An Evaluation of Alternative Methods of Soil Mapping

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EXECUTIVE SUMMARY

Soil surveys have been conducted in Alberta for the past 70 years. Over the last 15 years the majority of soils information has been compiled at Survey Intensity Level 3 (SIL3) 1:50 000 map scale. Production of these maps is costly and requires large numbers of personnel. The Federal and Provincial governments are no longer prepared to financially support soil inventory at this level. This project was conducted to evaluate and compare alternative soil mapping methods (top-down and landscape mapping) in comparison to traditional SIL3 1:50 000 soil maps. Six townships were mapped and compiled at 1:50 000 and evaluated on the basis of cartometrics, map accuracy and time required to conduct mapping.

Cartometric analysis showed that the average sized polygon occupied 124 ha on SIL3 1:50 000 maps, 166 ha on landscape maps and approximately 190 ha on the top-down maps. Consequently, the soil maps produced by alternative methods had fewer polygons delineated per township than the SIL3 1:50 000 maps.

Map accuracy was defined as the degree of correspondence between the soils predicted by a map legend to occur at a given site and the soils found in the field. Results of the study show that top-down and landscape mapping methods had map accuracies similar to SIL3 1:50 000 maps. Map accuracies between methods were not statistically significantly different at the 95% confidence level. The landscape mapping method provided the highest map accuracy, followed by top-down and SIL3 1:50 000 mapping methods. Map accuracies of the various mapping methods were similar regardless of the amount of time spent in the field or the number of observations.

Analysis of the results leads to the conclusion that both the top-down and landscape mapping methods are viable alternatives to SIL3 1:50 000 mapping and should be employed in future soil mapping projects.

1.0 INTRODUCTION

Similar field procedures for mapping soils have been used in Alberta for approximately the last 15 years. The need to investigate alternative (and more rapid) procedures for mapping soils is apparent in view of the increasing demand for soil and land information and the decreasing availability of financial and human resources to support conventional soil survey.

Several alternative methods for conducting soil inventory have been proposed and tested (Burrough 1986; Meijerink 1988; Pike 1988; Band 1989; Su, Ransom and Kanamasu 1989; Turchenek, Dietzler and Howitt 1990). A review of the literature on methods of soil mapping and techniques for evaluating soil map utility and accuracy was conducted by the Alberta Research Council (1992). The review identified ten methods with potential for increasing the speed of soil mapping in Alberta. This study evaluates two of the mapping methods (top-down and landscape) in terms of **map accuracy**[1], **cartometrics** and **field effort** required to map soils and compares these methods to SIL3 1:50 000 soil mapping. A third method, extrapolatory mapping is being addressed in a separate report.

1.1 Hypothesis

The top-down and landscape mapping methods are viable alternatives (in terms of accuracy, cartometrics and field effort) to SIL3 1:50 000 mapping.

1.2 Approach

The approach used in this study is illustrated (Figure 1). The study had three distinct components. The map compilation component involved the selection and mapping of areas using alternative mapping methods. Concurrent with map compilation was the collection of the independent (unbiased) sample data set which was used for evaluation of soil mapping. Evaluation and analysis of the data occurred upon completion of the soil mapping and collection of the sample data set.

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[1] Items in bold are defined in the glossery of terms, pages 14-15.

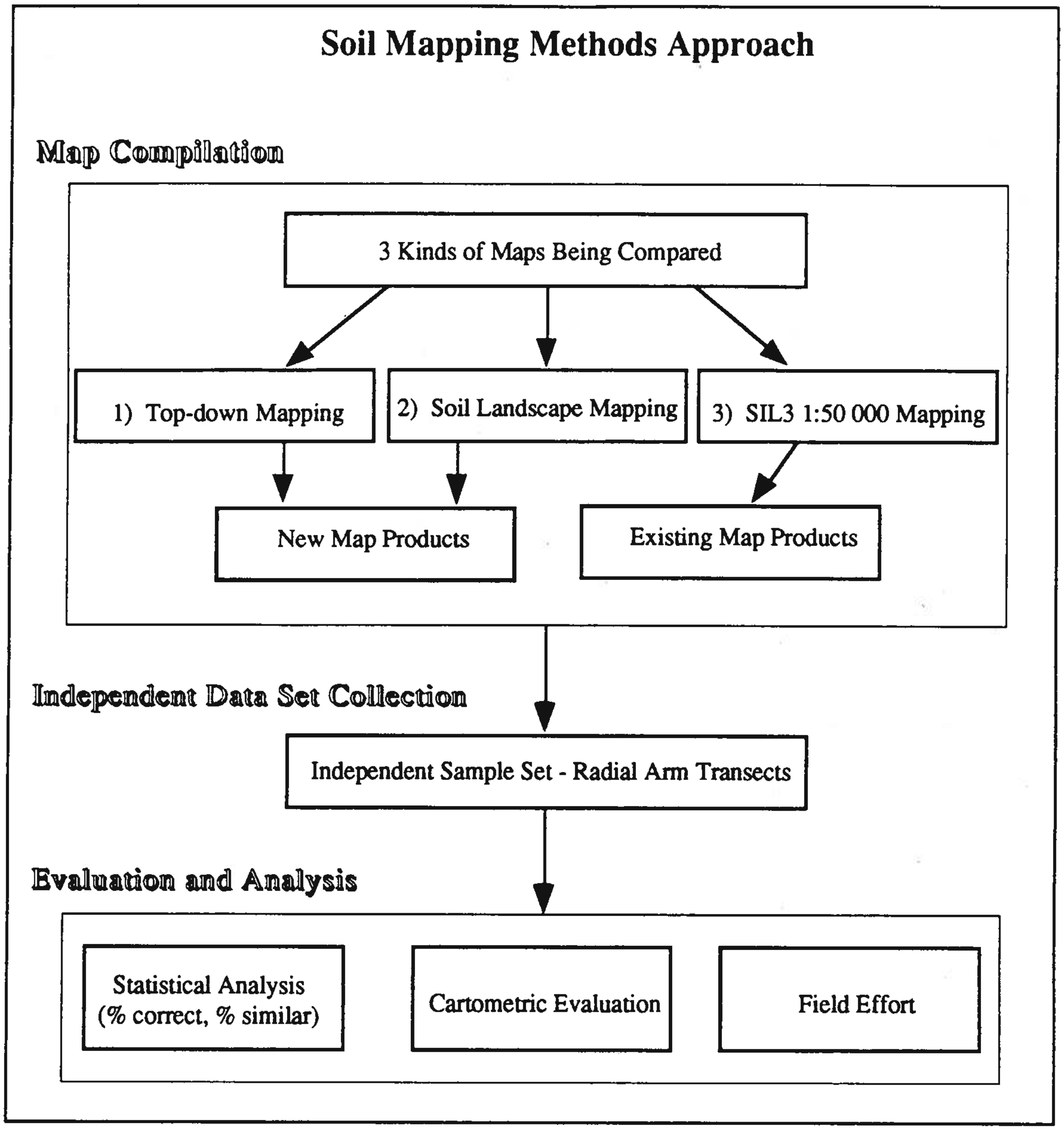

Figure 1. Approach

Two alternative soil mapping methods (top-down and landscape) (Appendix A) were defined and used to map a total of 6 townships in the Counties of Warner and Beaver and the Municipal District of Rocky View (Table 1, Appendix A). The townships selected had existing SIL3 1:50 000 soil maps and were representative of a diversity of landscapes and soils found in Alberta (Kjearsgaard, Tajek, Pettapiece and McNeil 1986; Howitt 1988; Turchenek and Fawcett in prep. (Appendix B)). Consequently, mappers were required to compile maps using the selected techniques for top-down and landscape mapping. Independent non-biased sample sets were collected for each area and all the maps were evaluated against these sample sets. The result was an evaluation of the maps produced by top-down and landscape methods in comparison to each other and to those produced by conventional SIL3 1:50 000 mapping. The benefit of applying all methods to the same geographic areas (townships) was that comparisons between methods reflected differences in mapping methods and not differences in variation arising from geographical location of soils and landforms or differences in test data sets.

The soil mapping component of the study was conducted by 5 different mappers (exclusive of the existing SIL3 1:50 000 maps). Each mapper was assigned to apply a different mapping method in each of the three areas. This minimized the possibility that analysis of map accuracy tested mapper skill rather than method success. Thus, each mapping method had examples produced by different mappers. The time allowed for conducting each mapping method was controlled and mappers were restricted to these time limits. For example, mappers were limited to one day in the field per township for verification of soil lines in the top-down mapping method.

Table 1. Location of the six townships selected for study.

County	Location
County of Beaver	Township 47 - Range 14 - W4th
	Township 51 - Range 19 - W4th
County of Warner	Township 2 - Range 16 - W4th
	Township 6 - Range 20 - W4th
Municipal District of Rocky View	Township 22 - Range 27 - W4th
	Township 27 - Range 3 - W5th

1.2.1 Mapping Methods

Procedures applied in the traditional SIL3 1:50 000 soil mapping method (completed prior to this project) involved office compilation of data and extensive field verification of soil lines. Field verification required 6 to 10 days per township. The SIL3 1:50 000 maps used for this study were published over a seven year period. A detailed description of this method is provided in Appendix A.

Top-down mapping was based primarily on office compilation of existing data. The method adopted certain activities undertaken as part of the normal procedures used in recent SIL3 1:50 000 mapping. That is, soil maps were compiled using existing data sources (**Soil Correlation Areas** (SCA), climate, surficial geology, soils maps and so on) available at various scales. The difference between top-down and SIL3 1:50 000 mapping was the time spent for field verification of soil lines. The top-down method, used in this study, limited field time to one day per township (excluding the time spent travelling to the study area). A detailed description of the method is provided in Appendix A.

The landscape method of mapping is based on the concept of conducting a limited number of field examinations in any given landscape and using this knowledge to define and describe similar landscapes without any further field verification. The two main differences between landscape and SIL3 1:50 000 mapping are that less time was spent on field verification of soil lines; and landscape mapping employed **purposive sampling** of soil catenary sequences whereas in SIL3 1:50 000 mapping, observations are made purposively on a 0.8 km grid. The landscape method limited field time to three to five days in the field per township. A detailed description of the method is provided in Appendix A.

1.2.2 Field Testing

Upon completion of initial pretyping and field verification of soil lines, legends were compiled and analysis of data was initiated. The relative accuracy of soil map legends was evaluated by comparing the soils predicted to occur within map units to an independently collected data set (Appendix C). A modified **radial arm transect** sampling approach was used to collect the independent data set. The radial arm transect method is an extension of the line transect method first documented by Wilding (1985). It differs from the **line transect** method in that sampling points are not selected on a unidirectional line. Rather, the distance and direction along a number of lines originating from a central starting point were randomly chosen.

Sampling for soil composition was conducted by randomly selecting 6 locations within each map area. The same data set was used for evaluation of each mapping method. A standard transect design was applied at each sampling location. The transect design consisted of four radial arms. The direction of each arm and distances between observations on each arm were randomly selected. Each transect had 17 sample sites. Information gathered at each site included soils and landform data (Appendix D). A detailed description and justification for use of this sampling method is provided in Appendix A.

1.2.3 Statistical Evaluation

The measures "**percent correct**" (Marsman and de Gruijter 1986) and "**percent similar**" (ARC 1992) were used to measure map and legend accuracy. These provided a means of assessing the relative accuracy of a series of maps produced by different methods and were used in view of their ease of application and interpretation. "Percent correct" was a measure of **exact match** between the soils predicted by a given map and legend to occur in a given polygon to results of the independent sample data set collected. The second measure, "percent similar", allowed for the quantification of how closely similar soils predicted by the soil map legends were to the observed soils. Both methods are described in detail in Appendix A. These two measures of accuracy were summarized for all mapping methods (Appendix E). Accuracy results were tested for significant differences at the 95% confidence level.

Statistics were applied to evaluate whether soils that were observed in the field were predicted by the soil map legend (**non-proportional** test); and whether soils that were observed were found in the proportions in which they were predicted to occur (**proportional** test).

1.2.4 Cartometric and Field Effort Evaluation

An evaluation of cartometrics and time required to conduct mapping was made in addition to statistical evaluation of the data. Cartometric evaluation consisted of the tabulation and comparison of the number and average size of polygons per township per mapping method. The field effort evaluation consisted of documenting the number of **field observations** made during compilation of soil maps and the field time required to collect soils information for each of the methods tested.

2.0 RESULTS AND DISCUSSION

This section is divided into two components (cartometrics and map accuracy). The cartometrics section provides information for attributes that are observed on the maps. The section on map accuracy examines how the methods compare to one another with respect to predicted soils versus soils information collected during the independent sampling. The section also examines the relationship between amount of time spent and number of observations made in the field and map accuracy.

2.1 Cartometrics

The combination of three mapping approaches and six townships resulted in the compilation of 18 soil maps that were used for comparing mapping methods (Appendix B). Polygon summaries were used for development of soil legends for each mapped township. Legends for each mapped township were developed using concepts that are currently used in SIL3 1:50 000 mapping (Appendix B). The top-down method had the largest (average size) polygons and the fewest delineations per township (Table 2). The SIL3 1:50 000 maps had the smallest (average sized) polygons and the most delineations per township (Table 2).

Minimum sized polygons ranged from 3 to 47 hectares. Approximately 40% of the maps had delineations smaller than the minimum size recommended for maps compiled at this scale (Mapping Systems Working Group 1981). This indicates that some mapping did not conform to general mapping procedures. Maximum sized polygons varied depending upon mapping method, and ranged from 707 to 4716 hectares.

Table 2. Summary of soil map attributes.

Mapping Method	Average number of delineations	Average minimum size polygon (ha)	Average maximum size polygon (ha)	Average size polygon (ha)	Average map delineation density (%)
Top-Down	49	12	2162	190	6.3
Landscape	56	18	1438	166	10.8
SIL3 1:50 000	78	11	1124	119	9.2

There is a difference in appearance of maps produced by the various mapping methods even though the methods delineate similar landscape features. The top-down and landscape maps contained fewer and larger polygons than SIL3 1:50 000 maps. The average map delineation densities met defined standards (Mapping Systems Working Group 1981). All methods (on average) had map delineation densities greater than 5 percent. However, all mapping methods had areas mapped in which the map delineation densities were less than 5 percent (Tables E-1 to E-3). This implies that defined standards are not consistently adhered to.

2.2 Map Accuracy

The study showed that the landscape mapping method had the highest accuracy of the three methods (Table 3). Top-down mapping consistently ranked second and SIL3 1:50 000 mapping had the lowest accuracy (Table 3). Accuracies were determined for soil series, parent materials, texture, drainage and subgroup classification for "percent similar" evaluations. However, soil series data was the only information used in the "percent correct" evaluation (Table 3, Appendix E) because it was considered the most important data represented on soils maps. The "percent similar" data showed that there was no statistically significant difference (95% confidence level) between mapping methods. The non-proportional "percent correct" data showed that the landscape method had a significantly higher accuracy than both the top-down or SIL3 1:50 000 methods.

Table 3. Average map accuracies of the soil inventory techniques tested.

	Landscape	Top-down	SIL3 1:50 000
Comparison (method, variable and test)	Accuracy (%)	Accuracy (%)	Accuracy (%)
Percent correct (soil series) - P	54 [a]	49	43
Percent correct (soil series) - NP	69 [a b c]	58 [b]	54 [c]
Percent similar (soil series) - P	91	88	86
Percent similar (texture) - P	98	97	97
Percent similar (parent material) - P	97	96	96
Percent similar (drainage) - P	99	99	98
Percent similar (subgroup) - P	95	92	91

[a] - significant difference at the 95% confidence level
[b] - significant difference at the 95% confidence level
[c] - significant difference at the 95% confidence level
P - proportional test
NP - non-proportional test

One likely explanation for the slightly higher levels of accuracy of the top-down and landscape mapping methods in comparison to SIL3 1:50 000 mapping, is that these soil maps were compiled using **controlled legends**. There is a recognized degree of inaccuracy built into soil survey maps that use **closed legends** which cannot be communicated within the context of the map legend. This inaccuracy is a result of the map unit compilation and correlation process. That is, during map correlation and legend compilation, the number of map units is restricted in closed soil legends. The result is that map units with limited extent or with few occurrences are incorporated into other map units. The process of merging two distinct map units into one may make the new map unit description inaccurate with respect to some of the areas it describes.

Soil legends were constructed for alternative mapping methods using concepts currently used in SIL3 1:50 000 mapping but the number of map units allowed was not restricted. No correlation exercise took place and legend compilation procedures consisted of listing the polygons and their map unit names. In effect, the field working legend was the final legend.

Tests for determining differences in accuracy due to mapper skill were not conducted. The degree of influence that mappers had upon the accuracy of the soil maps could not be determined from the results because only one mapper applied one technique in one area. Several mappers would have had to apply the same mapping method in the same area to determine the degree of influence that a mapper had upon map legend accuracy. Averaging the accuracy levels of the soil maps and legends compiled by all the mappers resulted in determination of map accuracy due to mapping method and not due to differences caused by mapper skills or complexity of geographic areas (Valentine, Lord, Watt, and Bedwany 1971).

2.2.1 Percent Correct

Results in this study ranged from 43% correct for SIL3 1:50 000 mapping on a proportional (P) basis up to 69% correct for landscape mapping on a non-proportional (NP) basis. These results are similar to those found by other authors (Table 4).

In a comparison of the "percent correct" results among the three mapping methods, there was a decrease in accuracy from landscape to top-down to SIL3 1:50 000 soil inventory products for both P and NP tests (Table 3, Appendix E). The accuracy increased 9 to 15% from P to NP tests for each individual mapping method. This increase was only significant for the landscape method (15%). Increases were not significant for both the top-down (10%) and SIL3 1:50 000 (11%) mapping methods. Due to the nature of the tests however, this increase was not unexpected. A P test is much more stringent than a NP test and higher accuracy levels were expected.

Table 4. Accuracy results of selected previous studies.

Authors and Date	Reported Accuracy
Amos and Whiteside 1975	36%
Bascomb and Jarvis 1976	60%
Beckett and Burrough 1971	53%
Beckett and Webster 1971	50%
Fawcett, MacMillan, Turchenek, and Howitt 1991	P - 68%; NP - 75%
MacMillan 1982	74%
MacMillan, Bennett, and Brierley 1985*	65-70% (Soil Survey) 80% (Land Classification)
Marsman and de Gruijter 1986	64-70%
Powell and Springer 1965	74%
Selby and Moon 1987	57%
Turchenek, Dietzler, and Howitt 1990	70%

* compared the accuracy of an interpretation (suitability for irrigation) made from two maps.

There was a decrease in accuracy of 5% from landscape to top-down to SIL3 1:50 000 mapping methods when using a P test for exact match accuracy. A t-test of the means showed that this was not a statistically significant decrease. The 11% decrease in accuracy from landscape to SIL3 1:50 000 mapping was statistically significant at the 91% confidence level. The results of the NP accuracy test showed that the landscape method was 11% better at identifying the soil series present than the top-down method and 15% better than the SIL3 1:50 000 method. In both cases, this was a statistically significant difference. The increase in accuracy from SIL3 1:50 000 to top-down was only 4% and this was not a significant increase.

2.2.2 Percent Similar

A relationship exists between the different mapping methods when analyzed using the "percent similar" and "percent correct" methods (Table 3). Landscape mapping was the most accurate method for all of the parameters analyzed (soil series, texture, parent material, drainage, and subgroup). Top-down was the next most accurate, followed by SIL3 1:50 000 mapping. Statistically, there was no significant difference between the "percent similar" results of the three methods at the 95% confidence level (Appendix E).

The results from soil series analysis of "percent similar" should be noted. The landscape method was significantly different from SIL3 1:50 000 mapping at the 93% confidence level. This was close to the accepted 95% level, indicating that there was an advantage in using the landscape method in place of the SIL3 1:50 000 method for soil mapping. There is a similar difference between the two methods when the predicted subgroups were analyzed. In this case, the two methods were significantly different at the 92% confidence level. The difference occurred at lower confidence levels for texture, parent material and drainage (Appendix E).

The degree of map accuracy increased when the data were analyzed using **similarity matrices**. This was attributed to the way in which comparisons of soils were made. The similarity matrix (SM) concept stated that if there was not complete agreement between the map legend and an observed soil, the legend was not wrong but rather was mostly right. Conversely, the "percent correct" comparison assumed that unless there was total agreement between the soil legend and the ground truth data, the soil map and legend were wrong.

One consideration that should be made when analyzing the "percent similar" results of this test is that the similarity values were relative and not absolute. The importance of the results was how they related to one another and whether or not there was a significant difference between them. The reason for this was that the SM values assigned for subgroup, drainage, texture, and parent material were based on an agricultural viewpoint and adjusted to reflect the ease with which soil properties could be identified in the field.

The results could be adjusted up or down depending upon the values used in the SM. That is, the relationship between any two numbers would remain constant if the same SM values were used consistently. For example, if every SM value were reduced by 10 points, as an arbitrary penalty for not having an exact match, all of the totals and percentages would be reduced accordingly. Their relative relationship would not be changed. That is, the landscape method would still produce a soil inventory product that was judged to be more accurate than the top-down method.

The relationships between the methods may change if a different interpretation or an alternative set of arbitrary rules is used to determine the SM values. For example, by using agricultural interpretations as the basis for determining the SM values, a comparison between glaciolacustrine and till parent materials returns a value of 90/100.

The same comparison may result in a value of 60/100 if engineering interpretations are used as the basis for determining the SM values (Andriashek, pers. comm. 1992). By using engineering interpretations as the basis for determining SM values, the weighting given to subgroup classification would decrease and the weighting given to parent material would increase. Consequently, the relationships between the accuracies of each mapping method may change.

The cause(s) of inaccuracies contained in the soil map can also influence the relationship between two "percent similar" accuracy results. A minor difference in texture is not considered as important as a minor difference in drainage. For example, Site A is predicted to be moderately fine textured but found to be medium textured and Site B is predicted to be moderately well drained but found to be imperfectly drained. In both cases, there is a difference of one texture or drainage class. For Site A, if all other factors are equal, the difference in texture would result in a SM value of 95/100. For Site B, if all other factors are equal, the difference in drainage would result in a SM value of 90/100. Therefore, a one class difference in texture results in a 5% 'error' but a one class difference in drainage results in a 10% 'error'.

2.2.3 Accuracy versus Field Effort

A comparison of the "percent similar" results with the number of field observations associated with each township (Table 5, Appendix E) implies that too much time is spent defining and confirming existing soil-landscape models. Increasing the number of observations and time spent in the field does not produce a corresponding increase in accuracy (Table 5). This was contradictory to Valentine and Lidstone (1985) who implied that field inspection quantity reflected accuracy and detail. That is, the more inspections, the higher the accuracy.

For SIL3 1:50 000 mapping, the increased number of field observations was associated with a decrease in map accuracy in all but one case (there was a 1% "percent similar" increase for soil series in township 27-3-W5) (Figures B-11 and B-17, Table E-1). Two inferences were made from these results. First, in many instances, increased field observations (digs) do not contribute to the refinement and definition of existing soil-landform models. Second, too much time is spent proving soil-landform models that are well documented and understood and more time should be spent investigating models that are not well defined or understood.

Table 5. Relationship between field time and map accuracy.

Mapping method	Number of field days per township	Average number of observations per township	Percent similar, soil series accuracy	Percent correct, soil series accuracy (P)	Percent correct, soil series accuracy (NP)
Top-down	1	15	88	49	58
Landscape	3 - 5	32	91	54	69
SIL3 1:50 000	6 - 10	105	86	43	54

2.2.4 Relationship Among Observed Accuracy, Soils and Landscapes

An evaluation of "percent similar" and "percent correct" results showed that some soil maps had higher observed accuracies than others (Table 6). Differences in accuracy were related to complexity of soils and parent materials. For example, soil mappers produced soil maps that were less accurate for soils found on fluvial landscapes dominated by Chernozemic and Solonetzic soils, than for soils found on undulating morainal landscapes dominated by Chernozemic soils. The observed accuracies of the six landscapes tested in this study were ranked (Table 6).

Table 6. Soil map accuracies of Alberta landscapes.

Parent materials (landform)	Dominant soils	Accuracy (% similar)	Ranking	Accuracy (% correct)	Ranking
Till (hummocky)	Chernozemic	96	1	67	1
Till (undulating)	Chernozemic	95	2	66	2
Lacustrine and fluviolacustrine (undulating)	Chernozemic	90	3	52	3
Till with minor fluvial (hummocky)	Luvisolic and Chernozemic	84	4	44	4
Glaciofluvial and fluvial (undulating)	Chernozemic	84	5	20	6
Till (undulating)	Solonetzic	82	6	44	5

A comparison of the "percent correct" and "percent similar" results showed that soil mappers were better at predicting the proportions of soils found in fluvial landscapes than in landscapes dominated by Solonetzic soils. The other areas maintained their rankings. The reasons for the differences in observed accuracy in different landscapes may be due to soil taxonomy or parent materials. For example, in landscapes dominated by Solonetzic soils, the decreased accuracy may be a result of the variability and the high degree of spatial unpredictability associated with these soils. In areas dominated by glaciofluvial and fluvial deposits, decreased accuracy may be a result of the variability in the type and texture of parent materials.

3.0 CONCLUSIONS AND RECOMMENDATIONS

3.1 Cartometrics

The mapping method has only a minor influence on the final soil map appearance. An evaluation of map delineation density showed that all mapping methods met the defined standards (Tables 2, E-1, E-2 and E-3) (Mapping Systems Working Group 1981). In general, the top-down method maps had the fewest polygons and the SIL3 1:50 000 method maps had the most polygons. Areas that contained distinct landforms had similar soil maps. There were cartometric map differences in areas that contained subtle changes in soil taxonomy, drainage and surficial materials. Qualitative or quantitative assessments of soil line placement were not conducted as part of this study.

3.2 Map Accuracy

There was no statistically significant difference in map accuracy among the methods (95% confidence) on a proportional basis. However, there was a significant difference in map accuracy on a non-proportional basis for the three methods evaluated (95% confidence). A suggested reason that there is no statistical difference in map accuracy between mapping methods (on a proportional basis) is that soil and landscape models which have been compiled over the last 40 years and used for estimating proportions of soils within landscapes, are adequate. The development and existance of these models contributed to the understanding of the distribution of soils in the landscape and to the similarity in map accuracies between SIL3 1:50 000 and alternative mapping methods.

The results indicated a correlation between complexity of landscape and soils and map accuracy. That is, certain landscapes were mapped with higher observed accuracies than others. We concluded that more time should be spent defining and investigating landscapes that were mapped with the lowest accuracies and less time should be spent investigating areas for which mappers have the greatest confidence. For example, till landscapes dominated by Chernozemic soils have well defined soil landscape models, therefore not much time should be spent testing soil/landscape models in these areas. Conversely, fluvial landscapes and landscapes which contain Solonetzic soils are more complex, variable and have poorly defined landscape models. Consequently more effort should be spent defining models and delineating map units in these areas.

The results also showed that there was no relationship between the amount of time spent in the field collecting information and map accuracy. That is, all mapping methods had similar accuracies. The optimal time spent in the field was reflected by the landscape method (which had the highest map accuracy). For this mapping method, an average of three days per township was spent in the field and 30 field observations per township were recorded in the compilation of the soils maps.

3.2.1 Recommendation

Based on these conclusions we conclude that the top-down and landscape mapping methods are viable alternatives to SIL3 1:50 000 mapping and recommend that they be employed in future mapping projects.

4.0 GLOSSARY OF TERMS

Cartometrics: The readability or legibility of a map as affected by the scale of presentation and texture (that is, the number and size of polygons) of the map.

Closed Legend: A closed legend limits the number of possible map unit edits to a predetermined level. The map unit edits used have a standard format.

Controlled Legend: A controlled legend allows for an unlimited number of map units, providing that the map unit edit conforms to a standard format.

Exact Match: In this project, an exact match between an observed and a predicted soil means that the soil texture, parent materials, internal drainage, subgroup classification, and soil phase were all the same.

Field Effort: A combination of the number of days spent in the field verifying soil lines and legend descriptions and the number of site inspections made.

Line Transect: A method of locating a given number of site inspections in the landscape. Line transects are unidirectional and usually have an equal spacing between site inspections. Line transects may or may not be directionally biased, depending on the orientation of the transect.

Map Accuracy: A measure of the degree of correlation between what the soil map and legend predict will be found in the landscape and what is actually there. Usually expressed as a percentage value.

Non-proportional: A non-proportional comparison only considers what soils were found or predicted. It does not consider how much of each soil was found or predicted.

Percent Correct: The number of exact matches between an independent sample data set and a soil map and legend, expressed as a percentage.

Percent Similar: A measure of how closely related the soil map and legend is to the ground truth data, expressed as a percentage.

Proportional: A proportional comparison considers both what soils were found or predicted as well as how much of each soil was found or predicted.

Purposive Sampling: Sample locations are biased and are chosen based on prior knowledge of the landscape and vegetation with the purpose of proving or disproving a given soil-landscape model.

Radial Arm Transect: Radial arm transects are an extension of the line transect, and contain two or more "arms" which are independent of directional bias. Multiple sample sites are located on each arm.

Similarity Matrices: A relative comparison of the soil properties associated with one soil to the soil properties associated with another soil.

Soil Correlation Area: An area of similar soil, climate and landscape ecology.

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APPENDIX A: METHODS

This appendix outlines and describes the methods used throughout this project. The three mapping methods (SIL3 1:50 000, top-down, and landscape), the selection of sample size, the sampling method used, and the analysis techniques employed (for cartometrics and accuracy) are described. A short introduction and background is provided along with the specific procedures used to accomplish each of the above. A short description of the rationale and procedures used in creating similarity matrices is also provided.

1.0 SIL3 1:50 000 METHOD

The soil mapping program in Alberta evolved from reconnaissance mapping to SIL3 1:50 000 standards. This evolution was a result of completion of reconnaissance mapping and a recognized need to update existing mapping in terms of the current state of knowledge and gaps or inconsistencies in existing mapping. The SIL3 1:50 000 mapping program produced 11 soil surveys for municipalities in east-central and southern Alberta. Some of these soil surveys were targeted for specific uses (for example, deep plowing interpretations in the County of Paintearth (Wells and Nikiforuk 1988)). However, the majority of these surveys were aimed at a generalized user audience that included farmland assessment, soil conservation planning, deep plowing, grazing land management, pipeline construction and pipeline reclamation. These soil surveys tended to have many uses and have been criticized for their technical nature and lack of specific (other than pedologic) focus. It is also argued that these characteristics made these reports more useful than those with a narrow focus. For example, the soil survey of the County of Warner (Kjearsgaard et al. 1986) provided irrigation ratings, that were comparable to ratings assigned specifically by irrigation specialists. However, the soil survey had broader application than thematic irrigation maps. Interpretive information also provided in the survey report included erosion potential and agriculture capability.

