Expert Committee
on Soil Survey

Proceedings of the Ninth Meeting

Ottawa, Ontario
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Canada

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Preamble

This report is a compilation of the progress reports received from the respective soil survey units and working groups across the country. A report on the plans to monitor soil quality for the National Soil Conservation Program is also included.

No attempt has been made to summarize the more important points made in the reports. It is anticipated that the discussions arising from the ECSS meetings will focus on the important agenda items. These will be reported as part of the meeting proceedings.

E.E. Mackintosh
Chairman, ECSS
October 17, 1990

FRENCH TRANSLATION TO GO HERE

Welcome to ECSS Members

M. Feldman

On behalf of the Land Resource Research Centre, and its Director, Richard Asselin, it is my pleasure to welcome you here. Dr. Asselin would have very much liked to have been here, but had to be away on a managers course.

Historically, the Research Branch of Agriculture Canada undertook the support of activities of the Canada Committee system by providing facilities for meetings, and staff time and resources for things like documenting and preparing meeting minutes and reports. Accordingly, we are happy to have you benefit from the availability of these facilities and from our staff members who are joining you for the next two days of your meeting.

I am quite familiar with the CASCC system through my involvement, over many years, with the Canada Committee on Engineering Services in Agriculture and Food (CCESAF). Of course, I am less familiar with CCLRS and your ECSS. However, I do understand that you have a long, useful history of contributions to agriculture. The ECSS has been operating since the 1940's, providing advice, developing standards, and undertaking related valuable activities. The committee brings together all the players concerned to ensure collaboration and coordination. With restructuring in the 1980's, adjustments need to be dealt with. The committee has fewer representatives and its role is becoming less clear.

I note from your reports that you cover a great deal of detail. There is a lot of real work to be done. You have a unique role to play, inclUding provision of a national perspective. (I see a parallel to the Canada Plan Service, that I can relate to, where a national committee establishes priorities, enlists and amalgamates provincial expertise, and prepares products that can be used as appropriate across Canada.)

We are all working in an atmosphere of change, and under continuing resource restraints. This requires examination of priorities, and of the way we all define and carry out our business. An important example is the Agriculture Canada soil survey evaluation. You already have many references to the evaluation report in the documentation for your meeting here. I think that you can reconfirm your responsibilities in ensuring relevance, coordination, standards and advice in soil survey work. The challenges are to provide transparency for what you do, and clearly define the mission. I think that you have an opportunity to be advocates of agricultural land, and to help develop the utilization of soil survey products in electronic form.

What I see from the Agriculture Canada side are a number of pressures for change. The GATT negotiations may have further negative effects on our agriculture industry. The message within the Department is that there is no new money; there are no miracles. We are defining our business and how we carry it out. The Agricultural Policy Review, being conducted by our Minister, has confirmed his four pillars (improved self-sufficiency,

improved market responsiveness, recognition of regional diversity, and environmental sustainability). A number of Federal-Provincial task forces are working to define issues and actions. Of particular note for us *is* the recent task force report on Environmental sustainability, and the emphasis on technology transfer. In our research work we are making more use of, and there *is* more availability of, outside funds, with concurrent focus on collaboration with partners. Communications *is* receiving high priority, because of the importance of keeping what we do transparent, and of keeping research a priority in the public mind. The Research Branch consultations and strategy development are published in a series of strategy/policy reports -- the latest *is* Part 8 on technology transfer. Internal items shaping the way we do business, that you may hear about at times, include IMAA - a memorandum of understanding between Agriculture Canada and the Treasury Board to delegate responsibilities, PS2000 - finding ways to streamline the bureaucracy, and EARP - environmental review of all programs.

At the Land Resource Research Centre, we are responding to a need to change program and organizational structure. The soil survey evaluation, already mentioned earlier, requires negotiation of roles with the Provinces; the results still to come of the Branch's soil research review will reshape our research program; the report on environmental sustainability raises *issues* that we are well-equipped to address; and we are preparing our action plan to contribute as one of the five Centres in Ottawa to the Central Experimental Farm strategy.

I know you have a busy schedule ahead of you. I am pleased to see the range of input that you will receive from our staff, and I have every confidence *in* their well-qualified capabilities. Thank you for this opportunity to speak to you. I wish you a good meeting.

1. PROVINCIAL/AGENCY REPORTS

1.1 British Columbia-Report to ECSS

(H.A. Luttmerding)

The following briefly summarizes soil inventory, interpretive and related undertakings in British Columbia during the past year or so.

1.1.1 Soil Inventory

Soil inventory per se in British Columbia is not a high priority at the present time. No new projects were initiated during the past year and existing ones are winding down. Volumes three (Galiano, Valdes, Thetis, and Kuper Islands) and four (Gabriola Island) of the Gulf Island survey were published during the past year, and Volume five (the final one) has been submitted for publication. Volumes one and two were published earlier. The soils report for the Ashcroft map area (92-1) is currently undergoing final edit prior to publication _ accompanying 1:100,000 scale soil maps are being prepared by Land Resource Research Centre, Ottawa.

Conversion from CanSIS to ARC/Info of data for several first-phase map areas has been completed. Soil name, layer and related files were developed for the Fort St. John - Dawson Creek, Nechako _ Francois Lake, Nazko, Quesnel, Barkerville, Horsefly, Williams Lake _ Alexis Creek, Taseko Lakes, Lac la Hache - Clinton, and Princeton _ Tulameen map areas.

Preparation of the 1:1 M scale Generalized Soil Landscapes map for British Columbia is continuing. The map for the southern half of the province is currently undergoing edit prior to submission for publication. Field work and analyses for the northern half is complete and mapping/coding has been initiated.

The second edition of "Describing Ecosystems in the Field" was jointly published during the past year by the British Columbia Ministry of Forests and Ministry of Environment. The manual provides a standardized methodology for describing site, soil, vegetation, mensuration, wildlife and humus form data.

Two new areas for wildlife habitat and capability mapping were undertaken by the Wildlife Branch, Ministry of Environment, during the past year. The Ospika Valley on the east side of Williston Lake was mapped for ungulate values at 1:50,000 scale. The Okanagan Critical Areas project consists of 1:20,000 scale habitat mapping for unique/ endangered species, both flora and fauna. These projects have a component of soils and terrain input but are not soil or terrain surveys.

1.1.2 Soil Classification

The proposed change from pyrophosphate extractable Fe + Al to oxalate extractable values for the definition of podzolic (Bf) horizons has potentially serious implications for the classification of some

British Columbia soils. This is particularly true in the southern part of the province where varying amounts of volcanic ash are present. Many soils which are Dystric Brunisols using pyrophosphate become Podzols with oxalate. As part of the solution for resolving this problem, all available soil profile information, for which both pyrophosphate and oxalate values are available, have been submitted to the national podzolic soils data bank being developed at LRRC. Additional sampling and field visits by Dr. C. Wang have also occurred.

1.1.3 Other Programs

A crop risk assessment program has been developed by the LRRC Vancouver Unit for the British Columbia Peace River region and utilizes updated climatic data and recent soil analyses which better characterize the physical soil properties.

Six erosion plots at Dawson creek continue in operation as well as nine further plots for comparing the effects of different tillage methods on soils erosion. The operation and monitoring of ten erosion plots in the Lower Fraser Valley also continues. These are all under the direction of the LRRC Vancouver Unit.

The Ministry of Forests has initiated a new soil research program directed at evaluating the productivity effects of forest soil disturbance. The program consists of the following components: (1) validation of the proposed mechanical site preparation guidelines;
(2) measurement of soil disturbance levels on six cut-blocks in each forest region to determine compliance with interim guidelines; (3) retrospective studies to help evaluate the effects of soil disturbance on productivity using an historical approach; (4) development of an aerial photographic system for soil disturbance measurement; (5) a study to evaluate productivity change on a cutblock basis, as opposed to an individual tree basis; (6) initiation of a long-term productivity project, evaluating the effects of different levels of organic matter removal and different levels of compaction on long-term productivity.

The Ministry of Agriculture and Food has approval in principle under the National Soil Conservation Program to develop a GIS based Land Evaluation Program for south-coastal British Columbia directed at agricultural waste management. The project will attempt to integrate soils; land use; numbers, kinds and locations of farm animals; manure fertilization; surface and groundwater regimes; among others.

Forestry Canada has completed 1990 monitoring sampling of fifteen ARNEWS plots established in British Columbia during 1984 through 1986. An attempt will be made to compare the 1984 - 1986 data with the 1990 data as it relates to tree vigour, foliage chemistry, etc.

Forestry Canada is also involved in evaluating the effects of forestry practices on site productivity. The studies concentrate on determining soil-site disturbance associated with various forestry practices. Examined are changes in soil physical and chemical characteristics resulting from harvesting, site preparation and site

climate change. These data, coupled with performance assessment of seedlings, will allow for assessment of relationships between forestry practices, site disturbance and long-term biological productivity. These undertakings are coordinated with the British Columbia Ministry of Forests' new research program described earlier.

Within the forest industry, biophysical surveys (soil/terrain/ bioclimatic) are undergoing a revival. Two types of surveys _ Terrain Stability and Wildlife Capability are becoming commonplace and very often are a condition of forest harvesting approvals. Terrain Hazard mapping is essentially terrain mapping with slope stability interpretations based on natural terrain and slope process features. Wildlife Capability mapping is basically biophysical mapping overlaid with a slope/elevation/aspect stratification that is subsequently interpreted for wildlife capability.

1.1.4 Comments

My contact with the forest industry had an interesting observation in that the terrain and biophysical mappers (consultants/contractors) working in the 1970's are the same people who are doing the Terrain Stability and Wildlife Capability mapping today. Despite the demand for this type of work, there are actually fewer people able to do it, and as a consequence, the forest industry may have to invest in training their own mappers if they are to accommodate expected workloads.

Another comment stresses the very real and pressing need for "baseline" soils inventory in currently unsurveyed forested areas to provide a mechanism for extrapolating and incorporating research into planning. The ability to predict sensitivities and avoid major adverse impacts is crucial.

1.2 Alberta Report to ECSS (S. Moran)

1.2.1 Operational Inventory

1. The report and maps for the County of St. Paul are completed and in review.
2. The report and maps for the G1eichen Map Area (Sl/2 821) are completed and in review.
3. There were 7 requests from Alberta Municipalities for soil survey in 1989.
4. New soil mapping projects were initiated this year in the County of Forty Mile, in the southeastern corner of the province, and in the M.D. of Rocky View in the Calgary area. It is anticipated that approximately 30 townships will be mapped this year. The mapping is being supported through a combination of provincial funding and federal NSCP funding. Correlation is being done by the federal unit.
5. The NSCP has funded a research project on the development of efficient techniques to upgrade maps in previously mapped areas.

1.2.2 Data Base/Information Systems

1. The provincial soils data base (SIDMAP) was transferred from Alberta Agriculture to the Alberta Research Council.
2. The Warner County soil information system was developed, based on the 1:50,000 scale mapping to support soil conservation decision making. Funding was provided by the Alberta Research Council and Alberta Agriculture.
3. A soil information system was developed to make soil inventory data more accessible and applicable to user needs (NSCP funded).
4. CanSIS database activities of the federal unit:
   In-house GIS capability was established for the Alberta unit. Attribute files were prepared for Buck Lake, Wabamun, Chip Lake, and Flagstaff map sheets.

1.2.3 Stakeholder support/Interaction

1. Map update project in the Calgary area to support soil conservation planning.
2. Detailed mapping (1:20,000 scale) of 4 townships in the Morinville area North of Edmonton to support farmland assessment and build links between the soil survey and assessment processes.
3. Research project on surface water storage and movement within agricultural landscapes.
4. Research project to link soil survey and land cover interpretations from Landsat imagery to support county scale soil conservation planning.
5. Research. project to develop new interpretive/presentation products to make soil inventory data more accessible/applicable for farm scale (1:5,000) soil conservation planning.
6. Technology Transfer activities of Federal Units:
   Warner County SIS .
   Municipal Affairs

University of Alberta Rural Economy

Compilation of data for Prairie Regional Land Evaluation
Alberta Soils Tour
CARTT committees

Establish NSCP information system projects

Several presentations on land use and how it affects planning.

7. Monitoring programs related to NSCP were conducted by the federal unit:

Benchmark sites were designed and installed. Land-use activities were designed and established.

A program to define soil quality criteria and standards was established.

1.2.4 External Correlation

1. The Soil Inventory Subcommittee met in February of 1990 with representatives of each agency dealing with inventory issues.
2. Correlation along Saskatchewan - Alberta Boundary.
3. Correlation of British Columbia - Alberta soil series for CanSIS attribute files.

1.3 Saskatchewan Report to ECSS
(D.W. Anderson)

The Saskatchewan *soil* survey group has completed another productive year of soil survey and related activity in conservation planning and land evaluation. Soil survey in Saskatchewan has been funded mainly by Agriculture Canada (LRRC), the National Soil Conservation Program and the Saskatchewan Agriculture Development Fund. The main accomplishments in 1990 have been:

1) Participation in Regional Conservation Teams, planning conservation activities as part of the joint Canada-Saskatchewan Save-our*Soils* Program. The soil survey provided a member to each of *six* regional teams, and most of the background soil and land information used in the planning exercise.

2) Increased activity in soil survey extension, with visits to agricultural extension, municipal and other offices to distribute maps and reports (- 2500 copies, in total, over the past three years).

3) The completion of mapping 1.1 M ha (2.7 M acres) in four rural municipalities (RMs) in southwestern Saskatchewan, including related sampling transects (60) measuring *soil* pH, organic C and salinity. In east-central Saskatchewan 0.5 M ha (1.2 M acres) were mapped in seven different RMs in 1990, with related work on transects and routine soil analyses.

4) The preparation of soil reports with several different interpretations related to agriculture and conservation for each RM within a year of completing the field survey.

5) The continuing development of LANDBASE, a soil-survey database using IBM microcomputers or equivalent to store and make easily accessible soil survey and related data for each RM, on a quartersection basis. There are now 115 RMs available in LANDBASE.

6) Other activities of importance include:

i) Preliminary work on a mapping system for a detailed *soil* and vegetation survey of the Grasslands National Park.

ii) Preparation of soil erosion risk and salinity maps for RMs in west-central Saskatchewan, using the PAMAP-GIS.

iii) Ground-truthing of two townships in east- central Saskatchewan, in a joint LRRC-Ducks Unlimited-Canada Centre for Remote Sensing project that monitors changing land use. iv) Deep tillage experiments on Solonetzic soils at Kerrobert and Weyburn, monitoring yield and moisture use in 1990.

v) Assessing the erodibility of clayey soils over the course of a year.

vi) Organic matter sampling to prepare an organic matter map of Saskatchewan.

vii) ~he amalgamation of parts of four adjacent RM soil maps, and the preparation of derived and interpretive maps using PAMAPGIS, for use in an environmental review of the great Sand Hills.

1.4 Manitoba Report to ECSS

(Prepared by G.F. Mills; presented by R.E. Smith)

1.4.1 Soil Inventory

Resurvey at the 1:50 000 scale was completed for 536 sq. miles (343,040 Ac) in the R.M. 's of Louise and Argyle in South-Central Manitoba.

Reports are In Press for the 1:20 000 scale soil information for selected townsites in the Red River Valley (Report D67), and for the soils surrounding selected lakes with recreation potential *in* the South Riding Mountain Area (D35). The funding to print the 1:20 000 scale soil map for D35 *is* not available this fiscal year.

The soil report for Grand Rapids (NTS 63G) has been prepared for printing pending availability of funds. The coloured 1:125 000 scale soil map for this area was previously printed by LRRC in 1983.

1.4.2 National Soil Conservation Program (NSCP)

NSCP funding of $680 K for 2 1/2 years has been approved for 7 soil quality monitoring projects. Soil survey has primary responsibility for 3 projects including GIS development, soil salinity and wind erosion, and is expected to provide soil and site characterization *in* support of 4 projects to be implemented by the Department of Soil Science and Agriculture Canada research stations at Brandon and Winnipeg.

Soil survey staff are also being requested to provide soil information required for implementation of various Farming For Tomorrow projects being initiated by MDA and PFRA staff as part of the NSCP in Manitoba.

1.4.3 Additional Projects

1.4.3.1 Soil Landscapes Map

Soil survey staff are involved in several activities related to the 1:1 M scale soil landscapes map:

a program of field sampling to evaluate the surface soil properties of soil landscape polygons in Agro Manitoba in terms of organic matter, pH and selected heavy metals

generalization of the soil landscapes in Agro Manitoba into a 1:2 M scale portrayal of Agroecological Resource Areas for Agro Manitoba. A draft extended legend for this map has been compiled and will be circulated for evaluation and revision

interpretation of the soil landscapes map for engineering properties is ongoing

interpretation of the soil landscapes map for salinity was published and distributed

1.4.3.2 Vertisol Study

The detailed characterization of cold Vertisols was initiated at a site in the Red River Valley and in the Thompson clay belt of northern Manitoba. Laboratory characterization of these soils is ongoing.

1. 4.3.3 Soil .Climate Study

A program of soil climate monitoring on a range of soils from Latitude 49° N to Latitude 56° N is continuing.

1.4.4 Concerns

1.4.4.1 Soil Inventory

Joint soil mapping capability is approximately 500 sq. miles per year. Concern has been expressed that provincial requirements for soil resource data may not be met, given the current federal program adjustment. Proposed downsizing of the provincial soil survey unit by 4 PY's as of April 1, 1991 will impact primarily on support services to the soil survey program. Every effort will be made to maintain the mapping capability at present levels but with reduced activity in GIS, data handling and monitoring.

The need to upgrade old, broadly based association mapping is recognized as a means of meeting the short-term soil data requirements of programs such as crop insurance, soil testing, extension, land assessment, PFRA and the National Soil Conservation Program. A program to upgrade the soil association maps has been initiated and will provide enhanced 1:125 K scale soil information for the area not covered by resurvey.

1.4.4.2 Publication

A backlog of unpublished soil survey reports continues and will increase this fiscal year due to reallocation of funds within the provincial publishing budget. The soil survey should work toward alternate publication formats combining revised hard copy and new digital output as being more cost-effective.

1.4.4.3 Geographic Information System Development

Development of an operational Geographic Information System (GIS) for soil survey data is of highest importance. The main concerns at present are:

1. There are major scheduling problems in georeferencing and database mergers to convert existing Manitoba digital soil maps to complete ARC/Info standards. This backlog affects the transfer of clean data from PAMAP to ARC/Info and back to the regional PAMAP GIS. Until the georeferencing is complete we are unable to process any of our currently clean data.

2. In-house GIS capability is limited by the *capacity* of the PAMAP system. At present, larger project areas have to be processed through ARC/Info at LRRC with associated difficulty in scheduling and turn-around.

3. In-house GIS capability may be enhanced if the proposed Manitoba Land Related Information System (MLRIS) is approved. The MLRIS is planned as a "port-of-entry" to various kind~ of land related data and would provide the opportunity and possible support to include our soil data as part of a GIS network for the province.

4. A provincial policy for distribution of digital data is not in place but discussion has been initiated with provincial agencies responsible for such concerns.

1.4.4.4 Provincial Reaction to the Federal Land Inventory Review

There are both positive and negative aspects to the program changes suggested by the Review. The suggested reorientation of the federal program is viewed as supportive of land resource evaluation research. However, the province regrets federal reduction in direct involvement in soil mapping. In the long term, an expanded federal role to provide a critical mass of pedological expertise and leadership in soil correlation and coordination appears to be unlikely given current program direction.

1.4.4.5 Continuance of a Unified Land Resource Research Centre (LRRC)

Maintenance of a coordinated program of land resource research is crucial to enabling LRRC to provide a national perspective for dealing with land use questions. The capability of the Land Inventory Section to assume its newly defined research activities will be enhanced within a unified LRRC with the opportunity to involve expertise from the Research Section as required.

1.4.4.6 Publication and Dissemination of Maps and Reports

A national working group is required to deal with joint federal-provincial concerns related to publication and dissemination of hard copy maps and reports. Report and map formats are expected to change with evolving GIS technology, client expertise and capability to utilize digital data.

1.4.4.7 Graduate Level Training in Pedology

There is a developing shortage of University graduates trained in pedology and soil survey. This is no doubt related to a perceived lack of job opportunities as well as lack of research funding at the university graduate level. A first step to change this situation would be to organize an adequately funded graduate student program within soil survey to support pedological and land evaluation research at the MSc and PhD levels. This initiative would be in keeping with the recognized federal mandate to maintain a critical mass of soil survey expertise.

1.5 Ontario Report to ECSS (Presented by B. van den Broek)

1.5.1. Soil Survey Activities

1.5.1.1 Inventories

In the past year, the provincial unit lost one position due to an internal transfer of one of our pedologists from the unit to the Land Use Planning Branch. Due to drastic budget cuts in the provincial government, we also lost the staff that was under contract with the University. The positions that were lost were: a lab assistant, a cartographer, and a data clerk. The Federal soil survey unit maintained its current strength.

