pilot soil survey project areas be selected to test the procedures and mechanisms to best record, summarize and present the additional information about the deep earthy material. When discussions are first held with the soil survey users, present and future needs will be fully evaluated in developing the Memorandum of Understanding. When and where those needs require information about the deep layers, an estimate describing the methods (ie: #boring/map unit) and the cost will be projected. A separate MOU will be entered into with USGS to formalize our cooperation on the shared layers. The MOU will include a plan of work to best accomplish the objectives for that survey. Any reference to obtaining a predetermined level of precision will specifically not be identified. Additional funding from SCS, cooperating agencies and local sources will be obtained to pay for the added expense of describing the deeper layers. The collection of the data will not jeopardize the safety of the soil scientist because they will continue close adherence to the OSHA regulations regarding work in excavations.

With the adoption of these recommendations there is no value in continuing Committee 4.

Respectfully submitted,

Steven J. Hundley
Chairman

Committee 4 -- Earthy Material Between the Base of Soil and Bedrock

Background

The quality of ground water is affected by its movement through the soil, earthy material below the soil, and bedrock. Soil scientists for years have gathered data relating to the soil and currently have large amounts of data that can be used for water quality models. Likewise, geologists have data for bedrock that is equally useful. The area above bedrock is described in surficial geology reports where available, but the descriptions are often inconsistent between states, and reports, and carry little data other than a name and brief description.

soil scientists have historically, and by decree, limited'their descriptions to 2 meters, and sometimes less than that. There are many field soil scientists though, who can predict the composition of the earthy material to a depth of many feet below the soil.

The earthy material between soil and bedrock is important in the movement of water and interaction with pollutants. Water quality models need information for all layers expressed in one set of terminology, expressions and measurements. With the anticipated demand for water quality information should soil scientists describe deeper material? This and other questions need to be addressed by the committee.

Committee Charges

1. Should soil survey be involved in describing the earthy material between soil and bedrock?
2. If the material is not described in soil survey how would the data be gathered and stored for future models.
3. If the description of the earthy material should be part of soil survey then:
   a. How would it be incorporated into soil survey activities?
   b. Should a description of the earthy material be the same as we currently describe soil horizons or should new criteria be developed?
   c. To what depth would soil scientists describe?
   d. What tools and personnel are needed to gather the data?
   e. What intensity would we inventory?

Committee 4 -- Earthy Material Between the Base of Soil and Bedrock (cont.)

Committee Members

Chair - Steve Hundley, SCS, MA
Vice Chair - Tom Simpson, VPI&SU, VA

N. Burt, FS, VT
W. Clapham, ARS, ME
E. Ealy, SCS, VA
W. Hatfield, SCS, WV
K. LaFlamme, SCS, ME
M. Rabenhorst, Univ. of Maryland, MD
O. Rice, SCS, Chester, PA
R. Shipp, Penn State, PA
R. Sinclair, SCS, NSSC
C. Smith, SCS, Chester, PA
A. Topalanchik, SCS, WV

United States Department of Agriculture

Soil Conservation Service

Federal Building
Durham, New Hampshire 03824

Subject: SOI -- 1990 Northeast Cooperative Soil Survey Conference Committee No. 4

Date: March 23. 1990

To: Members of Committee No. 4 -- Earthy Material between Soil and Bedrock

File Code: 430-3

I apologize for the delay in contacting you in regard to our responsibilities as committee members charged with the vadose zone. For the purposes of this committee, I would like to define the vadose zone as the earthy material that lies between 65 inches and bedrock. If you do not feel this is an adequate definition, there is room on the questionnaire to discuss improvement. Since I am the Committee Chairman, you can call me Darth Vadose.

For starters, I have developed a "quicky poll" that should not take too much time to fill out. I would appreciate having you return it to me at your earliest convenience. Some of the questions are awkward as I found it difficult to word them better. I will compile your answers, comments and suggestions from the questionnaire and formulate a more direct approach to addressing this issue.