The procedures used in the production of SIL3 1:50 000 soil inventory products for the six townships in this project were as follows:

1. **Definition of objectives, requirements and ongoing reviews**

   Steps in the survey plan included identification of the project, project definition and objectives, schedule and resource requirements, project management details, survey operations (including mapping strategies, correlation responsibilities, sampling strategy, interpretations and report format), resource allocation (including manpower), scheduling and public information and feedback.

   The project plan was revisited during the course of the survey to ensure that the objectives and requirements were being met.

2. **Compilation of existing data, preliminary field studies and initial stratification**

   During this stage, background information on climate, surficial and bedrock geology, hydrogeology, hydrology, topography, vegetation and soils was collected. Compilation of the background information provided the pedologists with a regional overview of the area to be mapped. The information was also used to develop preliminary landscape units.

Initial stratification allowed the mapper to develop preliminary map unit concepts. This step was conducted both in the office and by field visits to the project area. The goal of preliminary field studies was for the mapper to become familiar with the soils and landscapes in a project area before production mapping started.

3. Development of an initial mapping legend

The initial map legends were developed using a combination of two different approaches. First, the map legend was adapted from published (or existing) soils maps. This method was desirable in that time was saved and correlation was enhanced during the preliminary field study step. Second, the legend was supplemented and further developed based on observations made during preliminary field studies. This method was time consuming but the extra time spent on legend development using this method was needed to reach the level of confidence necessary for SIL3 1:50 000 mapping. The initial mapping legend underwent repeated revision during the mapping process. After a working legend had been established, field mapping commenced and the legend was updated as mapping progressed.

4. Field mapping

SIL3 mapping was conducted using 1:31 000 scale black and white aerial photographs. Initial stereoscopic examination of the photos was carried out in the office followed by a general field reconnaissance. This was followed by more intensive photo interpretation and ground truthing. During mapping, attempts were made to traverse all roads and trails in the townships. Occasional traverses by foot were made where necessary to verify soil and landscape conditions in areas without vehicle access. Soils were examined to the 1 metre depth using a shovel and hand auger. Soil inspections were done at an intensity of approximately one recorded inspection per quarter section (65 hectares). Each recorded inspection was supplemented by information obtained from several inspections to determine the local distribution and variability of different soils associated with each inspection site.

Data collected at inspection sites included horizon type, thickness, color, structure, texture and sequence; presence of lime, salts, mottles; slope position, length and steepness; landform; drainage; mode of deposition and texture of parent material. Data was recorded on field sheets and in notebooks.

As the surveys progressed, soil and topography lines were determined along the lines of the traverse and projected between them using landscape features and stereoscopic examination of aerial photographs. These boundaries were drawn on a field map consisting of an aerial photograph of the township enlarged to a 1:30 000 scale. Map delineations were identified with the appropriate map unit symbol. Each completed township was compared, checked and correlated with those of adjoining townships.

After all field data was gathered, checked and correlated, the soil boundaries and accompanying map unit symbols were transferred to 1:50 000 scale, mylar topographic base maps or aerial photograph mosaics. Soil maps for the County of Warner (Kjearsgaard et al. 1986) and Municipal District of Rocky View (Turchenek and Fawcett in prep.) were digitized. The County of Beaver (Howitt 1988) soil survey was not converted into digital format. The resultant digital files were used to produce the final soil maps. Finally, the soil survey information was compiled and a report was written that summarized and described the soils in the mapped area.

5. Interim correlation and remapping

The purpose of the correlation exercise was to verify polygon boundaries and to ensure that map unit concepts were applied consistently and uniformly across the project area. The process involved re-driving roads to check boundary placements and making additional soil and landscape inspections.

Once the townships had been mapped and correlated, legend compilation was started. Map units were consolidated and map unit names changed accordingly.

The philosophy of consolidation is that a balance must be achieved between cartographic simplicity and landscape detail (Hole and Campbell 1985). Map unit consolidation is a process used to reduce the number of map units (in a mapped area) to a workable number. In the process, map units that are only slightly different may be amalgamated. Those that occupy minor areas can be added to similar map units.

6. **Final correlation and report writing**
   The final correlation step ensured that a uniform and consistent map had been produced for the project areas. The survey report was written after the correlated maps had been compiled.

2.0 TOP-DOWN METHOD

The top-down method assumed that identifiable environmental factors exercise control on the formation and distribution of soils and that this control is reflected to varying degrees at various scales. It was assumed that a formalized methodology for hierarchical subdivision of Alberta into successively smaller segments, based on the known spatial pattern of these environmental variables, would result in more rapid production of better and more consistent maps of soil and land properties.

The procedure used to conduct a top-down stratification of the six townships and to produce a soil inventory product for this project was as follows:

1. Climate was assumed to be a major influence at all scales and to be the dominant influence at the largest (regional) scale. Alberta was subdivided into areas of more or less uniform regional climate as expressed by vegetation and gross physiography (SCA's), this provided the best means for restricting the expected range of soil types and soil properties for smaller mappable areas (Soil/Land Districts (SLD's)).

2. The SCA's were further subdivided into Soil/Land Districts (SLD's) on the basis of gross physiography according to physiographic districts as portrayed on the map Physiographic Subdivisions of Alberta (Pettapiece 1986). This would further restrict the range of intrinsic soil properties and associated sub-regional climate for smaller mappable areas (Soil/Land Systems (SLS's)).

3. The SLD's were subdivided into Soil/Land Systems (SLS's) based on a combination of surficial and bedrock geology; regional hydrogeology; local topography and drainage; and natural vegetation or dominant land use in areas where the natural vegetation has been disturbed by man. It was assumed that this

formal subdivision to the level of SLS's would make further subdivision to the level of soil polygons faster, more consistent, reproducible and understandable.

4. The SLS's were subdivided into soil polygons (using aerial photographs) based primarily on consideration of readily visible patterns of topography and drainage with additional consideration given to recognizable inclusions of soils of varying texture; salinity; degree of development or erosion; and degree of development of solonetzic features. Available information sources (assessment data and existing soil maps) were used where ever possible to assist in recognition of patterns of salinity, erosion, solonetz and wetness. For this study, existing soil maps at scales smaller than 1:126 000 were used in this step.

5. Preliminary legends and descriptions of the soil polygons delineated in step 4 were prepared.

6. Field checking of the preliminary polygons and legend was carried out by the mappers and changes to the maps and legend were made as necessary. Field time was limited to one day per township.

7. Final office correlation of the soil inventory product was done. Soil polygon boundaries were finalized and the map legend was compiled.

3.0 LANDSCAPE METHOD

A landscape (for example, an area of hummocky moraine) is composed of a set of unique mapping units. Each mapping unit consists of a repeating pattern of soils and landforms. It was assumed that if one surveyor had responsibility for an entire landscape, that surveyor could better recognize and characterize the variability of the landforms and soils. When the full range of variability within a landscape was known and understood, delineation of a landscape into unique mapping units of similar polygons could be done faster and with more confidence. The mapper would also be more consistent in the delineation of the landscape and in the application of map unit names to the polygons. The correlator should find that little effort is required to ensure uniformity of soil mapping within landscapes and less time is needed to check and verify map unit concepts. The main job of the correlator would be to ensure that boundaries between the separate landscapes were correctly placed and that legend design and control was consistent between the surveyors involved in the project.

The procedure used in this project to implement the landscape method of producing soil inventory products was as follows:

1. The six townships were delineated into unique landscapes according to the top-down approach to soil survey.

2. Aerial photo interpretation of each landscape was conducted and the preliminary mapping units were described using available information such as surficial geology maps and previous soil surveys (only used soil surveys at scales smaller than 1:126 000).

3. Field data was collected through a combination of transects and purposive site observations. The location and frequency of these observations was at the discretion of the mapper. Field time was limited to 3-5 days per township.

4. The mapping units within each landscape were characterized through the integration of field data (step 3) and previously derived information (step 2). Similar polygons received the same map unit label and description wherever they were recognized.

5. Polygon boundaries, map unit names and map unit descriptions were finalized in the office and the final product was compiled. The legend was written according to the standards used in SIL3 1:50 000 mapping.

The primary difference between landscape and top-down mapping is that in the landscape method of soil mapping the legend building and map unit description process is based on the collection of catenary sequence field inspections. In the top-down method, legend building is almost strictly an office exercise because of the restricted amount of time allocated for field work.

4.0 SAMPLE SIZE

The intensity of data collection (that is, the number of observation sites) depends on the objective of the project (Miller, McCormick, and Talbot, 1980). If the objective is to produce a soil map or survey product, then the most efficient sampling size will be determined by the complexity of the landscape and the experience of the soil surveyor. If the objective is to evaluate the accuracy of a soil inventory product, then a more rigorous approach is needed for the selection of sample size.

The number of sample points needed for a statistically valid estimation of map accuracy varies with the testing procedure used and the degree of confidence desired. For most tests, sample sizes of less than 30 result in unreliable statistical inferences while a sample size greater than 50 is not likely to provide an increased statistical benefit equal to the increased cost of data collection (Forbes, Rossiter, and Van Wambeke, 1985). Hay (1979) recommended a minimum sample size of between 50 and 100 in order to minimize the influence of asymmetrically distributed errors. These estimates were based on ten or more observation points at each sampling location, a number suggested by Steers and Hajek (1979).

In this project, six townships were mapped using three methods of producing soil inventory products. Six transects were located in each township with each transect considered as one sample, giving a total of 36 samples or transects for the study. This satisfied the criteria that the optimum sample size be between 30 and 50.

Binomial probabilities as outlined by Edmonds and Crouch (1991) were used (Howitt and Moran, 1991) in order to determine the number of observations needed on a single transect. This procedure was based on binomial statistical theory and the formula "np>5 where n is the number of samples, p is the probability of success and 5 defines a limit of statistical reliability. If a probability of 30% soil series composition in a polygon (p = 0.30) is selected, then n = (5/0.3) or 17 observations" (Howitt and Moran, 1991). This number of observations satisfied the criteria that ten or more observations be located on each transect. These calculations resulted in 17 observations per polygon, 102 observations per township (six transects), and 612 observations (36 transects) over the entire project area.

5.0 RADIAL ARM TRANSECTS

Radial arm sampling (Wilding, 1985) is essentially an extension of the line transect procedure for selecting multiple observation sites at a given sampling location. It is independent of directional bias and is recommended if the intention of the sampling scheme is to obtain multiple sites within delineation sized areas but without reference to any given polygon boundaries. The resultant sample set is applied with equal relevance to evaluate any number of superimposed maps produced by any method of mapping.

The procedure used to design the radial arm transect used in this project was as follows:

1) A starting point was selected. In this case, a random grid coordinate corresponding to the intersection points of a cartesian coordinate system overlaying the entire map area was used. This starting point became sample point number 1.

2) A number between 0 and 359 was randomly selected to represent a compass azimuth bearing (Figure A-1).

3) A transect from the starting point 200m along the previously defined direction was measured (Figure A-1).

4) Three other transects at randomly chosen directions from the initial starting point were defined by repeating steps 2 and 3 (Figure A-1).

5) A random 2 digit number from 00 to 99 was selected. This was used to compute the location of sample point #2 as xx% of the distance along transect arm A (Figure A-1).

6) Step five was repeated until 4 sample points were located along transect arm A. This was continued until four points were identified along each of the 4 radial arms (Figure A-1). The result was 17 sample points, randomly selected along four radial arms (Table A-1).

This procedure was used to design a standard radial arm transect which was then used at each of the 36 sampling locations. For this project, six sampling locations in each of six townships were randomly selected as per step 1 above. Sampling locations were rejected if they fell within 200m of a polygon boundary. This 200m buffer zone was used in order to ensure that the radial arm transects would be entirely within the selected polygons.

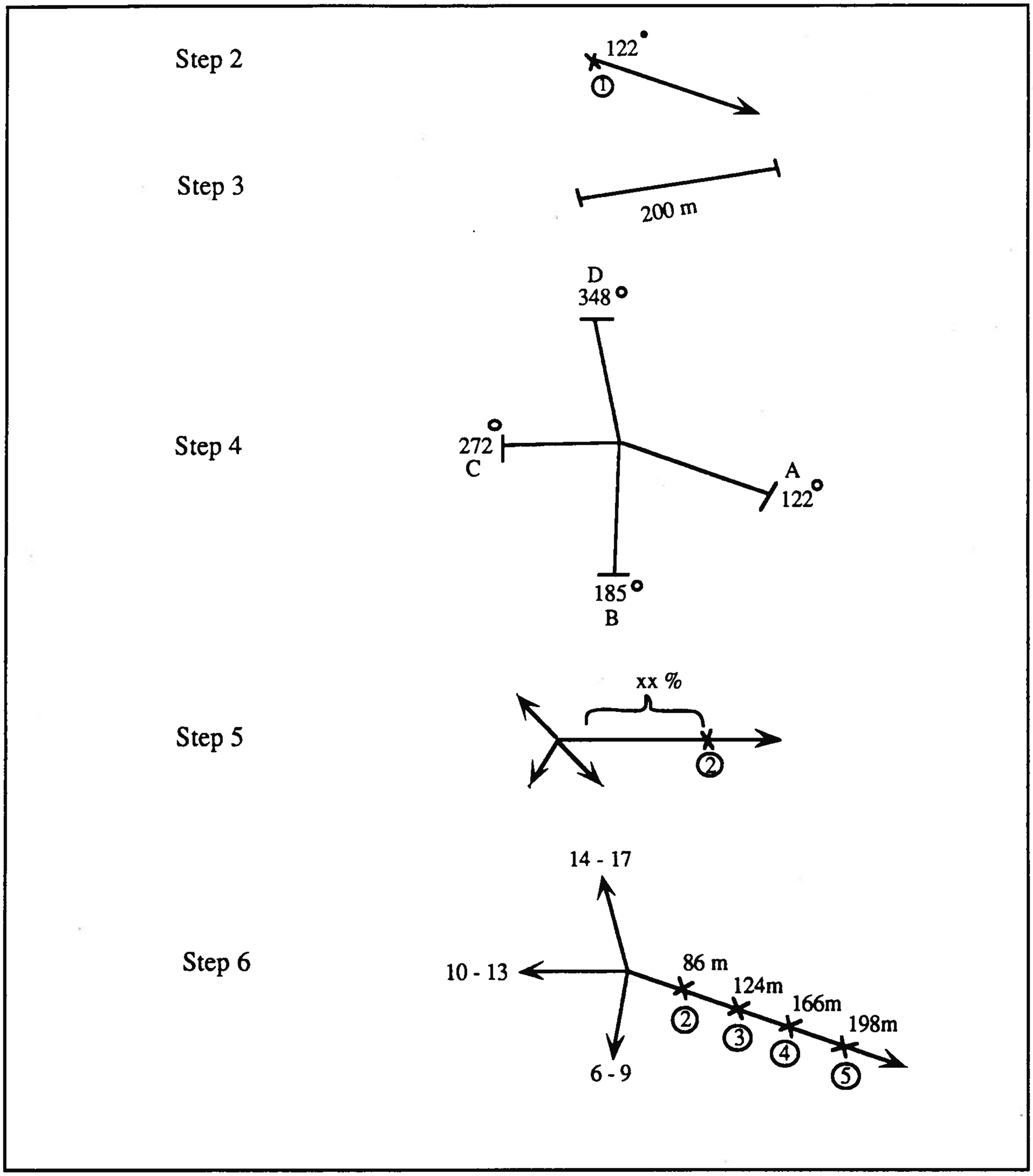

Figure A-1. Steps in the design of a radial arm transect (adapted from Wilding 1985).

Table A-1. Distance and compass azimuth of sample points from the centre of each radial arm transect.

Sample point no.	Distance from centre	Radial arm	Compass azimuth
1	0 m	-	-
2	86 m	A	122°
3	124 m	A	122°
4	166 m	A	122°
5	198 m	A	122°
6	6 m	B	185°
7	46 m	B	185°
8	70 m	B	185°
9	141 m	B	185°
10	60 m	C	272°
11	80 m	C	272°
12	140 m	C	272°
13	190 m	C	272°
14	56 m	D	348°
15	58 m	D	348°
16	112 m	D	348°
17	156 m	D	348°

By using the radial arm transect method of sampling, several advantages were gained. These were:

a) After the initial centre point had been located, all subsequent points were located quickly and easily using simple compass and pace methods.

b) The radial design minimized the threat of directional bias in the samples. The geometry of the radial arm transect approach minimized the likelihood of samples being influenced by periodicity or systematic variation in the landscape. The spokes of the transect radiated out from the central point at oblique angles to one another. Thus, even if one arm had paralleled a linear feature, the other arms would have been at some oblique angle to the feature and would have sampled different portions of the landscape. The geometry of the transect also protected against the biased sampling of repeating concentric patterns. In the unlikely event that the central point of the transect had coincided with the centre of a concentric pattern, the random placement of sample points along each radial arm would have ensured that samples did not capture the periodicity. The samples were drawn at different intervals along each arm and therefore could not have consistently sampled the same repeating portion of the landscape.

c) The scheme produced a cluster of sample points in relatively close proximity. This provided some assurance that there were sufficient points within any given polygon superimposed over the sample data to enable proportions of soils or soil properties to be assessed on a per polygon basis. (It was necessary to have a series of unbiased sample points within the same delineation of a polygonal map unit if there was to be any attempt to assess whether the soils or soil properties described for the map unit occurred in the proportions described.)

d) The method gave every point in the a project area an equal chance of being sampled. As such, the sample data were representative of the entire population of soils in the sampled area and provided a valid data set for comparing two or more different polygon maps of the same area produced by different techniques and mappers.

Along with the above advantages, certain limitations were also imposed upon the project by using the radial arm transect for collecting field data. These were:

a) Operationally there was some backtracking in going to and returning from sample points.

b) The method did not guarantee that samples would be taken from all portions of an overlain polygon nor that these samples represented the full extent of any overlain polygon.

c) The portion of the delineation represented by the transect is small relative to the overall size of the average delineation. Therefore, some radial arms might not be characteristic of or encompass all the soil and landscape variability within a map unit or they find a higher degree of variability because of their spatial scale.

6.0 CARTOMETRICS

Cartometrics usually refers to the scale of presentation and the texture of a soil map. Both can be related directly to the usefulness of the soil map through its readability (Marsman and de Gruijter 1986) or its legibility (Forbes et al. 1985).

Marsman and de Gruijter (1986) stated that map users generally dislike maps with a large number of very small polygons. Maps having an even distribution of mapping units in terms of the percentage of map area, maps having the fewest polygons, and maps having the largest average polygon size were considered to be the most readable. This is a subjective system, however, in that maps having too few polygons or polygons which are too large may not be precise enough for the needs of many users.

Map texture refers to the sizes and pattern of delineations on a map (Forbes et al. 1985). The pattern of map delineations is difficult to assess and is as dependent upon the surveyors mapping style (that is, lumping versus splitting) as it is upon the variability of the landscape. For this reason, map texture is usually only measured in terms of delineation size (Forbes et al. 1985).

In this project, six measures of cartometric utility were assessed. They are: 1) number of delineations; 2) number of observations; 3) minimum size polygon (ha); 4) maximum size polygon (ha); 5) average size polygon (ha); and 6) map delineation density. These six measures were calculated for each soil map (3 methods X 6 townships = 18 maps) and then averaged for each mapping method.

7.0 SIMILARITY MATRICES

The similarity matrix concept was developed as a method for assessing the relative degree of similarity between the soils predicted to occur in any given map unit and the soils observed to occur at selected sampling locations within that map unit (Alberta Research Council 1992).

It has long been recognized that the utility of a soil survey is not inexorably linked to its taxonomic purity. Hudson (1990) argued that most users had been successful in interpreting soil map units as if they were uniform areas of homogeneous soil as described in the legend and concluded that soil maps functioned well in practice despite the theoretical shortcomings associated with taxonomic impurity.

Byrd (1991) agreed with Hudson (1990) that people who use soil survey maps don't worry about supposed 'deficiencies' resulting from taxonomic impurity because the maps work for them. Schellentrager (1990) argued that evaluation of the accuracy of soil survey map units was hindered by the emphasis placed on taxonomic purity relative to interpretive success. He noted that "statistical analysis of a map unit's taxonomic composition assists in the definition and description of the map unit; it does not improve our assessment of the accuracy of soil interpretations of that map unit". He concluded that "a method of evaluating the accuracy and reliability of those soil properties used in rating a map unit for a specific use must be developed" (Schellentrager, 1990). He suggested that one possible solution would be "to improve the concept and definition of similar and contrasting (dissimilar) soils by defining similarity or contrast on the basis of fundamental soil properties (that is, depth, texture, coarse fragments and so on)". Map units could be tested and described in terms of the degree of similarity of each of the observed soils to each of the predicted soils.

Other investigators have recognized that evaluation of soil map accuracy in terms of binary (right/wrong) assessments is too stringent a test. For example, Marsman and de Gruijter (1986) recognized, as a limitation of their procedure, the fact that "all deviations from the (expected) class deviations are equally weighed, regardless of their type or extent".

The similarity matrix method of evaluating the accuracy of soil maps and legends assumes that many of the soils encountered when testing a given map unit polygon are similar, in some greater or lesser degree, to one or more of the soil series used to name or describe the map unit. The method seeks to systematically appraise and quantify this similarity and assumes that a relative "degree of similarity" can be manually estimated for all combinations of classes for all important soil attributes. The degree of similarity between any two classes for any given attribute can be stored in and read from a 'similarity matrix' constructed for that attribute. A further assumption is that an overall similarity of observed to predicted soil can be computed as some arithmetic average or cross product of the individual soil property similarities. A final assumption is that the relative degree of similarity between predicted and observed soils computed for any given map unit or entire soil map provides an effective indication of the likely utility of that map unit or map for making the interpretations required of it.

The degree to which one class is deemed to be similar to another class is strictly arbitrary and so is subject to criticism. Measures of absolute similarity should not be relied upon for judgments, but relative degrees of similarity between different types of maps may prove useful and reliable.

In this project, soil texture, parent material (PM), internal drainage, subgroup classification, and salinity were selected as the soil properties and characteristics to be tested. The approaches used in creating similarity matrices for this project are outlined below.

For soil texture (Table A-2) and internal drainage (Table A-3), similarity ratings were determined by deducting ten points for each class difference between the two classes to be compared. This approach was possible because both soil textural classes and internal drainage classes are ordinal and can be ranked in a logical manner (Moon, Hall, and Selby, internal memorandum, 1987). For example, a moderately well drained soil in comparison to a poorly drained soil would receive a similarity rating of 80/100 for drainage.

For soil PM (Table A-4), similarity ratings were assigned based on differences from an agricultural perspective and on ease of recognition in the field. This approach was used because soil parent materials are not ordinal and do not have a single logical ranking (for example, 1 to 10) and point deductions given accordingly. For example, fluvial (FLUV) materials can be equally similar to both glaciolacustrine (GLLC) and till (TILL), and were given the same similarity rating in comparison. When the ranking system was applied, a FLUV versus GLLC and FLUV versus TILL comparison did not receive the same rating.

Assigning similarity ratings to subgroup classifications posed a slightly different problem in that point deductions had to be consistent within different orders and different great groups. To achieve consistency, separate tables were set up for soil Orders (Table A-5), subgroup characteristics (Table A-6), Solonetzic properties (Table A-7), and Chernozemic - Luvisolic properties (Table A-8). Point deductions were given for each of the comparisons within these categories. In addition, point deductions were given for soil zone differences, presence or absence of salinity (not applicable in Solonetzic comparisons), and subsoil differences (applied to Solonetzic - Luvisolic comparisons). The point deductions assigned for subgroup characteristic differences, were considered to be cumulative when determining subgroup classification similarity ratings (for example, a comparison between a saline O.BL soil and a non-saline R.BL soil would receive point deductions for both the Orthic versus Rego difference and the saline versus non-saline difference) (Tables A-9 and A-10).

Subgroup classification differences based on drainage (Gleyed subgroups) were not assigned point deductions because this was already done in the drainage similarity category. Soils belonging to the Gleysolic Order were given a 50 point deduction (Table A-5) in comparison to all other soil Orders (except Organics). Additional points were then deducted based on profile characteristic differences.

The similarity between soil series was calculated after the similarity matrices for texture, PM, drainage and subgroup classification were completed. This was accomplished using the following formula:

$$\text{Similarity (Series)} = \frac{(\text{texture} + \text{PM})}{2} \times \text{drainage} \times \text{subgroup} \times \text{salinity}$$

An average of texture and PM was used in the formula because the two soil properties are closely associated. By using texture and PM individually within the formula, the effect would have been to double penalize any differences and give unwarranted weight to the effect of texture and PM upon a similarity rating between two soil series. The subgroup rating for soils of the Gleysolic Order was assumed to be independent of internal drainage, as were the gleyed subgroups. For example, an O.HG was considered to have the same profile characteristics as an O.BL soil and so no points were deducted beyond the automatic 50 in a comparison between the two (Table A-5). For the same reason, a GLE.BL soil was considered to be an E.BL soil as far as subgroup similarity ratings were concerned. Final similarity ratings for soil series encountered in the study were computed (Tables A-11 to A-18) and used to determine "percent similar" values for predicted versus observed soils.

Table A-2. Similarity matrix for textural classes.

	Very coarse	Mod. coarse	Medium	Mod. fine	Fine	Very fine
Very coarse	100	90	80	70	60	50
Mod. coarse		100	90	80	70	60
Medium			100	90	80	70
Mod. fine				100	90	80
Fine					100	90
Very fine						100

Very coarse = LS, S
Moderately coarse = SL, FSL
Medium = L, SiL, VFSL
Moderately fine = SCL, CL, SiCL
Fine = C, SiC, SC
Very Fine = HC

Table A-3. Similarity matrix for drainage classes.

	Rapid	Well	Mod. Well	Imperfect	Poor
Rapid	100	90	80	70	60
Well		100	90	80	70
Mod. Well			100	90	80
Imperfect				100	90
Poor					100

Table A-4. Similarity matrix for parent material.

	EOLI	FLEO	GLFL	FLUV	FLLC	LACU	GLLC	GLTL	TILL	RESI
EOLI	100	99	99	75	70	60	60	50	50	40
FLEO		100	99	95	85	70	60	50	50	40
GLFL			100	99	99	60	80	50	70	60
FLUV				100	99	95	70	50	70	60
FLLC					100	99	99	70	70	60
LACU						100	99	99	90	60
GLLC							100	99	90	60
GLTL								100	99	60
TILL									100	95
RESI										100

Table A-5. Similarity matrix for soil order.

	Chernozemic	Gleysolic	Luvisolic	Organic	Regosolic	Solonetzic
Chernozemic	100	50	*	30	*	*
Gleysolic		100	50	90	50	50
Luvisolic			100	30		
Organic				100		
Regosolic					100	
Solonetzic						100

* elaborated upon in Tables A-6 to A-10

Criteria used to derive Subgroup similarity matrices

Soil zone: 0-10 point deduction depending upon proximity to zone line
(Brown to Dark Brown; Black to Dark Gray)
5 point deduction (Thick Black and Thin Black)

Salinity: 30 point deduction (does not apply for Solonetzic soils)

Subsoil: Bt vs. Bnt (SS, SZ) = 20 point deduction
Bt vs. Bnt (SO) = 10 point deduction

Table A-6. Subgroup point deductions.

	Orthic	Rego	Calcareous	Eluviated	Solonetzic
Orthic	0	15	10	5	10
Rego		0	10	10	30
Calcareous			0	30	30
Eluviated				0	5
Solonetzic					0

Table A-7. Solonetzic soil point deductions.

	Orthic	Eluviated	Solonetzic	Solod	Solodized Solonetz	Solonetz
Orthic	0	5	10	30	50	40
Eluviated		0	5	25	45	35
Solonetzic			0	15	35	25
Solod				0	20	20
Solodized Solonetz					0	5
Solonetz						0

Table A-8. Chernozemic - Luvisolic point deductions.

	O.BL	O.DG	E.BL	D.GL	O.GL
O.BL	0	5	5	10	20
O.DG		0	5	5	10
E.BL			0	5	10
D.GL				0	5
O.GL					0

Table A-9. Similarity matrix for Black and Dark Gray subgroups.

	E.BL	CA.BL	R.BL	SZ.BL	BL.SZ	BL.SS	BL.SO	DG.SO	O.DG	CA.DG	SZ.DG	D.GL	O.GL	O.HG	HU.LG	SZ.LG	R.HG
O.BL	95	90	85	90	60	50	70	65	95	85	85	90	80	50	45	35	40
E.BL	100	70	90	95	65	55	75	70	95	65	90	95	90	45	50	40	40
CA.BL		100	90	70	50	40	60	55	85	95	65	80	70	40	40	35	45
R.BL			100	70	45	35	55	50	80	85	65	75	65	40	40	35	50
SZ.BL				100	75	65	85	80	85	65	95	80	70	40	45	45	40
BL.SZ					100	95	80	75	55	50	70	60	55	30	35	40	30
BL.SS						100	80	75	45	35	60	65	60	25	30	35	25
BL.SO							100	95	65	55	80	70	70	35	40	45	30
DG.SO								100	70	60	85	90	85	35	40	45	30
O.DG									100	90	90	95	90	50	45	35	40
CA.DG										100	70	80	80	40	40	35	45
SZ.DG											100	90	80	40	45	45	40
D.GL												100	95	40	45	40	35
O.GL													100	40	45	40	35
O.HG														100	95	85	85
HU.LG															100	95	90
SZ.HG																100	70
R.HG																	100

Table A-10. Similarity matrix for Dark Brown and Brown soil subgroups.