The soil maps and report for the R.M. of Niagara have now been published. The soil report for Brant county has been submitted for printing and the maps are currently being processed in the Cartography Section of the LRRC.

The field work in Kent county continued over the summer and so far about 60% has been remapped at a scale of 1:50,000. We hope to finish the field work in the summer of 1991. The writing of the soil reports for Elgin and Middlesex counties will resume this winter.

We are continuing to reprint the out-of-print soil reports and hope to catch up with the printing in this fiscal year. Most of the stockpile of the northern Ontario maps have now been shipped to the regional offices of the Ministry of Natural Resources, thus creating much needed space in our warehouse.

1.5.1.2 Soil Survey Extension

With the limited resources that we have, we still tried to maintain some sort of an extension program. Three field days were held in Kent county to familiarize the farmers with the work we are doing. A workshop was held with the planners in the R.M. of Niagara to acquaint them with the soil report and maps. Staff also participated in soil conservation field days in Oxford and Simcoe counties as well as at the 1990 International Plowing Match in Brant county. Several seminars were held with the various farm organizations.

1.5.2 Additional Projects

1.5.2.1 GIS Update

The Federal staff continued to work on creating the SMUF, SNUF, and SLUF files for the various counties that have been recently digitized by CanSIS.

The provincial unit now has four PC ARC/Info stations in operation and is currently digitizing all the remaining counties in eastern Ontario that have not yet been digitized. We also started to generate some interpretive maps for our soil conservation program (Land Stewardship II). These maps are:

1. A generalized eLI map whereby the classes are grouped according to the Food Land Guidelines Reports.

2. A soil limitation map which is based on the subclasses of the CLI information.

3. A potential soil erosion map for bare soil conditions based on the USLE.

4. A soil tillage management map based on the surface texture and the natural drainage.

These maps have been well received by our conservation specialist and farmers alike. We therefore hope to generate these maps for every county in the coming year.

Besides the soils information, the GIS unit is also involved in generating the land use maps and is currently working under contract with the Ministry of the Environment on a major Remedial Action Plan for the Severn Sound area near Midland.

1.5.2.2 Yield Studies in Kent County

In conjunction with the Kent county inventory project, we started to take yield data from distinct soil landscapes in Kent county. This information will be used to verify the CLI ratings as well as serve as the base line information for a general crop model yet to be developed.

1.5.2.3 Farm Planning

Staff of the Institute were involved in developing a Farm Plan that will be used in the Land Stewardship II program. The plan itself is some sort of a resource inventory plan for each farm in which soils information plays a significant role.

1.5.3 Concerns and Issues

1.5.3.1 New Ontario Institute of Pedology Agreement

Five months have passed without a new five-year OIP agreement. One of the concerns we have is that, with the reorganization of the Soil and Water Management Branch into the newly formed Resources Management Branch, the future role of the provincial pedologists is not clear. The tendency may be to shift away from regular resource inventories towards more issue oriented, small scale soil surveys ("quick in and out" surveys). However, the negotiations are still ongoing and we hope to resolve the issue in the next few months.

1.5.3.2 Methodology for upgrading existing soil information

The Kent county survey appears to be the last major full scale soil survey inventory. The field work for this project will be finalized in the summer of 1991. Beyond the Kent project we will be more

involved in upgrading existing soil survey information (either a whole county or by township). To do this we need an established and tested methodology by the beginning of 1992. Our concern is that we still will have no methodology when that time comes.

1.5.3.3 Exchange of GIS Information

As mentioned earlier, the province now has a well established GIS unit with demand for information increasing every day. There are two issues that confront us now:

1. We would like to exchange digital files with LRRC so that we can quickly proceed with generating our previously mentioned interpretive maps. We are not sure what policy the LRRC has in terms of releasing digital map files to the regional units and we would like clarification on this aspect.

2. There is also an increasing demand for releasing digital map files between the various provincial agencies and even to the general publi~. We would like to "fine tune" our releasing policy with Agriculture Canada for the benefit of our customers.

1.5.3.4 Concerns about our existing data base for the province

It appears that much effort is being directed into the GIS and its data base (the NSDB), crop modelling, environmental concerns, and the like. It is our fear that our data base is not keeping up with the state of the art of the current levels of interpretations, and that if we keep up with this movement away from actually conducting soil surveys, we will be in the unbearable position that we might have all the models and interpretations in the world but with no data to feed them.

What we urgently need is more hard fact data about our soils so that we can make the necessary interpretations on hard facts and not on assumptions as we seem to do now. This data can only be collected by means of conducting soil surveys whether we like it or not. We therefore urge both the provincial and federal agencies not to neglect the soil inventory program and to keep providing the necessary manpower and capital to maintain this essential service.

1.6 Le rapport du Quebec au ECSS
(Dominique Carrier)

Les activites en pedologie des trois organismes oeuvrant dans Ie domaine des sols sont en general conformes aux priorites de recherches de la Section Pedologie de la Commission des sols du CPVQ. Elles concernent l'etude des couvertures pedologiques et leur evolution en termes de conservation ou de degradation.

1.6.1 Equipes provincia1es (Service de recherche en sols, MAPA)

A. Inventaire sur la conservation des sols

Cette vaste etude effectuee a la ferme est au stade de publicaton. Les resultats indiquent que les degradations observees sont reliees a la pratique en continue de monoculture de plantes annuelles. Des 486 000 hectares en monoculture continue, 429 000 ha montrent une deterioration de la structure, 308 000 ha de la surfertilisation, 252 000 ha de la diminution de la matiere organique, 207 000 ha de l'acidification, 48 000 ha de la pollution par les metaux, 46 000 ha de l'erosion hydrique et 29 000 ha de l'erosion eolienne.

B. Classification et Cartographie

L'etude des sols des comtes de Beauce, de Frontenac et de la region de l'Abitibi-Temiscamingue sont au stade de redaction.

1.6.2 Equipes federales

A. Prospection et Cartographie

L'etude des sols du comte de Vercheres est sous presse et celles des comtes de Saint-Hyacinthe et de Chambly ont ete envoyees au SPR pour revision. Les travaux d'echantillonnage sont termines dans Rouville et 9500 ha ont ete cartographies dans Ie comte de Laprairie.

B. Projets Speciaux

Monitoring:	Resistance a la penetration d'un sol argileux en culture de soja.
Qualite des sols:	Les mesures de conductivite hydraulique sont completees aux sites de St-Elzear de Beauce.
Prospections:	La carte de pedopaysages du centre du Quebec est completee.
Correlation:	Le rapport sur les sols argileux du Quebec est en voie de realisation.

1.6.3 Equipes de l'universite

Laval Les recherches portent principalement sur:

l'etude de l'erosion hydrique en utilisant Cs137 comme traceur la conservation des sols organiques
la geomatique et l'erosion

biodegradation et valorisation agricole des produits de la peche
mobilite des metaux dans les sols amendes avec les boues residuaires
amelioration fonciere des sols
pratiques culturales et migration des fertilisants
amendements ligneux et rotation
valeur de l'humus comme amendement organique
deperissement des erablieres
cartographie informatisee
caracterisation des sols sulfates acides

McGill: Les recherches effectuees sont principalement les suivantes
snowmelt-induce erosion of soil
the role of available carbon in controlling forest soil biological activity and N dynamics
soil acidification at high elevation sites in Quebec nitrogen fertilizer application for minimum environmental impact and maximum corn quality
deperissement des erablieres: caracteristiques physiologiques, effets de la fertilisation des changements climatiques et de la chimie du sol
innovative techniques for improving urea and phosphorus fertilizer efficiency in corn production
P-Zn-Mo interactions in soils and in plant uptake
technology requirements for maximum grain corn yields
fertilizer value of sewage sludge
reduction des odeurs du lisier de porc à l'entreposage par l'addition de produits
interaction of urea and potassium chloride placement on yield and nutrient uptake of corn
intensive cereal management of two wheat cultivars: fertilizer effects on yield, quality, soil test calibration and soil environment
influence of management on phosphorus cycling
the use of controlled fertilization to improve wetland productivity

1.7 New Brunswick Report to ECSS

(H.W. Rees)

1.7.1 Provincial Activities

On April 1, 1990, the Land Resources Section of the Plant Industry Branch was made a separate Land Resources Branch (LRB). This indicates a greater emphasis on *soil* and land management by the NB Department of Agriculture.

The On-Farm *Soil* Evaluation Program *is* ongoing with 27 farms completed in 1990. One farm *is* a cooperative project with the LEAPS staff of Nova Scotia, with a view to using their methodology to develop a land management plan.

Much time and effort has been devoted to *soil* and land management extension activities through displays, tours, meetings, factsheets and talks to interested groups. Probably the highlight of these activities was the pUblishing of a calendar similar to the one done by crop insurance, with soil and land management as its theme.

The CARIS system is in operation. Presently, data from the CanSIS system is being entered in our CARIS system for future manipulation and retrieval.

Staff of the LRB are involved in a number of projects under the ALFI, the NSCP and the Cooperative Agreement on Agri-Food Development. The staff are actively promoting the concept of sustainable agriculture with a number of projects relating to sustainable and organic agriculture.

Provincial Concerns

Our main concern is the lack of up-to-date soil survey information and the turn-around time for such information. Examples of this would be the North Central NB report, Woodstock area reports and the Westmorland County reports. While some of the data can be obtained, it would be more effective to have the information readily available so that we could better answer the inquiries we receive for specific information. It *is* important to have the information in the
CARIS system so it can be retrieved as required.

Another concern of ours is the lack of soil training for summer students or staff we hire under the development agreements.

1.7.2 Agriculture Canada, LRRC Soil Survey Unit

Activities

The activities of the New Brunswick LRRC Soil Survey Unit have been modified to reflect the change in direction of the federal soil inventory program. Essentially this entails a reduction in active field mapping, and an expansion of the efforts directed towards such activities as correlation, interpretations, soil quality monitoring,

and compilation of the National Soils Data Base. Specific achievements include:

1. A Canada - New Brunswick Soil Conservation Agreement project was initiated to investigate the sustainability of the agricultural industry and protection of environmental quality in New Brunswick's potato lands. This project is jointly managed by representatives from the New Brunswick Department of Agriculture, the Agriculture Canada Fredericton Research Station, and our LRRC soil survey unit.

   The objectives of this project are to define the impacts of cropping practices, soil characteristics, and climatic conditions on the hydrologic processes of water run off and water percolation within the New Brunswick potato belt; and to identify the impact of these hydrologic processes on agricultural sustainability (crop production and soil degradation) and environmental quality (surface and ground water contamination).

   The major efforts expended under this project are concentrated on the Black Brook watershed and in the St. Andre area 5 km north of Grand Falls which is typical of the land resource base presently being used for potato production. This watershed consists of approximately 1300 ha of land. The following activities have been or are in the process of being completed:

   detailed soil survey (scale 1:10, 000)

   present land use inventory with information on yields, rotations, etc. through farmer interviews

   5 weather stations established to collect the relevant, appropriately-scaled climatic data: temperature, precipitation, soil temperature, soil moisture (Ap), evaporation, and incoming radiation

   surface water monitoring (weirs with stilling wells) at 5 strategic locations

In addition to these activities in the selected watershed, the following complementary activities have also been undertaken:

i) A second site has been established for soil quality monitoring. This is a "terraced" site under intensive potato production. It is paired with the first soil quality monitoring site which is also under intensive potato production but NOT terraced. The major forms of soil degradation being monitored are: soil erosion, compaction, organic matter loss, acidification, and heavy metal/insecticide/pesticide contamination.

ii) In order to investigate, characterize and test the cropping management factors associated with the major soil erosion

prediction models - WEPP (Water Erosion Prediction Project), and RUSLE (Revised Universal Soil Loss Equation) - a miniature rainfall simulator has been manufactured for use on small plots.

2. Data procurement has been completed for a joint project with the Canada Centre for Remote Sensing (CCRS) and the University of New Brunswick (UNB) to test the applicability of synthetic aperture radar and infrared data for assisting in soils mapping, in particular by classifying soils according to their drainage class, organic matter content, and surface coarse fragment content. MEIS and SAR imagery was flown and ground truthing data was collected including soil samples from 126 sites located on some 20 fields, with climatic parameters recorded (data loggers) for 8 of these sites. This was conducted the first week of June in the Woodstock area where detailed soil survey data is available for correlation.

3. CanSIS ARC/Info map attribute files were completed for the Sussex map area. The Woodstock-Florenceville map area (area #1) is 50% completed.

4. The extended legend for the New Brunswick portion of the Generalized Soil Landscape Map of the Maritimes was completed and work has commenced on its interpretation for susceptibility to water erosion.

5. Soil inventory was continued in the Woodstock-Florenceville survey area with completion of two 1:20,000 scale map sheets. The efforts directed here represent less than 25% of the unit's activities. The major purpose of this involvement in active field mapping is to maintain the unit's credibility as an authority in this subject area. This inventory involvement is also used to test out new soil mapping methodologies and techniques, such as the use of remotely sensed data.

1.7.3 Concerns and Issues

1.7.3.1 New Brunswick 'ALIS' - New Brunswick Agricultural Land Information System

Agricultural land information is presently being compiled for local storage and manipulation on a joint federal-provincial geographic information system. If soils resource information is to be incorporated into the decision-making process, then it is essential that this data be available in a format that is readily accessible and easily analyzed. This requires costly GIS hardware/software, and support personnel with sophisticated levels of computer expertise to interact with other specialists in soils, crops, economics, etc. Additional federal-provincial support is required to attain operational status for this system.

1.7.3.2 Farming Systems Information

While numerous land use inventories have been conducted in New Brunswick and more specifically the potato belt, only minor attempts have been made to develop an inventory of farming systems from this data. Land use inventories are but a "snap shot" of land use activities at any given point in time, whereas characterization in terms of farming systems provides information of a more permanent nature that can be used in the assessment of soil quality sustainability and environmental protection. In order to be applicable to local agricultural operation, it is essential that this information be suitably detailed in scale.

1.7.3.3 Correlation

a) Compilation of soils/landscape information in electronic format for the National Soils Data Base requires national/regional correlation to ensure that standards are being consistently applied. While guidelines have been developed and used to assist in quality control, application at the provincial level has the potential for discrepancies to occur. Standardized map attribute files provide a consistent level of information for each map
area. This is especially significant for GIS applications. Thus, the correlation of this information to provide a reliable database is essential.

b) A large number of on-farm soil surveys have been conducted in New Brunswick. These inventories provide farmers with information required for on-farm planning. In order to ensure the flow of interpreted information between farms, and also from the farm level to the regional level and vice versa, it is imperative that these maps be correlated with the provincial database. Efforts to correlate with established soils names and concepts must be continued.

1.7.3.4 Remote Sensing Applications to Land Resource Assessments

Advances in the collection and analyses of remotely sensed data are such that greater efforts should be made to take advantage of this technology. There are numerous potential applications for the incorporation of remotely sensed data into land resource assessments. Remotely sensed data in digital format should be integrated with existing GIS technologies to provide superior interpretations of existing databases. Areas of applicability of remotely sensed data include the following:

reduction of field verifications for soil mapping
identification of land use patterns to determine farming systems
monitoring the utilization (or acceptance) of soil conservation/ development programs and practices

1.7.3.5 Quantification of Crop Yield Interpretations

Crop productivity on selected soil types and under specific management practices must be quantified. Existing yield data is not sUfficiently controlled to be used for these purposes. Yield data could be collected in conjunction with government incentive programs as a

means of verifying the benefits of the subsidized activity. This data must be based on systematic sample collections and not just estimated yields. All dominant crops grown in the province should be considered. Existing interpretive tables are not sufficient for sound _decision-making.

1.7.3.6 Soil Inventories

The need to collect basic soil survey data still exists within the province of New Brunswick. Of the 191,000 ha (475,000 acres) of improved farmland, it is estimated that less than one third has been inventoried *in* sufficient detail to meet the needs of present-day agricultural land management. Requirements for *detailed* resource information are increasing. Proper application of federal _ provincial programs dealing with *soil* conservation (Canada _ New Brunswick *Soil* Conservation Agreement), and land development (Canada _ New Brunswick Cooperation Agreement on *Agri-Food)* require these data. Expanding potato processing facilities *in* the Grand Falls area will put additional pressure on existing potato acreages to produce more, with possibly a negative impact on the adoption of soil conservation practices. Additional lands that are suitable for potato production will also have to be identified. Both detailed regional resurvey of intensively used agricultural areas and on-farm survey data are *required.*

1.8 Atlantic Report to ECSS (Newfoundland, Nova Scotia, Prince Edward Island) (D. Moerman)

1.8.1 Land Resource Surveys

1.8.1.1 Newf0undland

The On-Farm Mapping Program continued its program with an additional ten farms being surveyed with a combined area of approximately 1,090 hectares (2,700 acres).

Three detailed (1:12,500 scale) soil surveys were initiated at the request of the Department of Forestry and Agriculture. These had a combined area of approximately 9,000 hectares (22,300 acres).

Numerous site inspections were performed throughout the year in response to lease, grant, land clearing and subsidy requests, etc.

Several unpublished Exploratory and Reconnaissance soil survey reports were prepared for publication. This included re-sampling of approximately 20 soils to supplement and enhance the soil data file.

The Generalized Soil Landscape Map (GSLM) for the island of Newfoundland was published. The southern half of Labrador has been surveyed to date for the GSLM program. The phase II legend for the GSLM program was completed in electronic form for both the island of Newfoundland and Southern Labrador.

The 1:50,000 scale soil survey report of Grandy's Lake - Little Friars Cove Area was recently published.

Soil Names Files, Soil Map Unit Files and Soil Layer Files for the National Soil Data Base were completed for fourteen map sheets, revised for ten, and all twenty-four were submitted for input in CanSIS.

1.8.1.2 Nova Scotia

The LEAPS farm soil survey and management program continued its successful development and gained further support from the farming community.

The LEAPS program initiated an update mapping service to clients already enrolled., This service provides surveys of land acquired since the date of original survey.

NSDAM was successful in acquiring an ARC/Info Geographic Information System in support of the LEAPS program and other soils related activities.

Soil survey reports for Pictou County, Colchester County, and the Nappan Experimental Farm were published.

In cooperation with the other provinces, work was started on the production of a soil erosion risk map for the Atlantic Provinces using the Soil Landscapes data.

Correlation efforts by LRRC staff in Nova Scotia included:

- provision of quality control for the AFDA soil survey contract in Kings County, interpreting the survey data for crop sUitability and agricultural capability ratings, producing the report and coordinating report and map publication

- correlation assistance for the LEAPS PROGRAM

ARC/Info files for Nova Scotia were completed, and EDP procedures established to manage Nova Scotia CanSIS data, AFDA soils data, and lab and site data.

1.8.1.3 Prince Edward Island

Since publication of the last soil survey by the federal government entitled "Soils of Prince Edward Island" (published in 1988 at a scale of 1:75,000), there have been no soil survey programs within the province.

The present surveys are used extensively by extension staff for crop management and by engineering staff, particularly when dealing with erosion control. Other users of the soil survey information include:

- the department of Community and CUltural Affairs (e.g. Urban Planning)
- the Department of Energy and Forestry (e.g. CLI capability classifications, reforestation of non-agricultural lands, etc.) - the P.E.I. Assessment Offices (e.g. land assessment values)
- Realtors (e.g. potential land use)
- Land speculators (e.g. possible land use, i.e. golf courses, campsites, etc.)

1.8.2 Research and Monitoring

1.8.2.1 Newfoundland

Newfoundland Soil Survey initiated or was involved in several projects funded under the ALFI and Agri-Food Agreements. Some of the subjects dealt with were:

- organic matter enhancement of soils
- evaluation of soil physical and chemical parameters for forage variety trials
- effects of manure application on soil and groundwater quality
- effects of land clearing on soil physical properties
- effects of soil physical parameters on rooting of alfalfa

1.8.2.2 Nova Scotia

On-going soil resource research and monitoring activities in Nova Scotia include:

- sub-surface drain spacing studies
- compaction/ripping investigations
- ripping/drainage studies
- soil climate monitoring in strawberry fields
- irrigation scheduling studies
- long term soil quality monitoring
- well water quality monitoring and evaluation
- database survey for lowbush blueberries

1.8.3 Policies and Programs

1.8.3.1 Nova Scotia

The province of Nova Scotia, through a Manure Management Task Force, is currently developing new manure management guidelines. It is anticipated that these will be ready for release early in 1991.