I am enclosing some material that may serve as a base to start from. The Guide for Describing Earthy Material Between Base of Soil and Bedrock was drafted by Oliver Rice. It provides some excellent insight. Also enclosed is a single page identifying Step 4 of the SEEPPAGE model. (A SYSTEM for EARLY EVALUATION of the POLLUTION POTENTIAL of AGRICULTURAL GROUNDWATER ENVIRONMENTS). The model requires an evaluation of the vadose zone as discussed on this page.

The third document is a proposal that was put together in Massachusetts to use the Ground Penetrating Radar to assess some of the nature and properties of the vadose for the Buzzards Bay Water Quality Committee. It was not funded and no action was taken beyond this initial proposal.

If you are aware of any activities going on in your area relating to the collection of vadose zone data, please send me information on the activity. I will compile the information and distribute it to the other committee members.

Congratulations on being appointed to Committee No. 4! The vadose zone is an exciting and challenging subject and one that warrants careful attention as we move more and more into the arena of water quality. I will get back to you as soon as I compile your responses.

[redacted]

Enclosure

cc: D. L. Mussulman, State Conservationist, SCS, Durham, New Hampshire

QUICKY POLL

1990 NORTHEAST COOPERATIVE SOIL SURVEY CONFERENCE
MORGANTOWN, WEST VIRGINIA
JUNE 3-8, 1990

COMMITTEE 4 -- SHOULD SOIL SURVEY BE INVOLVED IN DESCRIBING THE EARTHY MATERIAL BETWEEN SOIL AND BEDROCK7

For the purpose of this questionnaire, the vadose zone is defined to be the earthy material between a depth of 65 inches and bedrock.

Please return to Steve Hundley, Soil Conservation Service, Federal Building, Durham, New Hampshire 03824.

1. The NCSS should describe and publish properties of the vadose zone as a regular part of all progressive soil surveys.

NO	YES
I	卌 II

a) If consistent
b) If enough knowledge is available to support our statements

2. Describing the vadose zone is appropriate for some surveys. but not for all.

NO	YES
II	卌 I

a) Depending on user needs
b) more appropriate for intensive agricultural areas
c) when would it not be appropriate ?

3. Interpretations should be provided for vadose zone material.

NO	YES
III	卌

4. It should be permissible to publish vadose zone data for some geomorphic regions (terraces. lakeplains) and not for others (till plains) within a survey area.

NO	YES
II	卌 I

5. Vadose zone data should be collected, but not published.

NO	YES
卌 III	

STOP! IF YOU ANSWERED "NO" TO ALL OF THE QUESTIONS ABOVE, YOU NEED NOT CONTINUE WITH THIS QUESTIONNAIRE, IF YOU CHOOSE NOT TO.

IF YOU ANSWERED "YES" TO ANY OF THE ABOVE, PLEASE CONTINUE. CIRCLE YOUR RESPONSE.

(A.1) Extent of descriptions should be limited to:

Bedrock	10'	20'	50'
IIII	II	II	

(A.2) Depths of descriptions should be variable depending on the soil property described.

NO	YES
	~~IIII~~ III

(B.1) Confidence level of vadose zone data should be:

50%	85%	95%
II	~~IIII~~	

I

(B.2) Degree of reliability should be variable depending on soil depth and soil property described.

NO	YES
	~~IIII~~ III

(C) Characterization data should be required for vadose zone material.

NO	YES	NOT SURE
IIII	III	I

(D) How much additional time would you expect to complete a normal survey based on your answers above?

10%	25%	50%	75%
I	~~IIII~~ I	I	

(E) What field methods do you propose to accomplish the task of describing and publishing vadose zone data?

Deep borings — Well data — GPR

Drill logs — Road cuts

(F)

Structure	I	Depth & thickness	III
Color	I	Lithology	~~IIII~~ I
Texture	~~IIII~~ I	Db	~~IIII~~ II
Perm.	I	water table depth	III
Co. Frag.	~~IIII~~	Bedrock depth	III
Reaction	~~IIII~~ I	restrictive layers	I
Hydraulic conductivity	I		

(G) We should publish general information on what we already know about the vadose zone. but make no particular effort to collect additional data as part of the NCSS.