	O.B	R.B	E.B	CA.B	O.DB	E.DB	CA.DB	R.DB	SZ.DB	B.SS	B.SO	O.HG	CA.HG	O.HR	CU.R
O.B	100	85	95	90	98	93	88	83	88	50	70	50	45	75	75
R.B		100	90	90	83	88	88	98	68	35	55	40	45	90	90
E.B			100	70	93	98	68	88	93	55	75	45	40	80	80
CA.B				100	88	68	98	88	68	40	60	40	50	80	80
O.DB					100	95	90	85	90	48	68	50	45	75	75
E.DB						100	70	90	95	53	73	45	40	80	80
CA.DB							100	90	70	38	58	40	50	80	80
R.DB								100	60	33	53	40	45	90	90
SZ.DB									100	63	83	40	40	60	60
B.SS										100	80	25	30	25	25
B.SO											100	35	35	45	45
O.HG												100	90	30	30
CA.HG													100	35	35
O.HR														100	95
CU.R															100

Table A-11. Similarity matrix for soil series in SCA 7.

	COR	DYD	EOR	HER	KLM	LOG	RED	ROS	SHS
COR	100	36	41	41	27	32	22	35	29
DYD		100	70	85	80	80	34	55	78
EOR			100	90	50	60	48	79	49
HER				100	65	75	43	71	59
KLM					100	95	24	39	98
LOG						100	29	47	93
RED							100	70	19
ROS								100	38
SHS									100

Table A-12. Similarity matrix for soil series in SCA 10.

	AGS	BVH	CCB	CMO	EDG	HBM	HGT	MLS	MMO	NRM	POK	TFD
AGS	100	95	86	55	90	83	32	68	90	95	80	75
BVH		100	90	50	85	88	36	63	86	90	76	70
CCB			100	45	77	81	36	70	95	81	86	63
CMO				100	35	47	18	72	50	65	44	80
EDG					100	83	29	50	81	70	72	55
HBM						100	32	69	93	88	93	69
HGT							100	27	36	29	32	24
MLS								100	75	77	60	90
MMO									100	86	90	68
NRM										100	76	85
POK											100	60
TFD												100

Table A-13. Similarity matrix for soil series in SCA 11.

	COA	ELP	GBL	LFD	LNN	RDW	RLV	TBY
COA	100	64	83	76	80	61	90	
RLV	90	64	75	90	90	68	100	
UCS	95	68	79	86	90	64	95	90

Table A-14. Similarity matrix for soil series in SCA 6.

	BED	BZC	DEL	IND	LTA	RKV
BED	100	19	50	30	48	49
BZC		100	40	77	30	30
DEL			100	45	90	98
IND				100	36	39
LTA					100	98
RKV						100

Table A-15. Similarity matrix for soil series in SCA 8.

	DVG	MFT	OKY	POT	PPE
DVG	100	95	50	36	70
MFT		100	50	38	75
OKY			100	20	50
POT				100	26
PPE					100

Table A-16. Similarity matrix for soil series in SCA 1.

	KBD	WDW	RIR	TIY	BUT	CVD	CHN	SPS	BVL
MKR	36	20	64	57	71	62	63	44	75
aaSXT	36	20	64	57	71	62	63	44	75
BVL	56	40	92	85	95		88	63	100

Table A-17. Similarity matrix for soil series in SCA 2.

	FOK	HRK	LUP	MGR	PUR	WID	ANO	CRD	BVL	HMS	KSR	LET
FOK	100	90	85	87	72	59	86	72	90	59		
HRK		100	81	82	63	54	73	63	83	54	85	68
LUP			100	87	80	68		80				
MGR				100	79	67		79				
PUR					100	85	77	100	74	85		
CRD						85	77	100	74	85		
CVD		98							85			

Table A-18. Similarity matrix for soil series in SCA 3.

	CLD	CRD	DIM	KSR	LET	OAS	SXT	VEB	WNY	BKE
CLD	100	90	80	68	95	80	47	77	92	81
CRD		100	72	68	85	68	51	85	93	81
DIM			100	61	85	68	64	85	79	95
KSR				100	72	95	75	57	74	61
LET					100	69	67	72	93	85
OAS						100	71	57	78	65
SXT							100	61	56	61
VEB								100	78	95
WNY									100	83
BKE										100

8.0 ACCURACY

The purpose of calculating the accuracy of a soil inventory product is to make a quantitative estimate of the utility of that product. If the soil map and legend have a high level of accuracy in the prediction of the discreet soil entities which occur in the landscape, the utility of the map product regarding its intended use is considered to be high. For this project, the accuracy was calculated in two ways: a) "percent correct"; and b) "percent similar". Both methods of calculating accuracy were used to evaluate the soil maps and legends.

The measure "percent correct" is a binary system which says yes, the soil was predicted or no, the soil was not predicted. For the "percent correct" evaluation, the observed soils (in the independent data set) were compared to the predicted soils (in the map legends) on an exact match basis. There was no allowance for 'close' in the "percent correct" evaluation. Soils which were similar to but not the same as the series listed were classed as incorrect even though the difference may not have been great enough to affect any interpretation which may be made (for example O.BL vs. E.BL).

This evaluation was done on both a proportional and a non-proportional basis for the "percent correct" measure of accuracy. On a proportional basis, an observation was in agreement with the map legend up to the predicted percentage of that soil in the map unit. For example, if in 17 observations the map legend predicted six (30%) wet soils and eight wet soils are found, then only six of the eight soils were classed as correct. The remaining two soils were classed as incorrect. On a non-proportional basis, an observation was classed as correct if it was mentioned in the map legend. Using the previous example, all eight wet soils would have been correct on a non-proportional basis.

The "percent similar" evaluation of the data used a slightly modified version of the measure "percent correct". This evaluation considered the 'closeness' between the observed and the predicted soils. Instead of using the number of exact matches, the similarity value of each observed soil (Tables A-11 to A-18) was used in the formula. The sum of the similarity values was divided by the total number of observations to obtain an average for each transect. This average was then used as the similarity value for each transect.

A "percent correct" or "percent similar" evaluation of a soil map can only be made at the level of precision used to make the map. For example, if the soils in the landscape are only described to the subgroup level, the "percent correct" for soil series cannot be calculated. As well, four assumptions were made before the data could be analyzed. It was assumed that 1) the ground truth sample population was representative of the soil population as a whole, 2) the sample population was independent of the data used to make the soil inventory products, 3) the sample population used to calculate the "percent correct" and "percent similar" values was large enough to make a statistically valid estimate and 4) the sampling method used was statistically valid.

The procedure used to calculate and evaluate the accuracy of each mapping method was:

1. Each site observation (soil series) was classified as either correct (predicted by the soil map and legend) or incorrect (not predicted by the soil map and legend). In order for a soil to be considered correct, an 'exact match' was needed between the observed and predicted soils. Only the map unit description for the polygon in which the sample point occurred was used when deciding if the observed soil series was predicted by the soil map and legend.

   This classification was done on both a proportional and non-proportional basis for the percent correct evaluation. On a proportional basis, an observation was in agreement with the map legend up to the predicted percentage of that soil in the map unit. The number of predicted soils was determined by the upper limit of the range given in the legend (for example 10 - <u>30</u>%). For example, if in 17 observations eight wet soils were found and the map legend predicted six (30%) wet soils, then six of the eight soils were classed as correct. and two soils were classed as incorrect. If four wet soils had been found, then all four soils would have been considered correct. On a proportional basis, an observation was classed as correct if it was mentioned in the map legend. Using the previous example, all eight soils would have been classed as correct on a non-proportional basis.

2. The number of 'correct' sample points were totaled and the percentage correct was calculated using the formula:

   $$\% \text{ correct} = \frac{\text{number of 'exact match' observations}}{\text{total number of observations}} \times 100$$

   (Marsman and de Gruijter 1986).

3. Each observation site was assigned a similarity value based on the similarity matrices described earlier (Tables A-11 to A-18). All observations classed as correct in step 1 on a proportional basis were assigned a similarity value of 100.

For each of the observed soil series not predicted by the map unit description, comparisons were made with other soils predicted as occurring in greater proportions than were actually found. All comparisons were made such that the highest possible similarity value was obtained for each soil. This evaluation of the field data was done on a proportional basis only and was done for soil series, soil texture, parent material, internal drainage, and subgroup classification.

4. The similarity value of each transect was calculated using the formula:

$$\% \text{ similar} = \frac{\text{sum of the similarity values}}{\text{total number of observations}} \text{ X } 100$$

Steps one through four were done for each radial arm transect for each method. The same set of field data was used for evaluating all three mapping methods.

5. The "percent correct" and "percent similar" values were then totaled and averaged for each mapping method. This step produced the following averages for each of the landscape, top-down, and SIL3 1:50 000 mapping methods (Appendix E):

    a) % correct, proportional, soil series
    b) % correct, non-proportional, soil series
    c) % similar, soil series
    d) % similar, soil texture
    e) % similar, parent material
    f) % similar, internal drainage
    g) % similar, subgroup classification

6. F-Tests at the 95% confidence level for each of the following comparisons were done (Appendix E) using Microsoft Excel Version 4.0:

    a) landscape method, % correct, proportional vs. non-proportional
    b) top-down method, % correct, proportional vs. non-proportional
    c) SIL3 1:50 000, % correct, proportional vs. non-proportional
    d) % correct, proportional, landscape vs. top-down
    e) % correct, non-proportional, landscape vs. top-down
    f) % similar, soil series, landscape vs. top-down
    g) % similar, soil texture, landscape vs. top-down
    h) % similar, parent material, landscape vs. top-down
    i) % similar, internal drainage, landscape vs. top-down

j) % similar, subgroup classification, landscape vs. top-down

Comparisons d through j were also done for both top-down vs. SIL3 1:50 000 methods and landscape vs. SIL3 1:50 000 methods. This step was done in order to test the results of step 5 for any statistically significant differences in the variances.

7. t-Tests for significant difference of the means at the 95% confidence level were done for each of the comparisons outlined in step 6, using Microsoft Excel Version 4.0 (Appendix E). Two different tests were run depending upon the results of step 6. If there was a significant difference in the variances, a t-Test for two samples assuming unequal variances was used. If there was no significant difference between the two variances, a t-Test for two samples assuming equal variances was used.

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APPENDIX B: SOIL MAPS AND LEGENDS

Soil maps and soil map legends for each township are presented. Maps and legends are sorted by township. Each map sheet contains a summary of the results and information pertaining to that map and legend.

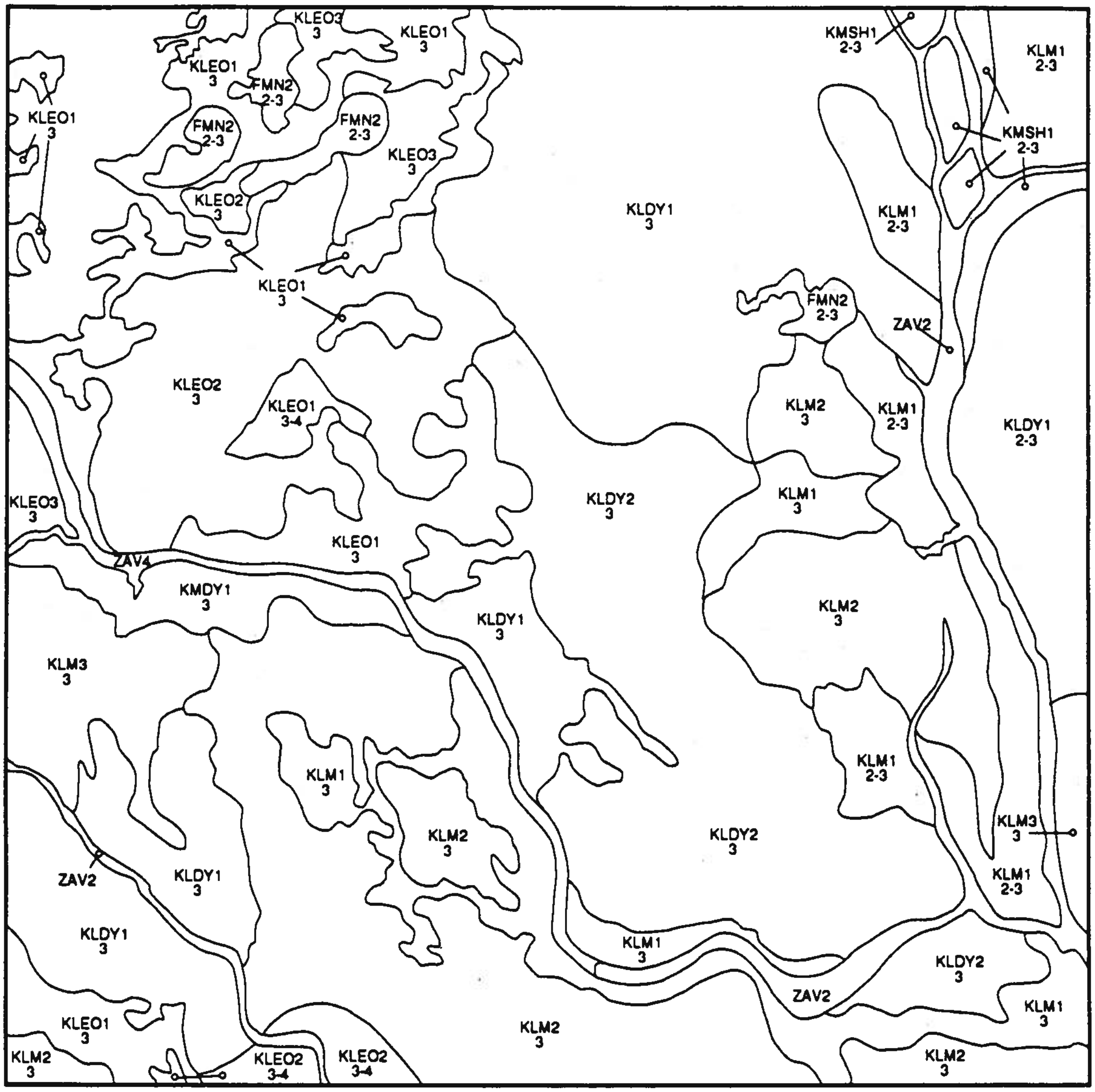

Figure B-1. Soil Map of Township 47 Range 14 W4 (Landscape Mapping Method).

General landscape description: undulating till plain; Solonetzic soils.

Cartometrics	
Number of polygons:	50
Number of observations:	38
Minimum size polygon:	18 ha
Maximum size polygon:	1241 ha
Average size polygon:	187 ha

Accuracy		
Percent correct, proportional		56%
Percent correct, non-proportional		72%
Percent similarity,	soil series	90%
	soil texture	99%
	parent material	99%
	internal drainage	99%
	subgroup classification	92%

Table B-1. Soil Map Legend for Township 47 Range 14 W4 (Landscape Mapping Method).

Map Unit	Parent Materials	Major Soils (%)	Minor Soils (%)	Comments
FMN2/2-3	Moderately fine to fine textured lacustrine veneer over moderately fine textured till	FMN 30 - 60 COR 20 - 40 Saline variants 5 - 30 KLM 10 - 40	HER 0 - 10 EOR 0 - 10 DYD 0 - 10	
KLDY1/2-3	Moderately fine textured till	KLM 40 - 70 DYD 20 - 50	EOR 0 - 20 HER 0 - 20 GGW 0 - 10 Saline GGW 0 - 10	
KLDY1/3		KLM 40 - 70 DYD 20 - 50	EOR 0 - 20 HER 0 - 20 GGW 0 - 10 Saline GGW 0 - 10	
KLDY2/3		KLM 40 - 70 DYD 20 - 50 GGW 15 - 30	HER 0 - 20 EOR 0 - 10 Saline GGW 0 - 10	
KLEO1/3		KLM 30 - 60 EOR 15 - 30 HER 10 - 30 DYD 10 - 30	GGW 0 - 10 Saline GGW 0 - 10	
KLEO1/3-4		KLM 30 - 60 EOR 15 - 30 HER 10 - 30 DYD 10 - 30	GGW 0 - 10 Saline GGW 0 - 10	
KLEO2/3		KLM 30 - 60 EOR 15 - 30 GGW 15 - 30	HER 0 - 10 DYD 0 - 10 Saline GGW 0 - 10	
KLEO2/3-4		KLM 30 - 60 EOR 15 - 30 GGW 15 - 30	HER 0 - 10 DYD 0 - 10 Saline GGW 0 - 10	
KLEO3/3		KLM 30 - 60 EOR 15 - 30 Saline HGT 15 - 30	HER 10 - 30 DYD 10 - 30 COR 0 - 20	Surface salts.
KLM1/2-3		KLM 60 - 90	GGW 0 - 10 HER 0 - 20 DYD 0 - 20 EOR 0 - 10 Saline GGW 0 - 10	
KLM1/3		KLM 60 - 90	GGW 0 - 10 HER 0 - 20 DYD 0 - 20 EOR 0 - 10 Saline GGW 0 - 10	
KLM2/3		KLM 50 - 80 GGW 15 - 30	HER 0 - 20 DYD 0 - 20 EOR 0 - 10 Saline GGW 0 - 10	
KLM3/3		KLM 50 - 80 Saline GGW 15 - 30	HER 0 - 20 DYD 0 - 20 EOR 0 - 10	

continued ...

Table B-1. Concluded.

Map Unit	Parent Materials	Major Soils (%)	Minor Soils (%)	Comments
KLSH1/2-3	Moderately fine textured till over fine textured saline weathered residual	KLM 30 - 70 SHS 30 - 70	GGW 0 - 10 DYD 0 - 20 HER 0 - 10	
ZAV2	Variable textured fluvial deposits (shallow to bedrock)	GGW 60 - 90	Humic Regosols 0 - 20 KLM 0 - 20 EOR 0 - 20	3t and 3i slopes
ZAV4		GGW 20 - 60 Valley sides 20 - 60	Humic Gleysols 0 - 20	Tub shaped valley

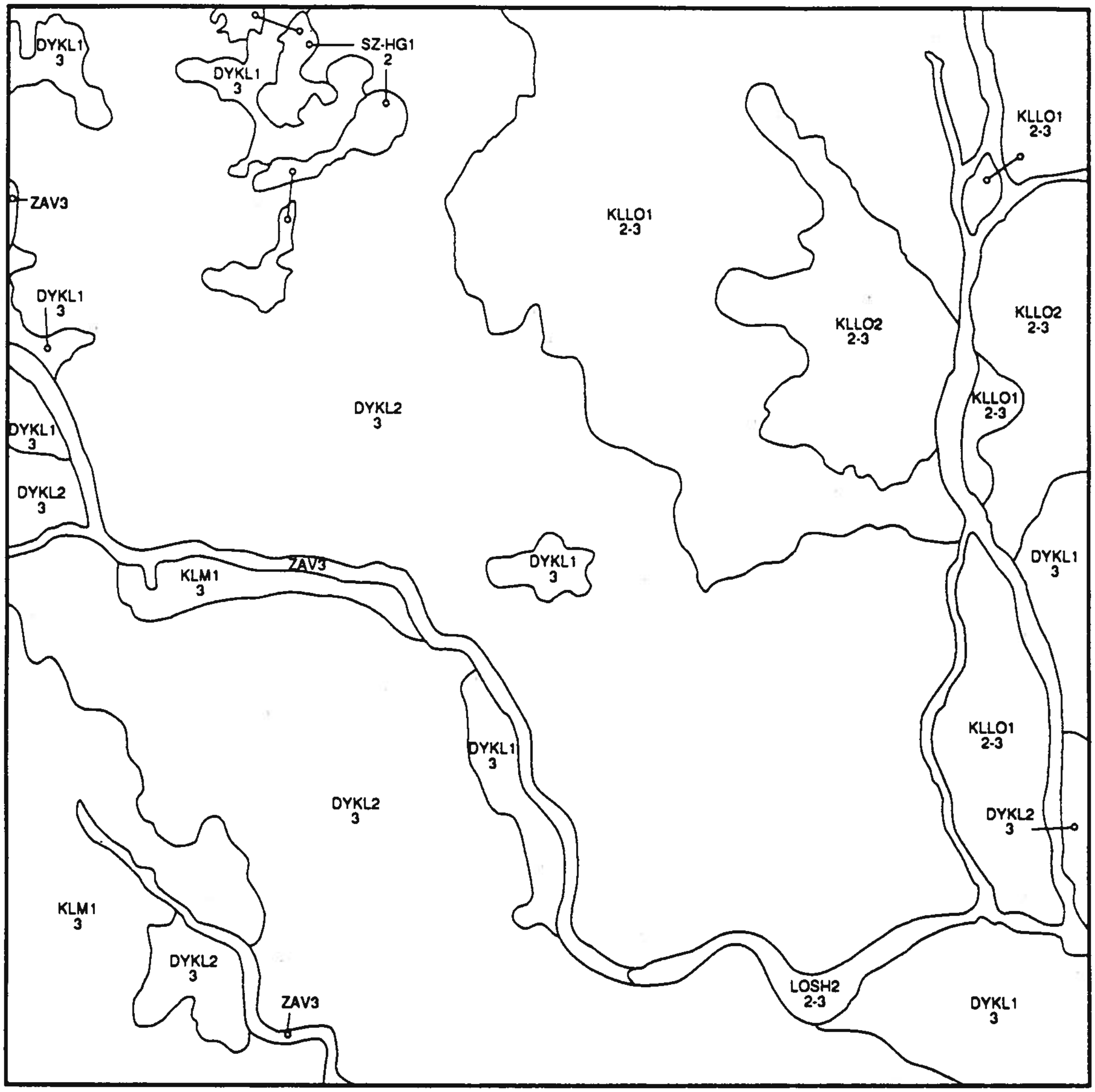

Figure B-2. Soil Map of Township 47 Range 14 W4 (Top-Down Mapping Method).

General landscape description: undulating till plain; Solonetzic soils.

<u>Cartometrics</u>	
Number of polygons:	42
Number of observations:	19
Minimum size polygon:	24 ha
Maximum size polygon:	2354 ha
Average size polygon:	222 ha

<u>Accuracy</u>		
Percent correct,	proportional	44%
Percent correct,	non-proportional	55%
Percent similarity,	soil series	80%
	soil texture	98%
	parent material	99%
	internal drainage	98%
	subgroup classification	82%

Table B-2. Soil Map Legend for Township 47 Range 14 W4 (Top-Down Mapping Method).

Map Unit	Parent Materials	Major Soils (%)	Minor Soils (%)	Comments
DYKL1/3	Moderately fine textured till	DYD 30 - 50 KLM 20 - 40	LOG 10 - 20 HER 5 - 15	Lots of undulations where solodization is well advanced. Ah horizons are thicker at upper and crest positions.
DYKL2/3		DYD 20 - 40 KLM 20 - 40 GGW 15 - 20	LOG 10 - 20 HER 5 - 15	
FMN1/2	Fine textured lacustrine blanket and veneer over moderately fine textured till	FMN 50 - 70 HGT 15 - 30		Groundwater discharge conditions
KLLO1/2-3	Moderately fine textured till	KLM 20 - 40 LOG 30 - 50 DYD 15 - 25	HER 5 - 15 GGW 5 - 15	Few undulations, generally level landscape. Solodization proceeding only on undulations.
KLLO2/2-3		KLM 20 - 40 LOG 30 - 40 DYD 15 - 20 GGW 15 - 20		
KLM1/3	Moderately fine textured till blanket overlying residual	KLM 30 - 50 DYD 15 - 30 LOG 15 - 30	SHS 10 - 20	About 2 m to bedrock
LOSH2/2-3	Moderately fine textured till veneer and blanket overlying residual	LOG 20 - 30 SHS 20 - 40 GGW 20 - 40		Scoured channel and till veneer and blanket over residual. High water table.
ZAV3	Undifferentiated			Salinity and wetness are both significant.

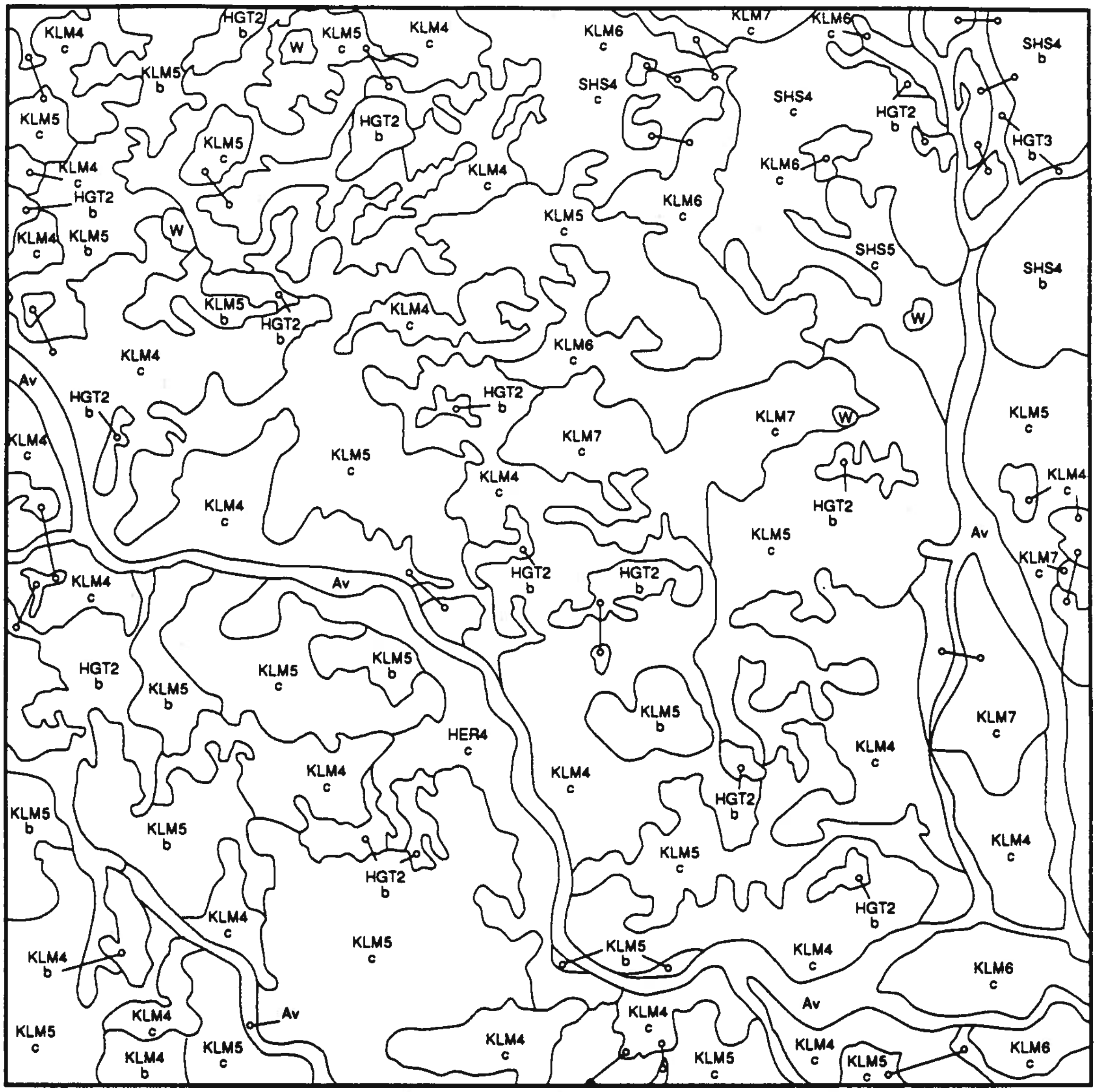

Figure B-3. Soil Map of Township 47 Range 14 W4 (SIL3 1:50 000 Mapping Method).

General landscape description: undulating till plain; Solonetzic soils.

Cartometrics	
Number of polygons:	81
Number of observations:	170
Minimum size polygon:	6 ha
Maximum size polygon:	707 ha
Average size polygon:	115 ha

Accuracy		
Percent correct,	proportional	31%
Percent correct,	non-proportional	48%
Percent similarity,	soil series	77%
	soil texture	98%
	parent material	99%
	internal drainage	98%
	subgroup classification	82%

Table B-3. Soil Map Legend for Township 47 Range 14 W4 (SIL3 1:50 000 Mapping Method).

Map Unit	Parent Materials	Major Soils (%) *	Minor Soils (%) **	Comments
HER4/c	Moderately fine textured till	HER 60	KLM, DYD 0 - 40 GGW 0 - 15	
HGT2/b	Moderately fine to fine textured lacustrine	HGT	KLM, DYD, SHS, HER, AGS,CMO, NRM	
KLM4/b	Moderately fine textured till	KLM	CMO, DYD 0 - 40 GGW 0 - 15	
KLM4/c		KLM	CMO, DYD 0 - 40 GGW 0 - 15	
KLM5/b		KLM	CMO, DYD 0 - 40 HGT 0 - 20 GGW 0 - 15	
KLM5/c		KLM	CMO, DYD 0 - 40 HGT 0 - 20 GGW 0 - 15	
KLM6/c	Moderately fine textured till veneer and blanket over moderately fine textured weathered residual	KLM	DYD 0 - 20 SHS 0 - 15 GGW 0 - 15	
KLM7/c		KLM	DYD 0 - 20 SHS 0 - 15 GGW 0 - 15 HGT 0 - 20	
SHS4/b	Moderately fine textured till veneer over moderately fine textured residual	SHS 80	DYD, HER 0 - 20 HGT, POK, PHS GGW 0 - 15	
SHS4/c		SHS 80	DYD, HER 0 - 20 HGT, POK, PHS GGW 0 - 15	
SHS5/b		SHS 60	DYD, HER 0 - 20 HGT, POK, PHS GGW 0 - 15 HGT 0 - 20	
SHS5/c		SHS 60	DYD, HER 0 - 20 HGT, POK, PHS GGW 0 - 15 HGT 0 - 20	
AV	Undifferentiated			
ZW	Undifferentiated			

* Major soils not having a specified percentage can occupy up to 100% of the map unit.