1.8.4 Extension

1.8.4.1 Newfoundland

Extension activities pertaining to land and soil resources are being developed in Newfoundland. These activities include:

- On-Farm Soil Survey Workshops
- workshop on soil resource management for vegetable production
- workshop on soil resource management for forage production
- publication of fact sheets on soil compaction, soil organic matter, soil and landscape relationships

As well, soil survey staff in Newfoundland are responsible for the implementation of the farm weather forecast which was expanded with reports on Hay Drying Index now covering all agricultural regions. Its broadcast time is from June 1 through September 15, 1990. An Agro-meteorological data bank initiated in 1989 continued to be a success with agricultural staff and farmers.

1.8.4.2 Nova Scotia

A number of land resource extension events were held in 1990, including:

- Workshop on the Application of Climate and Weather Information to the Farm
- On-Farm Soil Survey Workshop
- Field Crops EXPO '90
- Soil Research Project Fall Tour

Events are also being planned for 1991, including:

- an Agro-forestry Workshop
- an educational campaign on manure management

1.8.5 Concerns

1.8.5.1 Newfoundland

With most of the basic land inventory of the province, and its agricultural areas in particular, completed, together with a much decreased involvement of the LRRC Soil Survey Unit in the actual soil survey activities in the province, (On-Farm Mapping, and detailed and single purpose soil surveys), the role of the LRRC Land Inventory section and LRRC Soil Survey unit in Newfoundland should be re-evaluated in light of the province's land inventory and soil resource management needs.

Newfoundland's soil survey program has outgrown its needs for basic land inventory, and is now concentrating on the interpretation of soils information for soil management and soil conservation recommendations at the farm level. Interpretation of soils information for soil management recommendations is seriously hampered by a lack of applied research in the prOvince on soil-plant relationships and on soil management practices.

Extension activities related to the application of soil survey data are increasing. Easy retrieval of soil survey information in a form understandable by farmers and the general public is required.

1.8.5.2 Nova Scotia

1.8.5.2.1 Land Resource Surveys

Existing soil survey interpretive guidelines are subjective and untested. Improved recommendations and interpretation guidelines are needed to gain best advantage of land resource inventories.

Land use surveys are needed to monitor land use change and to evaluate appropriate land use applications.

Evaluation of new soil models and land use technology should be supported in order to evaluate their applicability under Atlantic conditions.

There is a need to upgrade survey information for Hants, Queens, and Lunenburg counties.

Attribute values for Nova Scotia soils in the CanSIS ARC/Info data base are, to a large degree, estimated. There is a need to validate these estimated values with a sampling program.

A policy that addresses the ownership and release of electronic soil data is required.

1.8.5.2.2 Policies and Programs

The continued viability of the agricultural industry in Nova Scotia depends on the protection of its limited agricultural land resource.

New policies and programs are required to circumvent non agricultural development in high priority agricultural areas.

Increased environmental awareness from the public sector has sometimes resulted in enthusiastic although not generally informed demands for controls on farming practices and ultimately the use of the land resource. There is a need for public education to be supplied with factual information on which to make informed assessments of agriculture's impact on the environment.

Soil degradation and conservation work is required to accurately assess the degree of and the potential for soil resource degradation in the province over the long term. While the National Soil Conservation Program (NSCP) provides funding for such work in the short term, there is a need for continued support for soil conservation activities in Nova Scotia beyond the 3 years of the current NSCP agreement.

1.8.5.3 Prince Edward Island

Because of the discontinuation of an actual soil survey section within the provincial Department of Agriculture, there is always the concern that there is a lack of qualified pedologists to assist potential users in the interpretation and application of existing soil survey information.

1.9 Yukon Report to ECSS
(C.A.S. Smith)

The Yukon Soil Survey Unit is staffed by one professional PY and provides the range of services and activities, albeit on a smaller scale, covered by the Units in the provinces. This is exemplified in the new Canada-Yukon Soil Conservation Initiative signed in April 1990. A total of $100,000 is available to fund programs in research (soil salinity), producer incentives, and conservation education and awareness.

Virtually every project that the Unit undertakes is conducted cooperatively with the government of Yukon. Jointly, we completed the field work for the 1:1M scale soil landscape map for the territory this summer. On my behalf, Michael White, soil specialist with the Yukon Agriculture Branch, represented Yukon on the Agronomic Interpretations Working Group. He *is* testing interpretive systems locally as well as helping me with formulating interpretations for permafrost-affected soils. Under the CanSIS Working Group, I am compiling soil names and soil layer files for detailed mapping undertaken by LRRC but funded by the Yukon government ($150,000) over the last three years.

Under the LRRC Global Change project, I participated in an international program with the Geological Survey of Canada and the U.S. Geological Survey in studying the ecology of greenhouse climates experienced in the sub-arctic prior to the *ice* ages (late Tertiary). The work *is* designed to help predict the impact of present global warming on northern regions.

In conjunction with other researchers, papers on topics of soil biology, soil genesis and soil climate were published in 1990.

1.10 Forestry Canada Report to ECSS (0. Hendrickson)

Current needs for soil information in forestry:

Uniform GIS capabilities across disciplines are desired to merge existing climate/soil/surficial geology/land cover data to enhance decision-making capabilities for a variety of purposes:

Climate change - Estimate potential productivity of forest types and growth of tree species in areas where they may not currently be found.

Marginal agricultural land - Identify agricultural land, currently abandoned or in suboptimal use, which is suitable for biomass energy plantations and for intensive management of conifer crops.

Prime agricultural soils in northern areas - Urgent need for accurate identification of areas which may be suitable for crop production following climate warming (e.g., clay belts) to avoid conflicts in planning for intensive forestry investment. Note that the best forest soils in terms of ease of management are less fertile than the best agricultural soils.

National soil Carbon inventory - Make quantitative estimates of soil C pools. Data are particularly weak for peat accumulations in wetlands, bogs, and lakes. Such an inventory would permit comparisons with above ground C pools and assessing the effects of agriculture and forestry on global C budgets.

Agroforestry - A greater mix of cropped/forested areas may become a key feature of future land management programs. Do we know to what extent trees in low-lying areas can improve upland drainage and accessibility or improve groundwater and surface water quality via nutrient capture? Can existing data bases be used to design windbreaks? Do we know enough about microclimatology to build a set of rules for this? In essence, can we design "optimum" rural landscapes using GIS and DSS?

Access road construction - This is affected by various soil/terrain properties including slope, erosion potential, proximity to aggregates, and response to loading.

Flagging of sensitive areas - Modified harvesting procedures are needed on steep slopes, seepage areas, wetlands and other areas with high compaction potential, and shallow-to-bedrock soils. Also, forest site preparation (including burning, plowing, scarification, and herbicide application) depends on the factors listed above, plus moisture and nutrient regimes, nature and thickness of surface organic horizons, etc.

Soil structure assessment and prediction - Soil compaction potential, especially in organic soils and wetlands, determines whether one can harvest in summer or only when soil is frozen. It also determines the types of equipment used for harvesting, and strategies for rehabilitation of landings and other remedial activities. Few quantitative data are available on compaction of different forest soils under different loadings.

2 • WORKING GROUP REPORTS

2.1 Soil Classification Working Group
(Charles Tarnocai)

Introduction

During the two years since the last Expert Committee on Soil Survey meeting, a number of important activities have taken place which affect the future program of this working group. The Sixth International Soil Correlation (ISCOM VI) meeting was held in August of 1989. One of the main objectives of this meeting was to test changes in the classification of cold Vertisols. The most northerly Vertisols were examined in Saskatchewan during this meeting. A number of soil scientists from more southerly countries, where Vertisols are common, indicated that the Saskatchewan Vertisols were very similar to those found in their countries and that they should be classified under the revised Vertisolic Order in the U.S. soil taxonomy.

It became very clear during this correlation meeting that Vertisols and other soils with vertic properties do occur in Canada. The current Canadian soil classification, however, does not recognize these soils. Ten Canadian participants held a meeting at Bozeman, Montana to formulate plans for activities which would lead to a revision of the Canadian soil classification so that these soils could be included. All agreed that the priority assigned to soil classification should be reviewed by the head of the Inventory Section, the Director of LRRC and the chairman of the ECSS. For the last ten years soil classification has had a low priority in ECSS and LRRC activities. Many problems relating to soil classification have arisen during this time. In order to maintain a healthy and up-to-date Canadian soil classification system, more concentrated effort is required. This will only be possible if soil classification work is given a higher priority.

This request was presented to the management of LRRC and it was decided that, in the future, soil classification would have a higher priority within LRRC. As a result, a soil classification project has been established. It is to begin in the 1990-91 fiscal year and PY's and budget have been allocated to cover time and expenses for the work relating to soil classification.

It should also be mentioned that, as a result of the evaluation of the Inventory Section (Soil Survey) in LRRC, soil correlation, including the national soil classification, was recognized as an important category in the activities of the Inventory Section. This further emphasizes the importance of soil classification at the national level.

Working Group Meeting, 1990

A Soil Classification Working Group meeting was held in Ottawa on April 18 and 19, 1990 to deal with soil classification problems and to formulate a work plan for the next three years.

A summary of this plan is given below:

1. A key to the Canadian System of Soil Classification will be developed by a small working group within the SCWG. This group will be headed by Chang Wang with cooperation from J.-M. Cossette, B: Stonehouse and A. Green. Chang will report on the progress at the next SCWG meeting in 1991.

2. The classification of Aridisol-like soils in Canada will be included in the agenda for the 1991 meeting of the SCWG. It was agreed that someone from Saskatchewan would make the presentation, drawing on their experience with southwestern Saskatchewan mapping projects.

3. During the 1990 SCWG meeting, Bernie Stonehouse presented three options for the incorporation of Vertisols in the Canadian System of Soil Classification. At this time all options were open, but most people at the meeting favoured option 1; classifying soils with vertic properties at the sub group level in some orders.

4. The next meeting of the SCWG, in the summer of 1991, will be held in conjunction with a correlation tour focusing on the Vertisols. This tour will probably start in Winnipeg, proceed north to The Pas and then continue south through Saskatchewan to the Regina area. A similar correlation tour, concentrating on the clay areas of Alberta, B.C., Ontario and Quebec, is planned for 1992.

5. C. Wang presented a proposal for changing the chemical criteria for the Podzolic soils. Herb Luttmerding pointed out that his proposed change would convert most of the Brunisols in B.C. to Podzols. Chang Wang therefore agreed on the need for chemical criteria research on the west coast soils. He will visit B.C. this year to gain experience with this problem.

6. Cathy Fox presented both a proposal for the lower case suffixes for the L, F and H horizons and the test results. The working group suggested that all organic horizons be reviewed and lower case suffixes be developed in close cooperation with people involved in the humus form classification. A small working group was established under the leadership of Cathy Fox to seek solutions to this problem. The suggested members of this working group were: H. Luttmerding, H. Veldhuis, E. Woodrow, L. Turchenek, and J.-M. Cossette. Cathy Fox will report on the progress of this work at the 1991 SCWG meeting.

Working Group Meeting, 1991

It was agreed that the next SCWG meeting would be held in the summer of 1991 in conjunction with the Vertisol tour of Manitoba and Saskatchewan.

The Canadian System of Soil Classification Book

In 1989, Supply and Services Canada indicated to the director of LRRC that this book was out of print. It was requested that the book be reprinted so that copies could be made available to universities and others.

ISCOM VII - Classification of Wet Soils

This international soil correlation meeting, with approximately 80 participants from 30 countries, was held in Louisiana and Texas in October, 1990. Charles Tarnocai attended this meeting as a representative of the Soil Classification Working Group.

Suggested new definitions:
Aquic conditions: saturation, reduction and redoximorphic features

Endoaquic
Epiaquic
Antraquic

ISCOM - Proposed Int. Correlation Meeting on permafrost soils

Topics: Classification, management and climate change Date: 1993
Place: Alaska and northern Canada

Members of the Soil Classification Working Group

K.T. Webb
J.-M. Cossette
C.J. Acton
W. Michalyna
R.E. Smith
H. Veldhuis H.B.
Stonehouse A.R.
Mermut
L. Turchenek
B.D. Walker
A.J. Green
H. Luttmerding
S. Smith
C. Wang
C. Fox
C. Tarnocai (chairman)

Recommendation to ECSS

1. It is recommended that the ECSS accept the workplan outlined herein for the Soil Classification Working Group.

THE MOTION TO ACCEPT THIS RECOMMENDATION WAS CARRIED BY THE ECSS.

2.2 CanSIS Working Group (K. Bruce MacDonald)

The CanSIS Working Group has not met since the last ECSS Meeting. The progress reported here represents initiative started from the last meeting and also the. results of visits by MacDonald to the regional representatives.

At the previous meeting, the mandate of the CanSIS Working Group was revised to read as follows:

> to guide the future responsibilities, activities, and organization of CanSIS by providing advice about requirements and deficiencies

> to carry out some resulting tasks that fall within the field of computerized information systems

Over the past two years, the activities of the group members on behalf of the working group fit well within these revised terms. The major activities can be grouped into three areas:

1. Creation of the National Soil Data Base (NSDB) through preparation of attribute data files for soil inventory maps and maps of the soil landscapes series, and conversion of data from the custom CanSIS format (in table coordinates) into complete digital soil maps in real world coordinate systems.

2. Documenting the considerations and requirements for a consistent policy of data distribution/marketing.

3. Working with members of the Ag Interpretations WG to adapt the system of Land Capability Classification for Arable Agriculture in Alberta to run through a computer program against the standard soil attribute files.

2.2.1 The National Soil Data Base (NSDB) - Current Status of Maps

Number of maps with linework clean in ARC/Info . Number of these which are Soil Inventory maps .. Number which have soil map unit file (SMUF) data	1358 1249
Number of above linked to SMUF	671
Number of above group of maps geoedited	110
Number of Inventory and Soil Landscape maps geoedited:	32 48

2.2.2 Consideration and Requirements for a Consistent Policy of Data Distribution/Marketing

Regional meetings have been held with all units except Quebec, B.C. and Yukon to discuss distribution of data in digital form.

> A discussion document outlining the technical considerations, management and identifying policy concerns and questions has been circulated

Attention has been given to the format of citation appropriate for digital data and to the acknowledgement of the data when used in applications

2.2.3 Developing a computerized algorithm to run against the standard soil attribute files and producing output consistent with the Land Capability Classification for Arable Agriculture in Alberta

On the Assumption that the Land Capability Classification for Arable Agriculture in Alberta was representative of the kinds of interpretations to be made from soil inventory information in digital form, the task was to show how these procedures could be adapted to run against the standard soil attribute files.

W. Pettapiece developed the approximations of the procedure in a form which could be programmed. A. Moore developed an algorithm in Info to carry out the procedures and ran the procedures for data in Ontario and PEl.

The Interpretations WG is modifying the classification system and, after that time, the changes will be incorporated into the algorithm and the resulting interpretations will be verified by experts.

Recommendations to ECSS

That the CanSIS Working Group reviews the operation of the NSDB and related databases, including their organization, format, content and applications.

That digital data publication, data distribution and marketing be promoted and advanced by defining appropriate packages for digital map data including citation, acknowledgement and procedures involving the LRRC publication committee and continuing negotiations with counterpart provincial and regional agencies to resolve questions of standards, shared data management, distribution and marketing.

THE MOTION TO ACCEPT THESE RECOMMENDATIONS WAS CARRIED BY THE ECSS.

2.3 Soil Survey Handbook Working Group (G.M. Coen)

In the two years since we met in Winnipeg no progress has been made on the Soil Survey Handbook. As a group, the soil survey community continues to struggle with standardizing mapping procedures. In my experience many protracted discussions on aspects of soil correlation could be settled by reference to the already published portion of the Soil Survey Handbook. Perhaps if it was in computerized format, it would have caught on. In any event, there has not been enough commitment by the soil survey community to designate staff to continue the preparation of the Soil Survey Handbook.

At the 1988 ECSS meetings three recommendations were presented to the voting delegates for consideration:

1. that the ECSS endorses the completion of Section 600 (Soil Survey Investigations) by March, 1990,

2. that the ECSS endorses the preparation of an appropriate introduction to Section 500 (Applications) of the Soil Survey Handbook with submission for publication by March, 1990, and

3. that Section 700 (Information and Display) be put on hold until such time that the ECSS would find it useful to reactivate the working group with further instructions.

The meeting defeated the first resolution and carried the second and third. So the task that remained was to prepare an appropriate introduction to the Applications Section and submit it for publication by March 1990. Insufficient commitment to the task has not allowed it to be completed.

I am disappointed that sufficient interest could not be generated in the soil survey community to insist that we complete this important project. As we continue to convert to automated databases and GIS, I have no doubt that we will continue to make ad hoc and sometimes disparate decisions as to the appropriate procedures to use. We will not benefit, however, from a documented set of procedures which would save us, in aggregate, more time than we would spend in preparing the document. It is a bit like the "tragedy of the commons" where no one person or agency can spare the resources that would be in excess of their personal return but with the aggregate benefit providing much greater value than the effort required. We still need the Soil Survey Handbook ❙

Recommendation

That the ECSS should solicit commitment from the management of member agencies to identify at least 0.5 PY and support for a single individual to work full time on completing (with some volunteer submission and editing) the Soil Survey Handbook.

THE MOTION TO ACCEPT THIS RECOMMENDATION WAS DEFEATED BY THE ECSS.

2.4 Agronomic Interpretations Working Group (W. Pettapiece)

In 1988, a report was presented outlining the formation of the Agricultural Interpretations Working Group in 1987. It included a terms of reference and results of two meetings which concluded that:

1. there was a requirement to upgrade the CLI
2. we should retain the capability concept
3. we require a national climatic framework
4. Climate, Soils and Landscape would be rated separately
5. we incorporate organic soils and
6. all ratings be based on a single group of crops (small grains and short season oilseeds).

The discussion of the 1988 report suggested that we consider permafrost soils, that we don't want to duplicate the CLI and that we continue for two years with a report in 1990.

The first attempt at classification of the various components were presented and discussed at a workshop in 1989. The following conclusions/recommendations were made:

1. In order to remain manageable, we must restrict all interpretations to the selected suite of crops for both mineral and organic soils.

2. Climate parameters would relate to the growing season: EGDD and P-PE.

3. After much discussion, stoniness and pattern were retained in the landscape component.

4. Drainage should be redesigned to recognize SWIG criteria.

5. Soil-climate interactions should be recognized in subsoil as well as in moisture considerations.

Over the next year, climate maps were prepared and circulated and revised ratings developed. A workshop was held in July 1990 to:

i) finalize the content and format of the first draft
ii) finalize component details, and
iii) develop a strategy for testing and completion of this phase.

It was decided that a draft be distributed for testing:

it should be ready for fall 1990
each 'province/region should conduct a preliminary office test based on soil survey records to compare to old CLI and identify anomalies or problems (January, February)
modifications made and returned for field testing (March, April)
field testing (May, June)
system finalized for distribution (July)

There were separate discussions on the issue of naming and on the inclusion of a fertility factor.

Recommendations - Agronomic Interpretations Working Group

1. That ECSS accept the report and encourage members to contribute to the testing.

2. That there is a high priority need for a companion document for forages.

3. That the Working Group be dissolved after the testing and publication phase.

4. That crop specific suitability ratings, using the same format, should be developed by appropriate regional working groups.

5. That the Land Resource Research Centre (LRRC) maintain a core study to provide coordination, to receive concerns or suggestions, and to respond to *issues* identified by ECSS or other agencies.

THE MOTION TO ACCEPT THESE RECOMMENDATIONS WAS CARRIED BY THE ECSS.

2.5 Soil Water Regime Classification Working Group (R.G. Eilers)

In 1981 a framework for describing and classifying soil water regimes was proposed for testing and evaluation (ECSS proceedings 1981). This framework recognized 8 characteristics, in addition to the existing soil drainage classes, which could be used to describe and classify soil water regimes more quantitatively. The evolution of the changes to the criteria has been reported in the proceedings of the annual meetings of ECSS in 1982, 1983, 1984, and in 1986 a preliminary review of the utilization of the criteria by soil survey units across Canada was presented.

The soil water regime classification system utilizes the following factors, collectively referred to as ihe SWIG criteria:

1. Aridity Index - (mm)
2. Hydraulic conductivity - (cm/hr)
3. Saturated zone - (cm)
4. Persistence - Duration of least depth (days)
5. Seepage - (presence/absence, and quality)
6. Impeding Layers, Depth to (cm) - (reduced porosity)
7. Impeding Layers, Depth to (cm) - (increased porosity)
8. Man made modifiers - (degree of impact if present)

Current Status of SWIG

2.5.1 Aridity Index

There is still a concern about how soil surveyors use (or will use) the aridity index (long term average of the supplemental water required to maintain plant available water equal to or greater than one-half of capacity throughout the growing season for a perennial crop). The original intention was that it be utilized as an "off-the-_shelf" parameter. That is, it would be obtained from look-up tables generated for each appropriate climatic station. Soil surveyors could then assign each soil to an appropriate station or area, based on local conditions and requirements.