NO	YES
𝍸 I	II

(H) Vadose zone properties are needed. but this is research, and should not be part of the NCSS.

NO	YES
𝍸 III	

(I) Additional comments.

1. Change name of Committee
   Suggest: "Descriptions & Interpretations for vadose zone material"
2. Estimates should be differentiated from actual data
3. we should collect & publish what we know
4. Since multiple Series will occur on the vadose zone with similar properties, the data collection is not so overwhelming a task.
5. Research or pilot study may be appropriate in selected area(s) to determine:
   a) Best data collection approach
   b) cost/time/needs for such data collection
   c) Reliability and applicability of the data collected
6. much needed topic for discussion considering our current emphasis on water quality.
7. many of these questions are not simply a yes or no answer, but requires discussion.
8. there is a real need for good descriptive information about the vadose zone.

No response from anyone aware of current activities relating to the collection of vadose zone data.

DRAFT - 12/88 OWR

GUIDE FOR DESCRIBING EARTHY MATERIAL BETWEEN BASE OF SOIL AND BEDROCK #1

INTRODUCTION

The current emphasis in SCS to develop procedures to evaluate water quality effects of soil and crop management practices has placed a demand on soil data that is not fully supplied with our current soil data bases. A major limitation is that our current inventories describe soils to a maximum depth of approximately 2 meters, patterned after instructions that are now obsolete. We really need information on all unconsolidated material between the surface and "bedrock".

Water quality assessments are not the only urgent need for this information. Another need is for a real inventory of soil resources. In order to plan for permanent agriculture we need an inventory of all unconsolidated sediments, not simply the top meter or two. With such an inventory, we could begin to develop a more rational meaning for soil loss tolerance.

We are in a position of needing to reevaluate our definition of soil survey as a resource inventory and to make additional soil quality standards and to make our only defined one (T value of USLE) realistic.

Surficial geology maps provide some information for some areas, but are not well linked to soils data and use a different set. of terminology. It would be highly desirable to describe the whole section from soil surface to bedrock using one set of conventions. It seems logical to use soil *science terminology* and conventions because many models are designed to operate using soil survey data.

Current instructions for describing the upper 2 meters of soil are generally adequate for describing the soil material to bedrock, but standard layer and property class limits may not be commensurate with the in-exactness with which the deeper layers have been examined or the impression we want to give readers of the detail with which we or geologists have examined the material. It is because of these concerns that many have chosen not to record anything about the material below about 2 meters, even though much more is known than is recorded. Another reason is time constraints, although the principle excuse used has been that this portion of the regolith "belonged" to the geologists. The soils memorandum on which this belief was based was cancelled years ago. It is now necessary that we record an appropriate

---

#1 Bedrock or other material that would become soil material through weathering very slowly or be made soil material with difficulty with machinery.

description of the material, one which contains a minimum set of information in all cases, but that may be highly detailed for specific uses. In some areas good information is available in surficial geology surveys, however, in all cases I know of it needs to be converted to soil survey terminology to be useful with soil data bases, and to be useful at more than a qualitative level, additional estimates of physical and chemical properties must be gathered. We need to use geologist in updating soil surveys. As soil surveys are updated, the unconsolidated material should be characterized by the NSSL.

This guide is for describing these materials. Guides and procedures to sampler analyze, and characterize these layers need to be incorporated into our standard character-ization procedures and guides are needed for including the information into standard soil surveys. Unless these data are included in the minimum set of data to be included in the next generation of soil surveys, it is not likely to happen.

This is not a suggestion to attempt to survey the substratum at the same intensity as the surface layers (the solum). The suggestion is that we set a minimum standard for what we ought to know at various depths and that the solum and substratum be described using a uniform system of terminology. This may require additional laboratory data and greater cooperation and collaboration with geologists.