** Minor soils not having a specified percentage can occupy up to 15% of the map unit.

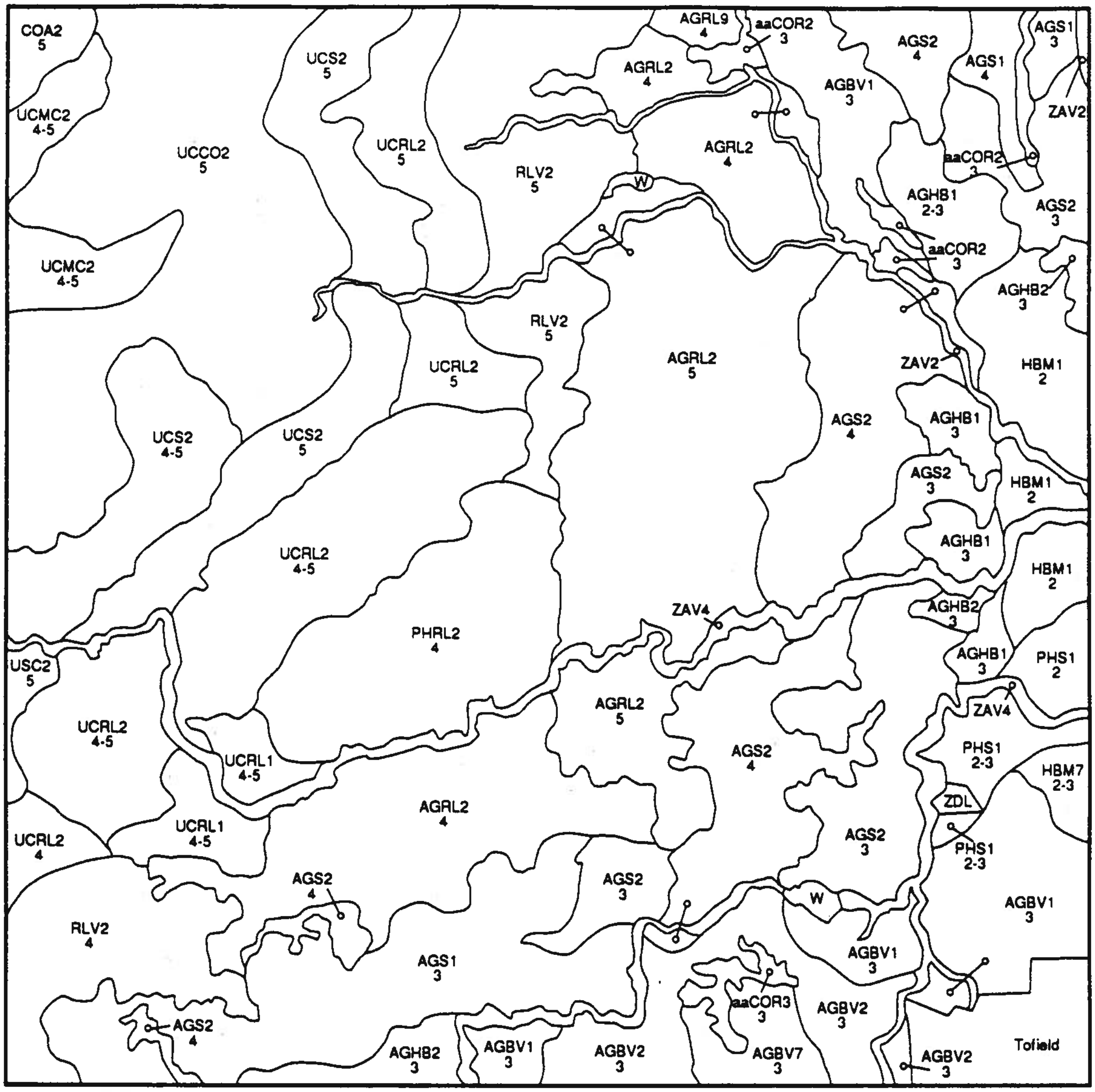

Figure B-4. Soil Map of Township 51 Range 19 W4 (Landscape Mapping Method).

General landscape description: hummocky till with minor fluvial deposits; Luvisolic & Chernozemic soils.

Cartometrics	
Number of polygons:	73
Number of observations:	35
Minimum size polygon:	4 ha
Maximum size polygon:	890 ha
Average size polygon:	128 ha

Accuracy		
Percent correct,	proportional	43%
Percent correct,	non-proportional	52%
Percent similarity,	soil series	85%
	soil texture	97%
	parent material	92%
	internal drainage	98%
	subgroup classification	91%

Table B-4. Soil Map Legend for Township 51 Range 19 W4 (Landscape Mapping Method).

Map Unit	Parent Materials	Major Soils (%)	Minor Soils (%)	Comments
AGBV1/3	Moderately fine textured till	AGS 40 - 70 BVH 20 - 50	GGW 0 - 10	
AGBV2/3		AGS 40 - 70 BVH 20 - 50 GGW 15 - 30		
AGBV7/3		AGS 30 - 60 BVH 20 - 50 CMO 5 - 20 GGW 5 - 20	NRM 0 - 10 TFD 0 - 10	
AGHB1/2-3	Moderately fine glaciofluvial veneer over moderately fine till	AGS 30 - 60 HBM 20 - 50	BVH 5 - 20 POK 5 - 20 GGW 0 - 10	
AGHB1/3		AGS 30 - 60 HBM 20 - 50	BVH 5 - 20 POK 5 - 20 GGW 0 - 10	
AGHB2/3		AGS 20 - 50 HBM 20 - 50 GGW 15 - 30	BVH 0 - 10 POK 0 - 10	
AGRL1/3	Moderately fine textured till	AGS 30 - 70 RLV 20 - 50 BVH 10 - 30	GGW 10 - 30	
AGRL2/4		AGS 30 - 50 RLV 20 - 40 GGW 15 - 30	BVH 0 - 20	
AGRL2/5		AGS 30 - 50 RLV 20 - 40 GGW 15 - 30	BVH 0 - 20	
AGRL9/4		AGS 20 - 40 RLV 20 - 40 GGW 10 - 30 UKT 10 - 30	BVH 0 - 20 RDW 0 - 20	
AGS1/3		AGS 50 - 80 BVH 20 - 40	GGW 0 - 10	
AGS1/4		AGS 50 - 80 BVH 20 - 40	RLV 0 - 20 GGW 0 - 10	
AGS2/3		AGS 50 - 80 BVH 15 - 30 GGW 15 - 30		
AGS2/4		AGS 40 - 70 BVH 10 - 30 GGW 15 - 30	RLV 0 - 20	
COA2/5	Moderately fine textured till	COA 50 - 80 UCS 10 - 30 GGW 15 - 30		
aaCOR2/3	Moderately fine textured till	aaCOR 30 - 70 AGS 20 - 40	R.HG and O.HG 10 - 40 BVH 10 - 30	
aaCOR3/3		aaCOR 30 - 60 AGS 10 - 30 saline variants 15 - 30	R.HG and O.HG 5 - 20 BVH 5 - 20	
HBM1/2	Moderately fine textured glaciolacustrine veneer over moderately fine textured till	HBM 50 - 70 POK 20 - 40	AGS 0 - 10 GGW 0 - 10	

continued ...

Table B-4. Concluded.

Map Unit	Parent Materials	Major Soils (%)	Minor Soils (%)	Comments
HBM7/2-3	Moderately fine textured glaciolacustrine veneer over moderately fine textured till	HBM 30 - 60 POK 10 - 40 ARM 10 - 30	AGS 0 - 20 GGW 0 - 10 ARM variants 5 - 20	
PHRL2/4	Moderately coarse textured fluvial-aeolian blanket and veneer over moderately fine textured till and moderately fine textured till	PHS 20 - 40 RLV 20 - 40	GGW 15- 30 RDW 15 - 30 UKT 5 - 15 AGS 5 - 15	
PHS1/2	Moderately coarse textured fluvial-aeolian	PHS 50 - 80	UKT 10 - 30 GGW 0 - 10 zePHS 10 - 30	
PHS1/2-3		PHS 50 - 80	UKT 10 - 30 GGW 0 - 10 zePHS 10 - 30	
RLV2/4	Moderately fine textured till	RLV 40 - 70 GGW 15 - 30	UCS 5 - 20 AGS 10 - 30	
RLV2/5		RLV 40 - 70 GGW 15 - 30	UCS 5 - 20 AGS 10 - 30	
UCCO2/5	Moderately fine textured till	UCS 30 - 60 COA 20 - 40 GGW 15 - 30	RLV 0 - 20	
UCMC2/4-5	Moderately fine textured till and fine textured glaciolacustrine	UCS 30 - 50 MCO 20 - 40 GGW 15 - 30	COA 0 -10 RLV 0 - 20	
UCRL1/4-5	Moderately fine textured till	UCS 30 - 50 RLV 30 - 60	GGW 0 - 10 AGS 5 - 20	
UCRL2/4		UCS 20 - 50 RLV 30 - 60 GGW 15 - 30	AGS 0 -10	
UCRL2/4-5		UCS 20 - 50 RLV 30 - 60 GGW 15 - 30	AGS 0 -10	
UCRL2/5		UCS 20 - 50 RLV 30 - 60 GGW 15 - 30	AGS 0 -10	
UCS2/4-5		UCS 50 - 70 GGW 15 - 30	COA 0 - 20 RLV 0 - 20	
UCS2/5		UCS 50 - 70 GGW 15 - 30	COA 0 - 20 RLV 0 - 20	
ZAV2	Undifferentiated	GGW 60 - 90	Humic Regosols 0 - 20 AGS 0 - 10 BVH 0 - 20	
ZAV4	Undifferentiated	GGW 20 -60 Humic Regosols 10 - 50 Regosols 20 - 60		Tub-shaped valleys
ZDL				Tofield
ZW		Water 80 - 100	GG 0 - 20	

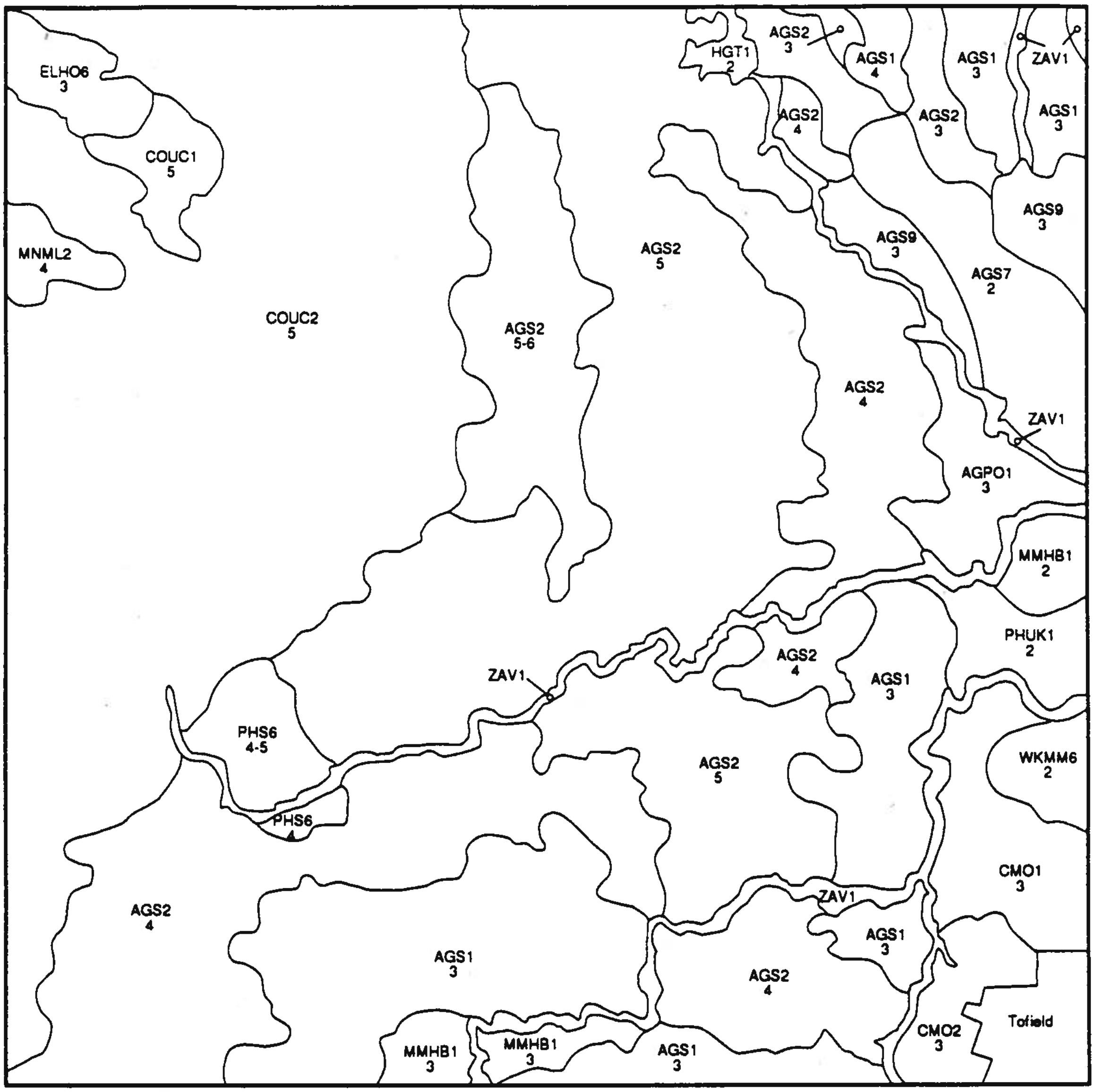

Figure B-5. Soil Map of Township 51 Range 19 W4 (Top Down Mapping Method).

General landscape description: hummocky till with minor fluvial deposits; Luvisolic & Chernozemic soils.

Cartometrics	
Number of polygons:	29
Number of observations:	16
Minimum size polygon:	16 ha
Maximum size polygon:	4716 ha
Average size polygon:	322 ha

Accuracy		
Percent correct, proportional		41%
Percent correct, non-proportional		63%
Percent similarity,	soil series	86%
	soil texture	95%
	parent material	92%
	internal drainage	98%
	subgroup classification	92%

Table B-5. Soil Map Legend for Township 51 Range 19 W4 (Top Down Mapping Method).

Map Unit	Parent Materials	Major Soils (%)	Minor Soils (%)	Comments
AGPO1/3	Moderately fine textured lacustrine veneer and blanket overlying moderately fine and medium textured till	AGS 30 - 50 POK 20 - 40	Solonetzic variants 5 - 15	
AGS1/3	Moderately fine textured till	AGS 60 - 80	GGW 5 - 10 BVH 0 - 15	Some units also contain minor amounts of POK and Sz'ic soils.
AGS1/4		AGS 60 - 80	GGW 5 - 10 BVH 0 - 15	Some units also contain minor amounts of POK and Sz'ic soils.
AGS2/3		AGS 50 - 70 GGW 15 - 25	BVH 0 - 15	
AGS2/4		AGS 50 - 70 GGW 15 - 25	Solonetzic variants 5 - 15 BVH 0 - 15	
AGS2/5		AGS 50 - 70 GGW 15 - 25	BVH 0 - 15	
AGS2/5-6		AGS 50 - 70 GGW 15 - 25	BVH 0 - 15 FLU 0 - 15	
AGS7/2		AGS 50 - 70 Solonetzic soils 15 - 30	GGW 0 - 10 BVH 0 - 10	
AGS9/3		AGS 30 - 50 GGW 15 - 25 Solonetzic soils 15 - 30	BVH 0 - 10	
CMO1/3	Moderately fine textured till	CMO 50 - 70 AGS 15 - 30		
CMO2/3		CMO 40 - 60 GGW 15 - 30 AGS 15 - 25		
COUC1/5	Moderately fine textured till	COA 40 - 60 UCS 20 - 30	FLU 0 - 15	
COUC2/5		COA 30 - 50 GGW 15 - 25 UCS 15 - 25	FLU 0 - 15	
ELHO6/3	Moderately coarse to very coarse fluvial veneer or blanket over moderately fine textured till	ELP 20 - 40 HOD 20 - 40 Coarse variants 15 - 30	Solonetzic variants 0 - 10	
HGT1/2	Fine textured lacustrine	HGT 30 - 50 HGT (peaty) 20 - 40		
MMHB1/3	Moderately fine to fine lacustrine veneer or blanket over moderately fine textured till	MMO 40 - 60 HBM 20 - 40		Lacustrine deposition over till hummocks
MNML2/4	Fine to very fine lacustrine blanket	MNK 40 - 60 MLA 20 - 30 GGW 15 - 20	COA 5 - 15	Saline and sodic materials deposited in hummocks and developing into solonetzic soils.

continued ...

Table B-5. Concluded.

Map Unit	Parent Materials	Major Soils (%)	Minor Soils (%)	Comments
PHS6/4	Moderately coarse to very coarse textured glaciofluvial blanket	PHS 40 - 60 Coarse variants 20 - 40		Some O.DG soils are also present in these units.
PHS6/4-5		PHS 40 - 60 Coarse variants 20 - 40		Some O.DG soils are also present in these units.
PHUK1/2	Moderately coarse textured fluvial veneer or blanket overlying moderately fine textured till	PHS 30 - 50 UKT 20 - 40	POK 10 - 20	
WKMM6/2	Fine to moderately fine textured lacustrine blanket	WKN 20 - 40 MMO 20 - 40 Coarse variants 15 - 30		
ZAV1	Undifferentiated			Stream valley; contains sloughs, creek, steep banks and various parent materials and soil types.
ZDL				Tofield

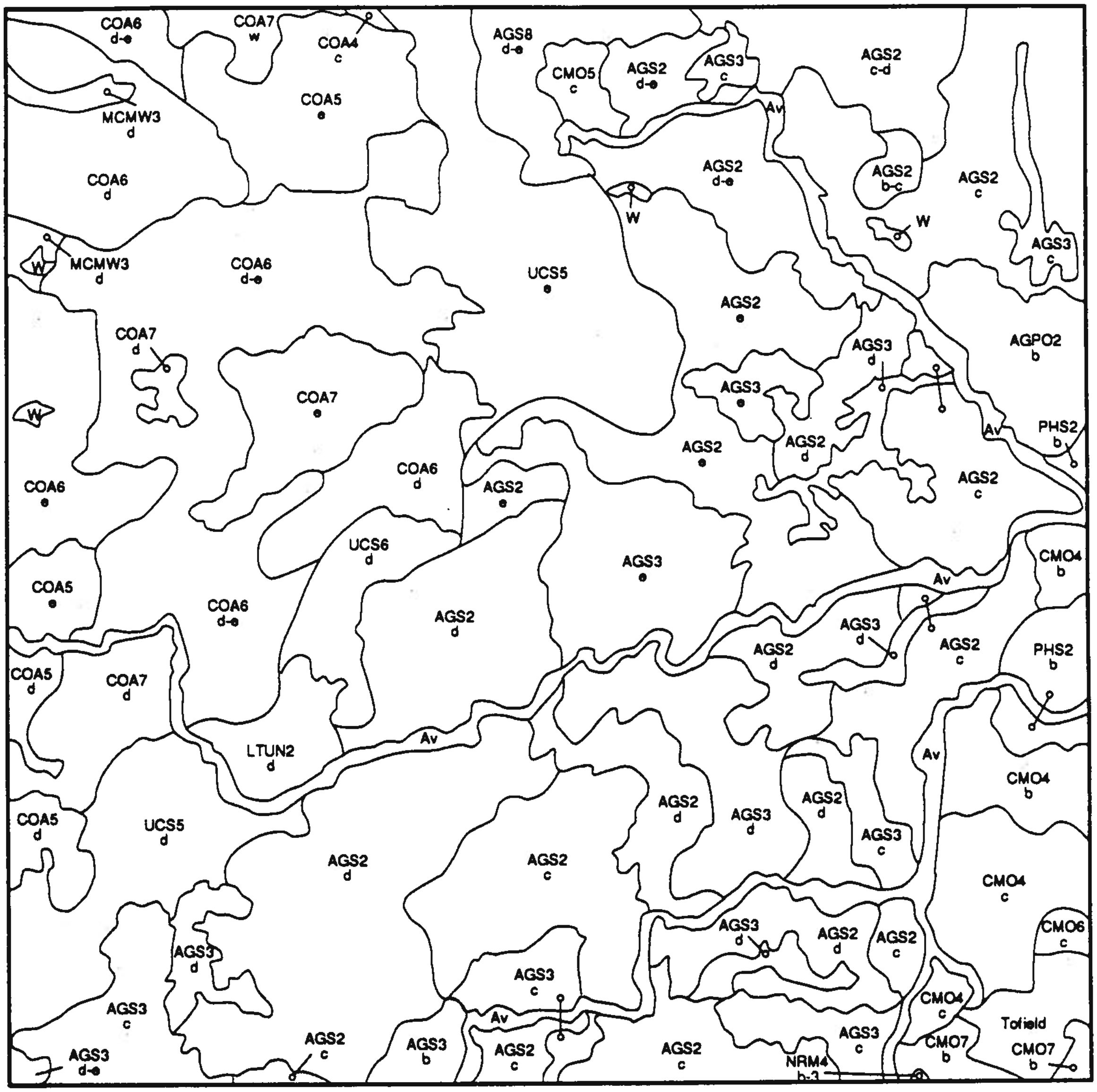

Figure B-6. Soil Map of Township 51 Range 19 W4 (SIL3 1:50 000 Mapping Method).

General landscape description: hummocky till with minor fluvial deposits; Luvisolic & Chernozemic soils.

<u>Cartometrics</u>	
Number of polygons:	101
Number of observations:	76
Minimum size polygon:	3 ha
Maximum size polygon:	829 ha
Average size polygon:	92 ha

<u>Accuracy</u>		
Percent correct,	proportional	47%
Percent correct,	non-proportional	70%
Percent similarity,	soil series	80%
	soil texture	95%
	parent material	90%
	internal drainage	96%
	subgroup classification	86%

Table B-6. Soil Map Legend for Township 51 Range 19 W4 (SIL3 1:50 000 Mapping Method).

Map Unit	Parent Materials	Major Soils (%) *	Minor Soils (%) **	Comments
AGPO2/b	Moderately fine textured till and medium textured fluviolacustrine	AGS 50 POK 50	GGW 0 - 15 PHS	
AGS2/b-c AGS2/c AGS2/c-d AGS2/d AGS2/d-e AGS2/e	Moderately fine textured till	AGS 70	BVH 20 GGW 10 Sandy, silty or Solonetzic	
AGS3/b AGS3/c AGS3/d AGS3/e		AGS (BVH) 80	GGW 20 Sandy, silty or Solonetzic	
AGS8/d-e		AGS 60	UCS, COA 20 GGW 35	
CMO4/b CMO4/c	Moderately fine textured till	CMO	KLM, DYD 0 - 40 GGW 0 - 15	
CMO6/c	Moderately fine textured till and moderately fine textured till veneer over moderately fine textured weathered residual	CMO	SHS 15 KLM, DYD 0 - 40 GGW 0 - 15	
CMO7/b		CMO	HGT 20 SHS 15 KLM, DYD 0 - 20 GGW 0 - 15	
COA4/e	Moderately fine textured till	COA	UCS 20 Sandy or clayey variants 0 - 10	
COA5/d COA5/e		COA 50	UCS 20 ptyHGT , CTW 20 Sandy or clayey variants 0 - 10	
COA6/d COA6/d-e COA6/e	Moderately fine textured till and organics	COA	CTW, T.M 10 - 25 GGW 15 Sandy or clayey variants 0 - 10	
COA7/d COA7/e	Moderately fine textured till and organics	COA	CTW, T.M 25 - 40 GGW 15 Sandy or clayey variants 0 - 10	
HGT1/b	Fine textured lacustrine	HGT	KLM, DYD, SHS, HER, AGS, CMO, NRM	
LTUN2/d	Moderately coarse glaciofluvial and moderately fine till	LTH 60 UCS 40	GGW 0 - 15	

continued ...

Table B-6. Concluded.

Map Unit	Parent Materials	Major Soils (%) *	Minor Soils (%) **	Comments
MCMW3/d	Very fine textured glaciolacustrine	MCO 60 MYW 40	GGW 0 - 15	
NRM4/b-c	Moderately fine textured till	NRM 60	CMO, KLM, DYD 0 - 40 GGW 0 - 15 AGS, PHS, POK	
PHS2/b	Moderately coarse textured fluvial or aeolian	PHS	AGS POK GGW	
UCS5/d	Moderately fine textured till	UCS	COA 20 Sandy or clayey variants 10	
UCS5/e		UCS	COA 20 Sandy or clayey variants 10	
UCS6/d	Moderately fine textured till	UCS	COA 20 GGW 20 Sandy or clayey variants 10	
AV	Undifferentiated	Gleyed Regosols		

* Major soils not having a specified percentage can occupy up to 100% of the map unit.

** Minor soils not having a specified percentage can occupy up to 15% of the map unit.

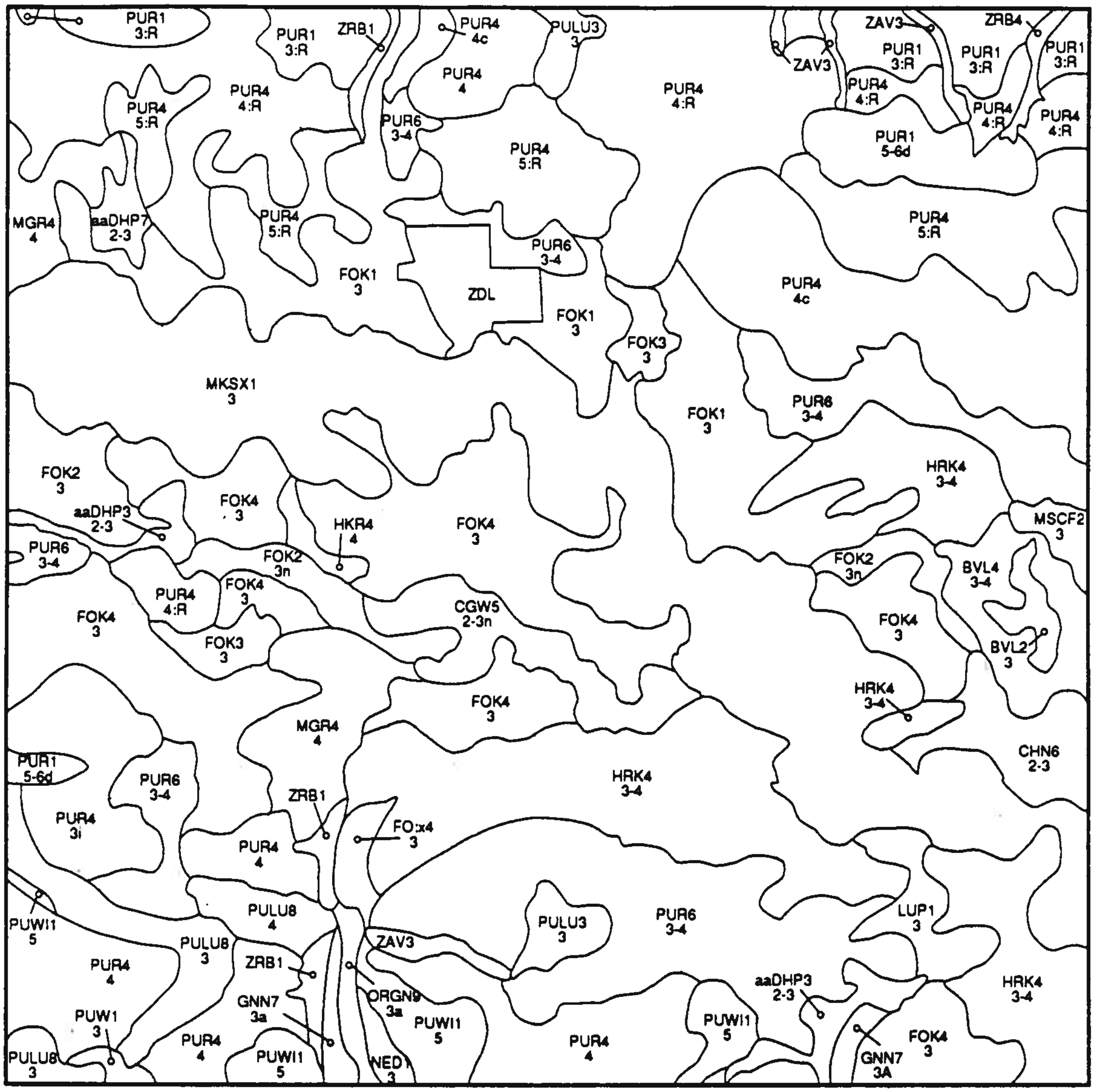

Figure B-7. Soil Map of Township 2 Range 16 W4 (Landscape Mapping Method).

General landscape description: undulating, glaciofluvial and fluvial deposits; Chernozemic soils.

Cartometrics	
Number of polygons:	90
Number of observations:	40
Minimum size polygon:	15 ha
Maximum size polygon:	1234 ha
Average size polygon:	104 ha

Accuracy		
Percent correct, proportional		24%
Percent correct, non-proportional		50%
Percent similarity,	soil series	87%
	soil texture	94%
	parent material	96%
	internal drainage	98%
	subgroup classification	94%

Table B-7. Soil Map Legend for Township 2 Range 16 W4 (Landscape Mapping Method).

Map Unit	Parent Materials	Major Soils (%)	Minor Soils (%)	Comments
BVL2/3	Moderately coarse textured fluvial blanket	BVL 20 - 60 GGW 15 - 40 Rego and calcareous variants 15 - 30	CFD 0 - 10 RIR 0 - 10 TAB 0 - 10 Saline variants 0 - 10	
BVL4/3-4		BVL 20 - 50 Rego and calcareous variants 15 - 30 ANO 15 - 20	MSN 0 - 10 GGW 0 - 10 CVD 0 - 10 PLS 0 - 10	
CHN6/2-3	Medium textured lacustrine blanket	CHN 20 - 50 Coarse variants 20 - 40 EXP 15 - 25	Saline variants 0 -10 CFD 0 - 10	
CGW5/2-3n	Moderately fine textured glaciofluvial and glaciolacustrine	CGW 20 - 60 Fine textured variants 15 - 30 GGW 15 - 40	LUP 0 - 15 Saline variants 0 - 10 Coarse variants 0 - 10	n = concave landform
aaDHP3/2-3	Moderately fine textured lacustrine blanket	GGW 15 - 80 Saline variants 15 - 60 Rego variants 15 - 60	Solonetzic soils 15 - 25	If this unit was in the Dark Brown soil zone it would be a DHP unit.
aaDHP7/3	Moderately fine to fine textured lacustrine and moderatelt fine textured fluvial fan/apron sediments	GGW 20 - 60 Fine textured 20 - 60 Medium textured 15 - 40 Solonetzic soils 20 - 40	Regosols 15 - 30 Saline variants 15 - 25	Only one unit. Solonetzic soils are significant within this unit.
FOK1/3	Moderately coarse textured fluvial blanket	FOK 40 - 70 MGR 15 - 25	LUP 0 - 10 HRK 0 - 10 Rego and calcareous variants 0 - 10 Gravelly FOK 0 - 10	
FOK2/3		FOK 30 - 70 GGW 15 - 40	Saline variants 0 - 10 Rego and calcareous variants 0 - 10 Gravelly variants 0 - 10	
FOK2/3n		FOK 30 - 70 GGW 15 - 40	Saline variants 0 - 10 Rego and calcareous variants 0 - 10 Gravelly variants 0 - 10	n = concave
FOK3/3		FOK 20 - 50 Fine textured variants 15 - 30 Saline variants 15 - 40 GGW 15 - 30	LUP 0 - 10	
FOK4/3		FOK 30 - 50 Rego and calcareous variants 15 - 35	HRK 0 - 10 zrHRK 0 - 10 grFOK 0 -15	

continued ...