2.5.2 Cryosolic Soils

The SWIG criteria were originally proposed for application to mineral soils lacking permafrost within the framework of the soil climates of Canada. In 1986 (ECSS proc.) a proposal was made to accommodate cryosols with water tables perched on permafrost. The proposal was to modify the depth to water table class - "H", by SUbdiViding according to: HI - 0-20 cm (Extremely High), H2 - 20-50 cm (Very High), and H3 _ 50-100 cm (Moderately High). To date there has been little, if any, disagreement or concurrence with this proposal.

2.5.3 SWIMM

A revised abbreviated draft of the Soil Water Investigations Methods Manual was completed as recommended to the 1988 ECSS meeting~, and has been circulated to several WG members for comments and review.

2.5.4 Regional

A very recent poll of SWIG members across Canada indicated that there has been little activity directly related to incorporating or evaluating SWIG criteria into routine soil surveys. However, it has been pointed out that the soil water regime classification system as currently proposed does not entirely accommodate soil as defined in taxonomy. According to the definition (CSSC. 1987, p. 19), soil may have up to 60 cm of water on the surface either at low tide in coastal areas or during the driest part of the year in areas inland. The presence and persistence of shallow surface water is of major importance to the definition and distinction of several types of very productive wetlands.

2.5.5 Suggestion

One solution would be to add an "S" (Surface water) class to the Saturated Zone Depth classes. Two classes would accommodate the wetlands with surface: S1 - 0-20 cm (shallow) and S2 _ 20-60 cm (moderately shallow). These depth classes reflect a relative degree of permanency for surface water. Areas distinguished by these classes would be characterized by distinctive vegetative communities and wildlife habitat.

Evaluation

It is apparent that adoption and use of SWIG criteria is proceeding at a much slower rate than had been originally anticipated. Perhaps this should not be surprising however, since it is only quite recently that many soil surveyors have become involved with automated data analysis and simulation modelling which require a more quantitative data base. It is likely however, that the increasing use of models for land evaluation, long term monitoring for soil quality and soil sUitability assessment, will require the collection of more physical data for soil characterization and classification. It is also apparent that the requirements for automated data analysis, development of data bases such as CanSIS, and the increasing use of simulation models will force us to "Act our way into a new mode of thinking rather than trying (on our own) to think our way into a new mode of action". (Nowland, ECSS proc. 1979)

Recommendations

In view of the foregoing discussion, SWIG has formulated the following recommendations:

RECOMMENDATION: 1. Aridity Index tables be generated for each appropriate climate station in Canada using long term values of precipitation and evapotranspiration. These aridity indices could be included and published in the methods manual - "SWIMM".

RECOMMENDATION: 2. The criteria for depth to saturated soil zone be amended as follows:

a) class "H", be subdivided into three intervals: HI - 0-20 cm (Extremely High), H2 - 20-50 cm (Very High) and H3 - 50-100 cm (Moderately High) for application to soils with perched water tables due to permafrost tables, and/or to other soils with near surface, restricting, or compacted layers. (Note: permafrost table not to be considered a frozen water table.)

b) class "S" for surface water be added to accommodate wetland classification and that two intervals be recognized: Sl _ 0-20 cm (Shallow) and S2 - 20-60 cm (Moderately Shallow).

RECOMMENDATION: 3. SWIG recommends to ECSS that the Soil Water Regime Classification System be considered operational and that it be finalized and officially adopted for use in soil water regime characterization in Canada.

RECOMMENDATION: 4. ECSS makes arrangement for a technical edit of SWIMM to be completed for distribution prior to the 1991 field season.

RECOMMENDATION+... 5. SWIG recommends to ECSS that, on the complet ion of SWIMM (in prep.), the activities of the Working Group be considered complete as per the original terms of reference.

THE MOTION TO ACCEPT THESE RECOMMENDATIONS WAS CARRIED BY THE ECSS.

2.6 **Map and** Report Formats Working Group
(Charles Tarnocai)

1. Introduction

This working group was formed to set up standard soil map and report formats for the ARC/Info system. The work of the Map and Report Formats Working Group (MRFWG) has the following objectives:

1. To develop standard formats for soil and interpretive maps generated by CanSIS.

2. To develop standard formats for soil and survey reports.

The following work plan was agreed upon in order to carry out these objectives:

1. An interim report containing descriptions of the ARC/Info standard map formats and examples of these formats was to be ready by September 30, 1988.
2. This interim report was to be reviewed by the CanSIS Working Group and federal and provincial colleagues and correlators.
3. The CanSIS Working Group was to meet and their modifications were to be submitted to the Map and Report Formats Working Group by the end of February, 1989.
4. The revised map formats were to be ready for implementation by March 31, 1989.
5. Development of the standard formats for soil survey reports was to begin in 1989.

2. Standard Soil Survey Maps

In May, 1988 the working group completed its first report which described various standard product formats for both soil and interpretation maps. This report was presented at the CanSIS Working Group meeting in September, 1988 together with some preliminary standard map examples. Peter Brimacombecompleted the necessary programming for the "standard soil map with legend" format in the fall of 1988. The 1:25,000 scale Wainfleet soil map was then selected as a test of this format.

Some samples of the interim maps were presented during the Expert Committee on Soil Survey meeting in Winnipeg in 1988.

Packages containing standard soil maps and single attribute and interpretive maps were completed and distributed to the Soil Survey Units for review in August of 1989. Comments received from the units were reviewed by the MRFWG during the meeting held on November 30, 1989.

As was pointed out at that time, these maps are not necessarily the only products that CanSIS will produce. The maps in this package, however, are as fully automated as possible. The computer-generated products are representative of what ARC/Info is able to produce with

the current set-up. With added hardware (e.g., an electrostatic plotter) and manual enhancement, other types of maps could be produced. The production methods considered by the working group are given in Table 1 below.

Table 1. Map production.

Production Methods	Manual Enhancement*	Type of Reproduction**
A. Line Plotter	M	1, 2, 3
B. Electrostatic Plotter	M	1, 2, 3
C. Digital File		

* Manual enhancement makes it possible to position map symbols and generates a more desirable legend. ** 1. Plotting (less than 10 colour copies)

2. Xerox (less than 100 black and white copies)
3. Printing (greater than 100 copies)

The standard soil maps and single attribute and interpretive maps distributed for review are product types Al (colour) arid A2 (black and white). The colour maps were produced by a line plotter (AI); the original black and white maps were produced by a line plotter and copies were reproduced by a map xerox machine (A2).

The most common criticisms that the Soil Survey Units had concerning this package were:

1. More detailed base map information is required on these maps.
2. Soil maps similar to the traditional soil maps, including the traditional legend, are required by the users.
3. Soil maps should have map unit symbols (soil names) and not polygon reference numbers.

In answer to these criticisms the MRFWG suggested the following:

1. More detailed base map information is not possible on single colour maps. ISCU does not have the resources to produce additional base data. If this data becomes available from EMR or other sources, it is technically possible to produce a more detailed map base using an electrostatic plotter and/or printing. At the present time the more detailed base map information required can be achieved by manual enhancement.
2. Soil maps similar to the traditional soil maps, inclUding the traditional legend, can be produced by methods AM and BM (Table 1).
3. Soil maps with map unit symbols (soil names) as colours and not polygon reference numbers can be produced by method B if a colour is assigned to each map unit symbol (depending on the number of soils) or by methods AM and BM if it is preferred that the map unit symbol be manually placed on the polygon.

It should be noted however, that in the absence of an electrostatic plotter, products A1 and A2 will require the least time and lowest cost to produce. All other products are more time consuming and more costly to produce than the automated standard products. Since the introduction of the GIS in our map production, we have been able to produce certain products much faster and at lower cost than was the case in the past. This system does, however, have limitations and, if products similar to the traditional types are required, added hardware and manual production are necessary.

The MRF Working Group feels that the production scheme presented in Table 1 should satisfy all the needs of the Soil Survey Units. CanSIS does, however, require an electrostatic plotter to produce colour maps since, without this hardware, colour maps would still have to be produced by the more costly and time consuming manual method.

Recommendation

The MRF Working Group feels that the standard map package represented by the Wainfleet map and the production scheme presented in Table 1 should satisfy basic needs of the Soil Survey Units and should be accepted as a system for producing standard maps.

THE MOTION TO ACCEPT THIS RECOMMENDATION WAS CARRIED BY THE ECSS.

3. Soil Survey Reports

3.1 Standard Soil Survey Reports

The standard soil survey report is generated by importing the ARC/Info-generated soil and map unit description report to a word processor and merging it with generic text. The origins of the various types of information and the associated report types are shown in Figure 1.

Figure 1. The origin of the information and the types of soil survey reports

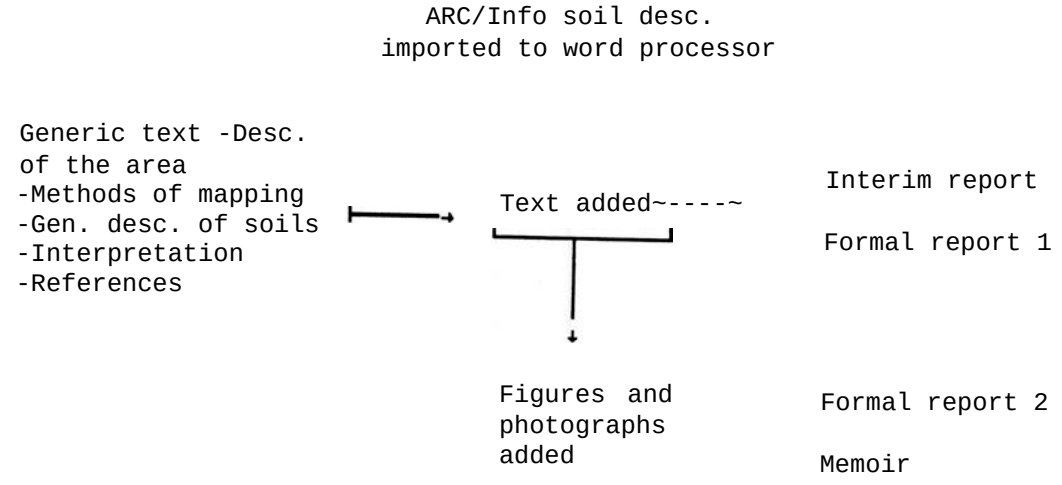

Table 2 outlines the sections which the standard report should contain. Sections 1 - 3 (Table 2) are prepared by using a word processor to update and fill in the generic text. All of these sections are short and contain only the essential information. Section 4 (Table 3) is imported from ARC/Info to a word processor. This ARC/Info-generated report is modified slightly in style and format by using the word processor. Section 5 is currently manually-generated, but it is hoped that the interpretations will be computer-generated in the future.

Table 2. Sections of the standard soil survey report*.

1. General Description of the Area

   General information of the map area (computerized text).

2. Mapping of the Soils (Methods)

   General information about the soil classification, survey intensity, map reliability and how the soil mapping was carried out (computerized text).

3. General Description of the Soils

   A key to the soils (computerized text).

4. Descriptions of Soils and Map Units

   Detailed description of soils and map units, including summary tables and analytical data in the appendices (computerized text or ARC/Info-generated).

5. Interpretation

   Interpretation for various uses (manual- or computer-generated).

6. References

7. Appendices

* The source of information for the section is given in brackets.

Memoirs and type #2 formal reports (Figure 1) are generated by enhancing these standard reports with figures and photographs. All of these report types are produced by a desktop pUblishing system using a two-column format.

The bound paper copy should be maintained as a form of packaging. Soil survey projects, especially those containing large amounts of interpretive and analytical data, should be distributed on computer disks. Standard soil survey reports should not be prepared for small soil survey projects. The information generated during these small projects should be published using the CLI format, in which brief text is included on the soil or interpretive map.

3.2 Special Reports

a. Saskatchewan LANDBASE information systems for RM area

LANDBASE is an MS-DOS based soil information system which supplies soil resource, land use and productivity data for the agricultural areas of Saskatchewan.

Once the legal location or the soil area number is entered, LANDBASE displays the information for the following categories:

Soil resource data
Assessment data
Conservation notes
Crop insurance data
Productivity data
Wetlands data

b. Newfoundland On-Farm survey report

- With this system a 20 page soil survey report can be written, complete with a cover letter, cover page and complex tables.

- A series of program modules have been written which access the dBase IV database file. Information in the file is retrieved and analyzed during the report-writing process.

- The analyzed data is presented in a series of tables.

- The text of the report is mainly standardized with a few conditional statements, i.e. sentences added as commentary for a given scenario.

- When the tables and text are completed, the computer converts the report to the Wordperfect 5.1 format.

Members of the MRF Working Group

Peter Brimacombe
Brian Edwards
Bruce MacDonald
Brian Monette
Charles Tarnocai (chairman)

SUMMARY AND RECOMMENDATIONS:

1. The recommended types of standard soil survey reports are:
   MEMOIRS
   FORMAL REPORTS (types #1 and #2)
   INTERIM REPORTS

   All of these reports contain ARC/Info-generated soil descriptions and standardized text, except for interim reports which could contain only the ARC/Info information.

2. That reports for special projects should also be standardized and should be generated as per the Saskatchewan LANDBASE information system or Newfoundland On-Farm reports as examples.

3. That some soil survey reports should be produced and distributed on computer disks.

4. That all small soil survey projects should be published using the CLI format.

5. That the members of the MRF Working Group feel that all objectives have been met and that our activities concerning the standard maps and reports have been completed.

THE MOTION TO ACCEPT THESE RECOMMENDATIONS WAS CARRIED BY THE ECSS.

2.7 Soil Survey Reliability Working Group (D.E. Moon)

2.7.1 Introduction

The Expert Committee on Soil Survey delegated the working group with developing a method of attaching estimates of reliability to the new National Soil Data Base map upgrade. Other work commitments prevented the group meeting. However, I will present some guidelines, considerations, and recommendations related to the problem. I will then make a recommendation regarding the future of the working group.

The charges given the "committee really deal with 2 problems. To meet the charges we must:

1. Define methods, procedures, and standards for estimating reliability and;
2. Develop and implement methods of attaching them to the map files.

Neither is a simple problem.

2.7.2 Estimating Reliability

2.7.2.1 What is reliability?

My thesaurus gives the following synonyms for reliable: trustworthy, credible, dependable, and· reputable. I believe that our users will have a measure of all of these in mind when they look at an estimate of reliability for our maps. In scientific terms we may refer to accuracy, precision, or accuracy and precision. To meet the general understanding of reliability, we must also attach at least an intuitive measure of confidence or probability. We may use these terms in referring to our data and our interpretations.

I propose that the resulting estimate or estimates of reliability include the following elements.

1. Accuracy - do we find the predicted value or value range.
2. Precision - how narrowly defined are the property limits we are portraying.
3. Confidence - what is the probability of finding the predicted value or value range.

2.7.2.2 What are we estimating the reliability of?

We estimate the reliability of properties or attributes portrayed by the survey. These attributes are of three kinds. Each will have its own sources of error.

1. Primary properties

   - primary properties are directly measurable or observable. Things like depth, pH, C.E.C., colour, stickiness and others. - primary properties have as their primary sources of error, sampling error and measurement error.

2. Secondary properties

- secondary properties are not directly measurable. We infer a value from primary properties. For example, we infer field texture from a combination of stickiness, grittiness, plasticity, and others.
- secondary properties have the same sources of error as primary properties since they are based on primary properties but they add errors of inference as well.

3. Tertiary properties

- tertiary properties are not directly measurable. They require two stages of inference. They may use some primary properties but they use at least one secondary property as part of the inference.
  tertiary properties have the same sources of error as secondary properties since they are based on secondary properties but they add additional errors of inference as well.

2.7.2.3 Sources of Data

We must also be careful not to confuse type of data with source of data in estimating reliability. We know for example, that we base some soil descriptions and property estimates on samples taken outside the survey area. If we are sure the soil is well correlated, the sample error will probably be larger than if the sample were taken from within the survey area. This will be true of primary, secondary, and tertiary data.

2.7.2.4 Possible Methods of Estimation

We must decide what methods we will use to estimate reliability. There are three possible.

2.7.2.4.1 Opinion

We could simply use the surveyor's or correlator's estimate. This approach has some inherent dangers. We tested two surveys. The survey and correlation staff estimated reliability for named soil from 80% to 95%. The estimate included allowance for up to 30% unidentified inclusions. Statistical sampling found a 70% probability of error. The statistical estimate also allowed for up to 30% unidentified inclusions.

2.7.2.4.2 Heuristics

We could use rules of thumb or guidelines to estimate reliability. There are a large number of possible characteristics we could use. The following is a list of only a few possible characteristics of the survey.

1. Method of survey

- free survey, transect, grid sample, combined free survey with systematic and others.

2. Sampling
    a. type of sample

- field observation, air photo interpretation, detail site and soil and others.

    b. method of selection

- modal or selective, random, stratified random, systematic, and others.

    c. intensity of sample
        - number of samples per area, per soil, per map unit, per polygon, and others.

3. Experience of surveyor
4. Degree and method of correlation
5. Quality of base maps
6. Method of transfer of thematic boundaries to base

2.7.2.4.3 Statistics

Statistical estimates can provide unbiased and quantifiable estimates of property variation. Statistical procedures are the most rigorous but they are also the most expensive.

2.7.2.5 Recommendations

1. Statistical estimates where available.
2. Re-sampling to provide statistical estimates where feasible.
3. Heuristic methods if necessary. We should attach the attributes used to make the estimate to the map files. We should publish the heuristic procedure.

2.7.3 Attaching Estimates

There is a widely accepted, if arguable, premise of data management. It is that, wherever possible, we store primary data and construct secondary or tertiary data when needed. Following this premise will be difficult. In order to do so, I will need to refer to entities and relationship.

2.7.3.1 Entities

In simple terms, entities are things to which we want to attach data. For example a soil polygon, a soil name, a map unit. In the National Soil Data Base we have four main entities. They are the map, the map unit, the soil name, and the soil layer file. We have others as well, for example, polygons within the geographic data files, but I will not discuss these.

2.7.3.2 Relationship

A relation refers to the interaction of two entities. For example a specific soil and specific crop. Some properties are the properties

of the relationship between entities. For example, productivity is a function of the relationship of a specific crop with a specific soil. Similarly, the reliability of a soil property may be the function of the relationship of a soil name to a map. Soils will have narrower ranges and greater accuracy in some maps and less in others. Because of this fact, the simple data model may present some complexities.

If we want to attach reliability to the National Soil Data Base, we must decide two things. What we are going to attach and to what are we going to attach it. Listed below are two possibilites of what we might attach it to.

1. We can attach an estimate of the reliability of an individual property or properties to any of the existing NSDB tables.
2. We can attach the data necessary to derive estimates of reliability to the NSDB. To do so will require that we attach values of properties to both NSDB entities and relationships between entities. The current file structure will not allow us to do so.

The long term implications of this decision are important. At a minimum, the choice of the first option closes off a number of potential applications and will significantly increase data maintenance problems. In addition, it prevents us from storing the data needed to answer these questions as part of routine data archive. Any changes in approach or interpretation will require re-compilation and analysis of the data.

2.7.3.3 Concerns

There is a need to create, within the NSDB, relational tables to store and archive needed data. The tables should be designed to make it easy to upload the data into a truly relational data model when the NSDB has the software capability to exploit it. Estimates can then be attached to the existing entities. Data model design can be done independently of the software used. In addition, tables can be created and maintained within the existing software, even if the software cannot make use of it in an efficient manner.

2.7.4 Recommendations to ECSS

The chairman of the working group recommends that member agencies write duties and responsibilities into individual work plans. If the member agencies are not willing to do so, the chairman recommends that the working group be dissolved.

THE MOTION TO DISBAND THIS WORKING GROUP WAS CARRIED BY THE ECSS.

2.8 Forestry Interpretations Working Group

It was reported that no further action was taken on the manual for Forestry Interpretations.

A MOTION REQUESTING MR. OLE HENDRICKSON AND SOME OF HIS COLLEAGUES OF FORESTRY CANADA TO INVESTIGATE THE POSSIBILITY OF A CONTINUING WORKING GROUP ON THE USE OF SOIL SURVEY INFORMATION FOR FOREST MANAGEMENT WAS CARRIED BY THE ECSS.

3. **DETAILED PRESENTATIONS**

3.1 THE NATIONAL SOIL QUALITY EVALUATION PROJECT

A Report of Plans to Mo~itor Soil Quality for the National Soil Conservation Program

(D. Acton)

INTRODUCTION

This report will review the circumstances that led to the development of a soil quality monitoring program, present the vlslon, outline the plans and anticipated results, and conclude by addressing some administrative aspects of the program.