The guidelines for describing the unconsolidated layers consist of two parts. The minimum set of soil material attributes to record, and the description detail and depth increments of each layer.

Minimum Set of Soil Material Attributes

To arrive at the suggested minimum set of soil material attributes, we made a estimate of what would be the the commonly required data needed to estimate with computer models the crop producing life of a soil and the underlying soil material, and the ability of the soil and regolith beneath it to attenuate and transmit potential pollutants moving in the soil water. In this draft, we have selected items only from those currently listed in the National Soils Handbook - Soil Survey Manual. The detail (exactness) uith which these are recorded is defined for the minimum requirement, as opposed to the maximum requirements such as for special studies or research which might be more extensive and detailed than for a standard description. Suggestions are made for grouping attribute descriptions (classes) and increasing thickness of layers described so as to simplify the description as depth increases. In future drafts we might include items not normally recorded In soil descriptions provided field procedures are available that have acceptable time and equipment requirements. In general, however, any new subsoil attributes approved for inclusion in soil descriptions would also be included In descriptions of the substratum.

List of Attributes to include in descriptions

a.
b.
c.
d.
e.
f.
g.
h.

Guide for Description Detail

NEEDSTBL
GUIDE FOR DESCRIPTION DETAIL - table (updated 12/88)

attributes	depth interval 1	depth interval 2	depth interval 3
	2-5 m	5-20 m	20 + m
characterization intensity			
attributes to select layer thickness	items c,d,f,g,and h attribute classes listed below	items c,d,f,g,and h attrobite classes listed below	items c,d,f,g,and h attribute classes listed below
reaction	manual classes	acid,neutral,alkaline,calcareous	acid,neutral,alkaline,calcareous
texture	manual classes	11 particle size classes or 5 general texture classes	7 particle size classes or 3 general texture classes
lithology	taxonomy mineralogy classes or manual parent material classes	manual parent material classes9 geologic unit and material	geologic unit and material
rock fragment content	4 manual classes	4 manual classes or 11 family particle size classes	geologic unit and material
soil or material structure	manual classes, substitute material structure for soil structure	manual classes, substitute material structure for soil structure	geologic unit and material
cementation,induration,etc.	manual classes of concentrations,cementingrconsistence	manual classes of concentrations,cementingrconsistence	geologic unit and material
consolidation and bulk density	NSH (603.12) range of moist bulk density	NSH (603.12) range of moist bulk density	NSH (603.12) range of moist bulk density
surface coats, pores,etc.	manual classes	manual classes	geologic unit and material

COMMITTEE 5

Chairman: Dean D. Rector, SCS, VA

Vice Chairman: Richard Weismiller, UMD, MD

Committee Members: (Including Private and Public Sector Soil Scientists that are not NOW a part of the NCSS.)

- D. Amos, VPI & SC, VA
- E. Ciolkosz, Penn State, PA
- L. Daniels, VPI & SU, VA
- H. Raymond Sinclair, Jr., SCS, NSSC
- E. Stuart, SCS, RI
- D. van Houten, scs, VT
- J. Vrana, SCS, NY
- E. White, SCS, PA

Background

Traditionally, the National Cooperative Soil Survey has been some combination of public sector effort (Federal, State, Local) where responsibilities and contributions of each participating agency has been specified by an agreed upon Memorandum of Understanding.

In most recent years the private sector, including soil scientists and consulting scientists working in Geotechnical-Soils subject matter areas have been increasingly active in mapping and in making soil interpretations, some very site specific. The hiring of interpretive soil scientists in the public sector (County, City) has increased in the pant few years. In urbanizing areas, and in regions where the environment is under increasing pressure, such as wetlands, the activity of these soil scientists can be much more intense than the

5. How extensive are the problems that would arise from confidentiality of "client information?"

6. How does SCS currently share the information (SSSD) with educational institutes?

COMMITTEE REPORT

General

A questionnaire was used to address the charges. It was sent to all committee members. A questionnaire was also sent to all the State Soil Scientists in the Northeast asking for the number of soil scientists that work in that state and the agencies they work for.