Table B-7. Continued.

Map Unit	Parent Materials	Major Soils (%)	Minor Soils (%)	Comments
FO:X4/3	Moderately coarse textured fluvial blanket	FOK 30 - 60 grFOK 15 - 35 Rego and calcareous variants 15 - 25	GGW 0 -10 LUP 0 -10 GNN 0 -10	Only one unit
GNN7/3a	Medium textured fluvial fan or apron sediments	GNN 30 - 70 Solonetzic variants 15 - 30	Coarse variants 0 - 10 Rego and calcareous variants 0 -10 GGW 0 -10 Fine textured variants 0 -10	Solonetzic soils include CGW.
HRK4/3-4	Very coarse textured fluvial veneer to blanket overlying medium to moderately fine textured till	HRK 30 - 60 zrHRK 20 - 40 PUR 15 - 25	FOK 0 -10 MGR 0 -10 WID 0 -10 Coarse variants 0 -10	
LUP1/3	Medium to moderately fine textured lacustrine veneer overlying medium textured till or moderately coarse fluvial	LUP 30 -70 PUR 15 - 30	GGW 5 -10 Coarse variants 0 -10 Rego and calcareous variants 0 -10 Saline variants 0 - 10	
MGR4/4	Moderately coarse textured fluvial veneer overlying medium to moderately fine textured till	MGR 30 - 60 Rego and calcareous variants 15 - 35 PUR 15 - 35	LUP 0 - 10 HRK 0 - 10 Coarse variants 0 - 10	
MKSX1/3	Moderately coarse textured fluvial	aaMKR 15 - 35 aaSXT 15 - 35 Regosols 15 - 25 Solonetz 15 - 25	Fine variants 0 -10 Coarse variants 0 - 10 Saline variants 0 - 10	Approximately 30% 4 topo. A real mixture.
MSCF2/3	Medium textured till and a discontinuous medium to moderately fine textured lacustrine veneer	MSN 20 - 40 CFD 20 - 40 GGW 15 - 30	HMS 0 - 10 TVS 0 - 10 Coarse variants 0 - 10	
NED1/3	Gravelly, moderatly coarse fluvial	NED 60 -100		
ORGN9/3a	Medium to moderately fine textured fluvial fan or apron sediments	aaORN 20 - 40 GNN 20 - 40 Solonetz 15 - 25 GGW 15 - 50	Fine variants 0 - 10 Coarse variants 0 - 10	
PULU1/3	Medium to moderately fine textured till and discontinuous medium to moderately fine textured lacustrine veneer	PUR 30 - 60 LUP 30 - 60	Rego and calcareous variants 0 -10 GGW 0 - 10 Coarse variants 0 - 10	
PULU3/3		PUR 30 - 50 LUP 20 - 40 Saline variants 15 - 40	Fine textured variants 0 - 10	May be close to bedrock.

continued ...

Table B-7. Concluded.

Map Unit	Parent Materials	Major Soils (%)	Minor Soils (%)	Comments
PULU8/3	Medium to moderately fine textured till and discontinuous medium to moderately fine textured lacustrine veneer	PUR 20 - 40 LUP 20 - 40 GGW 15 - 35 WID 15 - 35	Fine textured variants 0 - 10 Coarse variants 0 - 10	
PULU8/4		PUR 20 - 40 LUP 20 - 40 GGW 15 - 35 WID 15 - 35	Fine textured variants 0 - 10 Coarse variants 0 - 10	
PUR1/3:R	Medium to moderately fine textured till	PUR 40 - 70 LUP 15 - 40	WID 0 - 10 Saline variants 0- 10 Coarse variants 0 - 10	
PUR4/3i		PUR 40 - 80 WID 15 - 40	Coarse variants 0 - 10	Only unit.
PUR4/4		PUR 30 - 60 WID 15 - 40	GGW 0 - 10 Coarse variants 0 - 10	
PUR4/4:C		PUR 30 - 60 WID 15 - 40 LUP 15 - 25	Saline variants 0- 10 Coarse variants 0 - 10	Significant rill erosion
PUR4/4:R		PUR 30 - 60 WID 15 - 40 LUP 15 - 25	Saline variants 0- 10 Coarse variants 0 - 10	
PUR4/5:R		PUR 40 - 70 WID 15 - 40	LUP 0 - 10 GGW 0 - 10 Coarse variants 0 - 10	Bedrock within 5 meters.
PUR6/3-4		PUR 30 - 60 LUP 15 - 30 MGR 15 - 40	FOK 0 - 10 HRK 0 - 5	
PUWI1/5		PUR 30 - 60 WID 20 - 50	GGW 0 - 10 Coarse variants 0 - 10	This unit is found south of the MKR valley and is cultivated.
ZAV3				
ZDL				Town of Milk River
ZRB1				
ZRB4				

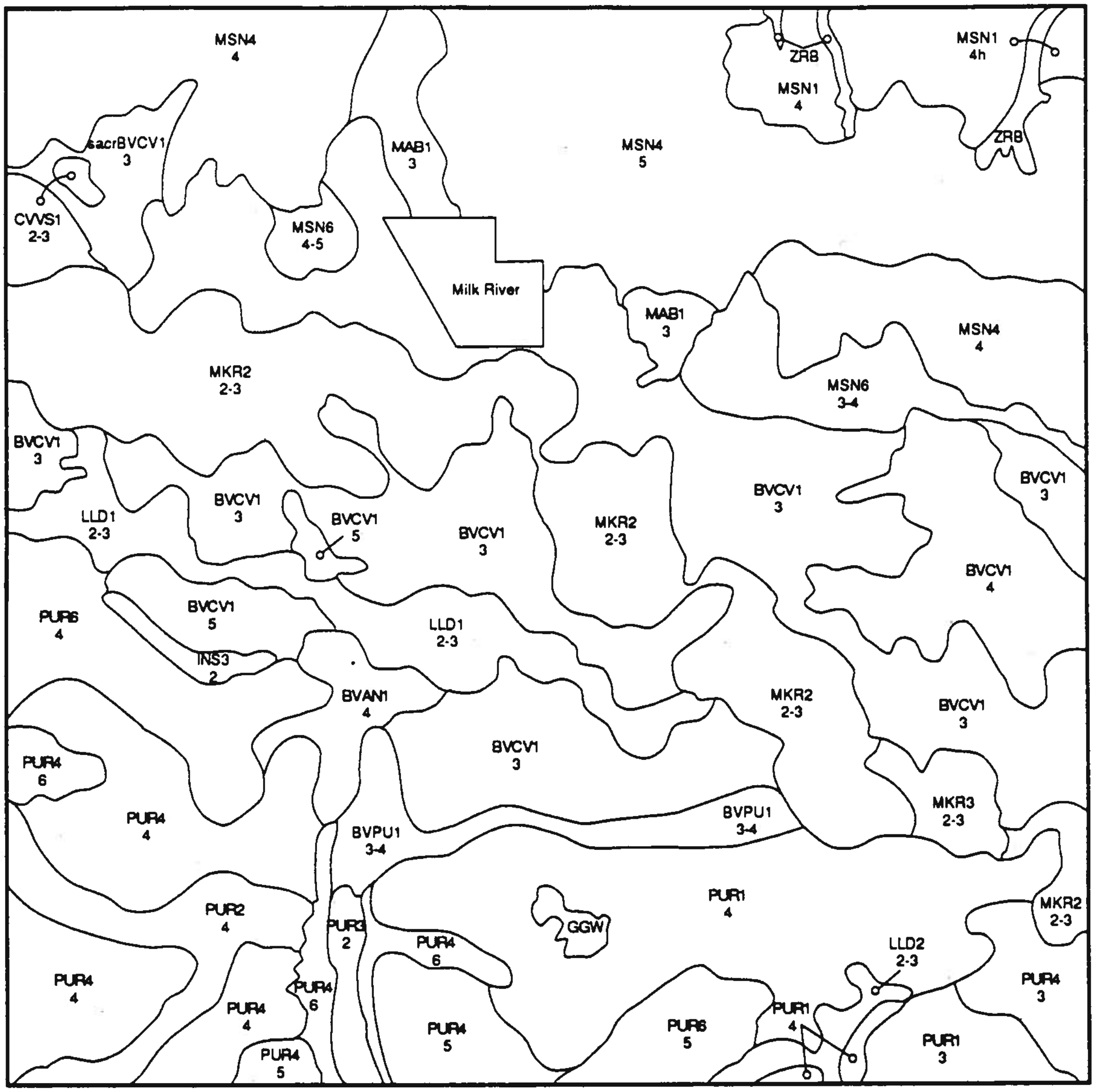

Figure B-8. Soil Map of Township 2 Range 16 W4 (Top-Down Mapping Method).

General landscape description: undulating, glaciofluvial and fluvial deposits; Chernozemic soils.

Cartometrics	
Number of polygons:	51
Number of observations:	19
Minimum size polygon:	10 ha
Maximum size polygon:	901 ha
Average size polygon:	183 ha

Accuracy		
Percent correct,	proportional	22%
Percent correct,	non-proportional	22%
Percent similarity,	soil series	83%
	soil texture	95%
	parent material	95%
	internal drainage	98%
	subgroup classification	93%

Table B-8. Soil Map Legend for Township 2 Range 16 W4 (Top-Down Mapping Method).

Map Unit	Parent Materials	Major Soils (%)	Minor Soils (%)	Comments
BVAN1/4	Moderately coarse textured glaciofluvial veneer over moderately fine textured till	BVL 40 - 60 ANO 40 - 60	CVD 10 - 20	
BVCV1/3	Moderately coarse and very coarse textured glaciofluvial and eolian	BVL 40 - 70 CVD 40 - 70		3 topo - 70%; 2 topo - 30%
BVCV1/4		BVL 40 - 70 CVD 40 - 70	ATP 15 - 30	4 topo - 70%; 3 topo - 30%
BVCV1/5		BVL 40 - 70 CVD 40 - 70	Rego variants 10 - 20	5 topo - 80%; 4 topo - 20%
sacaBVCV1/3		BVL 40 - 70 CVD 40 - 70	Saline variants 10 - 20 Carbonated variants 10 - 20	3 topo - 70%; 2 topo - 20%; 4 topo - 10%
BVPU1/3-4	Moderately coarse textured glaciofluvial veneer and blanket over moderately fine textured till and moderately fine textured till	BVL 40 - 60 PUR 40 - 60	GGW 5 - 10 ZW 0 - 5 ANO 0 - 15	3 topo - 60%; 4 topo - 20%; 2 topo - 20%
CVVS1/2-3	Very coarse textured glaciofluvial and aeolian	CVD 40 - 70 VST 40 - 70	Gravelly variants 15 - 30	2 topo - 70%; 3 topo - 30%
INS3/2	Very coarse textured fluvial aeolian	INS 30 - 50	Saline INS 20 - 40 ZW 10 - 20	There could possibly be DHP or GLS soils present in this unit. There were not digs in it.
LLD2/2-3	Medium textured fluvial	LLD 40 - 70	GGW 15 - 30 PUR 0 - 10	There are probably some saline PUR soils in this unit.
MAB1/3	Moderately fine textured till	MAB 60 - 90	GGW 5 - 15 MSN 5 - 15	
MKR2/2-3	Moderately coarse textured fluvial	MKR 40 - 70	ZW 0 - 5 Fine variants 5 - 15 BVL 0 - 10 GGW 5 - 15	Area adjacent to Milk River. Unit is similar to areas adjacent to the North Saskatchewan River (St. Paul) and Battle River (Paintearth).
MKR3/2-3		MKR 40 - 70	ZW 0 - 5 Fine variants 5 - 15 BVL 0 - 10 GGW 5 - 15 Saline variants 10 - 15	
MSN1/4	Moderately fine textured till	MSN 60 - 90	MAB 0 - 10 Eroded and rego variants 0 -15	4 topo - 60%; 3 topo - 40%
MSN4/4		MSN 50 - 80	MAB 0 - 10 Eroded and rego variants 0 - 15	
MSN4/5		MSN 40 - 80	Eroded and rego variants 20 - 40 GGW 5 - 100	5 topo - 50%; 4 topo - 30%; 3 topo - 20%

continued ...

Table B-8. Concluded.

Map Unit	Parent Materials	Major Soils (%)	Minor Soils (%)	Comments
MSN 6/3-4	Moderately fine textured till and coarse textured ice-contact material	MSN 40 - 70	Coarse variants 15 - 30 MAB 10 - 15	3 topo - 70%; 4 topo - 30%
MSN6/4-5		MSN 40 - 70	Coarse variants 15 - 30 MAB 10 - 15	4 topo - 50%; 5 topo - 50%
PUR1/3	Moderately fine textured till	PUR 60 - 90	GGW 0 - 10 Eroded and rego variants 0 - 15	3 topo - 90%; 2 topo - 10%
PUR1/4		PUR 60 - 90	GGW 0 -10 Eroded and rego variants 0 - 15	4 topo - 60%; 3 topo - 40%
PUR2/4		PUR 40 - 70	ZW 0 -15 GGW 10 - 20 Rego and eroded variants 0 - 10	
PUR4/3		PUR 40 - 70	Rego and eroded variants 15 - 30 GGW 0 -10	
PUR4/4		PUR 40 - 70	Rego and eroded variants 20 - 40	
PUR4/5		PUR 40 - 70	Rego and eroded variants 20 - 40	
PUR4/6		PUR 40 - 70	Rego and eroded variants 20 - 40 Coarse variants 0 - 10	
PUR6/4		PUR 40 - 70	Coarse variants 15 - 35 Rego and eroded variants 0 - 15	
PUR6/5		PUR 40 - 70	Coarse variants 15 - 35 Rego and eroded variants 0 - 15	
ZRB				

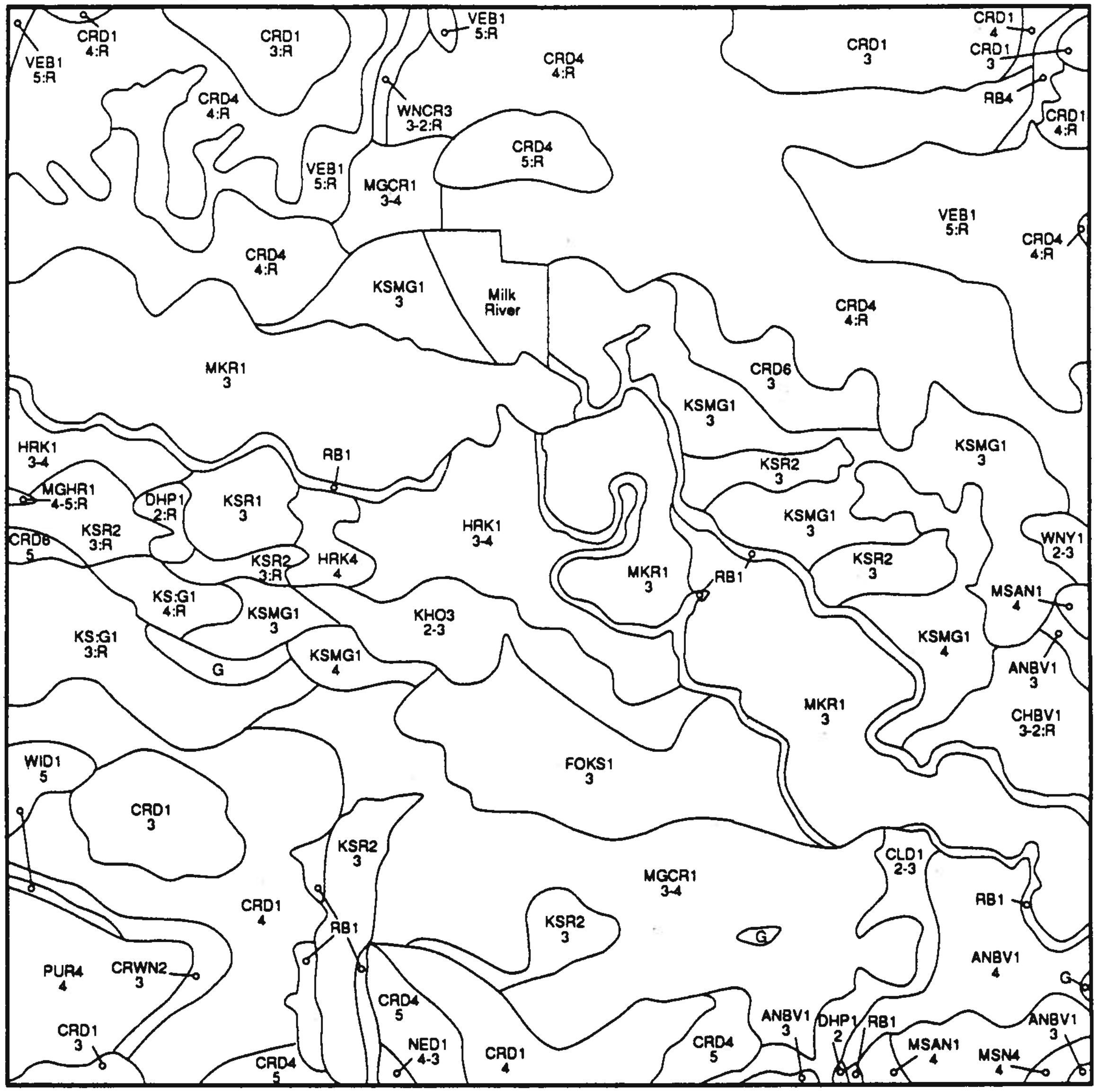

Figure B-9. Soil Map of Township 2 Range 16 W4 (SIL3 1:50 000 Mapping Method).

General landscape description: undulating, glaciofluvial and fluvial deposits; Chernozemic soils.

Cartometrics	
Number of polygons:	90
Number of observations:	124
Minimum size polygon:	15 ha
Maximum size polygon:	1215 ha
Average size polygon:	104 ha

Accuracy		
Percent correct,	proportional	12%
Percent correct,	non-proportional	12%
Percent similarity,	soil series	81%
	soil texture	90%
	parent material	95%
	internal drainage	96%
	subgroup classification	90%

Table B-9. Soil Map Legend for Township 2 Range 16 W4 (SIL3 1:50 000 Mapping Method).

Map Unit	Parent Materials	Major Soils (%)	Minor Soils (%)	Comments
ANBV1/3	Moderately coarse textured fluvial veneer and blanket over till	ANO 30 - 60 BVL 30 - 60		
ANBV1/4		ANO 30 - 60 BVL 30 - 60		
CHBV1/3-2:R	Medium to moderately fine textured lacustrine and moderately coarse textured fluvial	CHN 50 - 70	BVL 20 - 30	Bedrock less than 5 metres
CLD1/2-3	Moderately fine to fine textured lacustrine	CLD 60 - 80	Saline variants 0 - 20 LET 0 - 10 WNY 0 - 10	LET and WNY amounts estimated by WLN (from description in the soil survey report).
CRD1/3	Medium to moderately fine textured till	CRD 60 - 90		
CRD1/3:R		CRD 60 - 90		Bedrock less than 5 metres
CRD1/4		CRD 60 - 80	VEB 0 - 20	
CRD1/4:R		CRD 60 - 80	VEB 0 - 20	Bedrock less than 5 metres
CRD4/4:R		CRD 50 - 70	VEB 20 - 40	Erosion on steeper slopes; bedrock less than 5 metres.
CRD4/5		CRD 40 - 60	VEB 30 - 50	Erosion on steeper slopes
CRD4/5:R		CRD 40 - 60	VEB 30 - 50	Erosion on steeper slopes; bedrock less than 5 metres
CRD6/5	Medium to moderately fine textured till and moderately coarse textured fluvial	CRD 40 - 60	KSR 10 - 20 MGR 10 - 20 Gravelly phases 10 - 20	
CRWN2/3	Medium to moderately fine textured till andmedium to moderately fine textured lacustrine over till	CRD 30 - 50 WNY 30 - 50	GGW 15 - 30	Many sloughs and undrained depressions
DHP1/2:R	Medium to moderately fine textured lacustrine	DHP 70 - 100		Bedrock less than 5 metres
FOKS1/3	Moderately coarse textured fluvial veneer and blanket over medium to moderately fine textured lacustrine	FOR 40 - 70 KSR 20 - 40	LET 0 - 10	
HRK1/3-4	Very coarse textured fluvial or aeolian	HRK 60 - 80	KSR, FOR, MGR 0 - 20	
HRK4/4		HRK 50 - 70	Rego variants 20 - 40	Erosion on steeper slopes
KHO3/2-3	Medium to moderately fine textured lacustrine	KHO 50 - 60	AWD 20 - 30 LLD 20 - 30	Localized saline spots
KS:G1/3:R	Moderately coarse textured gravelly fluvial	grKSR 60 - 80	MGR, FOR 0 - 15	Gravel content 10 - 15%; bedrock less than 5 metres
KS:G1/4:R		grKSR 50 - 70	MGR, FOR 0 - 15	Gravel content 10 - 15%; bedrock less than 5 metres

continued ...

Table B-9. Concluded.

Map Unit	Parent Materials	Major Soils (%)	Minor Soils (%)	Comments
KSMG1/3 KSMG1/4	Moderately coarse textured fluvial blanket and veneer over till	KSR 50 - 70 MGR 20 - 50		
KSR2/3	Moderately coarse textured fluvial	KSR 50 - 70	GGW 15 - 30	Many sloughs and undrained depressions
KSR2/3:R		KSR 50 - 70	GGW 15 - 30	Many sloughs and undrained depressions; bedrock less than 5 metres
MGCR1/3-4	Moderately coarse textured fluvial veneer over till and medium to moderately fine textured till	MGR 50 - 70 CRD 20 - 40		
MGHR1/4-5:R	Moderately coarse textured fluvial veneer over till and very coarse textured fluvial or aeolian blanket over till	MGR 50 - 60 HRK 20 - 40		Bedrock less than 5 metres
MKR1/3	Very coarse to moderately coarse fluvial blanket and veneer over fluvial gravels	MKR 60 - 80	O.R 10 - 30	Recent alluvium
MSAN1/4	Medium to moderately fine textured till and moderately coarse textured fluvial veneer over till	MSN 50 - 70 ANO 20 - 40	CLR 10 - 30	
MSN4/4	Medium to moderately fine textured till	MSN 50 - 70	CLR 20 - 40	Erosion on steeper slopes
PUR4/4	Medium to moderately fine textured till	PUR 50 - 70	WID 20 - 40	Milk River upland; erosion on steeper slopes
VEB1/5	Medium to moderately fine textured till	VEB 60 - 70	CRD 20 - 30	Erosion on steeper slopes; usually associated with Milk River upland
VEB1/5:R		VEB 60 - 70	CRD 20 - 30	Erosion on steeper slopes; bedrock less than 5 metres
WID1/5	Medium to moderately fine textured till	WID 50 - 60	PUR 30 - 40	Milk River upland
WNCR3/3-2:R	Medium to moderately fine textured lacustrine veneer over till and medium to moderately fine textured till	WNY 40 - 60 CRD 20 - 50	Saline variants 20 - 40	Localized saline spots; bedrock less tha 5 metres
WNY1/2-3	Medium to moderately fine textured veneer and blanket over till	WNY 60 - 80	LET 10 - 30	
ZDL	Disturbed land			Raymond
ZG	Lacustrine, fluvial or till			Undifferentiated gleysol
ZRB1	Undifferentiated			
ZRB4	Undifferentiated			Modern erosional channels

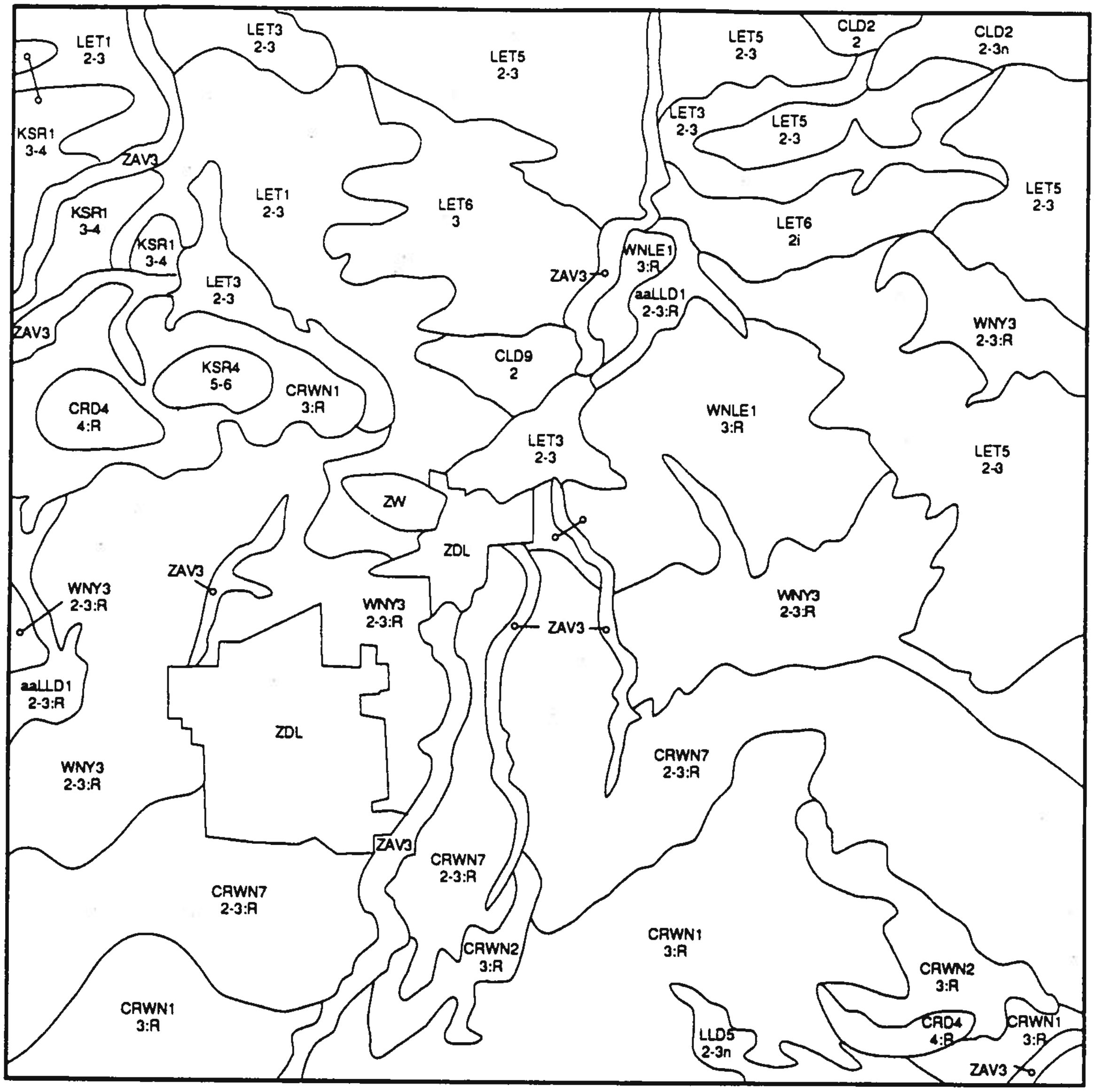

Figure B-10. Soil Map of Township 6 Range 20 W4 (Landscape Mapping Method).

General landscape description: undulating lacustrine and fluviolacustrine; Chernozemic soils.

<u>Cartometrics</u>	
Number of polygons:	53
Number of observations:	39
Minimum size polygon:	17 ha
Maximum size polygon:	839 ha
Average size polygon:	176 ha

<u>Accuracy</u>		
Percent correct, proportional		59%
Percent correct, non-proportional		85%
Percent similarity,	soil series	92%
	soil texture	98%
	parent material	97%
	internal drainage	99%
	subgroup classification	95%

Table B-10. Soil Map Legend for Township 6 Range 20 W4 (Landscape Mapping Method).

Map Unit	Parent Materials	Major Soils (%)	Minor Soils (%)	Comments
CLD2/2	Fine textured lacustrine	CLD 30 - 50 GGW 15 - 40 Solonetz 15 - 25	Saline variants 0 - 10 Rego and calcareous variants 0 - 10	There are some solonetzic gleysols present.
CLD2/2-3n		CLD 30 - 50 GGW 15 - 50	Saline variants 0 - 10 Regosols 0 - 10 Solonetz 0 - 10 Rego and calcareous variants 0 - 10	
CRD4/4:R	Medium to moderately fine textured till	CRD 30 - 50 VEB, NEM 15 - 40 WNY 15 - 25	LET 0 - 10 Solonetz 0 - 10 Saline variants 0 - 10	
CRWN1/3:R	Medium to moderately fine textured till and discontinuous veneer of medium to moderately fine tesxtured lacustrine	CRD 30 - 60 WNY 30 - 60	Solonetzic soils 0 - 10 Rego and calcareous variants 0 - 10 LET 0 - 10 Fine textured variants 0 - 10	Bedrock within 5 metres.
CRWN2/3		CRD 30 - 60 WNY 30 - 50 GGW 15 - 50 Saline variants 15 - 25	Solonetzic soils 0 - 10 Rego and calcareous variants 0 - 10 LET 0 - 10 Fine textured variants 0 - 10	Bedrock within 5 metres.
CRWN7/2-3:R		CRD 30 - 60 WNY 30 - 60 Solonetzic soils 15 - 25	Solonetzic soils 0 - 10 Rego and calcareous variants 0 - 10 LET 0 - 10 Fine textured variants 0 - 10	Bedrock within 5 metres. 60% 3 topo; 40% 2 topo.
KSR1/3-4	Moderately coarse textured glaciofluvial	KSR 30 - 60	grKSR 0 - 10 LET 0 - 10 GGW 5 -10 Rego and calcareous variants 0 - 10 Fine textured 0 - 10 Very coarse textured 0 - 10	
KSR4/5-6		KSR 30 - 50 grKSR 15 - 40 Rego and calcareous variants 15 - 25	Medium textured soils 0 - 10	Mostly disturbed land (variable textures).
LET1/2-3	Medium to moderately fine texture lacustrine blanket	LET 30 - 70	Saline variants 0 - 10 Rego and calcareous variants 0 - 10 GGW 0 - 10 Fine textured variants 0 - 10 Coarse textured variants 0 - 10	

continued ...

