The Basic Survey Program and its Relationship to Productivity Research in Saskatchewan

J. G. Ellis

WHY A RESURVEY?

In recent years the Institute and, in particular, the soil survey staff have been asked why a resurvey. At times I am almost inclined to agree that maybe a resurvey is not necessary as anyone who uses the map and report together can become very knowledgeable regarding the soils delineated on No. 12. Unfortunately, many people use the No. 12 map without the report and miss a great deal in information necessary for the proper interpretation of the map. By using the map alone one can only identify the Association, its parent material, its surface texture, and topographic phase. If, however, this information is complemented by reading the report the user will find that various series are contained in the association and each series has a specific location in the landscape. People who made maximum use of No. 12 maps and report and who were able to identify the series and parent materials mentioned in the reports indicated to the Institute that various areas in the province required a re-evaluation. This fact was not unknown to the survey personnel who were aware that due to the scale of the mapping and the rapidity of the survey that many separations had been overlooked and detail sacrificed in order to compile a map of the soil resources in the settled or agricultural portion of the province. Thus the Institute initiated a resurvey in 1958. This resurvey is known within the Institute as the "Basic Survey Program". Such a program utilizes the latest mapping aids and techniques plus the nomenclature of the Canada Soil Classification System which is used nationally by all soil survey units.

To introduce the Canada Soil Classification System to Saskatchewan readers the Institute published a book entitled, "A Guide to Understanding Saskatchewan Soils". This book describes the classification, morphology and agricultural significance of the

major soil profiles in Saskatchewan.

The initiation of the Basic Survey Program with the first publication appearing in 1965 introduced to the user the 'Map Unit Concept', and the second publication in 1967 complemented and further enhanced the Map Unit Concept by introducing the 'Landform Concept'.

What then is this Map Unit Concept and what contribution does the Institute think it is making in this resurvey program?

Once the Soil Association has been identified, the Map Unit becomes the most important feature of the soil map. It represents a portion or segment of a Soil Association and is composed of one or more Soil Series. Different Map Units are separated on the basis of different proportions of Soil Series occurring within the Association. Within the Map Unit the various Soil Series profiles are associated with differences in topographic position and related drainage conditions. Hence, in the field, a Map Unit may be identified first by its landscape (the pattern of differences in relief or height, the kind and frequency of slopes, the comparative roughness of the surface and the drainage of the area). The full identification of the Map Unit requires the recognition of the Soil Series profiles and their place and extent within the landscape.

The Map Unit represents an important advance in the mapping of Saskatchewan soils. In the earlier surveys, such as No. 12 and No. 13, the only separations made in the Soil Associations shown on the map were of areas differing in texture or of areas differing in topography. As mentioned previously the position in the landscape of the various member (Series) profiles of the Association was discussed in the report, but because of the broad scale of mapping they could not be shown on the soil map. The adoption of the Map Unit makes it possible to indicate the location and extent of the most important Series profiles of a given Association.

In the legend and on the soil map the Map Units are indicated by the letters representing the abbreviation of the Soil Association name and by a number. The numbers are used to distinguish the

different Map Units belonging to the same Association. For example 08.

To explain the Landform Concept and how it complements the Map Unit Concept we must return to a discussion of the soil association because map units are subdivisions within an association. Association names, as you all know, are names for the different parent materials which occur in the various climatic zones in the province. For example, Weyburn is a glacial till in the dark brown zone, Melfort is a lacustrine clay in the black zone.

The types of geological deposits which occur most frequently in Saskatchewan are glacial till, glacio-lacustrine, glacio-fluvial, aeolian, alluvial and colluvial materials. These in turn can be subdivided into undifferentiated, resorted, modified, slightly, moderately or strongly calcareous glacial tills; sandy, silty or clayey glacio-lacustrine, etc., depending on the detail you wish or can present and the significance of these more detailed parent materials. By significant I mean how the parent material affects the profile development and profile sequences which occur in particular areas.

Fortunately glacial deposits in Saskatchewan, as in most other glaciated areas, are characterized by rather static landform configurations. Glacial tills occur as ground moraines or till plains and moraines (the undulating and rolling landscapes so familiar in Saskatchewan); glacio-lacustrine deposits occur as level to gently undulating lacustrine (lake) plains; glacio-fluvial deposits occur as outwash plains, kames, eskers, etc.; aeolian deposits occur as dunes or in the case of loess as overlays on other landforms; alluvial deposits occur on river levees, flood plains, deltas, etc.; and colluvial deposits occur at the base of valleys, hills and escarpment. These various landforms are indicated on the soil map as are their various surface configurations (meaning knoll and depression, ridge and swale, a combination of these two or dissected) and the slope class. The landform and surface configuration are indicated by

letters and the slope class is indicated by a number, for example, Ma4 meaning a moraine of the knoll and depression type and slope class 4 (6-9% slopes). So combining the Map Unit Concept and Landform Concept together we arrive with edits on the new maps as follows 08Ma4. So essentially what you can gather off the new map from the symbols 081-cl.Ma4 is as follows. 0 and M indicate that the parent material is glacial till, 0 being the symbol for the Oxbow association which is developed on glacial till in the black soil zone while M informs the reader that the landform is morainic and therefore is composed of glacial till. "a" indicates that the moraine has a knoll and depression surface configuration where the depressions are undrained and are therefore collection basins for excess water. 4 indicates that the slopes between the knoll and depressions are between 6 and 9%, for example, there is a 6' to 9' drop from the knoll per 100' along the slope. 08 is the map unit and means that the Orthic Black series occupies over 40% of the area, Rego and Calcareous Black series together occupy over 15% of the area and Gleysolic series occupy over 15% of the area. 1-cl indicates that the surface textures vary from loam to clay. Knowing that the landscape is rolling knoll and depression moraine with undrained basins and knowing the soil series you now have a mental picture from the map of a rolling area with eroded coarser textured knolls, arable finer textured slopes and wet sloughs or depressions. We believe that such a presentation tells the users of the new soils maps quite a bit more about a portion of the Oxbow soils than can be interpreted off No. 12.