The questions are listed in the form of the charges below, followed by a summary of the responses. Included are charts summarizing the people that are working in soils in the Northeast and the summary of the Kinds of SSSD request in Virginia from May 1989 to April 1990

Some of the problems are:

Recommendations

2. HOW DO PRIVATE SECTOR SOIL SCIENTISTS ACCESS NCSS INFORMATION, ESPECIALLY THAT IN DATA BASES?

Summary of responses:

Ranged from... I don't know; to.. the private sector soil scientist stops by SCS offices and request the information that is needed.

Generally, the private sector soil scientist uses the published soil survey report or request soils information that he needs for each client.

Some of the problems are:

a. In the absence of an organized system to distribute the data to the consultant, few even Know what is available, or how to get it.

b. Consultants who have worked for NCSS cooperators think they don't need it.

c. Much of the request that the consultant have, the SSSD info is irrelevant (example, recording Profile data for a on-mite septic system).

Recommendations:

1. The national office should clarify policy on release of data, including copywriting issue.
2. Data files should include statements that caution users of limitations.
3. Set up a national data base center for distribution.

3. SHOULD PRIVATE SECTOR SOIL SCIENTIST BE "INCORPORATED" INTO THE NCSS?

Summary of responses:

Ranges from... yes, they should be incorporated to.. only if they are willing to share information.

Generally, all responses were favorable to incorporate the private sector soil scientist into the NCSS, with the same contract or MOU that all NCSS members have.

Some of the problems are:

a. Not all private sector soil scientist are organized enough to agr.. on . contract or MOU.

b. Fitting the NCSS Data bases to fit the need of the consultants.

c. Few have ● ithar the time or financial resources to attend NCSS meetings.

Recommendations:

Private sector people should be part of the NCSS. A MOU between each private sector organization and the NCSS should state what is ● xpmtad from each.

4. HOW IS QUALITY CONTROL FOR A PRIVATE SECTOR SOIL SCIENTIST MAINTAINED, WITH OR WITHOUT, A COOPERATIVE AGREEMENT WITH THE NCSS?

Summary of responses:

Ranged from... that's a good question; to.. I don't think the NCSS can address this unless the consultant has a contract with a agency that requires NCSS standards.

Generally, responses were... there is no Quality Control over the private sector soil scientist that state laws don't require.

Some of the problems are:

a. No budget to help with Quality Control (training sessions, etc.).

b. Quality Control originates with the consultant. They should feel . sense of responsibility to themselves and their clients.

Recommendations:

No recommendations.

Statement:

If law does not require quality control through federal or local governments there is no quality

5. HOW EXTENSIVE ARE THE PROBLEMS THAT WOULD ARISE FROM CONFIDENTIALITY OF "CLIENT INFORMATION?"

Summary of responses:

Ranged from... unsurmountable; to.. if collecting the data is required by law, it is public property.

Generally, the responses thought that general information could be shared without breaching a client's confidentiality.

Problem:

a. At what point does the client's ownership of the data end?

Recommendation:

The NCSS receive guidance from USDA legal ataff.

Recommendation:

A SUMMARY OF THE KINDS OF SSSD REQUEST IN VA FROM MAY 1989 TO APRIL 1990

Who	In-SCS	Out-SCS	P-OP
Area Conservationist	1	0	
Agronomist	1	0	
Area Soil Scientist	3	0	
Consultant	0	7	
Corp of Engineers	0	1	
Correlator	65	0	
county	0	7	
Map Compiler	2	0	
Map Compiler	1	0	
Party Leader	3	0	
Realtor	0	1	
state	0	4	
State Fish & Game	0	1	
State Health Dept.	0	1	
TVA	0	1	
US Fish & Wildlife	0	1	
USPS	0	3	
VP1	0	17	
	76	44	TOTAL