Table B-10. Concluded.

Map Unit	Parent Materials	Major Soils (%)	Minor Soils (%)	Comments
LET3/2-3	Medium to moderately fine texture lacustrine blanket	LET 40 - 70 Saline variants 15 - 40	Rego and calcareous variants 0 - 10 GGW 5 - 10 Fine textured variants 0 - 10 Solonetzic 0 - 10	
LET5/2-3		LET 30 - 60 CLD 15 - 40	Rego and calcareous variants 0 - 10 GGW 0 - 10 Fine textured variants 0 - 10 Solonetzic 0 - 10	
LET6/2i		LET 30 - 60 Coarse variants 15 - 40	Rego and calcareous variants 0 - 10 GGW 0 - 10 Fine textured variants 0 - 10 Solonetzic 0 - 10	KSR and OAS soils are included in coarse variants.
LET6/3		LET 30 - 60 Coarse variants 15 - 40	Rego and calcareous variants 0 - 10 GGW 0 - 10 WNY 0 - 10 Saline variants 0 - 10	KSR and OAS soils are included in coarse variants.
LLD1/2-3:R	Medium to moderately fine textured lacustrine veneer and blanket overlying medium to moderately fine textured till	aaLLD 30 - 50 WNY 15 - 40	LET 0 - 10 GGW 0 - 10 Rego and calcareous variants 0 - 10 Solonetz 0 - 10	
LLD5/2-3n		aaLLD 30 - 70 Fine textured variants 15 - 40 WNY 15 - 25 CRD 15 - 25 GGW 15 - 40	Solonetz 0 - 10 Coarse variants 0 - 10 Rego and calcareous variants 0 - 10	
WNLE1/3:R	Medium to moderately fine textured lacustrine veneer and blanket overlying medium to moderately fine textured till.	WNY 40 - 60 LET 20 - 50 CRD 15 - 30	LLD 0 - 10 Solonetz 0 - 10 Rego and calcareous variants 0 - 10	
WNY3/2-3:R		WNY 30 - 60 aaLLD 15 - 40	CRD 5 - 15 LET 0 - 10 Solonetz 0 - 10 Rego and calcareous variants 0 - 10	Bedrock within 5 metres.
ZAV3				
ZDL				Town of Raymond
ZW				Ponded water

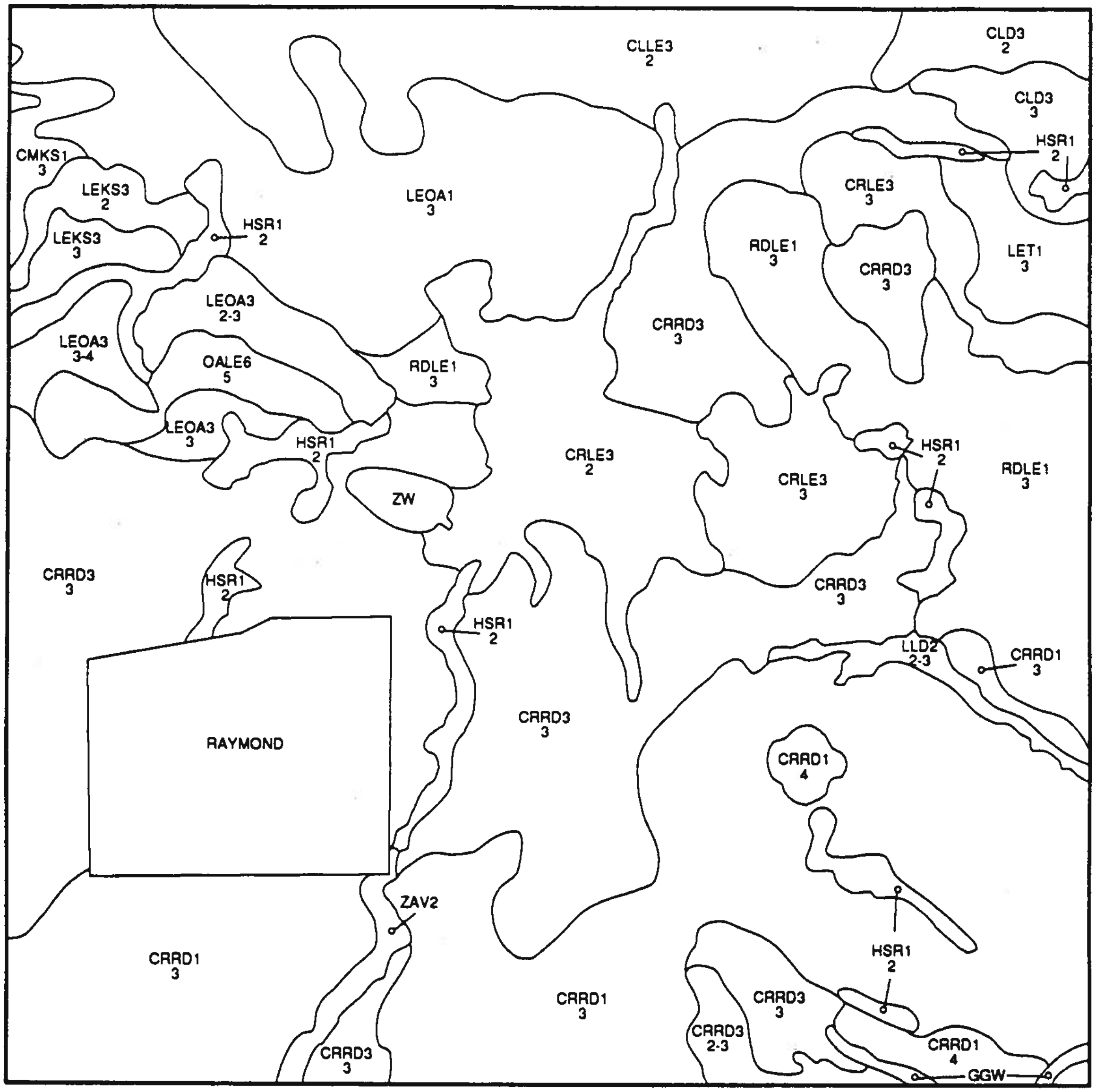

Figure B-11. Soil Map of Township 6 Range 20 W4 (Top-Down Mapping Method).

General landscape description: undulating lacustrine and fluviolacustrine; Chernozemic soils.

Cartometrics	
Number of polygons:	47
Number of observations:	15
Minimum size polygon:	10 ha
Maximum size polygon:	1400 ha
Average size polygon:	198 ha

Accuracy		
Percent correct,	proportional	60%
Percent correct,	non-proportional	61%
Percent similarity,	soil series	91%
	soil texture	98%
	parent material	98%
	internal drainage	99%
	subgroup classification	92%

Table B-11. Soil Map Legend for Township 6 Range 20 W4 (Top-Down Mapping Method).

Map Unit	Parent Materials	Major Soils (%)	Minor Soils (%)	Comments
CLD3/2	Fine textured glaciolacustrine	CLD 50 - 80	Saline variants 15 - 30 GGW 5 - 10	2 topo - 100%
CLD3/3		CLD 50 - 80	Saline variants 15 - 30 GGW 5 - 10	2 topo - 30%; 3 topo - 70%
CLLE3/2	Fine textured glaciolacustrine and moderately fine textured fluviolacustrine	CLD 40 - 70 LET 30 - 50	Saline variants 15 - 30 GGW 5 - 10	2 topo - 95%; 3 topo - 5%
CMKS1/3	Moderately coarse textured glaciofluvial veneer and blanket over moderately fine textured glaciolacustrine	CMY 30 - 60 KSR 30 - 60	GGW 5 - 10	Area similar to MEDC units in the County of Flagstaff. 3 topo - 70%; 2 topo - 30%
CRLE3/2	Moderately fine textured fluviolacustrine and till	CRD 40 - 70 LET 20 - 40	Saline variants 15 - 30 GGW 5 - 10 WNY 0 - 15	2 topo - 70%; 3 topo - 30%
CRLE3/3		CRD 40 - 70 LET 20 - 40	Saline variants 15 - 30 GGW 5 - 10 WNY 0 - 15	3 topo - 70%; 2 topo - 30%
CRRD1/3	Moderately fine textured till	CRD 50 - 80 RDM 50 - 80		Compound map unit because the difference between CRD and RDM is unknown. Some units may contain <15% LET soils. 3 topo - 60%; 2 topo - 40%.
CRRD1/4		CRD 50 - 80 RDM 50 - 80	Eroded and rego variants 0 - 10	Compound map unit because the difference between CRD and RDM is unknown. Some units may contain <15% LET soils. 4 topo - 60%; 3 topo - 40%.
CRRD3/2-3		CRD 40 - 70 RDM 40 - 70	Saline variants 15 - 30 GGW 0 - 10	2 topo - 60%; 3 topo - 40%
CRRD3/3		CRD 40 - 70 RDM 40 - 70	Saline variants 15 - 30 GGW 0 - 10	3 topo - 80%; 2 topo - 20%
HSR1/2	Fine textured glaciolacustrine	HSR 70 - 100	Saline variants 10 - 20	2 topo - 100%
LEKS3/2	Moderately fine textured fluviolacustrine and moderately coarse textured glaciofluvial	LET 20 - 50 KSR 20 - 50	Saline variants 15 - 30 GGW 10 - 20	2 topo - 90%; 3 topo - 10%
LEKS3/3		LET 20 - 50 KSR 20 - 50	Saline variants 15 - 30 GGW 5 - 10	3 topo - 80%; 2 topo - 20%

continued ...

Table B-11. Concluded.

Map Unit	Parent Materials	Major Soils (%)	Minor Soils (%)	Comments
LEOA1/3	Medium textured fluviolacustrine over very coarse textured glaciofluvial and moderately fine textured glaciolacustrine	LET 40 - 70 OAS 20 - 30	RDM 10 - 20 CRD 10 - 20	3 topo - 60%; 2 topo - 40%
LEOA3/3		LET 30 - 60 OAS 15 - 30	Saline variants 15 - 30 RDM 5 - 15	3 topo - 70%; 2 topo - 30%
LEOA3/3-4		LET 30 - 60 OAS 20 - 40	Saline variants 15 - 30 RDM 5 - 15	3 topo - 50%; 4 topo - 50%
LET1/3	Moderately fine textured glaciolacustrine	LET 50 - 90	CLD 15 - 30	3 topo - 80%; 2 topo - 20%
LLD2/2-3	Medium textured fluvial	LLD 50 - 90	GGW 15 - 35	Need a dark brown equivalent of LLD. 2 topo - 50%; 3 topo - 50%
OALE6/5	Medium textured fluviolacustrine over very coarse textured glaciofluvial and moderately fine textured glaciolacustrine	OAS 30 - 60 LET 30 - 60	Coarse variants 15 - 30	5 topo - 50%; 4 topo - 40%; 3 topo - 20%
RDLE1/3	Moderately fine textured glaciofluvial and till	RDM 40 - 70 LET 30 - 50	WNY 0 - 15 CRD 10 - 20	3 topo - 80%; 2 topo - 20%.
ZAV2		AV - miscellaneous soils 40 - 60	GGW 15 - 30 Water 10 - 20	

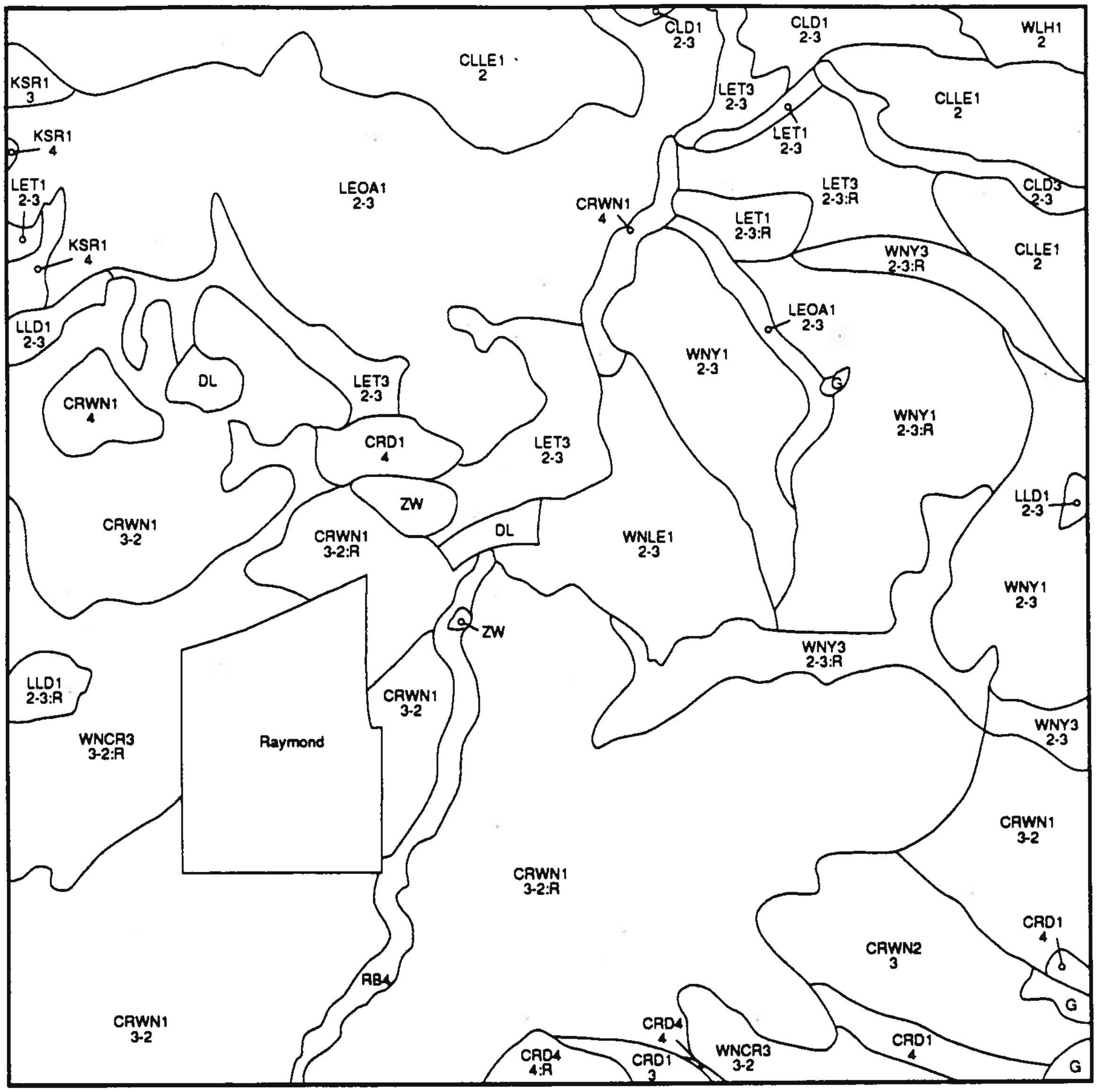

Figure B-12. Soil Map of Township 6 Range 20 W4 (SIL3 1:50 000 Mapping Method).

General landscape description: undulating lacustrine and fluviolacustrine; Chernozemic soils.

Cartometrics	
Number of polygons:	56
Number of observations:	136
Minimum size polygon:	3 ha
Maximum size polygon:	1476 ha
Average size polygon:	166 ha

Accuracy		
Percent correct,	proportional	37%
Percent correct,	non-proportional	53%
Percent similarity,	soil series	87%
	soil texture	97%
	parent material	95%
	internal drainage	99%
	subgroup classification	91%

Table B-12. Soil Map Legend for Township 6 Range 20 W4 (SIL3 1:50 000 Mapping Method).

Map Unit	Parent Materials	Major Soils (%)	Minor Soils (%)	Comments
CLD1/2-3	Moderately fine to fine textured lacustrine	CLD 60 - 80	Saline variants 0 - 20 LET 0 - 10 WNY 0 - 10	LET and WNY amounts estimated by WLN (from description in the soil survey report).
CLD3/2-3		CLD 60 - 80	Saline variants 20 - 40	Localized saline spots; bedrock less than 5 metres.
CLLE1/2	Moderately fine to fine and medium to moderately fine textured lacustrine	CLD 50 - 70 LET 30 - 40		
CRD1/4	Medium to moderately fine textured till	CRD 60 - 80	VEB 0 - 20	
CRD4/4		CRD 50 - 70	VEB 20 - 40	Erosion on steeper slopes
CRD4/4:R		CRD 50 - 70	VEB 20 - 40	Erosion on steeper slopes; bedrock less than 5 metres.
CRD6/3	Medium to moderately fine textured till and moderately coarse textured fluvial	CRD 50 - 70	KSR 10 - 20 MGR 10 - 20 Gravelly phases 10 - 20	
CRWN1/3-2	Medium to moderately fine textured till and medium to moderately fine textured lacustrine veneer over till	CRD 40 - 70 WNY 20 - 50		
CRWN1/3-2:R		CRD 40 - 70 WNY 20 - 50		Bedrock less than 5 metres
CRWN1/4		CRD 40 - 70 WNY 20 - 40		
CRWN2/3		CRD 30 - 50 WNY 30 - 50	GGW 15 - 30	Many sloughs and undrained depressions
KSR1/3 KSR1/4	Moderately coarse textured fluvial	KSR 70 - 90		
LEOA1/2-3	Medium to moderately fine textured lacustrine blanket and veneer over moderately coarse textured fluvial	LET 50 - 70 OAS 20 - 40		
LET1/2-3	Medium to moderately fine textured lacustrine	LET 60 - 80	WNY 10 - 30	
LET1/2-3:R		LET 60 - 80	WNY 10 - 30	Bedrock less than 5 metres
LET3/2-3		LET 40 - 60	LLD 20 - 40	Localized saline spots
LET3/2-3:R		LET 40 - 60	LLD 20 - 40	Localized saline spots; bedrock less than 5 metres.
LLD1/2-3	Medium to moderately fine textured lacustrine	LLD 50 - 70	Saline Humic Regosol 15 - 30	Moderately to strongly saline
LLD1/2-3:R		LLD 50 - 70	Saline Humic Regosol 15 - 30	Moderately to strongly saline; bedrock less than 5 metres
WLH1/2	Fine textured lacustrine	WLH 80 - 90		

continued ...

Table B-12. Concluded.

Map Unit	Parent Materials	Major Soils (%)	Minor Soils (%)	Comments
WNCR3/3-2	Medium to moderately fine textured lacustrine veneer over till and medium to moderately fine textured till	WNY 40 - 60 CRD 20 - 50	Saline variants 20 - 40	Localized saline spots
WNCR3/ 3-2:R		WNY 40 - 60 CRD 20 - 50	Saline variants 20 - 40	Localized saline spots; bedrock less tha 5 metres
WNY1/2-3	Medium to moderately fine textured veneer and blanket over till	WNY 60 - 80	LET 10 - 30	
WNY1/2-3:R		WNY 60 - 80	LET 10 - 30	Bedrock less than 5 metres
WNY3-2-3		WNY 50 - 70	Saline variants 20 - 40	Localized saline spots
WNY3/2-3:R		WNY 50 - 70	Saline variants 20 - 40	Localized saline spots; bedrock less than 5 metres
ZDL	Disturbed land			Sand, gravel or coal mine
ZG	Lacustrine, fluvial or till			Undifferentiated gleysol
ZRB4	Undifferentiated			Modern erosional channels

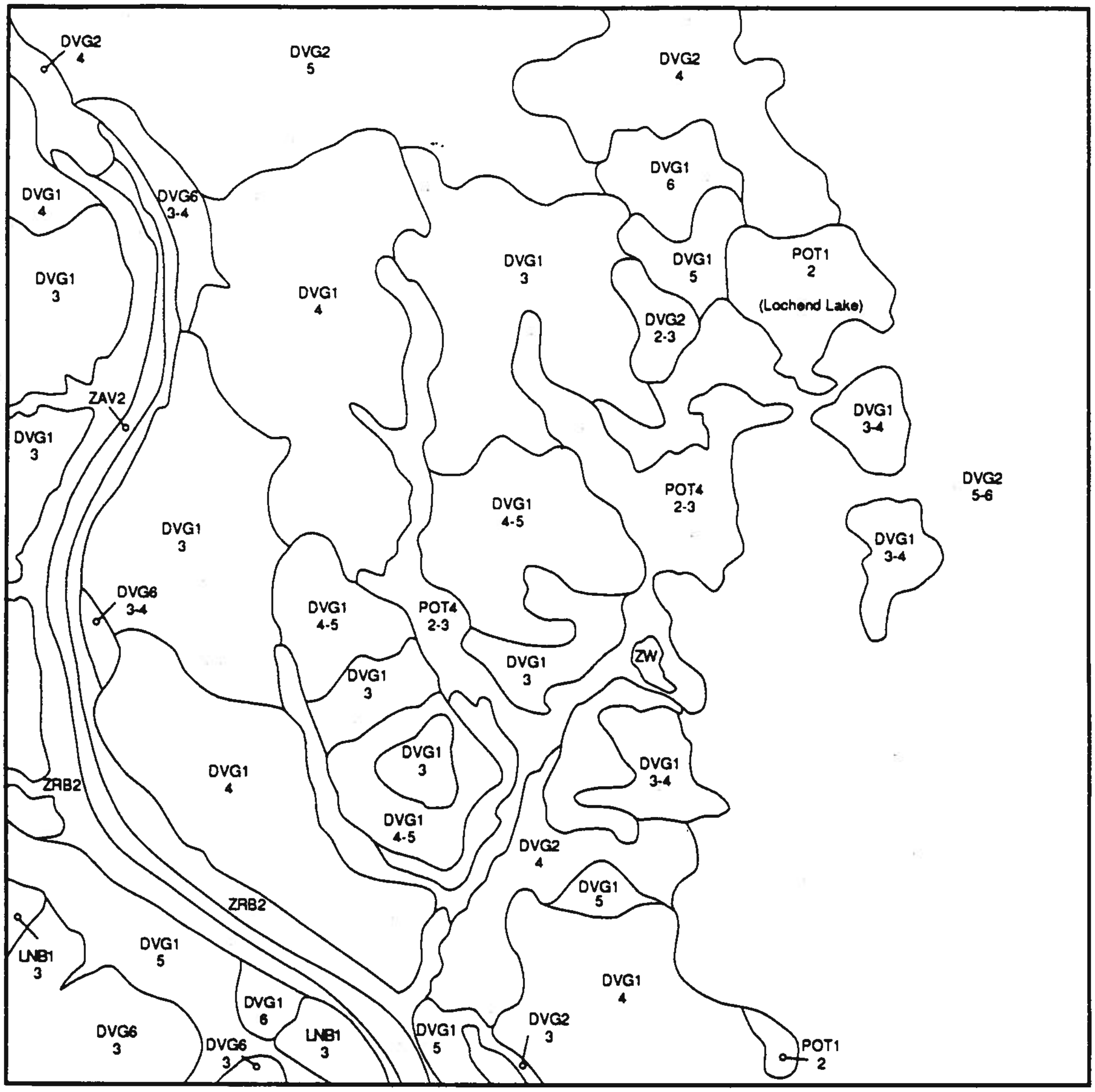

Figure B-13. Soil Map of Township 27 Range 3 W5 (Landscape Mapping Method).

General landscape description: hummocky till; Chernozemic soils.

Cartometrics	
Number of polygons:	46
Number of observations:	20
Minimum size polygon:	8 ha
Maximum size polygon:	1769 ha
Average size polygon:	203 ha

Accuracy		
Percent correct,	proportional	73%
Percent correct,	non-proportional	81%
Percent similarity,	soil series	97%
	soil texture	98%
	parent material	96%
	internal drainage	100%
	subgroup classification	99%

Table B-13. Soil Map Legend for Township 27 Range 3 W5 (Landscape Mapping Method).

Map Unit	Parent Materials	Major Soils (%)	Minor Soils (%)	Comments
DVG1/3	Moderately fine textured till and moderately fine textured lacustrine veneer over till.	DVG 60 - 100	GGW 0 - 10	Dominantly hummocky landform (3 topo - 60%; 4 topo - 40%)
DVG1/3-4		DVG 50 - 80	Rego, eroded profiles 5 - 20 GGW 0 - 10	3 topo - 50%; 4 topo 50%
DVG1/4		DVG 50 - 80	Rego, eroded profiles 5 - 20 Gleyed variants 0 - 10 Gravelly variants 0 - 5 Fine variants (LGv/M) 0 - 10	The unit has 2 distinct landforms. Some polygons are hummocky, some are rolling. 4 topo 50%; 3 topo 40%; 2 topo - 5%; 5 topo - 5%.
DVG1/4-5		DVG 50 - 80	Rego, eroded profiles 5 - 20 Gleyed variants 0 - 10 Gravelly variants 0 - 5 Fine variants (LGv/M) 0 - 10	Landforms include hummocky, rolling and inclined. 4 topo - 40%; 5 topo - 40%; 3 topo - 20%.
DVG1/5		DVG 50 - 80	Rego, eroded profiles 5 - 20 Gleyed variants 0 - 10 Gravelly variants 0 - 5 Fine variants (LGv/M) 0 - 10	Hummocky, inclined and rolling landforms.
DVG1/6		DVG 50 - 80	Rego, eroded profiles 5 - 20 Gleyed variants 0 - 10 Gravelly variants 0 - 5 Fine variants (LGv/M) 0 - 10	Hummocky and rolling landforms.
DVG2/2-3		DVG 20 - 40	GGW 15 - 30 POT 10 - 20 Calcareous variants 0 -15 GL. DVG 15 - 30	
DVG2/3	Moderately fine textured till	DVG 40 - 80	GGW 15 - 30 Calcareous variants 0 - 15	

continued ...

Tables B-13. Concluded.

Map Unit	Parent Materials	Major Soils (%)	Minor Soils (%)	Comments
DVG2/4	Moderately fine textured till	DVG 40 - 80	GGW 15 - 30 Eroded variants 5 - 15	4 topo - 60%; 5 topo - 20%; 3 topo - 20%
DVG2/5		DVG 40 - 80	GGW 15 - 30 Rego and eroded variants 15 - 30 Calcareous variants 0 -10	Hummocky and rolling landforms. 5 topo - 60%; 4 topo - 20%; 6 topo - 20%
DVG2/5-6		DVG 40 - 80	GGW 15 - 30 Rego and eroded variants 15 - 30 Calcareous variants 0 -10 Gravelly variants 5 - 10	Hummocky landform. 5 topo - 30%; 6 topo - 30%; 4 topo - 10%; 2 and 3 topo - 30%.
DVG6/3	Moderately fine textured till and medium to coarse textured ice-contact materials	DVG 30 - 70	Gravelly variants 15 - 30 Rego variants 0 - 10	
DVG6/3-4		DVG 30 - 70	Gravelly variants 15 - 30 Rego variants 0 - 10	Some bedrock outcrops - old terrace.
LNB1/3	Very coarse textured, gravelly glaciofluvial	LNB 40 - 90	Gravelly DVG 0 - 20 Gleyed variants 0 - 15	Old meander scar.
POT1/2	Fine textured lacustrine	POT 60 - 100		Lochend Lake. Probably ZW for some portion of the year.
POT4/2-3		POT 40 - 80	Calcareous POT 10 - 30 Rego POT 10 - 30 Calcareous and rego POT 10 - 30	Drainage channel system.
ZAV2				
ZRB2				Gravel and bedrock outcrops. Could split some of the unit into RB4 if necessary.

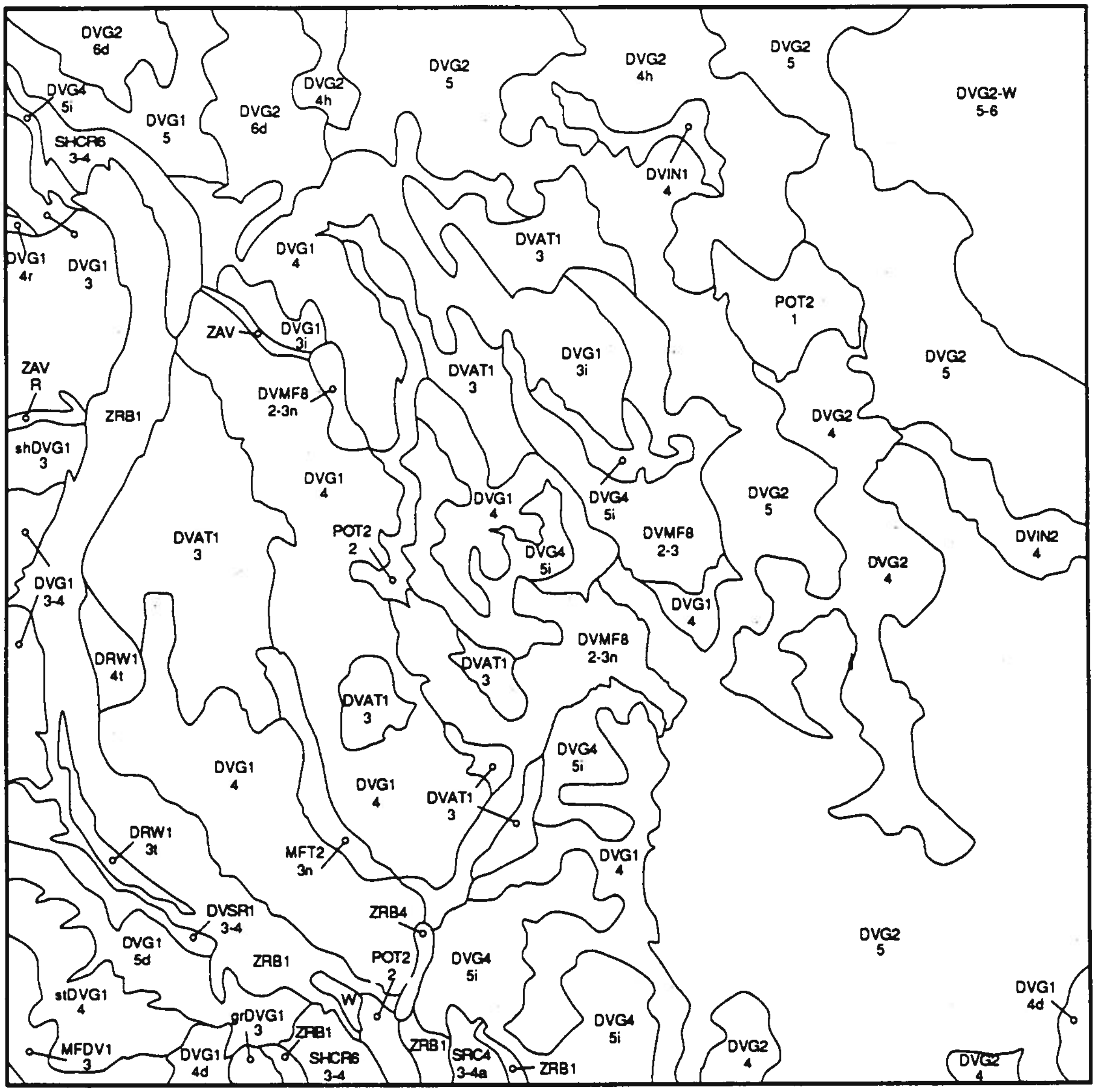

Figure B-14. Soil Map of Township 27 Range 3 W5 (Top-Down Mapping Method).