Numerous studies have been conducted and statements prepared pertaining to the decline in quality of the agricultural land resources of Canada. The National Agricultural Strategy (NAS), 1986, in a review of current programming in soil and water conservation and development, concluded there was no consistent effort to monitor change to soil quality in Canada. As part of the NAS process, every province in Canada addressed their soil and water conservation and development concerns, including those of monitoring. The initiative of a National Soil Conservation Program (NSCP) in 1987 provided an opportunity for a partnership-based program involving Agriculture Canada and each of the provincial governments to address' the concerns raised in the NAS. The Research Branch of Agriculture Canada was delegated responsibility to implement a monitoring program under contract to the lead agencies of NSCP, namely PFRA and the Agriculture Development Branch.

The Land Resource Research Centre (LRRC) was delegated responsibility for developing and implementing a soil quality monitoring program. Drawing on the expertise of a number of scientists within the LRRC and based on a host of previous studies that addressed the kind, extent and cause of soil quality degradation, a plan for a comprehensive national program to evaluate change to soil quality was conceived. After consultation with a large number of colleagues within and outside of Agriculture Canada, a Soil Quality Evaluation Project (SQEP) was approved at the national level as an appropriate means to monitor soil quality as part of NSCP. Plans for the SQEP envisaged a partnership between various federal and provincial government agencies, universities and nongovernment organizations in program planning and development. NSCP funds would be used on a short-term basis to accelerate the development of this program with the Research Branch providing a commitment for continuing the program over the longer term. Another feature of the plan was to base the program on the requirements of potential users of a soil quality monitoring system capability. To this end, advisory boards have been established with the dual purpose of ensuring that the program is directed toward regional as well as national priorities and that at least some of the critical agencies are positioned to utilize various components of the monitoring program when developed.

Twelve separate but highly integrated studies were established to facilitate effective management of the project. The first will

develop nationally-accepted criteria and standards for evaluating soil quality. These criteria and standards will form the basis for developing a system to measure changes in soil and closely related environmental quality in a second study. This latter study will require a land use data base derived from a third study to complement soil, topographic, and climate data bases in a geographic information system environment. A fourth study will involve establishing a series of benchmark sites to independently measure soil quality change. Studies 5 to 9 address the development of systems to monitor wind and water erosion, soil salinization, change in soil organic matter levels and soil structure. The research part of these studies also will improve our capability to predict change to soil quality arising from these processes and, as such, will contribute to national assessment of soil quality. In a similar vein, studies 10 and 11 will monitor soil and groundwater contamination from organic and inorganic chemicals and develop capabilities to predict change to soil and environmental quality and to make national assessments related to these chemicals. All of the predictive systems mentioned above will be capable of application for local and regional soil conservation planning purposes as well as meeting objectives for national assessments. The last study, Land Evaluation for Agricultural Sustainability, will develop the framework to evaluate the impact of soil degradation on biological productivity, economic viability and environmental quality thereby linking the physical assessment of soil quality to the socio-economic reality.

STUDY SYNOPSES

1. SOIL AND WATER QUALITY CRITERIA AND STANDARDS (SOCS):

Study Team: G.M. Coen* (LRRC, Edmonton), J.A. McKeague (LRRC, Ottawa), M.A. Arshad (Beaverlodge Res. Sta.), C.A. Campbell (Swift Current Res. Sta.), G.R.B. Webster (U of M., Winnipeg), M. Miller (U of G., Guelph), P. Milburn (Fredericton Res. Sta.), G.C. Topp (LRRC, Ottawa), B. Harker (PFRA) , L. Lavkulich (U.B.C., Vancouver).

Objectives, Features and Anticipated Results: The objective of this study is to provide nationally-accepted standards and criteria for evaluating soil and water quality. The standards and criteria will be developed in co-operation with potential users. Methods to be used in applying the criteria will be specified and procedures for assessment and modification of the standards and criteria developed. Weaknesses in the information base required for developing soil and water quality standards will be identified and research required to meet these needs will be specified .and conducted in the near time frame, if feasible. The objective of this study must be met if we wish to know the trends in the state of our soil resources, and the effects of various agricultural systems on soil quality. An early milestone in the attainment of the objective will be publication, in 1992, of a consultation document specifying the criteria and standards by which soil quality will be assessed in Canada. Subsequent consultation with government and non-government organizations will result in a consensus document, in 1993. Through national and international dialogue and review, an agreement for soil quality criteria and standards for Canada will be achieved by 1994.

2. SOIL AND ENVIRONMENTAL QUALITY ANALYSIS AND ASSESSMENT SYSTEM (SEQAAS):

Study Team: K.B. MacDonald* (LRRC, Ottawa), W.R. Fraser (LRRC, Winnipeg), C. Pupp, (Env. Can., Ottawa), R. Post (Env. Can., Ottawa), G.M. Coen (LRRC, Edmonton), J.C. Hiley (LRRC, Edmonton), C. Wang (LRRC, Ottawa), G.A. Padbury (LRRC, Saskatoon), D.R. Coote (LRRC, Ottawa), E.A. Gregorich (LRRC, Ottawa), J.L.B. Culley (LRRC, Ottawa), J. Dumanski (LRRC, Ottawa), P. Fehr (PFRA, Regina), B. Harron (PFRA, Regina).

Objectives: 1) To develop an operational geographic information system that integrates standard data bases of soil, soil degradation, land use, topography and climate at an appropriate scale for regional and national assessments of the current status as well as the kind, rate, direction and cause of change to soil quality, and 2) to demonstrate, in selected areas of Canada, the current status of soil quality at scales appropriate to regional assessment.

Features and Anticipated Results: The national soil quality and environmental assessment will be based on a 1:1 million scale soil landscapes data base for Canada with complementary data bases for elevation, land use, and climate. The status of or estimated changes to the intrinsic properties of soil known to influence crop production will be predicted from our knOWledge of the processes affecting these properties. For example, organic matter status will be predicted from known relationships between wind and water erosion, organic matter additions and mineralization - all in relation to other intrinsic soil properties, land uses, climate and topography.

This study will enable a national assessment of soil quality to complement the State of the Environment Reporting System to inform officials, producers and the public on the quality and sustainability of Canada's agricultural lands.

This study will be directed by scientists at the LRRC in Ottawa with assistance from many of the other study teams and Soil Survey Units across Canada in the development of data bases and the various linkages between data bases that will be required to implement this national assessment system. Regional assistance in sensitivity analysis will be provided by the Soil Survey Unit, LRRC, in Winnipeg. Although the map products are designed for national comparisons, they will also provide insight into soil quality status at the provincial and regional level.

3. LAND USE ANALYSIS AND MONITORING SYSTEM (LUAMS):

Study Team: J.C. Hiley* (LRRC, Edmonton), E.C. Huffman* (LRRC, Ottawa), A.R. Mack (LRRC, Ottawa), L. Chambers (D.U., Regina), L. Marciak (A.D.A., Edmonton), R. van den Broek (O.M.A.F., Guelph), P. Fehr (PFRA, Regina), A. Eagle (PFRA, Regina), J. Tokarchuk (Man. Agric., Winnipeg), G. Dorn (Sask. Agric. & Food, Regina), A.J. Anderson (LRRC, Saskatoon), S. Konrad (D.U., Winnipeg).

Objectives: 1) To design and implement a land use analytical capability to be used for national and regional assessments of soil quality and 2) to develop a capability, using remote sensing, to analyze and monitor land use for provincial and district soil quality assessments and soil conservation planning.

Features and Anticipated Results: National and regional land use data bases will be compiled from Statistics Canada, 1991 Census of Agriculture information. Not only will this data set contain considerably more soil conservation-oriented land use information than was previously available, but it will be possible to analyze this data at the farm headquarters level to more closely relate land use practises with soil and other data bases. An analysis of land use and cropping systems for the Agroecological Resource Areas of Canada will be completed by 1992. Analysis for the more detailed Soil Landscapes of Canada data base is anticipated to be completed for the Prairie Provinces by 1993 and for the remainder of Canada by 1994. These analyses, in the first instance, will facilitate various soil quality analyses and risk assessments as part of the National Soil Quality Evaluation Project.

Pilot studies in selected test areas of Western Canada and Ontario will serve to evaluate the capability of remote sensing technology to contribute to large-scale agricultural land use inventories and to develop the procedures required to incorporate it as an integral part of a national land use monitoring program. This will provide a layer of data to complement census-derived characterizations of specified landscape units in the selected areas. It will also provide a capability to utilize remote sensing data for regional soil and environmental assessments for soil conservation planning anywhere in Canada.

4 . SOIL QUALITY BENCHMARK SITES (SQUBS):

Study Team: C. Wang* (LRRC, Ottawa), B.D. Walker* (LRRC, Edmonton), C. Veer (LRRC, Charlottetown), L. Kozak (LRRC, Saskatoon), G.J. Wall (LRRC, Guelph), K.B. MacDonald (LRRC, Ottawa), D.R. Coote (LRRC, Ottawa), G.A. Padbury (LRRC, Saskatoon), E.A. Gregorich (LRRC, Ottawa), M. Brklacich (LRRC, Ottawa), J.L.B. Culley (LRRC, Ottawa), F. Wilson (PFRA, Winnipeg), G. Shaw (PFRA, Saskatoon), A. Stewart (PFRA, Edmonton).

Objectives: To establish a national network of benchmark sites that: 1) will provide reference points for future measurements of soil quality change, and 2) will meet the validation data requirements of predictive models for wind and water erosion, organic matter, salinity, compaction and organic and inorganic additions.

Approximately 25 sites, chosen to represent typical farming systems within major agroecological regions, will be selected across Canada. Baseline characterization of all soil properties anticipated to impact on crop production will be completed at all sites by 1993. Sites will be resampled for selected properties at prescibed intervals over
the next several years until a base-line for the property has been

ascertained. Samples will be archived for future analytical purposes. An electronic data base and a report on base-line characteristics and short-term trends in change to soil quality will be prepared by 1993.

Many of the benchmark sites will also serve as validation sites for process-oriented models such as wind or water erosion as well as for monitoring changes to soil salinity, organic matter or structure. Some sites will be used to assess the impact of change to soil quality on biological productivity while others will monitor surface and groundwater contamination associated with the soils and farming system at the site.

5. WIND EROSIO~ MONITORING AND PREDICTION STUDY (WIMPS):

Study Team: G.A. Padbury* (LRRC, Saskatoon), D.R. Coote (LRRC, Ottawa), H. Hayhoe' (LRRC, Ottawa), C.W. Lindwall (Lethbridge Res. Sta.), W. Michalyna (LRRC, Winnipeg), A. Moulin (Melfort Res. Sta.), L. Slevinsky (M.D.A., Winnipeg), J. Timmermans (A.D.A., Airdrie), M. Black (PFRA, Regina), G. Dorn (Sask. Agric. & Food, Regina), P. Haluschak (M.D.A., Winnipeg).

Objectives: 1) To monitor, quantitatively, soil loss from wind erosion at a number of sites across Canada; 2) to develop a system for predicting the severity of wind erosion that occurs on agricultural land in all regions of Canada and for estimating the impact of wind erosion on soil quality and the sustainability of land resource; and 3) to provide a means of selecting conservation practises at the farm level.

Features and Anticipated Results: A wind erosion research model, currently being developed in the U.S.A., is available for testing in Canada at the present time and is expected to be available for use by 1993. Five instrumented wind erosion sites will be established in the Prairies to validate this experimental model. In addition to this, approximately 35 sites to monitor soil loss and to characterize soil properties directly related to wind erosion will be located throughout the Prairies and several in Eastern Canada. All sites will be established in 1990 or 1991 with monitoring to begin upon establishment and to continue for at least 3 years.

A reassessment of wind erosion risk for Canada will be completed by 1993 using current wind erosion prediction technology but with an updated and improved land use data base. A further reassessment will be carried out in 1996-97 using the improved prediction system combined with updated and improved land use data bases from the next census.

6. WATER EROSION MONITORING AND PREDICTION STUDY (WAMPS):

Study Team: D.R. Coote* (LRRC, Ottawa), H. Hayhoe (LRRC, Ottawa), J.L.P. Van Vliet (LRRC, Vancouver), G.J. Wall (LRRC, Guelph), L. Chow (Fredericton Res. Sta.), T. Goddard (A.D.A., Edmonton), C.T. Shaykewich (U of M., Winnipeg), M. Black (PFRA, Regina), W. Nicholaichuk (NHRC, Saskatoon).

Objectives: 1) To monitor, quantitatively, soil loss from water erosion at a number of sites across Canada; 2) to develop a system for predicting the severity of water erosion that occurs on agricultural land in all regions of Canada, and for estimating the impact of water erosion on the sustainability of the land resource; 3) to develop a system for predicting the impact of agricultural soil erosion on environmental quality in all regions of Canada; and 4) to provide a means of selecting soil conservation practises at the farm level.

Features and Anticipated Results: Water erosion will be monitored at 12 sites already established in B.C., Alberta, Manitoba and New Brunswick to provide improved estimates of the severity of soil loss from this process. These sites and additional sites in Ontario, where rainfall is simulated, will provide valuable information for continued evaluation of the Universal Soil Loss Equation (USLE) and the revisions to it, as well as to test the accuracy of an event-based model (WEPP), currently under development in the U.S.A. A reassessment of water erosion risk for Canada will be completed by 1993 using the revised USLE and an improved land use data base. A further reassessment is planned for 1996-97 using the event-based model (WEPP) if this model is found to represent a significant improvement over the revised USLE. The impact of water erosion on soil and water quality will be evaluated nationally, and improved systems for soil conservation planning, at the regional level, will be developed.

7. EVALUATING SOIL ORGANIC HATTER CHANGE (OMPS):

Study Team: E.A. Gregorich* (LRRC, Ottawa), D.W. Anderson (U of S., Saskatoon). T.B. Goh (U of M., Winnipeg), D. Angers (Ste. Foy Res. Sta.), M. Carter (Charlottetown Res. Sta.), C. Monreal (PFRA/LRRC, Saskatoon).

Objectives: 1) To evaluate the Century and other physically-based models that have the potential to predict dynamic changes to the quantity and quality of soil organic matter under Canadian conditions; 2) to validate the experimental model; 3) to develop the appropriate soil, climate and associated data bases and operating systems for conservation planning and inventory and assessment purposes; 4) to validate the predictive system; and 5) to provide training for soil conservation planners and advisers on the predictive system.

Features and Anticipated Products: A model that will predict change to quantity and quality of soil organic matter developed for the U.S. Great Plains will be tested against research plot data from across Canada. If warranted, it will be modified, as required, through additional research and developed into a system that will predict long-term trends in soil organic matter as a function of land use and management, soils and environmental conditions. This predictive capability will be used in a national assessment of soil and environmental quality to be completed by 1993 and would be appropriate for use in regional soil conservation planning.

Saskatchewan scientists will playa major part in directing the testing and modification of the research model and the development of the predictive system. Scientists from Alberta, Manitoba, Ontario, Quebec and P.E.I. will collaborate in model validation.

8. SOIL SALINITY ASSESSMENT, MONITORING AND PREDICTION STUDY (SAMPS):

Study Team: R.G. Eilers* (LRRC, Winnipeg), M. Trudell (ARC, Edmonton), J. Miller (A.D.A., Lethbridge), W. Nicholaichuk (NHRC, Saskatoon), W. Stolte (U of S., Saskatoon), B.T. Schreiner (SRC, Saskatoon), W. Harron (PFRA, Regina), B. Harker (PFRA, Regina), J.T. Brierley (LRRC, Edmonton), W.D. Eilers (LRRC, Saskatoon), J.L. Henry (S.I.P., Saskatoon), H. van der *Pluym* (A.D.A., Edmonton).

Objectives: 1) To assess the change in the status (extent and severity) of *soil* salinity in the Prairies; 2) to monitor change in soil salinity at a number of sites in the Prairies; 3) to develop procedures to facilitate assessment of impact of land use management practices (and recommendations) on the status of soil salinity.

Features and Anticipated Results: Seven instrumented salinity sites will be established in the Prairie region in 1990 and 1991 with site characterization and salinity monitoring to proceed upon completion of instrumentation. In that salinization and desalinization are relatively slow processes, these monitoring sites will be most useful after a period of 5 to 10 years. Some of the sites, however, will have had some previous salinity investigations that *will* serve as a basis for an assessment of change in salinity over the previous decade at these sites and regionally. The monitoring sites will be important sources of data for the development of systems or procedures to predict the impact of land use and management on salinity control and reclamation. A report in 1993 will document the characteristics of these sites and indicate salinity trends over the period of evaluation.

9. SOIL STRUCTURE ASSESSMENT AND PREDICTION STUDY (STAPS):

Study Team: J.L.B. Culley* (LRRC, Ottawa), G.C. Topp* (LRRC, Ottawa), C. Chang (Lethbridge Res. Sta.), J.A. Stone (Harrow Res. Sta.), D. Angers (Ste. Foy Res. Sta.), K. Denholm (LRRC, Guelph), D.A. Holmstrom (LRRC, Truro), G. Owen (LRRC, Ottawa), B.D. Kay (U of G., Guelph), R .. McBride (U of G., Guelph), R. van den Broek (OMAF, Guelph), A.D. Ridley (U of M., Winnipeg).

Objectives: 1) To develop procedures to measure soil physical qualities related to the structures of agricultural *soils* in *all* regions of Canada; 2) to assess the current status of these qualities; 3) to determine how these measures are affected by crop, traffic, tillage as *well* as inherent soil properties over the short and long terms; and, 4) to develop relationships between these *soil* structure parameters and economic and environmental sustainability.

Features and Anticipated Results: The nonlimiting water range (NLWR) of a soil reflects the structural qualities of importance to crop production. Methods will be developed to determine NLWR and this parameter will be tested at a number of experimental plots and benchmark sites. If succesful, a limited survey of the NLWR dominant agricultural soils under representative crop production systems will be conducted to provide a national assessment of soil structure for Canada. Research activities will estimate the rate of change to NLWR as a function of vehicle traffic, crop, tillage and soil properties as well as develop relationships between crop productivity and NLWR stress levels and between NLWR's and water infiltration. In addition to the national assessment of soil structure that will be completed by 1993, this study will increase our capability to predict the impact of structure change on crop response and environmental quality.

10. PROCEDURES FOR PREDICTING FATE OF ORGANIC ADDITIONS (OPS):

Planning Team: G.C. Topp* (LRRC, Ottawa), R. de Jong (LRRC, Ottawa), W.D. Reynolds (LRRC, Ottawa), R.B. Harris (U of G., Guelph), W. Nicholaichuk (NHRC, Saskatoon), G.R.B. Webster (U of M., Winnipeg).

Objectives: 1) To evaluate several proposed physically-based equations or simulation models that have potential for predicting the fate of organic materials added to soil (pesticides) and select the most appropriate one for use in developing a predictive capability, or, develop a suitable equation or model; 2) to validate the equation or model; 3) to develop linkages to data bases and operating systems to facilitate the use of these models for conservation and environmental planning and inventory and assessment purposes.

Features and Anticipated Results: The focus of this study will be on pesticide contamination of groundwater. There are pesticide contamination research studies currently planned for Alberta, Manitoba and New Brunswick as part of the NSCP program and more are anticipated when work plans are fully developed in B.C. and Ontario. This study, as currently planned, will support and co-ordinate the modelling components of these studies to ensure the necessary linkages to the soil and environmental quality analyses and assessment system are developed.

11. PROCEDURES FOR PREDICTING FATE OF INORGANIC ADDITIONS (IPS):

Planning Team: S. Singh* R. de Jong (LRRC, Ottawa), (LRRC, Ottawa), G.C. Topp* (LRRC, Ottawa), W.D. Reynolds (LRRC, Ottawa), C.A. Campbell (Swift Current Res. Sta.), (U of M., Winnipeg). W. Nicholaichuk (NHRC, Saskatoon), C.M. Cho

Objectives: 1) To evaluate several available physically-based equations or simulation models that have potential for predicting the fate of inorganic materials from soils and to select the most appropriate ones for use in developing predictive capabilities, or, develop suitable equations or models; 2) to validate the equations or models; 3) to develop linkages to data bases and operating systems to facilitate the use of these models for conservation and enVironmental planning and inventory and assessment purposes.

There are two distinctly different activities planned in this study. The first will focus on nitrate contamination of groundwater. There are nitrate contamination research and monitoring studies currently planned for Alberta, Saskatchewan, Manitoba and New Brunswick and more could be forthcoming when work plans are fully developed in B.C. and Ontario. This study, as currently planned, will support and co-ordinate the modelling components of these studies to ensure the necessary linkages ~o the soil and environmental quality analyses and assessment system (SEQAAS) are developed.

The second activity is directed to monitoring the fate of heavy metals in sewage sludge at selected sites across Canada and to ensure the necessary linkages to the SEQAAS are developed.