SUMMARY OF SOIL SCIENTIST IN THE NORTHEAST

	WV	VA	MD	NH	PA	MA	ME	NY	DE	NJ	CN	VT	RI		TOTAL
SS in STATE	19	174	42	60	76	23	75	34	24	29	62	33	8		659
In the NCSS	19	59	6	8	20	8	16	25	5	7	7	13	3		196
County Gov't	0	1	1	9	0	1	0	0	1	0	0	0	0	0	22
Consultants	0	99	18	52	46	15	56	5	12	16	55	12	5		391
Stat. Gov't	0	5	9	0	9	0	3	3	7	6	0	8	0		50

NO

COMMITTEE 6
HOW TO ATTRACT STUDENTS INTO SOIL SURVEY

NORTHEAST COOPERATIVE SOIL SURVEY CONFERENCE
MORGANTOWN, WEST VIRGINIA
JUNE 3-8, 1990

COMMITTEE MEMBERS

Robert Cunningham, Penn Stat. University, PA (Chairman)
Maxine Levin, scs, NJ (Vice-chairman)
Marc H. Crouch, SCS, VA (prepared report)
Dale Childs, SCS, WV
J. Baker, VPI&SU, VA
K. Bracy, USFS, VA
R. Day, PSU, PA
C. Evans, Univ. of New Hampshire, NH
H. Luce, univ. of Connecticut, CT
R. Pennock, PSU, PA

COMMITTEE CHARGES

1. What can universities do to attract students to soil science programs?
2. What can SCS do to attract students to soil science programs?
3. Who else can help in this ● ndsavor?

COMMITTEE REPORT

Participant8 in discussions during the conference concluded that recruitment should be • joint effort of universities, SCS, USPS, and other cooperating agencies in each state. Therefore, the report addresses the charges together and not separately. The report consists of major points of emphasis that need to be recognized and addressed, and recommendations to the Steering Committee.

Points of Emphasis

We must recognize the demographics of the population pool for potential students. In the Northeast, SO to 85 percent are from non-farm backgrounds. 1

Upon recognition of the non-farm ● tudant pool, we should place emphasis on relating soil s cience and soil survey to ● nvironmantal sciences and de-emphasize the agricultural relationship.

The image of roil scientists in soil survey programs needs to be updated. Mapping is no longer the only or main thrust of the program. Opportunities in interpretations, investigations, database management, Geographic information systems, etc • rs now a very important part of the program and need to be ● mphasirod in recruitment.

---

1 Some Trends in Interest in Agricultural Colleges, John Hudak, SCS, PA, 1990

I" developing various methods/materials for recruitment (publications, videos, slide talks, personal contacts, etc), we need to emphasize the role of soil science and soil survey in todays and tomorrows environmental concerns in the Northeast; water quality, wetland management, environmental planning, urban/suburban planning and development, etc.

All those involved in the cooperative soil survey program need to de-emphasize the "completion of the once-over". This is turning potential student8 away because they s.. the program terminating by 1996.

All cooperators should develop recruitment objectives in Annual and Long Range Plans of Operations. This should be done at levels from state staffs to field staffs.

Management in all cooperative agencies and universities need to recognize and support the need for recruitment activities by individual8 throughout the program, especially at the field level.

"All" job opening announcements should be sent to universities for placement on bulletin boards for students to see. Recognizing the fact that students will not be qualified for many of the openings, and recognizing that many entry level openings in SCS are filled in a short timeframe as funds become available, this will still be an excellent opportunity to advertise soil • ciencm as career that has many opportunities for students in the future. It may encourage them to consider soil science as a career and to go through proper procedures for rating to be • ligiblm for entry level positions.

Federal agencies should maintain the Student Trainee programs for soil scientists.

Federal agencies should use Cooperative Education programs for encouraging the soil • cimc. field.

Federal agencies and others • hould develop internship program. for college credit.

Universities • hould develop undergraduate and graduate degree programs in soil • cianco. These programs should emphasize non-farm environmental studies. The University of Rhode Island is an excellent example.