General landscape description: hummocky till; Chernozemic soils.

<u>Cartometrics</u>	
Number of polygons:	66
Number of observations:	14
Minimum size polygon:	7 ha
Maximum size polygon:	1936 ha
Average size polygon:	141 ha

<u>Accuracy</u>		
Percent correct, proportional		65%
Percent correct, non-proportional		73%
Percent similarity,	soil series	95%
	soil texture	98%
	parent material	95%
	internal drainage	99%
	subgroup classification	99%

Table B-14. Soil Map Legend for Township 27 Range 3 W5 (Top-Down Mapping Method).

Map Unit	Parent Materials	Major Soils (%)	Minor Soils (%)	Comments
DRW1/3t	Medium textured glaciofluvial over very coarse textured, gravelly glaciofluvial	DRW 80	SRC 20	
DRW1/4t		DRW 80	SRC 20	3 topo 50%; 4 topo 20%; 5 topo 30%
DVAT1/3	Moderately fine textured till	DVG 60 - 70 ATL 20 - 30	GGW 0 - 15 Eroded 0 - 15	
DVG1/3		DVG 80	ATL 20 GGW 0 - 10 Eroded and calcareous variants 0 - 10	
DVG1/3i		DVG 80	Eroded and calcareous variants 0 - 10	
grDVG1/3		grDVG 60 DVG 30		Gravelly phase to this till; >15% coarse fragments; generally 20 - 25% gravels in the till.
shDVG1/3		shDVG 60 DVG 30	GGW 0 - 5	In road cut, observed R at 50 to 200 cm depth
DVG1/3-4		DVG 80	GGW 0 - 15	
DVG1/4		DVG 70	ATL 20 GGW 0 - 15 Eroded and calcareous 0 -15	Till has 5 - 8% coarse fragments
DVG1/4d		DVG 60 - 70	GGW 0 - 15 shDVG 0 - 15	
DVG1/4r		DVG 80	Eroded and calcareous 0 - 20	
stDVG1/4		stDVG 40 DVG 30	GGW 15	Stony phase; actually stones and boulders are frequent; a lag of S3 to S4 is common.
DVG1/5		DVG 80	GGW 5 - 10 Eroded and calcareous 0 -10	
DVG1/5d		DVG 60 - 80	Eroded and calcareous 0 -15	
DVG2/4		DVG 60	GGW 15 - 20 ATL 0 - 15 Eroded and calcareous 0 -10	
DVG2/4h		DVG 70	GGW 20 Eroded and calcareous 0 -10	
DVG2/5		DVG 50+	GGW 20 Eroded and calcareous 0 -10	
DVG2/6d		DVG 70	GGW 20 D.GL 10	Luvisols under trees; Gleysols are side hill seeps. 6 topo 70%; 5 topo 30%

continued ...

Table B-14. Concluded.

Map Unit	Parent Materials	Major Soils (%)	Minor Soils (%)	Comments
DVG2+W/5-6	Moderately fine textured till	DVG 50	GGW 20 - 30 Eroded and calcareous 0 -10	5 topo 50%; 6 topo 30%; 3 topo 20%. Larger depressions with higher and larger volume hummocks; more water than GG.
DVG4/5i		DVG 60	Eroded and calcareous 20 - 30 ATL 10 GGW 0 - 5	
DVIN1/4		DVG 40 aaIND 40	Eroded and calcareous 0 - 10 Luvisols 0 - 10	
DVIN2/4		DVG 30 - 50 aaIND 20 - 30	GGW >15	Probably former drainage channel on top or within ice.
DVMF8/2-3n	Moderately fine textured till and moderately fine textured glaciolacustrine	DVG 30 MFT 30	GGW 25 Rego, calcareous and carbonated variants 25	Some fine textures occur
DVSR1/3-4	Medium textured glaciofluvial veneer and blanket overlying moderately fine textured till and moderately fine textured till	DVG 50 SRC 30	GGW 0 - 10	
MFDV1/3	Moderately fine textured glaciolacustrine and till	shMFT 4O DVG 40	MFT 20	
MFT2/3n	Moderately fine textured glaciolacustrine	shMFT 40 MFT 30	GGW 20 DVG 10	
POT2/1	Fine textured glaciolacustrine	pty R.G 70	O.HG 20 Gleyed 10	Lochend Lake
POT2/2		POT 50	pty R.G 30 Gleyed 20	
POT3/2		POT 50	Saline and sodic soils (all Gleyed and Gleysols) 15 - 25 Water 5 - 10	Valley bottom unit
SHCR6/3-4	Moderately coarse textured glaciofluvial	SHL 30 - 40 CRW 30 - 40	DRW 15 - 20 GGW 0 - 15 Regosol 0 - 10	FG veneer over sandstone.
SRC4/3-4a	Medium textured fluvial	SRC 60	Rego SRC 30 Saline 0 - 5 Solonetz 0 - 10	Fluvial lacustrine apron varies from blanket to veneer over rock
ZAV				
ZAV/R				Bedrock <2m and in some places <50cm.
ZRB1				
ZRB4				Modern erosion channel.
ZW				Water impounded by dam

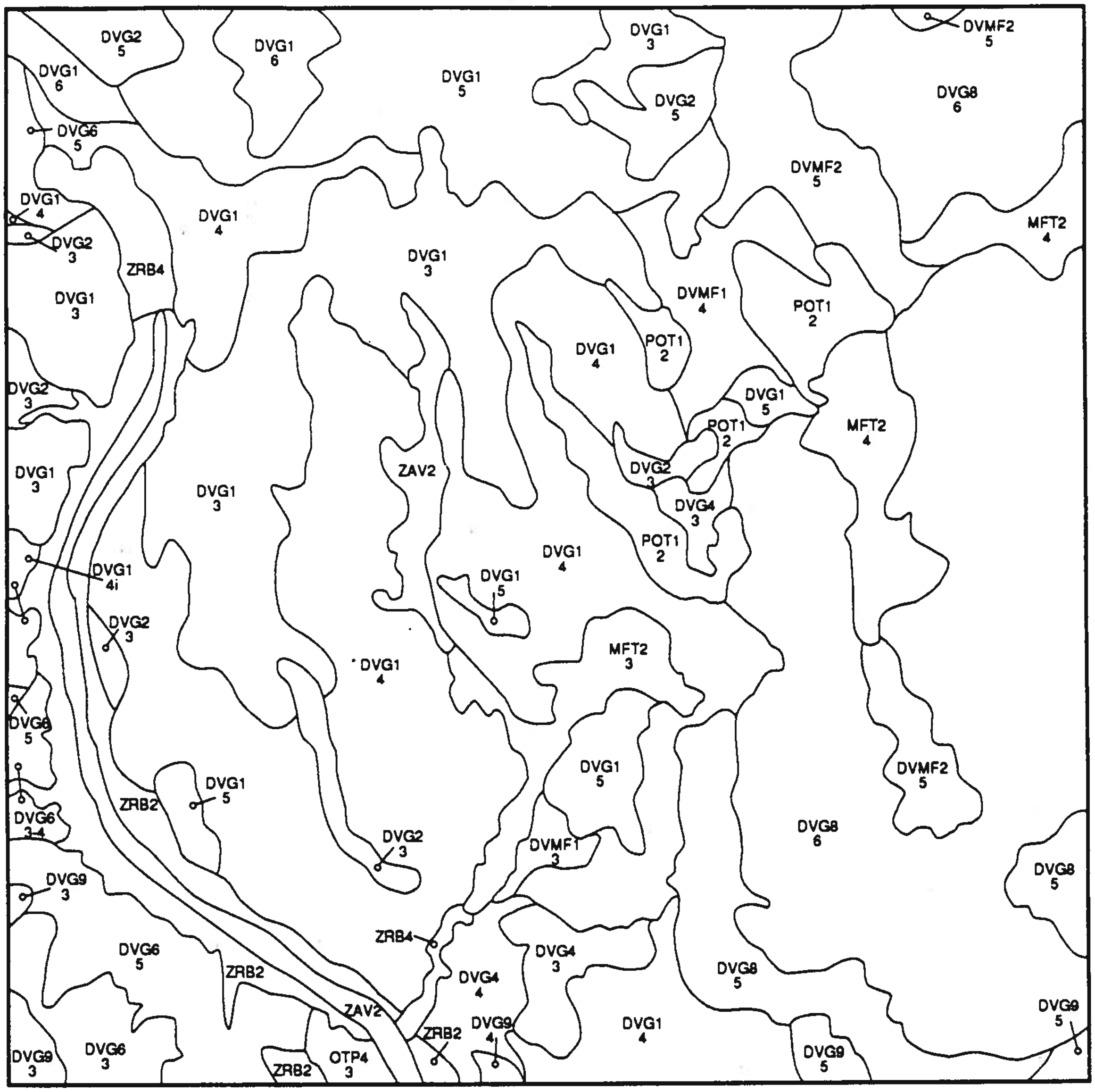

Figure B-15. Soil Map of Township 27 Range 3 W5 (SIL3 1:50 000 Mapping Method).

General landscape description: hummocky till; Chernozemic soils.

Cartometrics	
Number of polygons:	70
Number of observations:	55
Minimum size polygon:	15 ha
Maximum size polygon:	1512 ha
Average size polygon:	133 ha

Accuracy		
Percent correct,	proportional	63%
Percent correct,	non-proportional	65%
Percent similarity,	soil series	96%
	soil texture	99%
	parent material	97%
	internal drainage	99%
	subgroup classification	98%

Table B-15. Soil Map Legend for Township 27 Range 3 W5 (SIL3 1:50 000 Mapping Method).

Map Unit	Parent Materials	Major Soils (%)	Minor Soils (%)	Comments
ATL4/5i	Moderately fine textured till	ATL 50 - 70 Thin and eroded variants 30 - 50	POT 0 - 15	
DVG1/3 DVG1/4 DVG1/4i DVG1/5 DVG1/6	Moderately fine textured till	DVG 50 - 70 Thin and rego variants 20 - 40	Eroded variants 0 -15 POT 0 - 15	
DVG2/3 DVG2/4 DVG2/5	Moderately fine textured till	DVG 40 - 60 POT 20 - 40	Thin and rego variants 10 - 25 Eroded variants 0-15	
DVG4/3 DVG4/4	Moderately fine textured till	DVG 50 - 70 Eroded variants 20 - 40	Thin and rego variants 5 - 20 POT 0 -15	
DVG6/3 DVG6/3-4 DVG6/5	Moderately fine textured till with scattered inclusions of stony till and medium to coarse textured glaciofluvial gravels	DVG 50 - 70	OTP (LNB, DRW) 10 -20 Stony variants 10 - 20 Thin and rego variants 5 - 20 POT 0 - 15	
DVG8/5 DVG8/5-6 DVG8/6	Moderately fine textured till with a thin discontinuous, medium textured glaciolacustrine veneer	DVG 30 - 50	Calcareous variants 10 - 30 POT 10 - 30 MFT 5 - 20 Eroded variants 0-15	
DVG9/3 DVG9/4 DVG9/5	Moderately fine textured till with inclusions of stony till and glaciofluvial gravels	DVG 40 - 60	POT 10 - 30 OTP 10 - 30 Eroded variants 5-20	
DVMF1/3 DVMF1/4	Moderately fine textured till with a discontinuous medium textured glaciolacustrine veneer and blanket	DVG 30 - 50 MFT 30 - 50	Thin and rego variants 10 - 30 POT 0 - 15 FSH 0 - 15	
DVMF2/5		DVG 20 - 40 MFT 20 - 40 POT 20 - 40	Thin and rego variants 5 - 20 FSH 0 -15	
MFT2/2 MFT2/3 MFT2/4	Medium textured glaciolacustrine overlying moderately fine textured till with scattered pockets of fine textured glaciolacustrine	MFT 40 - 60 POT 20 - 40	FSH 5 - 20 DVG 0 - 15 Thin and rego variants 0 - 15	
OTP4/3	Medium textured glaciofluvial gravels with pockets of glaciofluvial sands	OTP 30 - 50 O.R 30 - 50	SHL 5 - 20	
POT1/2	Fine textured glaciolacustrine	POT 60 - 80	FSH 5 - 20 COD 5 - 20 WDC 0 - 15 DWT 0 - 15	
ZAV2				
ZRB2				
ZRB4				
ZZZ				

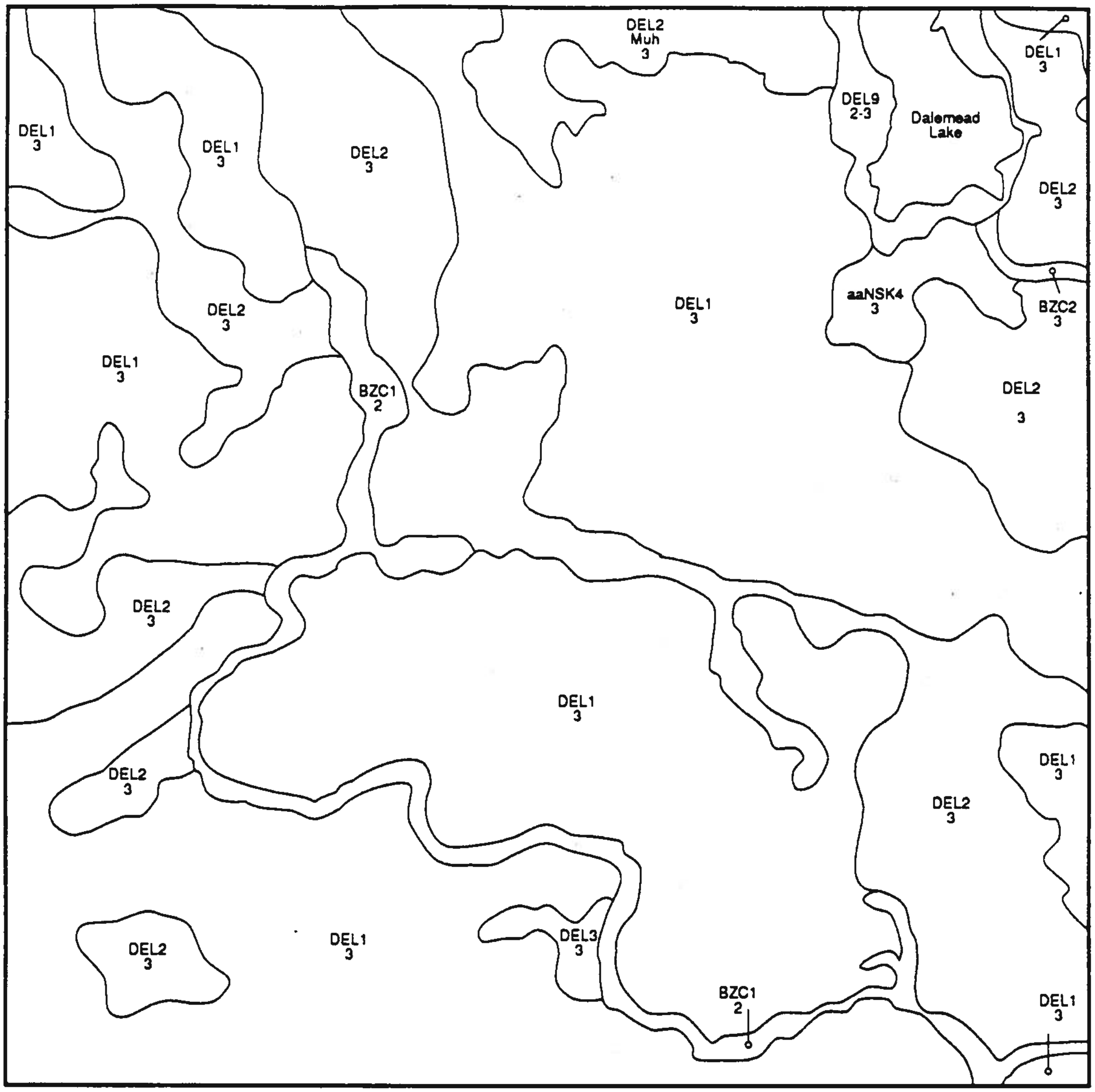

Figure B-16. Soil Map of Township 22 Range 27 W4 (Landscape Mapping Method).

General landscape description: undulating till; Chernozemic soils.

Cartometrics	
Number of polygons:	23
Number of observations:	18
Minimum size polygon:	47 ha
Maximum size polygon:	2655 ha
Average size polygon:	406 ha

Accuracy		
Percent correct,	proportional	72%
Percent correct,	non-proportional	76%
Percent similarity,	soil series	95%
	soil texture	99%
	parent material	99%
	internal drainage	100%
	subgroup classification	96%

Table B-16. Soil Map Legend for Township 22 Range 27 W4 (Landscape Mapping Method).

Map Unit	Parent Materials	Major Soils (%)	Minor Soils (%)	Comments
BZC1/3	Moderately fine glaciolacustrine and moderately fine till	BZC 20 - 50 DEL 20 - 50	ZW 0 - 5 GGW 5 - 10 saline variants 5 - 10	Minor drainage channel. Up to 40% 3 topography along edges of unit.
BZC2/3		BZC 30 - 60	Gleyed variants (GL. BL) 15 -30 ZW 5 -10 Saline-calcareous variants 5 -10	
DEL1/3	Moderately fine and medium textured till	DEL 40 - 70 RKV 20 - 30	E.BL 15 - 30 GGW 0 - 10	
DEL2/3		DEL 40 - 70 RKV 20 - 30	GGW 15 - 25 E.BL 15 - 30	
DEL3/3		DEL 40 - 70 RKV 20 - 30	Saline-calcareous variants 10 - 30 E.BL 0 - 20	
DEL9/2-3		DEL 30 - 50 RKV 15 - 30	BED 0 - 20 GGW 0 - 20 Saline DEL 0 - 15 Carbonated DEL 0 - 10	Area surrounding Dalemead Lake.
aaNSK4/3	Moderately fine textured till	aaNSK 40 - 60 Calcareous variants 20-40	DEL 0 - 10 Solonetzic variants 0 - 5	aaNSK = R.BL

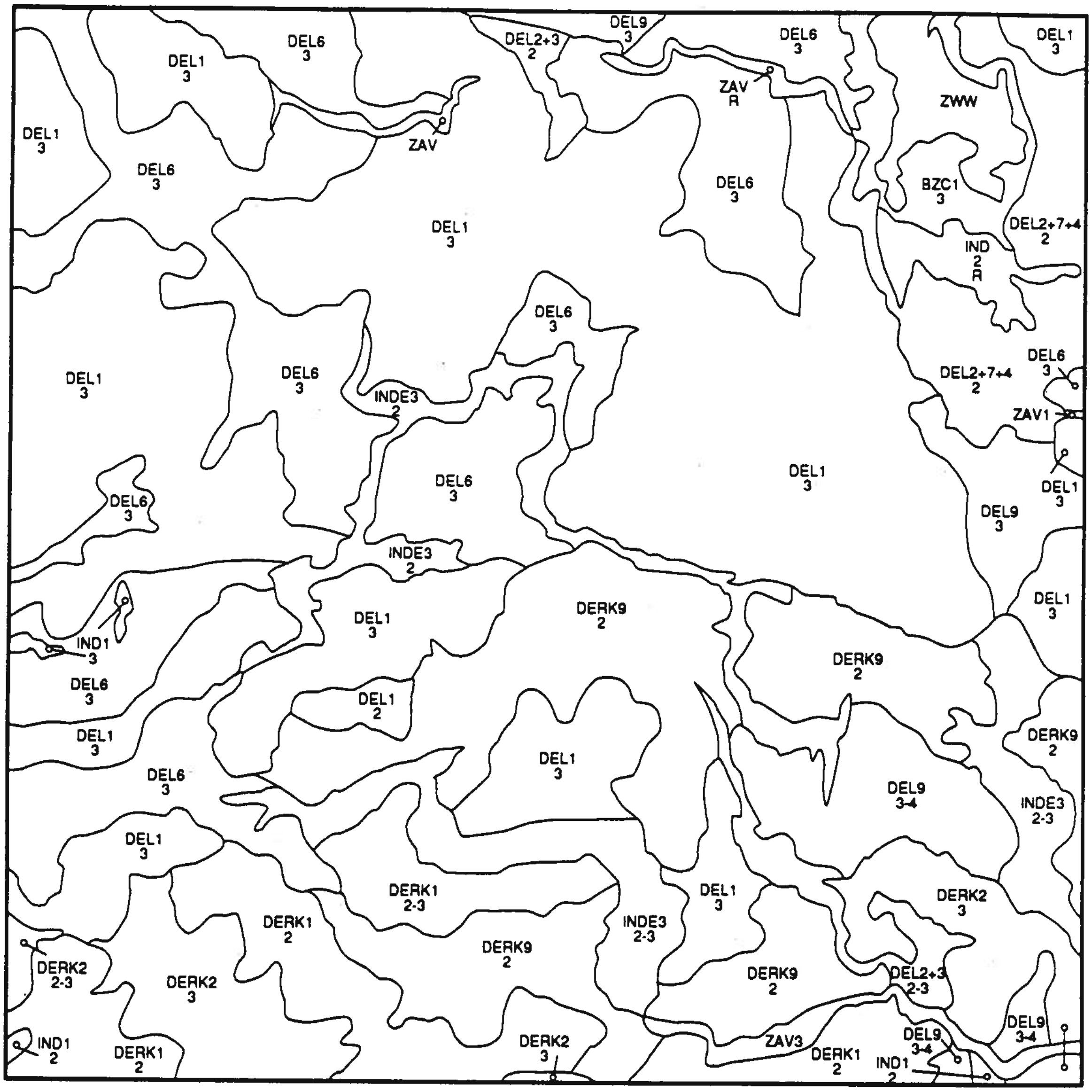

Figure B-17. Soil Map of Township 22 Range 27 W4 (Top-Down Mapping Method).

General landscape description: undulating till; Chernozemic soils.

<u>Cartometrics</u>	
Number of polygons:	59
Number of observations:	4
Minimum size polygon:	5 ha
Maximum size polygon:	1668 ha
Average size polygon:	158 ha

<u>Accuracy</u>		
Percent correct,	proportional	60%
Percent correct,	non-proportional	76%
Percent similarity,	soil series	95%
	soil texture	99%
	parent material	98%
	internal drainage	99%
	subgroup classification	96%

Table B-17. Soil Map Legend for Township 22 Range 27 W4 (Top-Down Mapping Method).

Map Unit	Parent Materials	Major Soils (%)	Minor Soils (%)	Comments
BZC1/2	Fine textured lacustrine overlying moderately fine textured till	BZC 60 Water and cattails 30	Gleyed 10	Lands adjacent to Langdon reservoir
DEL1/2	Moderately fine textured till	DEL 80 - 90	Eroded and calcareous 0 - 10 GGW 0 - 10	2 topo 70%; 3 topo 30%
DEL1/3		DEL 80	Eroded and calcareous 0 - 10 GGW 0 - 10	Convex landscape; almost exclusively a water shedding landscape
DEL2+3/2		DEL 60 Saline soils 15 - 20 GGW 20		2 topo 80%; 3 topo 20%. Seepage from ditch and lowlands adjacent to it
DEL2+3/2-3		DEL 50 GGW 25 Saline 15	RKV 10 Eroded and calcareous 10	
DEL2+7+4/2		DEL 40 - 60 GGW 15 - 20 Solonetzic soils 15 - 20 Rego and carbonated 15 - 20	Minor saline 0 - 5	Shallow to bedrock; was an active discharge area during a moister time of the Holocene. 2 topo 80%; 3 topo 20%
DEL6/3		DEL 70 GGW 20	Minor saline 0 - 5 Eroded and calcareous 5 - 10	Depressions are local groundwater discharge
DEL9/3		DEL 60 GGW 15 - 20 Solonetzic 15 - 20	Eroded and calcareous 0 - 10	Former overflow fluvial lacustrine from Langdon reservoir south to the Bow River; this is now a drainage divide.
DEL9/3-4		DEL 40 - 60 GGW 20 Solonetzic soils 15 - 20	Eroded and calcareous 10	3 topo 60%; 4 topo 40%
DERK1/2	Moderately fine textured aeolian over moderately fine till and moderately fine till	DEL 70 RKV 20 - 30	GGW 0 - 10	2 topo 70%; 3 topo 30%
DERK1/2-3		DEL 60 - 70 RKV 30	GGW 0 - 10	2 topo 60%; 3 topo 40%
DERK2/2-3		DEL 60 RKV 20 GGW 15 - 20	Eroded and calcareous 0 - 5	Recharge area.
DERK2/3		DEL 60 RKV 20 GGW 15 - 20	Eroded and calcareous 0 - 5	Recharge area. 3 topo 80%; 2 topo 20%
DERK9/2		DEL 50 RKV 20 GGW 15 Solonetzic 15		2 topo 60%; 3 topo 40%.

continued ...

Table B-17. Concluded.

Map Unit	Parent Materials	Major Soils (%)	Minor Soils (%)	Comments
IND1/2	Moderately fine textured till	IND 80 GGW 20		Slow groundwater recharge
IND1/3		IND 80 GGW 20		Slow groundwater recharge
INDE1/2		IND 50 DEL 30	RKV 10 GGW 10	
INDE3/2	Moderately fine textured till	IND 40 DEL 30 Saline, gleyed variants 20 - 30	RKV 0 - 10	2 topo 80%; 3 topo 20%
INDE3/2-3		IND 30 - 40 DEL 30 - 40	Saline variants 20 RKV 10 Eroded and calcareous 10	Could be a DEL2+3 unit but 40% GGW is too high for this. Canal seepage.
ZAV1	Undifferentiated			Alluvial channel; non saline
ZAV3	Undifferentiated			Alluvial channel; saline
ZAV/R	Undifferentiated			Sandstone bedrock at 1 to 2 meters
ZW				Water

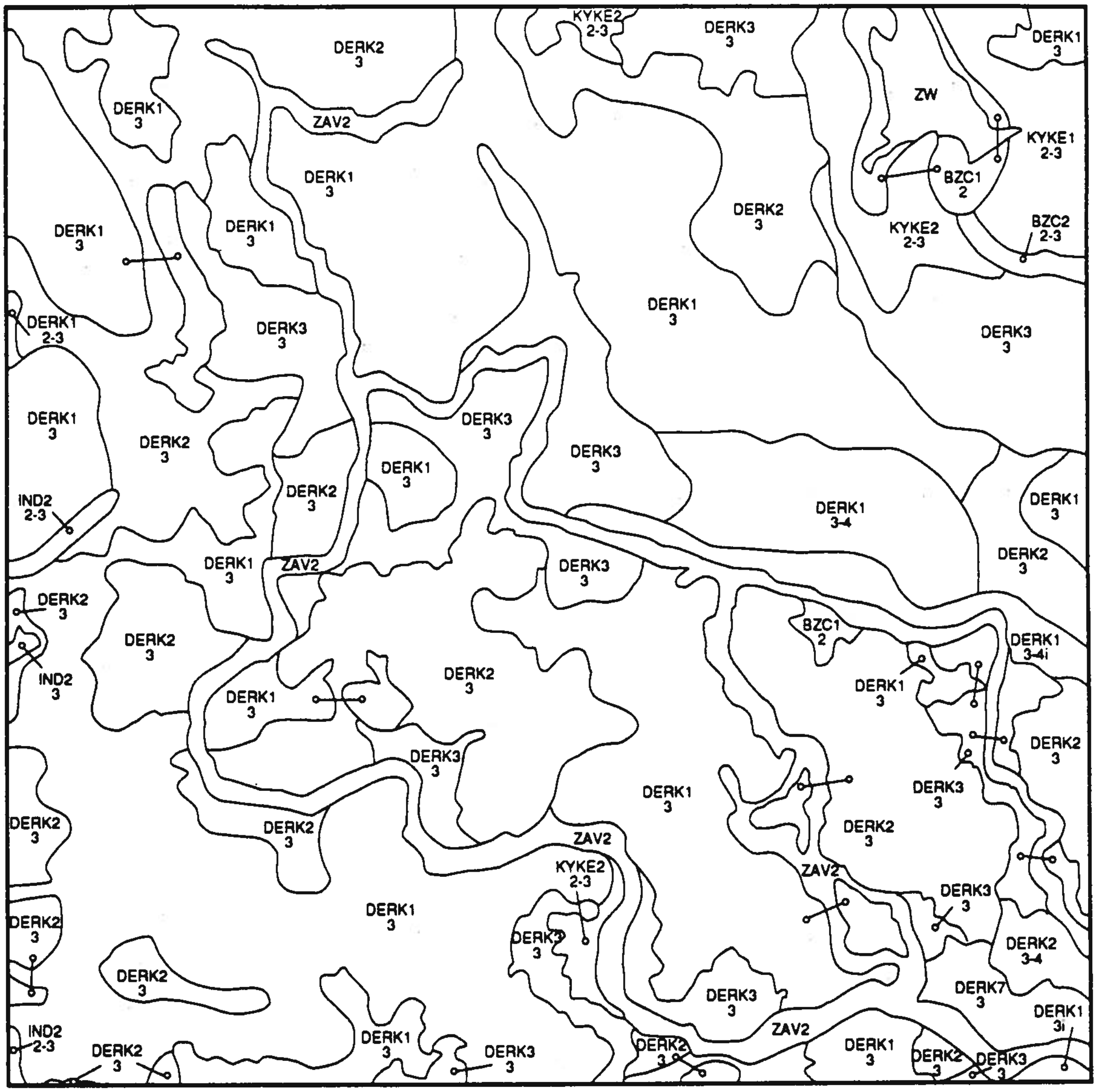

Figure B-18. Soil Map of Township 22 Range 27 W4 (SIL3 1:50 000 Mapping Method).