12. LAND EVALUATION FOR AGRICULTURAL SUSTAINABILITY (LEAS):

Study Team: J. Dumanski* (LRRC, Ottawa), M. Brklacich (LRRC, Ottawa), E. Allerdings (PFRA, Regina).

Objectives: 1) To conduct a state-of-the-art evaluation of published and unpublished research on the impact of soil degradation on crop yield, economic return and the environment, for selected regions in Canada and internationally; 2) to supplement existing research and fill knowledge gaps identified under Objective 1) with informed opinion analysis, primarily in Canada and the U.S.A.; 3) to develop and test an expert system for predicting and monitoring the impacts of soil degradation on crop production, environmental quality and economic issues, as a first approximation of a diagnostic system.

Features and Anticipated Results: The state-of-the-art evaluation will involve a literature search and characterization of research into soil degradation and its impact on productivity, the environment and economic return. A data base will be prepared, complete with a computerized, annoted bibliography. The focus of the research will be to identify critical limits to degradation and to identify research areas where there are major information deficiencies. Canadian and global information will be used.

Two areas in Canada with relatively large amounts of information will be selected; one area will be in western Canada and the other in eastern Canada. In these areas, experts on the relationships between soil degradation, crop yield and environmental and economic impact in Canada ~nd the U.S. will be systematically and scientifically interviewed to provide best estimates in lieu of published research. Scientists as well as others knowledgeable of degradation areas and impacts in selected regions will be systematically and scientifically interviewed using a questionnaire designed to provide information specific to prevailing environmental conditions, to the rate and extent of soil degradation and to specific crops.

The expert system would provide a practical means for extending the utility of information obtained under Objectives 1 and 2 to areas with a paucity of information. One such area in one region of Canada will

be selected, then, utilizing the information available from Objectives 1 or 2, a diagnosis system based on expert system technology will be constructed. A first approximation of a diagnostic system to predict the impact of soil degradation will be constructed.

ADMINISTRATION

The Soil Quality Evaluation Program is directed by the Land Resource Research Centre. Program delivery relies heavily on resources from the NSCP provided through second-party agreements with PFRA for the Prairies and regional offices of the Agriculture Development Branch for several other provinces. In some cases, resources are provided through third-party arrangements involving provincial ministries. The status of agreements, as of November I, 1990, is presented in Table 1.

Table 1. A list of agreements and proposed agreements between the LRRC of the Research Branch and the lead agency responsible for delivery of the Monitoring component of the NSCP program at the provincial level ($1,000).

	1990-91	Total (3-Year)
1. Agreements in Place:		
Prairies (PFRA) Ontario	603	1,820
(Ag. Dev. Br.) P.E.I.	368	1,096
(Ag. Dev. Br.) Subtotal	-1Q	-ill
Agreements Under Consideration:	991	3,043
N.S. (Ag. Dev. Br.)	0	150
B.C. (Ag. Dev. Br.)	__ 0	--lQQ
Subtotal	0	--lli
TOTAL Direct Agreements	991	3,293
2. Indirect Agreements:		
Agreements in Place:		
N.B. (Ag. Dev. Br./NBDA)	0	30
P.E.1. Dev. Br. /PEIDA)	Q	118
Subtotal	Q	148
TOTAL Indirect Agreements	0	148
TOTAL DIRECT AND INDIRECT AGREEMENTS	991	3,441

A number of agreements between the LRRC and collaborators in program delivery have been developed with Research Stations, Research Councils and Universities. Those in effect, as of Nov. I, 1990, are presented in Table 2.

Table 2. Agreements between the LRRC and their collaborators for the various studies of the Soil Quality Evaluation Project. Proposed agreements are enclosed in brackets.

STUDY	COLLABORATOR	TOTAL (3-YEAR)
SEQAAS	University of Manitoba (Fraser)	137,000
SQUBS	University of Saskatchewan (Kozak)	8,000
	Alberta Research Council (Moran)	(50,000)
WIMPS	University of Manitoba (Michalyna)	42,000
	University of Saskatchewan (Padbury)	29,000
	University of Alberta (Chanasyk) Melfort	(27,500)
	Research Station (Moulin) Lethbridge	51,500
	Research Station (Larney)	161,000
WAMPS	University of Manitoba (Shaykewich)	12,000
	University of Saskatchewan (Stolte)	11,000
	University of Alberta (Chanasyk)	(27,500)
	Beaver10dge Research Station	14,000
	Fredericton Research Station (Chow)	14,000
	University of Guelph (Kachanoski)	(40,000
OMPS	University of Manitoba (Goh)	10,000
	University of Saskatchewan (Anderson)	94.000
	University of Alberta (Robertson)	(15.000)
	Ste. Foy Research Station (Angers)	30,000
	Charlottetown Research Station (Carter)	30.000
SAMPS	University of Manitoba (Eilers)	42,000
	University of Saskatchewan (Eilers)	46.000
	University of Saskatchewan (Stolte)	45,000
	Alberta Research Council (Moran)	(94,000)
STAPS	University of Guelph (McBride)	(65,000)
OPS	University of Manitoba (Chow)	20.000
ADMIN	University of Saskatchewan (Acton)	39.000
Agreements in place:		823,500
Agreements proposed:		(319.000)
Grand Total of all Agreements:		$1,142,500

PREPARED BY: Dr. D.F. Acton, Project Leader, Soil Quality Evaluation Project

December 17. 1990

3.2 DIGITAL INFORMATION SYSTEMS

Elements of a Digital Data Release/Marketing Policy for Soil Inventory Data Managed by LRRC and Provincial Cooperating Agencies

(K.B. MacDonald)

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EXECUTIVE SUMMARY

This report identifies and resolves most of the technical details of data release. THESE ASPECTS ARE THE ONLY ONES WHICH THE EXISTING STAFF HAVE THE CAPABILITIES TO ADDRESS. There are some additional unresolved issues of policy, cost recovery, client negotiations, etc. These questions require input from personnel with different skills.

In this document, the distribution of soil inventory data in digital form has been discussed under four major headings; namely, (i) technical _ the actual physical details of the data for release are described; ***(ii)*** policy questions - decisions are required from regional partners, management and policy groups; (iii) mechanics - the details of who does the work, what are the costs and how are they recovered are discussed. Again, the final resolution of this item requires input from management, and; (iv) policy questions and concerns - some items of a policy nature from a variety of government pronouncements. Interpretation and advice is required from policy and management personnel to determine how/whether these items are relevant.

Management advice is required to establish: -
ownership of the data
- where the master copy resides
- resolution of miscellaneous policy issues
- the degree to which service can and should be provided and support for an appropriate organizational structure to meet the requirement.

INTRODUCTION

Traditionally, the soil inventory section of LRRC and provincial counterpart agencies have worked cooperatively to collect, compile and publish reports on the distribution and quality of the land resources of Canada. Normally, the projects have been published as a traditional printed report and accompanying map(s); the project has been considered completed with the publication. In most areas of Canada, this activity has been completely integrated federally and provincially. For example, frequently the field work has been carried out with both federal and provincial employees and support. The LRRC has produced many of the base maps for soil inventory projects and has also published the final maps while the province has taken responsibility for report publication. With the development of computer assisted cartography and geographic informatio~ systems the sharing of effort has continued.

Up until recently, the LRRC was the sole custodian of federal and joint federal-provincial soil map data in digital form (BC had a computer system for provincial data - this system is no longer operational). With the development of commercial GIS software and, in particular, software suitable for implementation on microcomputers, many provinces are actively developing local GIS capability. In several provinces, the equipment has been purchased federally and the operators are provided by the province. In other cases, there are both federal and provincial systems (e.g. Alberta) while for New Brunswick the actual equipment has been purchased jointly. In provinces like PEl and Newfoundland and the Yukon Territories there is no access to GIS for federal staff but provincial systems are being developed. In Nova Scotia, a provincial system is being developed but with federal personnel support.

Land resource data in digital form is much more dynamic than similar data in traditional published paper form. The data in digital form are more volatile in at least three important ways:

(i) output content - the content can range from very rudimentary, consisting of lines and polygon identification number, to a full set of attributes of the map unit, soil names and layers; and true geographic coordinates with accurate registration and associated coverages of hydrography, base data, annotations, etc. The data may be at the accuracy and detail of input or may be generalized.

(ii) output format - the data may be stored on disk, tape, or cartridge. It may be in ARC/Info format or DLG or other GIS formats.

(iii) date/stage of completion - unlike a published report and map, there is no final arbitrary date of completion; there is no definitive product beyond which everything further is value added. Therefore it is extremely difficult to define a MASTER copy.

The dynamic aspect of land resource data is an important and useful feature of the technology because it means that the data can be updated and maintained in current and useful forms as developments occur. It is important to note that if there is no policy for data maintenance and update, the data in the national soil data base will soon become outmoded and irrelevant.

TECHNICAL CONSIDERATIONS

This section deals with a series of technical questions in order to define and describe the objects being dealt with by the policy. It considers the questions:

1. What data are included?
2. How is the information packaged?
3. When are the data available?
4. How is the information updated and maintained?
5. How is the master copy of the data defined?
6. In what formats are the data available?

What Data Are Included?

This policy relates ONLY TO DATA WHICH HAVE BEEN COMPILED AND DIGITIZED BY LRRC and/or its direct cooperators. These data are managed within CanSIS, a soil Geographical Information System developed and supported by LRRC, and are stored in Ottawa in an archive called the National Soil Data Base (NSDB). The NSDB contains the location and attributes related to the biological productivity and susceptibility to degradation of major soils of Canada.

The entire country of Canada is covered at one or several levels of detail in approximately 1500 digital soil maps which are at some stage of completeness. Three general levels of information are stored:

- 1:5 M scale Soils of Canada and associated Land Potential Data Base.

The Soil Landscapes of Canada map series (1:1 million scale) with associated attribute files for dominant and subdominant soil landscape components.

- Detailed soil inventory maps at scales of 1:250,000 and larger.

- Data from LRRC research projects may be stored in the NSDB archive in which case it is available for release with permission of the Ottawa contact person as identified in the project pedigree file. Data obtained from other agencies and used for research or pUblication by LRRC will not normally be available for distribution. This includes base map, cultural and hydrographic information. These data which have not been digitized by LRRC will be subject to the data release policies of the agency of origin.

How is the Information Packaged and Input?

Procedures for input of data to the CanSIS National Soil Data Base archive: Any data in digital form, in particular those relating to interpretations or applications of land resource information, can be designated for storage in the NSDB archive. In addition to the actual data, the following elements of classification, documentation and description must be prepared.

1. The data file(s) will be assigned a unique CanSIS JOBID and descriptive title by the chief cartographer (B. Edwards). These "Special Project" numbers will provide identification throughout the system and will distinguish digital (ARC/Info) projects from others.

2. Project pedigree files are prepared to document the source, quality, nature, vintage of the data files and to specify which other NSDB data (maps) are related data files.

3. A validation procedure is developed and carried out to provide QAQC (Quality assurance and quality control) with all data in the archive.

4. A READ.ME file documenting the specific structure, fields and codes used in the data file is prepared. This file is optional and is distributed with the data and allows any user to understand the information.

5. Because the data input to the NSDB are prepared for general distribution (i.e. electronic publication) it is recommended that they be submitted to the LRRC publication committee for review and assignment of a publication (or contribution) number prior to input.

6. Where possible and appropriate, the data will be verified by a correlator or second researcher as it is input.

7. Where the data involve digitization of map information, this will normally be carried out by the Information Systems Unit (ISU), LRRC. Where the data are input by other resources, ISU will act as a consultant to ensure that consistent standards and quality are maintained.

8. Where map information data are included, the quality control group in ISU will verify the cartographic/geographic quality prior to archive.

In order to be generally useful, any soil map in digital form must meet certain minimum standards of completeness and documentation. For the purposes of this policy, two levels of package have been defined; namely, a minimum and a complete digital soil map. Anything less than the minimum digital soil map package is an interim product and subject to change and correction; its release at this stage would be confusing to the user and would seriously damage the credibility of the agency.

A complete digital soil map includes:

- * a complete project pedigree file
- * standard coverage for the soil theme
- may include hydro theme (for base data) and ANNO theme (only where these data have been digitized by LRRC)
- * the PAT file for the soil theme is extended to include the link to other attribute files and, optionally, additional properties of the polygon.
- a subset of the SNF and SLF which contains all combinations of SOIL CODE + MODIFIER is included as part of the complete digital soil map for all maps except the Soils of Canada.
- * all ARC/Info coverages are in geographic units or documented to be not accurate on conversion
- all ARC/Info coverages include AAT files to allow feature codes to be identified

Within the above list, the items identified by '*' represent the absolute minimum level of data for release of map data in digital form. More complete details of the attribute data files are provided in appendix A.

When is the Information Available?

The are several possible situations which arise when information is requested from the NSDB.

A. The data requested can be released for complete published/finalized soil maps if one of the following conditions are met:

the digital data are available in complete form
the digital data are available in minimum complete form

In both of these situations, the data will be completely verified, they will have received an LRRC contribution number and they will be stored in the FINAL ARCHIVE of the NSDB.

B. The data requested is not complete, published and final and can only be released:

- if author requests, in writing, release of the data and takes responsibility for data quality
- in cases where the data are not complete cartographically (i.e. converted to geographic coordinates and projection, generalized to 0.1 rom and geoedited), then permission is also required from the head of CanSIS for data release. Normally, data which are not complete cartographically WILL NOT BE DISTRIBUTED.

Data received at this stage of preparation should be considered as PERSONAL COMMUNICATION with the author.

C. The data requested are not complete and final and not available for release. Usually as a result of the request, the status of the map will be reviewed to determine the additional work/time required. The estimated time of availability will be discussed with the individual or agency requesting the data to determine whether the data can be provided in time to be useful.

What Constitutes the MASTER Copy of a Digital Soil Map?

The Master copy of a digital soil map has gone through a number of verification and quality control stages to ensure that the information is as complete, correct and consistent with national standards as possible. Briefly, these steps of. control include:

(i) data preparation and verification by the author
(ii) verification and correlation by the provincial correlator quality
(iii) checking of attribute data by computerized routines for completeness and consistency with national standards
(iv) ISU or equivalent edit and verification of the digitized version of the map
(v) author edit and verification of the digitized version of the map (lines and symbols)
(vi) map generalization to 0.1 mm at the manuscript scale geographic edit
(vii) of the map in geographic coordinates (UTM for large scale and Lambert for small scale) to document the correctness of its location and the expected accuracy of the graphic features. archive check
(viii) to ensure that the data content meets the minimum requirements for a digital soil map.

The master copy of the digital soil map is then stored in a secure FINAL ARCHIVE.

What is the Mechanism to Update Master Copies of Digital Soil Maps?

The update and maintenance of data in the National Soil Data Base is an essential part of the operation. This ensures that the data are as accurate and reliable as possible and maintains the ongoing utility and credibility of the data. It is the responsibility of all participants in the NSDB (both provincial and federal) to maintain the quality of the information base.

There are three major ways in which data in the NSDB need to be maintained; namely, ad hoc error correction, major projects to upgrade the quality of data, and technical upgrades to reflect changes in technology.

A. Ad Hoc Error Correction

After the data are published (finalized) there will frequently be small errors in content or accuracy which are detected during use and interpretation. It is unrealistic to expect that the management structure for the NSDB will be adequate to make all corrections immediately while maintaining the other standards of data quality.

The provincial and/or national correlator must approve all error corrections to maintain quality control. The changes will be noted in the project pedigree file as they are reported and maintained in the associated paper file. Periodically, or as the data are requested for use, any changes reported will be incorporated into the digital soil map.

B. Major Projects to Upgrade the Quality of the Data

Some of the data in the NSDB represents digital forms of soil maps and reports which are not complete by modern standards. In some cases this requires additional data added to the existing soil delineations (e.g. slope). In some cases, the new requirements for the data will be at a larger scale requiring both additional data and new delineations. These major upgrades will be carried out either using conventional means such as additional field surveys or increasingly, they will be done using other digital forms of data such as digital elevation models, etc. They will be planned as projects and the data input and upgrade will follow a cycle of verification and quality control similar to the original input of a digital soil map with correlation in the province or region, verification by ISU or equivalent and final checking for completeness prior to input to the final archive.

C. Technical Upgrades

Technical upgrades represent changes to the format or structure of data in the NSDB but not to its content or accuracy. They will be required for a variety of reasons such as changed software, changes in the standards of geographic projections (e.g. from NAD '27 to NAD '83) or changes in the design and organization of the data (e.g. from a combined PAT and SMUF to two separate files). These changes will be made as part of an overall upgrade project and will have verification from ISU and programmer/analysts. They will not normally involve the author or correlation staff.

In What Formats are the Data Available?

The data prepared by LRRC, Ottawa are available in a number of standard formats produced by ARC/Info software. Currently, procedures have been established to transfer data to GIS's operating as follows:

- ARC/Info on VAX
- ARC/Info on PRIME
- CARIS on VAX
- TYDAC SPANS on DOS
- PAMAP on DOS
- Terrasoft on DOS
- pcARC/lnfo on DOS.

POLICY CONSIDERATIONS - CONDITIONS FOR RELEASE OF DIGITAL SOIL MAP DATA:

General conditions

All digital soil maps which meet the m~n~mum level of data AND which have been published (or otherwise finalized) are available for release in digital form.

DIGITAL DATA WHICH DOES NOT MEET THE MINIMUM LEVEL OF COMPLETENESS ANDIOR WHICH HAS NOT BEEN PUBLISHED CAN BE RELEASED ONLY WITH PERMISSION OF THE AUTHOR.

All release of digital data is recorded in the project pedigree file.

A signed DATA RELEASE FORM must be returned and maintained on file for all digital data released to other individuals or agencies. Other than the terms outlined in the DATA RELEASE FORM and the conditions of CROWN COPYRIGHT there are no additional conditions of the use of the data by an outside agency.

Normally, the author of the map or the survey unit responsible for its compilation will be advised of the release of the data in digital form.

Data are released on magnetic tape or floppy disk in a limited number of standard formats easily produced from the ARC/Info format. The exact number and type changes with user requirements.

Data compiled at map scales of 1:250,000 and larger is released in UTM coordinates in units of meters; data at smaller scales is released in Lambert Conformal Projection. The accuracy of all data released is documented in the project file as calculated by comparison of points on the coverage with standard reference points. Where the data cannot be projected to georeferenced coordinates to an accuracy equivalent to 0.5 rom .on the manuscript (the definition of cartographic quality at LRRC) , the data will remain in arbitrary table coordinates.

Liability

Liability of the Crown in the use/misuse of the data has been considered by the legal section of Agriculture Canada and is summarized in the current Data Release Form as

point 6. The USER hereby releases Her Majesty The Queen In Right of Canada, Her servants and employees from all claims, demands, damages, actions or causes of action arising or to arise by reason of any inaccuracies, errors, omissions, misrepresentations or limitations in the CanSIS data.

and,

point 7. The USER shall indemnify and save harmless Her Majesty the Queen In Right of Canada, Her servants and employees from and against all claims, losses, damages, costs, expenses, actions and other proceedings made, sustained, brought, prosecuted, threatened to be brought or prosecuted, in any manner based upon, occasioned by or attributable to the release to or use by the USER of the CanSIS data.

Acknowledgement and Citation

The project pedigree file(s) accompanying the data contains details of the author(s) of the data, their agency and the date of publication (finalization). These are the normal elements to be included in a citation. In addition, because the data in digital form tend to be somewhat volatile, the citation should also include a date of last update.

The ACKNOWLEDGEMENT should include the citation and also the archive facility from which the data were obtained; e.g. NSDB, LRRC, Research Branch, Agriculture.

The advice received from Maria Bencsath of the SERVo & ACQ. / SERVo TECH. ET ACQ. section of the Agriculture Canada Library system is as follows:

Subj: Digital map citation

The order of elements to be included in citations of digital soil maps when provided:

1. Author (primary, responsible intellectually)
2. Title (material designation)
3. Statement of responsibility (person or corporate body as principal investigator, sponsoring agency)
4. Edition
5. Distributor (where to access)
6. Scale
7. Place of publication
8. Publisher
9. LRRC Publication Number
10. Date of original; date of update
11. Series
12. ID number

The first element is always the author up to three names: e.g. B. MacDonald, B. Smith, J. Jones.

When there are more than three authors, citation starts with the title followed by the author or statement of responsibility. e.g. Soils of Ontario [computer file]. B. MacDonald et al.

Title should be underlined.

The publication number contains a "D" to indicate that the data are in digital form. Publication numbers will be assigned to packages of data which correspond as closely as possible to traditional published packages and also to units which can be managed as independent entities.

Four situations arise in the packaging of digital data in comparison to traditional published (printed) formats.

(i) The digital data are identical in content and date with a printed publication - in .this case the digital data will have the same LRRC contribution number with a designation "D".