Federal agencies need to maintain or develop liberal education leave policies for student trainees who wish to pursue graduate degree programs before becoming full time • mployns. There are examples of student trainee employees being terminated because they did not come on board full time upon completion of an undergraduate degree, opting instead for a masters degree.

All cooperators could work jointly to develop and offer grants and/or scholarships. In return, the student guarantees . certain period of employment.

Universities should recognize the opportunity to use introductory soil science courses as "hooks" into soil science programs or into accumulating enough credits to qualify for employment in the soil survey programs. They should develop there courses to include units of instruction that include career opportunities.

All cooperators should recognize soil/land judging contests as "hooks" to soil science degree program. and careers. Participation in these programs will provide opportunities to recruit students at the high school level.

Universities could sand letters to all students accepted for admittance to the university that show interest in environmental and agricultural degrees, regardless of whether or not they have yet to declare attendance at that school. The letter could include recruitment material for soil science degree programs and careers.

Soil science faculty could make follow-up phone calls to these students for a personal touch in recruitment. This effort could be limited to those • tudents actually declaring that they will attend that particular school.

Federal agencies should include 'Workforce 2000' information in the development of recruiting materials.

We Recognize that once a • tudont is recruited into a soil science degree program, we have a problem competing with the private sector for beginning salaries and perks. The committee discussed two items that address this issue.

1. During recruitment, we need to promote what we see as compensations of public service versus private employment.
*Job security through economic peaks and valleys
*Excellent on-the-job training and educational opportunities not available to the private sector
*Travel opportunities within the country and internationally.
*A variety in work-related • ctivitiom not always available to private sector soil scientists (would you want to make a career out of leaching field investigations?)

2. Federal agencies, universities, and others could establish thesis and/or non-thesis masters degree programs that includes employment on a soil survey project as part of the curriculum. Contingent to hiring, the agencies could offer to pay tuition, contribute towards living expenses, and maintain employment during periods that the student would need to be on campus for completing classroom requirements. With certain requirements, the • tudantm receive course credits a. part of their soil survey activities. In return, the student would guarantee a certain period of employment. This would provide financial competition against the private sector that would not be that costly. A rid. effect to this proposal is that currently employed individuals may want access to the program. This could be done competively as part of the career system and would be incentive towards keeping out best people in public service.

The main item of emphasis, however, is this: whatever we do, we need to quit talking about it and getout and do it!

RECOMMENDATIONS

1. All within the cooperative soil survey program should jointly and independently develop recruitment materials - video taper,, brochures, slide sets, letters, etc - that reflect the needs of that state and/or the Northeast, that reflect a modern image of soil scientists and what they do, and that relater soil science and soil survey to todays environmental concern..

2. All within the cooperative soil survey program • hould jointly support educational incentives for attracting students into soil science degree programs and employment in soil survey programs. These should include grants and scholarships, internships, student trainee programs, cooperative education programs, liberal educational leave policies, innovative graduate degree programs linked to employment, and other viable options.

3. It is recommended that the charges to this committee have been completed and that the committee should be disbanded.

E. GENERAL REPORTS

NEC 50 REGIONAL COMMITTEE ON SOIL SURVEY

Minutes meeting on June 4, 1990 at West Virginia University, Morgantown, WV.

Present: R. Bryant*, E. Ciolkosz, R. Dolos, D. Fanning, J. Galbraith,
K. Langlois*, M. Rabenhorst*, J. Sencindiver*, P. Veneman,
W.J. Waltman, W.R. Wright*
(* denotes official representatives)

The meeting was convened at 8:15 PM by chairman Sencindiver. The 1989 minutes were accepted. Fanning and Rabenhorst discussed the upcoming regional

The future of NEC 50 was discussed. How often does this group need to meet? The suggestion was made to make the meeting dates more convenient, i.e. meet at night just prior or during the regional field trip. It was suggested that committee meetings be held in conjunction with other regional meetings or during the field trip. It was voted that the next meeting will be held during the 1991 field trip scheduled for southern New England. Wright and Veneman will co-chair this tour. The 19'32 trip is scheduled in Pennsylvania and possibly West Virginia with Ciolkosz as trip organizer.