Published maps to date in Saskatchewan are not of sufficient detail for the selection of specific areas to represent specific soil profiles for experimental work. They are, however, of sufficient detail to give the user of soil maps the clues to where he can most easily obtain the specific soil series or profiles he wishes to research be it in fertility, hydrology, construction, etc. It therefore becomes a prerequisite that those engaged in research or those

selecting sites for research purposes know their soil profiles and the profile relationships throughout the landscape so that their research is meaningful. It is of little value when seting up an experiment on glacial till in the black soil zone to select as your site a lower slope position (probably to obtain the benefit of better moisture conditions) and then reporting that Oxbow soils, which are dominantly Orthic series, respond to such and such a treatment when the research has been carried out on an Oxbow Eluviated series.

This important recognition of the various soil series and their productivity potential and history has become of such importance that it will in the near future become the basis for a more equitable assessment system in the province as outlined by Moss in his latest publication (A Revised Approach to Rating Saskatchewan Soils). This will no doubt involve the setting up by the Institute of bench mark sites where assessors can go to become familiar with the series distribution of a typical E3 area or a M4 area. Incidentally, such bench marks will be of value to others such as yourselves. I venture to say that the assessors will know the difference in the monetary value of a quarter section of E1 compared to an E4 before we know the productivity potential using various rates and types of fertilizers.

Assuming that the type of assessment evaluation outlined by Moss (e.g. based on the productivity history of the individual soil profiles that occur throughout the different soil landscapes and soil zones in Saskatchewan) is proceeded with I imagine that before a decade passes that farmers will not be requesting fertility and management advice on Melfort or Elstow soils, but will be asking for advice on Rego black soils developed on silty lacustrine clay in climatic zone 2, or Orthic Dark Brown soils on silty lacustrine deposits in climatic zone 3. The identification of the Association will not be as important as the identification of the soil series and its utilization. As time goes on the men on the land are becoming more specialized and more educated, the economics of farming is forcing this on them or forcing them out of the business of farming. Those

remaining will be more knowledgeable and will be planning their operations with the same business incentives used by industry and will be concentrating their amendment expenditures into those portions of the land that will give them the highest returns and they will want and demand advice about inputs - therefore research workers and the trade have an obligation to foresee these conditions and get prepared.

I have often wondered in this age of moon landing why a fertilizer application unit has not been manufactured commercially which could be filled with various types of fertilizers each of which could be applied at various rates. The operator could then go up and down a half mile or mile strip and drill in various types and rates of fertilizers as he passes over the various areas occupied by different soil series - would this not be more profitable than applying the same rate of fertilizer over the entire field? This would, I assume, necessitate a change in the procedure of soil sampling - instead of compositing the samples throughout the field the farmer would sample the orthic series, the eluviated series, the rego series and he would get specific data on these individual segments throughout the landscape on his farm. Having resolved his fertility requirements the men on the land will probably also be requesting advice regarding alternative crops to cereals and assistance in the production of these crops.

The soil survey units in the prairie provinces need and want their reports and maps utilized, partly to assure support so that the inventory of the soil types continues to be a prerequisite for soil research, and also because we believe there is considerable information in present soil reports that could be utilized by land planners, engineers, farmers, researchers, etc. If researchers and consultants, etc., cannot interpret the soil classification and identification I suggest that somewhere in their organization they employ a first class soil morphologist. I would suggest that the great and rapid strides that were made in the promotion of commercial fertilizer in

Western Canada were due in part to the big 3 - Wyatt, Mitchell and Ellis (who were leaders in soil classification and mapping in their respective provinces) working in harmony with C.M.S. who financially supported them regarding the experimentation necessary to gain the knowledge that led to the broad fertilizer recommendation that evolved for the various soil associations in the various soil zones throughout Western Canada. The task, however, is not complete - new types of soils maps, built on the foundation of these early soil workers are appearing. The soil associates in Manitoba are becoming better defined and delineated, as are the Soil Series in Alberta and the Map Units in Saskatchewan. The soil surveyor must and, at present, has to assess the productivity of his field separations in his report - this unfortunately is done mainly on field observations except in specific and limited areas where detailed fertilizer studies have been carried out. There are some 12 million acres of improved farm land in Manitoba, 44 million in Saskatchewan and 26 million in Alberta - surely we do not have to wonder what to do.

Up to about 15 years ago members of the soil survey staff in Saskatchewan were intimately associated with fertilizer research - they acted mainly as a combination of lackeys and public relations men - their job being mainly of conning a farmer into participating in a farm field trial and then placing a fertilizer attachment on his drill and putting in strips of various rates and types of fertilizer. Then, of course, there was the harvesting. With the advent of the South Saskatchewan Irrigation scheme, and the initiation of the Basic Survey Program the soil survey lost this close relationship with the fertility research.

Some fertility work has been initiated in the Swift Current survey area about which Ayres will be talking, but it is unfortunate that more money is not available so that trained soil surveyors could be retained and become involved in fertility research and thus make their contribution to the further gathering of knowledge about the most precious resource in the province, our soil. Does the Basic

Survey Program in Saskatchewan require a gearing up of research regarding crop productivity - you, Gentlemen, I believe act as both Judge and Jury regarding this matter.