(ii) The digital data are similar (equivalent) in content with a printed publication but represent an earlier or later version of the data with corrections. The digital data will normally carry the same contribution number as the printed form with the addition of a "D" but MAY have a different number if the date is quite different. The version of the digital data will indicate the date used but it is not part of the contribution number since minor updates and revisions do not represent a new publication.

(iii) The digital data may overlap with a published form BUT they contain additional (or less) information. If the digital data are entirely contained within a single digital package than they should receive a new digital contribution number. If the digital data can be grouped into several packages then the ones which correspond to situations *(i)* or *(ii)* should be treated as such and any additional packages given a new contribution number.

(iv) Where the digital data represent the only format in which the data are published then they will receive a new contribution number provided they meet the normal requirements for a publication.

Citation example:

Shields, J.A. and J.D. Lindsay. 1990. Soil Landscapes of Canada _ Alberta; Digital Map Data; Scale 1:1000000. CanSIS Number AL088200, version 90.10.30; LRRC Archive, Research Branch, Agriculture Canada, Ottawa, Canada. (LRRC Contribution No. 87-02-D)

When citing a "subfile":

Soil Landscapes of Canada - Alberta; Soil Landscapes Polygon Attribute Digital Data. 1990. Alberta Soil Survey Staff. CanSIS Number AL088200, version 90.10.30; LRRC Archive, Research Branch, Agriculture Canada, Ottawa, Canada. (LRRC Contribution No. 90-??-D)

Establishing a Date of Publication for Digital Data

Maria Bencsath, Agriculture Canada Library System, advises that a digital map is to be published at the date it becomes accessible to the users/readers. This date may differ from the date of publication of the printed map. It may also be the same as the date of the printed copy. The printed version may be readily available and accessible to the public while only certain users can have access to the digital version (for hardware or communications reason, etc.). From the citation point of view, printed and digital maps should be cited separately for the above mentioned reasons. That is the reason for including the material designation for digital maps. Printed maps should have the number of maps given in the citation after the date of publication even if there *is* only one map.

****

LRRC - MUST DECIDE on a mechanism to establish when information *is* "published" in digital form. This will likely be defined as when the data have passed through all the steps necessary to be entered into the FINAL ARCHIVE.

****

Kind of Use

Under the current policy, no distinction *is* made between users who require soil maps in digital form for direct combination with other data and use within their organization, and users who acquire the data to redistribute

it at a profit either directly or by adding value. According to the terms of the current data release agreement, the user agrees not to distribute the data directly at a profit.

The project pedigree file(s) accompanying the data contains specification of input scale and spatial resolution, these imply the range of scales over which the data may be used. However, there is no explicit documentation to state, for example, that the data should not be used at scales larger than twice the scale of the manuscript.

Where does the MASTER Copy of the Data Reside?

Throughout this document the assumption is made that the master copy of soil inventory data in digital form will reside in the NSDB in Ottawa.
With the development of regional GIS capability, this assumption may not be valid. This is particularly true as:

- regions such as PEl and New Brunswick are developing provincial corporate Land Information Systems;
- OIP is developing a provincial Land Information Unit with a draft data release policy;
- SIP is developing a joint Federal/Provincial data release policy for Saskatchewan.

It is necessary to review the listing of soil maps scheduled for completion in digital form to designate "ownership" of the master copy when complete (ownership in this context indicates responsibility). If the 'owner' is other than LRRC, then the master copy should reside with the 'owner' provided that the 'owner' agency can guarantee quality assurance and maintenance of the data equivalent to data stored in the NSDB and is prepared to make the data available to external users. LRRC may choose to retain a copy in Ottawa for completeness of the NSDB but it would normally be for internal use only and not for distribution.

MECHANICS OF DISTRIBUTION OF SOIL MAPS IN DIGITAL FORMAT

1. Who is responsible for distribution?

   Owner or designated agencies - it is important to identify a limited number of delivery agencies.

2. What is the response time?

   Currently, there is no organizational structure in LRRC, Ottawa for servicing requests for digital data. Consequently, the service is provided as an additional duty on an ad hoc basis. This means that a request may not be filled for 6 weeks to 3 months. The reasons for this are that frequently all the data to fill a request are stored in Ottawa but the final stages of quality control have not been carried out *(i.e.* the SMUF and PAT need to be linked, the final geographic edit must be carried out, etc.) and the personnel available to service the request are committed to other projects. This is an extremely frustrating situation both to LRRC personnel and also to the clients requesting data.

Response time for complete data sets should be approximately 2 - 3 weeks for data -in standard formats. If the organizational structure is provided to mobilize completion of the maps most in demand, then the overall time for data release could be shortened. In effect, staff is required to service requests as their primary responsibility.

3. What is the true cost of data distribution?

This question requires a fair assessment with considerations similar to the cost estimates used by Statistics Canada. Decisions about this item concern policy and are beyond the scope of this report.

4. What is the recoverable cost?

While this decision must be made at a policy level and not at the technical level of this report, the following questions need consideration. Is the cost recovered just the cost of copying data for distribution or is there a portion of funds which are to cover costs of the survey and maintenance of the data base? If there is profit and the data have joint ownership, how are these costs shared between a province and the federal government?

5. How are custom requests handled?

Should the Statistics Canada model be adopted to develop procedures to handle custom requests involving additional data processing?

POLICY QUESTIONS AND CONCERNS - from various sources:

1. From OTTD::EM019SEC - EMAIL - Message to Managers

Federal expenditure reductions and management improvements.
December 15, 1989.

point 7.

New Policy on User Charging - the government feels that the users and other direct beneficiaries of government services should pay their fair share, rather than have these services funded, in general, by all taxpayers.

The revised policy provides important new incentives to encourage government managers to pursue opportunities for cost recovery of services. An important new feature of the policy is the provision for departments to reinvest part of the proceeds from increased user charges to make necessary improvements to services generating those revenues.

The policy requires advance notification to users, and, where the impact might be considered large, consultation with users and other significantly affected parties. This will allow users to participate in the analysis and consideration of less costly options that might be proposed, such as reducing the level of service or streamlining delivery. Where services are mandatory and the impact of charging for such services is large, the governments will provide users and other significantly affected parties with the opportunity each year to make formal submissions to the

responsible Minister on the efficiency of program delivery and less costly ways to achieve program objectives.

The most noticeable impact of this new policy in Agriculture Canada will be in F.P.& I. and P.F.R.A.

2. From GUIDELINES FOR RESEARCH AND DEVELOPMENT AGREEMENTS WITH EXTERNAL COLLABORATORS distributed by W. Pettapiece. 90-04-18.

6.6 Ownership of research results

Normally. all technical information, inventions. designs, methods. processes, software and biological material conceived, developed or first reduced to practice in Agriculture Canada establishments as a result of carrying out the collaborative research project shall be the property of the Crown and, subject to Access to Information Act, shall be treated as confidential. However, special circumstances may warrant negotiating alternative arrangements. In consultation with the IRO and Agrilaw, fall-back positions will be negotiated on a case-by-case basis .
..... . etc

****
WHO OWNS THE LAND RESOURCE DATA???? should we not answer this before we try to develop a policy?
****

3. From GOVERNMENT DATABASES - A discussion paper to assist federal government institutions in the disseminating of databases. Prepared by the Federal Interdepartmental Working Group on Database Industry Support. (contact Roy Marsh. Ministry of Communications)

"Statutory Framework
The copyright act, the financial administration act, the access to information act, the privacy act and the official languages act all come into play in licensing Federal government databases and constitute part of the legislative framework under which the negotiations should take place."

"Copyright Act
Under the copyright act which was revised in 1988 and is now being revised again, for any work that is or has been prepared under the direction or control of Her Majesty, the copyright in the work shall belong to the Crown for a period of fifty years from the date of publication. The Crown has exclusive right to use the work in any manner whatsoever or to authorize others to copy it.

Government databases are Crown works protected under the copyright act. As such, the commercialization of databases can only be achieved through such methods as donation, sale, license or loan.

In order to dispose of a government database through a donation or a sale. it is necessary to obtain the approval of the Treasury Board and an Order-in Council under the FAA. Federal institutions, however, are able to license or loan their databases without obtaining prior approval as long as they protect crown ownership in the licensing or loan agreement .... "

"Treasury Board Policies and Practices

.... The new Federal Government approach to management embodied in Increased Ministerial Authority and Accountability (IMAA) and the policies of the Management of Government Information Holdings (MGIH) and on Government Communications provide an overall management frame of reference for decisions related to the licensing of databases .... "

"Initial Investments, Cost Recovery and Royalties

In recent years, the government has emphasized cost recovery for services provided by government institutions. This is reflected in the Policy on Government Communications which requires that in assessing the cost of making information available for purchase by the public, Federal Institutions should take into consideration the full costs of collecting, compiling, preparing, producing and disseminating information. This does not imply, however, that these costs must always be recovered in full.
"

4. From KEY ELEMENTS OF THE IMAA MOU between Treasury Board and Agriculture Canada. JUly I, 1990

Section 3 - Financial Management

B. NEW INITIATIVES

3.2 Decontrol of person-years for term employees paid from specified purpose accounts.

3.5 Revenue-sharing arrangements for research activities

(i) to provide incentives for the Branch to implement cost recovery for the provision of research facilities and SERVICES to outside parties ..... .

3.6 The second provision on the sharing of Research Branch revenues concerns the sale of any goods not specified in e.S above, THE CHARGING OF OUTSIDE USERS FOR SERVICES AND/OR THE USE OF RESEARCH BRANCH FACILITIES, ALL ROYALITIES (including those currently collected on plant varieties and those earned from licensing of technology developed by Agriculture Canada and which were previously collected by Canadian Patents Development Limited) .....

- the Research Branch will retain 100 percent of revenues up to $ 3.0 million for 1990-91

APPENDIX A: ELEMENTS OF A COMPLETE DIGITAL SOIL MAP

(a) Project file(s) - a map pedigree

The project file(s) provides a record of the lineage of the digital map and the data sources and checkpoints along the way to its completion. This file is produced for each map in the system.

In addition, the digital product is a model of a portion of the earth's surface; consequently, information about the georeferencing system, projection, etc., becomes important. Furthermore, it is important to record the parameters of tolerance and accuracy used in the computer to produce the final digital record.

(b) Thematic boundaries and associated information

The ARC/Info software generates a range of files to define the soil polygons (an ARC/Info coverage). Some files we have adapted to our application. The ARC attribute files characterize the thematic boundaries. The ARC attributes define features such as hydrographic or administrative boundaries normally stored and managed by other agencies. The definitions used by LRRC are identical to the other agencies', in this case EMR, and determine a subset of codes appropriate for our application.

(c) An operational definition of cartographic quality

One aspect of accuracy which had to be dealt with was a term carried over from published maps; namely, cartographic quality. This term has normally represented the fidelity with which the cartographer has reproduced the original manuscript map. Soil maps produced by LRRC have met a standard of cartographic accuracy on the final map to within 1 line width of the original. With computer assisted cartography, line widths from the plotter were normally 0.5 rom or less and this became the standard of accuracy for map output.

For data in digital format, the conceptual definition had to remain the same but the operational definition has changed to a specification of the tolerance within which the map is generalized. Our experience shows that data can be generalized to a tolerance corresponding to 0.1 rom on the manuscript and still meet our definition of "cartographic quality". A generalizing tolerance of 0.2 rom is marginally acceptable and larger tolerances result in distortions of the map which are unacceptable.

(d) Soil map attribute files and their relationships

The other important part of the definition describes the attributes and the relationships between the various kinds of data which make up a complete soil map. Within the thematic coverage, the individual polygons are classified to define the soil and/or landscape units which are to be represented on a soil map. The POLYGON ATTRIBUTE TABLE (PAT) as created by the GIS is combined with an attribute file to define the properties of each polygon and to relate them to the repetitive components of the soil map.

(d.i) For Soil Inventory Maps (large scale generally 1:20,000 to 1;125,000) the SOIL MAP UNIT FILE compiled by the *soil* surveyor *is* linked to the PAT. The surveyor can define up to three soils and associated information for each polygon.

(d.ii) For Soil Landscapes of Canada (SLC) Maps (scale of 1:1,000,000) the COVERAGE includes three (3) attribute files relating to the polygon. These are the PAT (Polygon Attribute Table) as created by the ARC/Info software, a DOMinant attribute file defining the properties of the dominant soil landscape component of each polygon and a SUBdominant attribute file describing the subdominant component. Each of these files contain references to specific typical soils which are further characterized in the Soil Names and Soil Layer files. The user is responsible for making any linkages required between the files. The LRRC has verified that attribute records are present for each polygon. Areas which have not been characterized are identified by a code in the Rock Outcrop or other Surface Material item and a proportion - 100. Further, the LRRC has confirmed that for all polygons for which the dominant landscape occupies less than 80 % there *is* a record in the SUBdominant file.

(d.iii) For the Soils of Canada Map (scale of 1:5,000,000) an extensive series of attributes have been compiled and stored in the Land Potential Data Base. The pAT *is* linked to a map symbol which *is* unique for each polygon. This symbol is the key to the other attributes documented in the Land Potential Data Base. There is no reference in any of these files to specific soils described in the Soil Names and Soil Layer files.

(d.iv) Data produced in conjunction with LRRC research projects and stored in the NSDB may have other specialized formats documented within the project.

(e) Description of the soil properties in the Soil Names and Soil Layer files

The soils which make up the map polygons represent entities which can occur over a wide geographic region. They are characterized by general properties of the soil (e.g. drainage, watertable, mode of deposition) and also properties of the layers or horizons. The Soil Map Unit File defines the combination of soils in a polygon or series of polygons and points to the Soil Names and Soil Layer files for specific detailed information about the soil. These latter files are provincial in scope. The overall organization of the attribute data is within a relational data base model.

APPENDIX B: Copy of the current checklist for release of digital data.

DATA EXCHANGE REQUEST. from -
(please complete all answers in uppercase letters)

CLIENT INFORMATION
****

-Date of receipt of written request -

-Copy of request from is on
file with

-Contact name of end user -

-Contact address and phone number. -

Tel
Fax

DATA REQUESTED (if coverage is not clean and in geographic coordinates and linked to SMUF or attribute files (SLC) then author must release the data)
********** -

Jobid, Maptitle
- Projection UTM ... (Y/N)
LAMBERT ... (Y/N)
- linked to SMUF ... (Y/N)

DATA MANAGEMENT ACTIVITIES
****

- Generalize ..... (y/n and specify tolerance)

-Procedure as specified in DATA EXPORT REPORT

Appendix 1 - (ARC/Info on VAX)	_ ( )
Appendix 2 - (ARC/Info on PRIME)	_ ( )
Appendix 3 - (CARIS on VAX)	_ ( )
Appendix 4 - (TYDAC SPANS on DOS)	_ ( )
Appendix 5 - (PAMAP on DOS)	_ ( )
Appendix 6 - (Terrasoft on DOS)	_ ( )
Appendix 7 - (pcARC/Info on DOS)	_ ( )

Special instructions not in appendix .....

PAPERWORK TO BE COMPLETED
****

Documentation to accompany medium must include:

- COMPLETED PROJECT FILE, INCLUDING:

-CanSIS ID ..... YES
-projection parameters .. YES
-scale of manuscript ..... YES
-resolution of coverage (if applicable)
-geo-edit resolution .... YES

-transfer format of cover/data •. YES
-medium identification and parameters .. YES
-indicate that medium is to be returned .... (Y/N)

- Verification plot to be sent with cover/data. (Y/N) paper/mylar
- CanSIS release form to be completed and returned .. YES

Other documentation required:

- Update coverage project file ... YES
- For information send copy request to (regional correlator)
  (TO BE DONE BY ISCU)
  Include log file if data put to tape using a VAX
  utility (ie. BACKUP) ... (Y/N)
- Notify GISITM if tape medium is exported ... (Y/N)
- Produce copies of documentation for your records ... YES
- Notify GISITM once tape is returned .... (Y/N)
- To be sent by (courier) ....(regular mail) ....(other) .....
  or returned to (e.g. MacDonald) .....to be sent
- Date Required by .....YYMMDD

4. SOIL SURVEY EVALUATION DISCUSSION

4.1 SOIL SURVEY EVALUATION DISCUSSION

(Wayne Pettapiece)

The Evaluation of the Land Inventory Section of LRRC was completed and reports with recommendations circulated to all collaborators. This presentation is to provide you with our interpretation and actions and to receive guidance on how to proceed.

The recommendations relate to federal, prOVincial and LRRC domains. They refer to changing relationships and reorientation. We look on it as a positiv.e report which confirms that LRRC should maintain a role in inventory and give it a renewed mandate albeit with reorientation.

I. Implementation activities:

1. Recommendation III called for a reorientation to place emphasis on:

a) NSDB
b) correlation and standards (taxonomy)
c) interpretations, monitoring
d) maintaining a critical mass.

The first two are directly inventory related and even though the Research Branch has a certain reluctance to embrace inventory because it is more of a service than research, there is a firm commitment to support these activities. We, for our part, have interpreted the National Soil Data Base (NSDB) as including the collecting of data where required - and it becomes our reason for collaboration with provinces in operational surveys.

We have transferred our activities relating to soil quality evaluation monitoring and land evaluation into a category called non-inventory. It does however still support provincial application of data and should not be considered a withdrawal from soil survey, - a gradual withdrawal from mapping per se, but accompanied by an increased support in application and interpretation activities.

We interpret the last item as the responsibility to maintain a pedological presence in all parts of Canada and to sponsor such activities as ECSS.

2. At the prOVincial level, Recommendation II calls for a gradual federal reduction in operational and service aspects of inventory:

This can be done by conSUlting with provincial partners and by pursuing cost recovery, etc.

In spite of the request for more inventory (or mapping) Support from provinces, the federal position is that the provinces should take the lead in areas such as land use and on-farm management projects which are clearly in their jurisdiction. Federal

activities must be related to federal mandates, but at the same time there is sensitivity to the strong message sent by provincial and other collaborators for continued cooperation.

Our response has been to develop a generic Memo of Understanding (MOU) which will be discussed later.

- The compromise seemed to be:

a) projects specifically designed to support provincial objectives (such as on-farm management, conservation planning, detailed land use) should be provincial responsibility.

b) but federally, we have a responsibility for a NSDB which can be used to analyze policy, programs, status of the environment, etc ... So we also need at least some of the information gathered in all inventories and therefore it makes sense to collaborate and we should be part of the process.

In terms of concrete numbers, let me share with you what we are sending up to senior management:

	Inventory PY	Non-Inventory PY
198	8	2
0	0	0
198	70	3
9	65	0
199	55	3
0	5	5
199	0	4
1	3	5
199		5
5	a)	0

I would like to stress two points:

a) Non-inventory is not a withdrawal from Soil Inventory but rather a shift to applications.

b) We feel very positive about the mandate, the reorientation and the roles, and feel we can justify and maintain the *50/50* split in PY allocation by 1995.

Cost recovery:

I think we are all looking at cost-recovery of some sort. Our response has been directed to two avenues:

a) Joint projects -- doesn't exactly bring in money, but will share the costs. ego temperature monitoring in Mackenzie.

b) Charging for data or services relating to special requests for data, particularly digital data;
- provinces can and are doing this
- we cannot yet charge to support our own programs

3. At the federal level we have to consider the following:
   - report to Treasury Board satisfying the Neilson Report
     memo going to DM level indicating that we recognize the need for soils information by other departments and would like to discuss opportunities for collaboration. For example, to consider activities on a joint venture basis outside of Agriculture (EnVironment, Forestry, Indian and Northern Affairs).

II Memo of Understanding

There was an obligation to bring provinces into the discussion of our reorientation. After all, we had been working together (in some provinces) for over 50 years. With that kind of history, and it has been a history of accomplishment, one does not sUddenly make unilateral decisions without consultation.

The main objective was to clearly outline the collaborative nature of our work and the expressed provincial support for the involvement of federal staff in provincial activities.

The development of the draft generic MOU was the first attempt to outline the situation. It says basically:

1) we need to and wish to cooperate;
2) there are some broad general guidelines which we need to recognize; and
3) there is an opportunity to establish more specific sUbsidiary agreements to allow integration/collaboration with others.

It is our wish and expectation that we can use this kind of instrument to establish a sound working relationship in each province.

Discussions indicated that the provinces were skeptical of federal initiatives which appeared to include a divestiture of responsibilities and that it was important to clearly indicate how an MOU would benefit the provinces. It was also pointed out that there were a plethora of MOUs presently under discussion and that it might be better to associate this one with existing accords if that was appropriate.

5. REVISED TERMS OF REFERENCE

Terms of Reference*

In response to a request to review and update the Terms of Reference for ECSS, the following revisions are suggested:

1. To advise the Canada Committee on Land Resource Services (CCLRS) and other agencies of the adequacy of soil survey and land evaluation services in providing for sustainable development of land resources for agriculture and other users.