Wright was nominated and elected the serve as NEC 50 secretary for the next meeting which will be chaired by Veneman. Wright will chair NEC 50 in 1992.

The meeting was adjourned at 9:30 PM.

Respectfully Submitted,

Peter Veneman
Secretary NEC 50

SCS Breakfast Discussion Notes

Tuesday, June 5, 1990

SCS personnel at the Conference met for a breakfast meeting on Tuesday morning from 7:00-8:45 a.m. The meeting was conducted by Karl Langlois.

Karl extended the appreciation of the NNTC Soil Interpretations Staff to the Northeast soil staffs for their review of material that has been sent to them in the past year. This included reviews of criteria for "T" and "K" factors and changes in the rating criteria for soil interpretations. Also the response was excellent

1992 Northeast Cooperative Soil Survey Conference

Steve Hundley extended an invitation to have the 1992 Northeast Cooperative Soil Survey Conference in New Hampshire. It was suggested that the Conference be held later in the month so school would be out and some participants could bring their families.

State Soil Survey Database

The State Soil Survey Database (3SD) was discussed along with the Soil Dataset Manager position. There are many areas in 3SD that need to be corrected before the data is distributed for use. Some of these are legend, crop yields, vegetation in hydric soil map units, inclusions in map units, and capability subclass.

Data management is a need in all states and it is time consuming. Larger states that have worked with 3SD stated that managing the database is a full time job for a Dataset Manager. It was discussed that it would be efficient for small states to

F. 1990 NORTHEAST SOIL SURVEY CONFERENCE

NORTHEAST COOPERATIVE SOIL SURVEY CONFERENCE
MINUTES OF BUSINESS MEETING

June 8, 1990

Recorded by Chris Smith

The business meeting was called to order at 9:30 a.m. by Karl Langlois, Conference Steering Committee Chairman. The minutes of the 1988 meeting were formally accepted. No old business was discussed.

New Business

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

Name	Term*
William Waltman	1988-1991
Christine Evans	1989-1992
Ed Ciolkosz	1990-1993
Ray Bryant	1991-1994
Garland Lipscomb**	1988-1991
Marc Crouch	1989-1992
Jim Brown	1990-1993
Steve Hundley	1991-1994

* Term ends January 1 of concluding year.
** Replaces Carol Wettstein for remainder of the term.

It was recommended that the Conference proceedings list past recipients of the Silver Spade Award.

It was recommended that the Conference Steering Committee consider holding the Conference at the end of June. At that time all schools are out and more participants could bring their families to the Conference.

The South region proposed the possibility of a joint Conference between the South and Northeast regions in 1992. A vote was unanimous that the Conference Steering Committee should consider a joint conference.

The Conference Steering Committee reported that if a joint meeting was not held with the south, that New Hampshire was the planned site for the 1992 Conference. The Committee appointed Steve Hundley as Vice-Chairman in charge of local arrangements.

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 John Sencindiver for the excellent arrangements made for the conference and the trip.

SILVER SPADE AWARD

The Silver Spade Award is presented to a member of the Conference who has contributed outstanding regional and/or national service to soil survey. Recipients of the Silver Spade Award are:

1984 Edward J. Ciolkosz, Pennsylvania State University
1986 Edward H. Sautter, State Soil Scientist, CT
1988 Sidney A.L. Pilgrim, State Soil Scientist, NH
1990 William R. Wright, University of Rhode Island

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.

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 arrangments for the conference (rooms, etc.). Included in the last mailing will be a copy ot 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 Technial 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 ot 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 ot 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

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

PROCEEDINGS OF THE 1990 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 John Sencindiver, vice-chairman, your talk, committee report or experiment station report. He should receive the report by June 29, 1990.

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, DC; Pennsylvania State University, etc.).
3. Followed by body of the talk of 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.

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