2. To encourage the establishment of a national system of soil classification and land evaluation by structuring working groups to recommend and encourage research on soil classification systems and operational procedures for use on a national basis.

3. To exchange information on major pedological activities, issues and concerns in members' respective jurisdictions.

4. To develop and recommend strategies and actions in response to land resource and environmental issues of national or regional importance.

5. To recommend to the CCLRS actions required for improved service in the resource areas of soil survey and land evaluation.

6. To carry out special tasks and studies and to perform other duties as may be required by CCLRS or other concerned agencies.

* This section is also contained in the ECSS report to CCLRS (appendix 4).

APPENDICES

APPENDIX 1. AGENDA AND MEMBERSHIP LIST FOR 1990 ECSS MEETING

Expert Committee on Soil Survey Meeting
Ottawa, 29-30th October, 1990
Main Floor, Conference Room, Neatby Building,
Central Experimental Farm, Ottawa

AGENDA

Monday, October 29th

8:30 - 9:00	Welcome, Mr. M. Feldman, Deputy Director, LRRC	
9:00 - 9:10	Introduction to meeting - E.E. Mackintosh CASCC	
9:10 - 9:30	Action Taken - 1989	
9:30 - 10:00	Provincial Reports: British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, New Brunswick, Atlantic Region	
10:00 - 10:30	COFFEE	
10:30 - 12:00	Provincial Reports: General discussion.	
12:00 - 1:30	LUNCH	
1:30 - 3:15	Reports of Working Groups	
	1:30 - 2:00 - Soil Classification	- C. Tarnocai
	2:00 - 2:25 - CANSIS	- B. MacDonald
	2:25 - 2:50 - Agronomic Interpretations	- W. Pettapiece
	2:50 - 3:15 - Map and Report Formats	- C. Tarnocai
3:15 - 3:30	COFFEE	
3:30 - 3:45	Soil Survey Handbook	- G. Coen
3:45 - 4:00	SWIG - Soil Water Investigations	- R. Eilers
4:00 - 4:15	Soil Survey Reliability	- D. Moon
4:15 - 4:30	Forestry Interpretations	- D. Moon
4:30 - 5:00	Soil Quality Evaluation Project	- D. Acton

Tuesday, October 30th

8:00 - 9:45	Soil Survey Evaluation - Brief presentation and discussion	- W. Pettapiece
9:45 - 10:15	COFFEE	
10:15 - 12:00	Digital Information Systems Requirements for the '90s, format, data ownership, cost recovery	- B. MacDonald
12:00 - 1:30	LUNCH	
1:30 - 2:00	Terms of Reference for ECSS	
2:00 - 2:30	Working Group Structure and Requirements	
2:30 - 3:15	Issues and Recommendations to carry forward to CCLRS	
3:15 - 3:30	COFFEE	
3:30 - 4:30	Issues and Recommendations	
4:30	Adjourn	

MEMBERSHIP LIST OF EXPERT COMMITTEE FOR SOIL SURVEY

The current members, full addresses and termination dates are listed below:

	Regional Members	Term ends*
British Columbia	H.A. Luttmerding Province of B.C. Integrated Management Br. Ministry of Environment 777 Broughton Street, Third Floor Victoria, British Columbia V8V lX5 Tel: (604) 387-9657 Fax: (604) 356-7183	199 1
Alberta	S. Moran Alberta Research Council P.O. Box 8330, Postal Station F Edmonton, Alberta T6H 5X2 Tel: (403) 438-7507 or 450-5251 Fax: (403) 461-2651	199 1
	Courier to: S. Moran Alberta Research Council 250 Karl Clark Rd., Environmental Research and Engineering Dept. Edmonton, Alberta T6H 5X2	
Saskatchewan	D. Anderson Head, Dept. of Soil Science John Mitchell Bldg., Rm. 144 University of Saskatchewan Saskatoon, Saskatchewan S7N OWO Tel: (306) 966-6827 Fax: (306) 966-6881	1993
Manitoba	G.F. Mills Canada Manitoba Soil Survey Soil Science Building, Rm. 362 University of Manitoba Winnipeg, Manitoba R3T 2N2 Tel: (204) 474-6105 Fax: (204) 275-5817	199 1

	Regional Members	Term ends*
Ontario	G. *Driver* Mgr. Soil Management Program O.M.A.F. 52 Royal Rd., Guelph, Ontario NIH 6NI Tel: (519) 767-3554 (Ext. 315) Fax: (519) 767-3635	1993
Quebec	D. Carrier *Service* de la recherche en sol du MAPA Complex Scientifique 2700, rue Einstein, B-1-205 ,Ste-Foy, Quebec GIP 2W8 Tel: (418) 643-2334 Fax: (418) 643-3361	1993
New Brunswick	I. Ghanem Dept. Agriculture & Rural Development N.B. Ministry of Agriculture Agriculture Research Station Lincoln Road, Box 6000 Fredericton, New Brunswick E3B 5Hl Tel: (506) 453-2666 Fax: (506) 453-7170	1991
Nova Scotia Prince Edward Island Newfoundland	D. Moerman Nova Scotia Dept. of Agriculture and Marketing Nova Scotia Agriculture College Harlow Institute, 176 College Rd., First Floor Truro, Nova Scotia B2N 5E3 Tel: (902) 893-6600 Fax: (902) 893-0244	1992
Chairman	E.E. Mackintosh Ecological *Services* for Planning Ltd. 361 Southgate *Drive* Guelph, Ontario NIG 3M5 Tel: (519) 836-6050 Fax: (519) 836-2493	1991

	Regional Members	Term ends*
Secretary	J.A. Shields Land Resource Research Centre Agriculture Canada Central Experimental Farm Neatby BUilding, Rm. 3035 Ottawa, Ontario KIA OC6 Tel: (613) 995-5011 Fax: (613) 995-7283	199 3

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(Courier to:)	O. Hendrickson Forestry Canada 3rd Floor 75 Albert Street Ottawa, Ontario KIA IG5
Envir.	J. Thie Conservation and Protection Inland Waters Directorate Environment Canada Director General's Office Place Vincent Massey 351 St. Joseph Blvd., 8th Floor Office of Denis Davis Hull, Quebec KIA OH3 Tel: (613) 953-1540 Fax: (613) 997-8701

APPENDIX 2. ACKNOWLEDGEMENTS FOR 1990 ECSS MEETING

Ecological Services for Planning Ltd. - For preliminary reformatting, compilation and word processing of the Provincial and Working Group Reports.

Linda Howe, Annette Davidson - For their expertise in word processing and their patient cooperation in formatting and typing these proceedings.

Jeff Brown, Dave Kroetsch - Meeting room arrangements, set up, photocopying, report writing.

Brian Edwards - Coffee supply.

Dian Beaudin, Donna Lacelle - Sending FAX Transmissions.

APPENDIX 3. SUMMARY OF WORKING GROUP RECOMMENDATIONS TO ECSS

SOIL CLASSIFICATION WORKING GROUP RECOMMENDATION:

1. It is recommended that the ECSS accept the workplan outlined for the Soil Classification Working Group.

The motion to accept this recommendation was carried by the ECSS.

CANSIS WORKING GROUP RECOMMENDATIONS:

1. That the CanSIS Working Group reviews the operation of the NSDB and related data bases, including their organization, format, content and applications.

2. That digital data publication, data distribution and marketing be promoted and advanced by defining appropriate packages for digital map data including citation, acknowledgement and procedures involving the LRRC publication committee and continuing negotiations with counterpart provincial and regional agencies to resolve questions of standards, shared data management, distribution and marketing.

The motion to accept these recommendations was carried by the ECSS.

SOIL SURVEY HANDBOOK WORKING GROUP RECOMMENDATION:

1. That the ECSS should solicit commitment from the management of member agencies to identify at least 0.5 PY and support for a single individual to work full time on completing (with some volunteer submission and editing) the Soil Survey Handbook.

The motion to accept this recommendation was defeated by the ECSS.

AGRONOMIC INTERPRETATIONS WORKING GROUP RECOMMENDATIONS:

1. That ECSS accept the report and encourage members to contribute to the testing.

2. That there is a high priority need for a companion document for forages.

3. That the Working Group be dissolved after the testing and publication phase.

4. That crop specific suitability rating, using the same format, should be developed by appropriate regional working groups.

5. That the Land Resource Research Centre (LRRC) maintain a core study to provide coordination to receive concerns or suggestions, and to respond to issues identified by ECSS or other agencies.

The motion to accept these recommendations was carried by the ECSS.

SOIL WATER REGIME CLASSIFICATION WORKING GROUP RECOMMENDATIONS:

1. That aridity Index tables be generated for each appropriate climate station in Canada using long term values of precipitation and evapotranspiration. These aridity indices could be included and published in the methods manual - "SWIMM".

2. That the criteria for depth to saturated soil zone be amended as follows:

   a) Class "Hit, be subdivided into three intervals: HI - 0-20 cm (Extremely High), H2 - 20-50 cm (Very High) and H3 - 50-100 cm (Moderately High) for application to soils with perched water tables due to permafrost tables, and/or to other soils with near surface, restricting, or compacted layers. (Note: permafrost table not to be considered a frozen water table.)

   b) Class "S" for surface water be added to accommodate wetland classification and that two intervals be recognized: SI - 0-20 cm (Shallow) and S2 = 20-60 cm (Moderately Shallow).

3. That the Soil Water Regime Classification System be considered operational and that it be finalized and officially adopted for use in soil water regime characterization in Canada.

4. That the ECSS makes arrangements for a technical edit of SWIMM to be completed for distribution prior to the 1991 field season.

5. That, on the completion of SWIMM (in prep.), the activities of the "SWIG" Working ·Group be considered complete as per the original terms of reference.

The motion to accept these recommendations was carried by the ECSS.

MAP AND REPORT FORMATS WORKING GROUP RECOMMENDATIONS:

1. The MRF Working Group feels that the standard map package represented by the Wainfleet map and the production scheme presented (in Table 1) should satisfy all the needs of the Soil Survey Units and should be accepted as a system for producing standard maps.

2. The recommended types of standard soil survey reports are:
   MEMOIRS
   FORMAL REPORTS (types #1 and #2)
   INTERIM REPORTS

   All of these reports contain ARC/Info-generated soil descriptions and standardized text, except for interim reports which could contain only the ARC/Info information.

3. That reports for special projects should also be standardized and should be generated using the Saskatchewan LANDBASE information system or Newfoundland On-Farm reports as examples.

4. That some soil survey reports should be produced and distributed on computer disks.

5. That all small soil survey projects should be published using the CLI format.

6. The members of the MRF Working Group feel that all objectives have been met and that our activities concerning the standard maps and reports have been completed.

The motion to accept these recommendations was carried by the ECSS.

SOIL SURVEY RELIABILITY WORKING GROUP RECOMMENDATION:

The chairman of the working group recommends that member agencies write duties and responsibilities into individual work plans. If the member agencies are not willing to do so, the chairman recommends that the working group be dissolved.

The motion to disband this Working Group was carried by the ECSS.

FORESTRY INTERPRETATIONS WORKING GROUP RECOMMENDATION:

It was reported that no further action was taken on the manual for Forestry Interpretations.

A motion requesting Mr. Ole Hendrickson and some of his colleagues of Forestry Canada to investigate the possibility of a continuing working group on the use of soil survey information for forest management was carried by the ECSS.

APPENDIX 4: REPORT AND RECOMMENDATIONS TO CCLRS

Report of the Expert Committee on Soil Survey to the Canada Committee on Land Services (November, 1990)

Executive Summary

A meeting of the Expert Committee on Soil Survey was held in Ottawa on October 29 and 3D, 1990. A detailed report of past year activities was prepared and circulated to the membership prior to the meetings.

A. Summary of Activities and Concerns

1. Soil Inventory and Mapping

The demand for soil survey information is probably at its highest level. In particular, several provinces and the Yukon Territory noted their inability to meet requests for additional survey information given the present level of support for the program.

2. GIS/CanSIS

Activities related to computerizing soil data bases continue to have a high priority across the country. Increased requests for the information have highlighted problems of data compatibility and transfer, as well as those relating to data ownership, citation and acknowledgement.

3. National Soil Conservation Program - Soil Quality Evaluation Project.

There were major activities in soil quality monitoring in nearly every province in response to the National Soil Quality Evaluation Project.

4. Backlog of Published Reports and Maps

The backlog in production of reports and upgrading of old inventories continues to be a major problem for many units across Canada and is impacting on our ability to deliver our product to user groups.

5. On-farm surveys continue to be a priority for provincial agencies in Atlantic Canada.

B. Areas of Concern

With few exceptions, there appears to be an increased emphasis on the use of soil survey information across Canada. This reflects increased activity in extension programs by the various soil survey units, a growing awareness by the public of soil conservation and degradation problems, and implementation of conservation programs such as the NSCP.

The following areas of concern reflect many of the issues identified in the 1989 report to CCLRS, and as well, new areas identified in individual reports received from various units across Canada.

1. Lack of Trained Fersonnel

A number of provinces and a private sector attendee expressed a common concern that there is a shortage of trained personnel, including graduate level pedologists and people capable of mapping soils, to service the growing demand for land resource inventories. Adequately funded graduate student programs to support pedological and l~nd evaluation research at the M.Sc. levels are needed to maintain a critical mass of soil inventory research and mapping expertise.

2. Soil Survey Extension and Technology Transfer

Substantial funding to soil inventory programs in several provinces has improved the availability of soil survey information and created a high demand for the product. At the same time the federal government is increasing its role in developing standards for correlation, geoinformation systems and applications. Consequently, greater emphasis must be placed on soil survey extension and technology transfer activities by provincial counterparts.

3. Soil Inventory Activities

The ECSS recognizes the important role the LRRC Inventory Section has had in assisting with the project supervision, standards development and a limited but important mapping activity. Furthermore, the Committee recognizes that it is essential to maintain active involvement of federal personnel in soil mapping programs in each province and the Yukon to ensure continued acceptance of soil correlation standards, interpretive guidelines and National Soil Data Base activities.

C. Recommendations

The following recommendations were approved by the ECSS.

1. Soil Quality Evaluation Project

That federal-provincial agencies assign the Soil Quality Evaluation Project a high priority and encourage the securance of adequate long term funding to complete the project in order to implement sustainable agriculture.

Background: A Soil Quality Evaluation Project has been developed by the LRRC in collaboration with other government agencies and universities across Canada. This project relies heavily on short-term funding from the NSCP for initiation, but the payoff for the response to sustainability and environmental issues is long-term. The strategy for continuance of this valuable and timely project is a concern recognized by ECSS. Implementation of aspects of the SQEP could be accomplished by relating it to safety net programs.

2. National Soil Data Base

That NSDB development, maintenance and application be promoted by exploring collaborative research programs to address land management problems and policies. These would represent joint FederalProvincial activities sharing expertise in GIS and other appropriate technologies and would involve discussions of marketing and access issues concerning the NSDB.

Background: Traditionally, the soil inventory section of LRRC and provincial counterpart agencies have worked cooperatively together to collect, compile and publish reports on the distribution and quality of the land resources of Canada. The inventory projects have been published as a printed report and accompanying map(s). In most areas of Canada this activity has been completely integrated federally and provincially. This joint effort has continued with the development of computer assisted cartography and geographic information systems. In addition, data have been compiled in digital form and stored in a computerized archive of the National Soil Data Base (NSDB). This data base contains the location of the major soils of Canada and their attributes related to biological productivity and susceptability to degradation.

In the NSDB, the entire country of Canada is covered at one or several levels of detail in approximately 1500 digital soil maps which are at some stage of completion. Three general levels of information, among others, are stored.

1:5 million scale Soils of Canada and associated Land Potential Data Base;

the Soil Landscapes of Canada map series (1:1 million scale) with associated attribute files for dominant and subdominant soil landscape components;

detailed soil inventory maps at scales of 1:250,000 and larger.

Further developmental research of the NSDB will enhance its ability to support land resource management. The next area of development will involve collaborative federal-provincial research and projects to evolve standards for applications, regional validation, maintenance and upgrade of the data base.

3. Land Resource Research Centre

That federal-provincial agencies proceed with discussions to clarify and stabilize their commitment to soil inventory programs across Canada.

Background: The evaluation of the LRRC Inventory Section is complete including recommendations calling for a gradual reduction in the federal soil inventory role accompanied by a reorientation to concentrate on standards for correlation, geoinformation systems and applications. Concern has been expressed by provincial partners that present programs might be jeopardized. To avoid further concerns and/or misinterpret-

ations it is recognized that documentation of partner responsibilities is @ssential. Doeumentation should proceed slowly, be sensitive to federal-provincial concerns and explore the possibility of appending to existing Accords.

4. Involvement in New Initiatives

That for new sustainable agriculture initiatives, such as those in Agriculture Canada and Environment Canada (Green Plan), pedologists familiar with land resource data bases and their use be requested to assume a major role similar to that taken in the design and implementation of the NSCP.

Background: Soil survey, land evaluation and the National Soils Data Base have made a substantial contribution to developing the Soil Quality Evaluation Project of the National Soil Conservation Program. Research activities of this Project are excellent examples of significant contributions to environmental sustainability.

5. Agriculture Safety Net Programs

That future Agricultural Safety Net Programs support the maintenance of soil quality by promoting sustainable agricultural systems suited to the land resource.

Background: The Agricultural Policy Review is proposing new Agricultural Safety Net Programs, the structure of which will affect producer management decisions and may further stress Canada's land resources which are currently limited in the ability to sustain agricultural production. Implementation of sustainable agriculture could be tied to safety net programs.

D. Terms of Reference

In response to a request to review and update the Terms of Reference for ECSS, the following revisions are suggested.

1. To advise the Canada Committee on Land Resource Services (CCLRS) and other agencies of the adequacy of soil survey and land evaluation services in providing for sustainable development of land resources for agriculture and other users.

2. To encourage the establishment of a national system of soil classification and land evaluation by structuring working groups to recommend and encourage research on soil classification systems and operational procedures for use on a national basis.

3. To exchange information on major pedological activities, issues and concerns in members' respective jurisdictions.

4. To develop and recommend strategies and actions in response to land resource and environmental issues of national or regional importance.

5. To recommend to the CCLRS actions required for improved service in the resource areas of soil survey and land evaluation.

6. To carry out special tasks and studies and to perform other dutJes as may be required by CCLRS or other concerned agencies.

E. Membership

Membership in the Committee has been updated for 1990 (Appendix 1). Several new members have been appointed. As well, Newfoundland, Prince Edward Island and Nova Scotia will be represented by one member in the future.

AffENDIX 5. ATTENDANCE AT 1990 ECSS MEETING

Attendance List

NAME	ADDRESS
I. Ghanem	Box 6000, Fredericton, N.B.
Don Acton	Soil Survey Unit, LRRC, Saskatoon Forestry
Ole Hendrickson	Canada, Sci. Div., Ottawa LRRC - Manitoba
Bob Eilers Dennis	Soil Survey, Winnipeg P.O. Box 550, Truro,
Moerman Harold	N.S. R2W 5E3 Sask. Survey Unit, U. of S.,
Rostad Herb	Saskatoon B.C. Ministry of Environment,
Luttmerding	Victoria
Darwin Anderson	Dept. of Soil Science, U. of Sask., Saskatoon Soil
Gerald Coen	Survey, Edmonton, Alberta
Ken Webb	LRRC, Truro, Nova Scotia
Charles Tarnocai	LRRC, Ottawa, Ontario
Herb Rees	P.O. Box 20280, Fredericton, N.B.
Bob Smith	Dept. Soil Sci., Univ. of Man., Winnipeg, Manitoba
Cliff Acton	Agric. Canada, Guelph Agr. Centre, Guelph
Chang Wang	LRRC, Ottawa, Ontario
Bruce MacDonald	LRRC, Ottawa, Ontario
Stephen R. Moran	Alberta Research Council, Edmonton
Scott Smith	LRRC, Whitehorse, Yukon
Bob van den Broek	OHAF, Guelph
Brian Edwards Jean	LRRC, Ottawa
Thie	DOE, Ottawa
J.-M. Cossette	Ag. Can. LRRC, Quebec
Ian Sneddon	DIAND, Ottawa
David Kroetsch	LRRC, Ottawa, Ontario
Dave Moon	LRRC, Vancouver, B.C.
Maria Bencsath	Agr. Canada, Ottawa, Ontario
Mottie Feldman	LRRC, Ottawa, Ontario
Jeff Brown	LRRC, Ottawa, Ontario
Jack Shields	LRRC, Ottawa, Ontario
Wayne Pettapiece	LRRC, Ottawa, Ontario
Erv Mackintosh	Ecological Services for Planning Ltd., Guelph
Bill Harron	PFRA, Regina, Saskatchewan