General landscape description: undulating till; Chernozemic soils.

<u>Cartometrics</u>

Number of polygons:	69
Number of observations:	66
Minimum size polygon:	21 ha
Maximum size polygon:	1010 ha
Average size polygon:	135 ha

<u>Accuracy</u>

Percent correct, proportional		67%
Percent correct, non-proportional		76%
Percent similarity,	soil series	95%
	soil texture	99%
	parent material	99%
	internal drainage	100%
	subgroup classification	97%

Table B-18. Soil Map Legend for Township 22 Range 27 W4 (SIL3 1:50 000 Mapping Method).

Map Unit	Parent Materials	Major Soils (%)	Minor Soils (%)	Comments
BZC1/2	Fine textured lacustrine overlying moderately fine textured till	BZC 70 - 90	gl BED 5 - 15 gl DEL 5 - 15	
BZC2/2-3		BZC 50 - 70	gl DEL 10 - 30 DEL 0 - 15 Coarse variants 10 - 30	
DERK1/3	Moderately fine textured till and discontinuous medium textured aeolian or glaciolacustrine veneer	DEL 40 - 60 RKV 30 - 50	Thin and rego variants 0 - 20 BED 0 - 20 BZC 0 - 20	
DERK1/3i		DEL 40 - 60 RKV 30 - 50	Thin and rego variants 0 - 20 BED 0 - 20 BZC 0 - 20	
DERK1/3-4		DEL 40 - 60 RKV 30 - 50	Thin and rego variants 0 - 20 BED 0 - 20 BZC 0 - 20	
DERK1/3-4i		DEL 40 - 60 RKV 30 - 50	Thin and rego variants 0 - 20 BED 0 - 20 BZC 0 - 20	
DERK2/3		DEL 20 - 40 RKV 20 - 40 IND 20 - 40	Thin and rego variants 0 - 20	
DERK2/3-4		DEL 20 - 40 RKV 20 - 40 IND 20 - 40	Thin and rego variants 0 - 20	
DERK3/3		DEL 20 - 40 RKV 20 - 40 BZC 20 - 40	Thin and rego variants 0 - 20 BED 0 - 20	
DERK7/3		DEL 20 - 40 RKV 20 - 40 BED 20 - 40	BZC 0 - 20	
IND2/2-3	Moderately fine textured till and discontinuous medium textured aeolian or glaciolacustrine veneer	IND 50 - 70	DEL 20 - 40 Thin and rego variants 0 - 20	
IND2/3		IND 50 - 70	DEL 20 - 40 Thin and rego variants 0 - 20	
KYKE1/2-3	Medium textured aeolian or glaciolacustrine veneer over moderately fine textured till	KYN 20 - 50 KEO 20 - 50 RKV 20 - 50	BZC 5 - 30	
KYKE2/2-3		KYN 20 - 50 KEO 20 - 50 BZC 20 - 50	RKV 5 - 20	
ZAV2	Variable textured fluvial	GAY 30 - 50 TBR 20 - 40	TWS/CRW 10 - 40 ARE 10 - 40	
ZW				

APPENDIX C: MAP UNIT NAMES AND COMPOSITION

The map unit names of each sampling location are listed for each township and mapping method. As well, the composition of each sampling location is provided, broken down by series, soil texture, parent material, internal drainage, and subgroup classification.

Legend for abbreviations used throughout the tables in Appendix C:

Soil textures:

fi = fine
mf = moderately fine
me = medium
mc = moderately coarse
vc = very coarse

Parent Materials:

TILL = till
GLFL =glaciofluvial
GLLC = glaciolacustrine
RESI = residual
FLEO = fluvial-eolian
EOLI = eolian
ORGA = organic
FLLC = fluvial-lacustrine
FLUV = fluvial
LACU = lacustrine

Drainage Classes:

P = poor
I = imperfect
MW = moderately well
W =well
GgW = Gleyed variants, gleysols and water.

Note: A dashed line through a table cell indicates that the radial arm transect occupied more than one soil polygon.

In tables C-1, C-2, C-4, and C-5, the numbers in brackets following a map unit name indicates the radial arm transect sample point numbers which fell in that map unit.

Table C-1. Map units evaluated for each mapping method in Tp47 R14 W4.

Twp.	No.	Landscape	Top-down	SIL3 1:50 000
47-14	1	KLM 1/2-3	DYKL 2/3	KLM 4/c
	2	KLM 1/2-3	KLLO 2/2-3	KLM 5/c
	3	KLEO 3/3 (1,6-17) KLEO 1/3 (2-5)	DYKL 2/3	KLM 5/b
	4	KLEO 3/3	DYKL 2/3	KLM 5/b
	5	KLEO 2/3 (1-15) KLEO 1/3-4 (16,17)	DYKL 2/3	KLM 4/c
	6	KLDY 1/3	KLM 1/3	HER 4/c

Table C-2. Map units evaluated for each mapping method in Tp51 R19 W4.

Twp.	No.	Landscape	Top-down	SIL3 1:50 000
51-19	1	HBM 1/2	MMHB 1/2	CMO 4/b
	2	AGS 1/3 (1-11,14,15) AGRL 2/4 (12,13,16,17)	AGS 1/3	AGS 2/c (2-5) AGS 2/d (1,6-17)
	3	AGS 1/3	AGS 1/3	AGS 2/d
	4	AGS 2/4	AGS 1/4 (1-9,14-17) AGS 2/3 (10-13)	AGS 2/c-d
	5	AGS 1/4	AGS 1/3	AGS 2/c
	6	UCS 2/5	COUC 2/5	UCS 5/e

Table C-3. Map units evaluated for each mapping method in Tp2 R16 W4.

Twp.	No.	Landscape	Top-down	SIL3 1:50 000
2-16	1	FOK 4/3	PUR 6/4	CRD 1/3
	2	HRK 4/3-4	BVCV 1/3	FOKS 1/3
	3	MKSX 1/3	MKR 2/2-3	MKR 1/3
	4	PUR 6/3-4	PUR 1/4	MGCR 1/3-4
	5	PUR 4/4:R	MSN 4/5	CRD 4/4:R
	6	FOK 4/3	BVCV 1/3	FOKS 1/3

Table C-4. Map units evaluated for each mapping method in Tp6 R20 W4.

Twp.	No.	Landscape	Top-down	SIL3 1:50 000
6-20	1	CRWN 7/2-3:R	CRRD 1/3	CRWN 1/3-2:R
	2	CRWN 1/3:R	CRRD 1/3	CRWN 1/3-2:R
	3	CRWN 7/2-3:R	CRRD 1/3	CRWN 1/3-2
	4	LET 5/2-3	CLLE 3/2	CLD 1/2-3
	5	WNY 3/2-3:R (1-8) LET 5/2-3 (9-17)	RDLE 1/3	WNY 1/2-3:R
	6	LET 6/3	LEOA 1/3	LEOA 1/2-3

Table C-5. Map units evaluated for each mapping method in Tp27 R3 W5.

Twp.	No.	Landscape	Top-down	SIL3 1:50 000
27-3	1	DVG 1/4	DVG 1/3i (3-5,16,17) DVG 1/4 (1,2,6-15)	DVG 1/3 (1-9,14-17) DVG 1/4 (10-13)
	2	DVG 1/4	DVG 1/4	DVG 4/3
	3	DVG 1/3 (1-10,14-17) POT 4/2-3 (11-13)	DVG 1/3i (2-5) DVAT 1/3 (1,6-9,14-17) POT 2/2 (10-13)	DVG 1/3
	4	DVG 2/5-6	DVG 2/5	DVG 8/6
	5	DVG 2/5	DVG 2/5	DVG 1/5
	6	DVG 2/5-6	DVG2/5	DVG 8/6

Table C-6. Map units evaluated for each mapping method in Tp22 R27 W4.

Twp.	No.	Landscape	Top-down	SIL3 1:50 000
22-27	1	DEL 1/3	DEL 1/3	DERK 1/3
	2	DEL 1/3	DERK 9/2	DERK 1/3
	3	DEL 1/3	DEL 1/3	DERK 1/3
	4	DEL 1/3	DERK 9/2	DERK 1/3
	5	DEL 1/3	DEL 1/3	DERK 2/3
	6	DEL 2/3	DEL 6/3	DERK 3/3

Table C-7. Series composition (%) of each transect and map unit sampled in Tp47 R14 W4.

Twp	No.	Transect	Landscape	Top-down	SIL3 1:50 000
47-14	1	EOR (3) 18% saEOR (4) 18% GgW (5) 29% Solz. (5) 29% 3 KLM 1 LOG 1 HER	KLM 60-90 HER <20 DYD <20 EOR <10 GgW <10 saGgW <10	DYD 20-40 KLM 20-40 GGW 15-20 LOG 10-20 HER 5-15	KLM CMO, DYD <40 GgW <15
	2	Solz. (9) 53% 7 KLM 1 LOG 1 DYD HER (3) 18% EOR (5) 29% 2 EOR 1 saEOR 1 caEOR 1 erEOR	KLM 60-90 HER <20 DYD <20 EOR <10 GgW <10 saGgW <10	KLM 20-40 LOG 30-40 DYD 15-20 GGW 15-20	KLM CMO, DYD <40 HGT <20 GgW <15
	3	Solz. (6) 35% 4 KLM 1 LOG 1 HER saEOR (3) 18% caEOR (1) 6% GgW (6) 35% aaUCS (1) 6%	KLM 30-60 EOR 15-30 saHGT 15-30 HER 10-30 DYD 10-30 COR <20 ------------------------- KLM 30-60 EOR 15-30 HER 10-30 DYD 10-30 GgW <10 saGgW <10	DYD 20-40 KLM 20-40 GGW 15-20 LOG 10-20 HER 5-15	KLM CMO, DYD <40 HGT <20 GgW <15
	4	EOR (9) 53% 4 EOR 2 reEOR 2 caEOR 1 saEOR GgW (5) 29% Solz. (3) 18% 1 KLM 1 DYD 1 LOG	KLM 30-60 EOR 15-30 saHGT 15-30 HER 10-30 DYD 10-30 COR <20	DYD 20-40 KLM 20-40 GGW 15-20 LOG 10-20 HER 5-15	KLM CMO, DYD <40 HGT <20 GgW <15
	5	GgW (11) 65% 8 COR EOR (3) 18% caEOR (1) 6% HER (2) 12%	KLM 30-60 EOR 15-30 GgW 15-30 HER <10 DYD <10 saGgW <10 ------------------------- KLM 30-60 EOR 15-30 HER 10-30 DYD 10-30 GgW <10 saGgW <10	DYD 20-40 KLM 20-40 GGW 15-20 LOG 10-20 HER 5-15	KLM CMO, DYD <40 GgW <15
	6	EOR (10) 59% saEOR (1) 6% KLM (3) 18% RED (2) 12% ROS (1) 6%	KLM 40-70 DYD 20-50 EOR <20 HER <20 GgW <10 saGgw <10	KLM 30-50 DYD 15-30 LOG 15-30 SHS 10-20	HER 60 KLM, DYD <40 GgW <15

Table C-8. Series composition (%) of each transect and map unit sampled in Tp51 R19 W4.

Twp	No.	Transect	Landscape	Top-down	SIL3 1:50 000
51-19	1	RDW (11) 65% CMO (4) 24% BVH (1) 6% AGS (1) 6%	HBM 50-70 POK 20-40 AGS <10 GGW <10	MMO 40-60 HBM 20-40	CMO KLM, DYD <40 GGW <15
	2	AGS (4) 24% Solz. (5) 29% 2 TFD 2 LNN 1 NRM GgW (5) 29% EDG (1) 6% BVH (1) 6% RLV (1) 6%	AGS 50-80 BVH 20-40 GGW <10 ------------------------- AGS 30-50 RLV 20-40 GGW 15-30 BVH <20	AGS 60-80 GGW 5-10 BVH <15	AGS 70 BVH 20 GGW 10 Sandy, Silty, & Solonetzic
	3	AGS (12) 71% BVH (5) 29%	AGS 50-80 BVH 20-40 GGW <10	AGS 60-80 GGW 5-10 BVH <15 POK Solonetzic	AGS 70 BVH 20 GGW 10 Sandy, Silty, & Solonetzic
	4	Solz. (9) 53% 3 erCMO 2 NRM 2 LNN 1 TFD 1 MLS GgW (4) 24% AGS (1) 6% RLV (1) 6% CCB (1) 6% BVH (1) 6%	AGS 40-70 BVH 10-30 GGW 15-30 RLV <20	AGS 60-80 GGW 5-10 BVH <15 POK Solonetzic ------------------------- AGS 50-70 GGW 15-25 BVH <15	AGS 70 BVH 20 GGW 10 Sandy, Silty, & Solonetzic
	5	Solz. (8) 47% 3 CMO 3 NRM 1 TBY 1 LNN AGS (5) 29% BVH (1) 6% GgW (3) 18%	AGS 50-80 BVH 20-40 RLV <20 GGW <10	AGS 60-80 GGW 5-10 BVH <15 POK Solonetzic	AGS 70 BVH 20 GGW 10 Sandy, Silty, & Solonetzic
	6	GBL (2) 12% RLV (2) 12% RDW (2) 12% ELP (2) 12% AGS (1) 6% LFD (1) 6% GgW (7) 41%	UCS 50-70 GGW 15-30 COA <20 RLV <20	COA 30-50 GGW 15-25 UCS 15-25 FLU <15	UCS COA 20 Sandy / Clayey variants 10

Table C-9. Series composition (%) of each transect and map unit sampled in Tp2 R16 W4.

Twp	No.	Transect	Landscape	Top-down	SIL3 1:50 000
2-16	1	ANO (8) 47% erANO (2) 12% HMS (6) 35% BVL (1) 6%	FOK 30 - 50 Rego and calcareous 15 - 35 HRK 0 - 10 zrHRK 0 - 10 grFOK 0 - 15	PUR 40 - 70 Coarse variants 15 - 35 Rego and eroded 0 - 15	CRD 60 - 90
	2	HRK (15) 88% glHRK (2) 12%	HRK 30 - 60 zrHRK 20 - 40 PUR 15 - 25 FOK 0 - 10 MGR 0 - 10 WID 0 - 10 Coarse variants 0 - 10	BVL 40 - 70 CVD 40 - 70	FOK 40 - 70 KSR 20 - 40 LET 0 - 10
	3	Solz.(8) 47% 4 caKBD 3 caWDW 1 RRD BVL (2) 12% RIR (2) 12% caTIY (1) 6% BUT (1) 6% CVD (1) 6% casaCHN (1) 6% glcaSPS (1) 6%	aaMKR 15 - 35 aaSXT 15 - 35 Regosols 15 - 25 Solonetz 15 - 25 Fine variants 0 - 10 Coarse variants 0 - 10 Saline variants 0 - 10	MKR 40 - 70 ZW 0 - 5 Fine variants 5 - 15 BVL 5 - 15 GGW 5 - 15	MKR 60 - 80 O.R 10 - 30
	4	MGR (10) 59% LUP (3) 18% glLUP (1) 6% PUR (2) 12% erWID (1) 6%	PUR 30 - 60 LUP 15 - 30 MGR 15 - 40 FOK 0 - 10 HRK 0 - 5	PUR 60 - 90 GGW 0 - 10 Eroded and rego 0 -10	MGR 50 - 70 CRD 20 - 40
	5	MSN (12) 71% erMSN (1) 6% CLR (4) 24%	PUR 30 - 60 WID 15 - 40 LUP 15 - 25 Saline variants 0 - 10 Coarse variants 0 - 10	MSN 40 - 80 Eroded and rego 20 - 40 GGW 5 - 10	CRD 50 - 70 VEB 20 - 40
	6	HRK (11) 65% fine var. (6) 35%	FOK 30 - 50 Rego and calcareous 15 - 35 HRK 0 - 10 zrHRK 0 - 10 grFOK 0 - 15	BVL 40 - 70 CVD 40 - 70	FOK 40 - 70 KSR 20 - 40 LET 0 - 10

Table C-10. Series composition (%) of each transect and map unit sampled in Tp6 R20 W4.

Twp	No.	Transect	Landscape	Top-down	SIL3 1:50 000
6-20	1	CRD (5) 29% erCRD (4) 24% VEB (5) 29% SZ.DB (3) 18%	CRD 30 - 60 WNY 30 - 60 Solonetzic soils 15 - 25 Saline soils 0 - 10 Rego and calcareous 0 - 10 LET 0 - 10 Fine textured 0 - 10	CRD 50 - 80 RDM 50 - 80	CRD 40 - 70 WNY 20 - 50
	2	CRD (15) 88% saCRD (1) 6% VEB (1) 6%	CRD 30 - 60 WNY 30 - 60 Solonetzic soils 0 - 10 Rego and calcareous 0 - 10 LET 0 - 10 Fine textured 0 - 10	CRD 50 - 80 RDM 50 - 80	CRD 40 - 70 WNY 20 - 50
	3	CRD (17) 100%	CRD 30 - 60 WNY 30 - 60 Solonetzic soils 15 - 25 Saline soils 0 - 10 Rego and calcareous 0 - 10 LET 0 - 10 Fine textured 0 - 10	CRD 50 - 80 RDM 50 - 80	CRD 40 - 70 WNY 20 - 50
	4	LET (10) 59% SZ.DB (3) 18% DIM (1) 6% GgW (3) 18%	LET 30 - 60 CLD 15 - 40 Rego and calcareous 0 -10 GGW 0 - 10 Fine textured 0 - 10 Solonetzic 0 - 10	CLD 40 - 70 LET 30 - 50 Saline variants 15 - 30 GGW 5 - 10	CLD 60 - 80 Saline variants 0 -20 LET 0 - 10 WNY 0 - 10
	5	CRD (6) 35% VEB (7) 41% WNY (3) 18% LET (1) 6%	WNY 30 -60 aaLLD 15 - 40 CRD 5 - 15 LET 0 - 10 Solonetz 0 - 10 Rego and calcareous 0 -10 ------------------------- LET 30 - 60 CLD 15 - 40 Rego and calcareous 0 -10 GGW 0 - 10 Fine textured 0 - 10 Solonetzic 0 - 10	RDM 40 - 70 LET 30 - 50 WNY 0 - 15 CRD 10 - 20	WNY 60 - 80 LET 10 - 30
	6	BKE (8) 47% saBKE (3) 18% GgW (4) 24% CLD (2) 12%	LET 30 - 60 Coarse variants 15 - 40 Rego and calcareous 0 -10 GGW 0 - 10 Fine textured 0 - 10 Solonetzic 0 - 10	LET 40 - 70 OAS 20 - 30 RDM 10 - 20 CRD 10 - 20	LET 50 - 70 OAS 20 - 40

Table C-11. Series composition (%) of each transect and map unit sampled in Tp27 R3 W5.

Twp	No.	Transect	Landscape	Top-down	SIL3 1:50 000
27-3	1	DVG (7) 41% caDVG (1) 6% glDVG (2) 18% MFT (3) 18% caMFT (3) 18% OKY (1) 6%	DVG 50 - 80 Rego and eroded 5 - 20 Gleyed 0 - 10 Gravelly 0 - 5 Fine variants (LGv/M) 0 - 10	DVG 80 Eroded and calcareous variants 0 - 10 ------------------------- DVG 70 ATL 20 GGW 0 -15 Eroded and calcareous variants 0 - 15	DVG 50 - 70 Thin and rego variants 20 - 40 Eroded variants 0 - 15 POT 0 - 15
	2	DVG (8) 47% erk (7) 41% MFT (1) 6% GgW (1) 6%	DVG 50 - 80 Rego and eroded 5 - 20 Gleyed 0 - 10 Gravelly 0 - 5 Fine variants (LGv/M) 0 - 10	DVG 70 ATL 20 GGW 0 -15 Eroded and calcareous variants 0 - 15	DVG 50 - 70 Eroded variants 20 - 40 Thin and rego variants 5 - 20 POT 0 - 15
	3	MFT (10) 59% DVG (3) 18% GgW (4) 24%	DVG 60 - 100 GGW 0 - 10 ------------------------- POT 40 - 80 calcareous POT 10 - 30 rego POT 10 - 30	DVG 80 Eroded and calcareous variants 0 - 10 ------------------------- DVG 60 - 70 ATL 20 - 30 GGW 0 - 15 Eroded 0 - 15 ------------------------- POT 50 pty R.G 30 Gleyed 20	DVG 50 - 70 Thin and rego variants 20 - 40 Eroded variants 0 - 15 POT 0 - 15
	4	DVG (6) 35% thin (3) 18% rego (3) 18% PPE (2) 12% GgW (3) 18%	DVG 40 - 80 GGW 15 - 30 Rego and eroded 15 - 30 Calcareous variants 0 - 10 Gravelly variants 5 - 10	DVG 50+ GGW 20 Eroded and calcareous 0 - 10	DVG 30 - 50 Calcareous variants 10 - 30 POT 10 - 30 MFT 5 - 20 Eroded variants 0 - 15
	5	DVG (11) 65% thin (2) 12% GgW (4) 24%	DVG 40 - 80 GGW 15 - 30 Rego and eroded 15 - 30 Calcareous variants 0 - 10	DVG 50+ GGW 20 Eroded and calcareous 0 - 10	DVG 50 - 70 Thin and rego variants 20 - 40 Eroded variants 0 - 15 POT 0 - 15
	6	DVG (8) 47% erk (2) 12% PPE (2) 12% GgW (5) 29%	DVG 40 - 80 GGW 15 - 30 Rego and eroded 15 - 30 Calcareous variants 0 - 10 Gravelly variants 5 - 10	DVG 50+ GGW 20 Eroded and calcareous 0 - 10	DVG 30 - 50 Calcareous variants 10 - 30 POT 10 - 30 MFT 5 - 20 Eroded variants 0 - 15

Table C-12. Series composition (%) of each transect and map unit sampled in Tp22 R27 W4.

Twp	No.	Transect	Landscape	Top-down	SIL3 1:50 000
22-27	1	DEL (8) 47% RKV (6) 35% LTA (3) 18%	DEL 40 - 70 RKV 20 - 30 E.BL 15 - 30 GGW 0 -10	DEL 80 Eroded and calcareous 0 -10 GGW 0 - 10	DEL 40 - 60 RKV 30 - 50 Thin and rego variants 0 - 20 BED 0 - 20 BZC 0 - 20
	2	RKV (7) 41% LTA (5) 29% DEL (4) 24% GgW (1) 6%	DEL 40 - 70 RKV 20 - 30 E.BL 15 - 30 GGW 0 -10	DEL 50 RKV 20 GGW 15 Solonetzic 15	DEL 40 - 60 RKV 30 - 50 Thin and rego variants 0 - 20 BED 0 - 20 BZC 0 - 20
	3	RKV (8) 47% DEL (6) 35% LTA (3) 18%	DEL 40 - 70 RKV 20 - 30 E.BL 15 - 30 GGW 0 -10	DEL 80 Eroded and calcareous 0 -10 GGW 0 - 10	DEL 40 - 60 RKV 30 - 50 Thin and rego variants 0 - 20 BED 0 - 20 BZC 0 - 20
	4	DEL (11) 65% saDEL (3) 18% erDEL (1) 6% GgW (2) 12%	DEL 40 - 70 RKV 20 - 30 E.BL 15 - 30 GGW 0 -10	DEL 50 RKV 20 GGW 15 Solonetzic 15	DEL 40 - 60 RKV 30 - 50 Thin and rego variants 0 - 20 BED 0 - 20 BZC 0 - 20
	5	DEL (10) 59% saDEL (4) 24% IND (3) 18%	DEL 40 - 70 RKV 20 - 30 E.BL 15 - 30 GGW 0 -10	DEL 80 Eroded and calcareous 0 -10 GGW 0 - 10	DEL 20 - 40 RKV 20 - 40 IND 20 - 40 Thin and rego variants 0 - 20
	6	DEL (13) 76% saDEL (2) 12% glDEL (1) 6% erDEL (1) 6%	DEL 40 - 70 RKV 20 - 30 GGW 15 - 25 E.BL 15 - 30	DEL 70 GGW 20 Saline 0 - 5 Eroded and calcareous 5 - 10	DEL 20 - 40 RKV 20 - 40 BZC 20 - 40 Thin and rego variants 0 - 20 BED 0 - 20

Table C-13. Parent materials and textures of the sampled areas in Tp47 R14 W4.

Twp.	No.	Transect	Landscape	Top-down	SIL3 1:50 000
47-14	1	mf TILL (17) 100%	mf TILL	mf TILL	mf TILL
	2	mf TILL (16) 94% me TILL (1) 6%	mf TILL	mf TILL	mf TILL
	3	mf TILL (17) 100%	mf TILL fi GLLC <30% ----------------------- mf TILL	mf TILL	mf TILL fi GLLC <20%
	4	mf TILL (12) 71% fi TILL (5) 29%	mf TILL fi GLLC <30%	mf TILL	mf TILL fi GLLC <20%
	5	mf TILL (11) 65% fi TILL (6) 35%	mf TILL ----------------------- mf TILL	mf TILL	mf TILL
	6	mf TILL (13) 76% me TILL (1) 6% vc GLFL (2) 12% mc GLFL (1) 6%	mf TILL	mf TILL mf RESI <20%	mf TILL

Table C-14. Parent materials and textures of the sampled areas in Tp51 R19 W4.

Twp	No.	Transect	Landscape	Top-down	SIL3 1:50 000
51-19	1	mc FLEO (9) 53% mc FLEO/mf TILL (2) 12% mf TILL (6) 35%	mf GLFL/mf TILL <70% me FLLC <40% mf TILL <10%	fi GLLC <60% mf GLFL/mf TILL <40%	mf TILL
	2	mf TILL (16) 94% fi GLLC (1) 6%	mf TILL -------------------- mf TILL	mf TILL	mf TILL
	3	mf TILL (17) 100%	mf TILL	mf TILL me FLLC <15%	mf TILL
	4	mf TILL (10) 59% fi TILL (4) 24% mf GLLC/mf TILL (1) 6% mf GLLC/fi TILL (1) 6% fi GLLC/mf TILL (1) 6%	mf TILL	mf TILL me FLLC <15% -------------------- mf TILL	mf TILL
	5	mf TILL (15) 88% fi GLLC/mf TILL (1) 6% mf EOLI/mf TILL (1) 6%	mf TILL	mf TILL me FLLC <15%	mf TILL
	6	mf TILL (5) 29% mc FLEO/mf TILL (4) 24% mc GLFL (3) 18% mc FLEO (2) 12% ORGA/mf GLLC (2) 12% water (1) 6%	mf TILL water <30%	mf TILL water <30%	mf TILL

Table C-15. Parent materials and textures of the sampled areas in Tp2 R16 W4.

Twp	No.	Transect	Landscape	Top-down	SIL3 1:50 000
2-16	1	mc GLFL/mf TILL (11) 65% me GLFL/mf TILL (3) 18% mf GLFL/mf TILL (1) 6% mc GLFL (2) 12%	mc FLUV/mf FLLC vc FLUV <20%	mf TILL co.var. <35%	mf TILL <90%
	2	vc GLFL (15) 88% vc GLFL/mf TILL (2) 12%	vc FLUV mc FLUV/mf FLLC <10% mc GLFL/mf TILL <10% co.var. <10%	mc GLFL <70% vc FLEO <70%	mc FLUV/mf FLLC<70% mc GLFL <40% mf FLLC <10%
	3	mf FLLC (5) 29% me FLLC (4) 24% fi FLLC (3) 18% vc FLLC (2) 12% mc GLFL (1) 6% vc GLFL (1) 6% vc EOLI (1) 6%	mc FLUV fine var. <10%	mc FLUV <70% fine var. <15% mc GLFL <15%	mc FLUV
	4	mc GLFL/mf TILL (5) 29% me GLFL/mf TILL (3) 18% mf GLFL/mf TILL (2) 12% mc GLFL (2) 12% me GLFL (1) 6% mf FLLC (1) 6% mf TILL (3) 18%	mf TILL <60% mc GLFL/mf TILL <40% me FLLC <30% mc FLUV/mf FLLC <10% vc FLUV <5%	mf TILL	mc GLFL/mf TILL <70% mf TILL <40%
	5	mf TILL (16) 94% me TILL (1) 6%	mf TILL me FLLC <25% co.var. <10%	mf TILL	mf TILL
	6	vc GLFL (16) 94% mc GLFL (1) 6%	mc FLUV/mf FLLC vc FLUV <20%	mc GLFL <70% vc FLEO <70%	mc FLUV/mf FLLC <70% mc GLFL <40% mf FLLC <10%

Table C-16. Parent materials and textures of the sampled areas in Tp6 R20 W4.

Twp	No.	Transect	Landscape	Top-down	SIL3 1:50 000
6-20	1	mf TILL (14) 82% me TILL (2) 12% mf GLLC/mf TILL (1) 6%	mf TILL mf FLLC/mf TILL mf FLLC <10% fine var. <10%	mf TILL	mf TILL <70% mf FLLC/mf TILL <50%
	2	mf TILL (17) 100%	mf TILL <80% mf FLLC/mf TILL <80% mf FLLC <10% fine var. <10%	mf TILL	mf TILL <70% mf FLLC/mf TILL <50%
	3	mf TILL (17) 100%	mf TILL mf FLLC/mf TILL mf FLLC <10% fine var. <10%	mf TILL	mf TILL <70% mf FLLC/mf TILL <50%
	4	mf GLLC (16) 94% mf GLLC/mf TILL (1) 6%	mf FLLC fi GLLC <70%	fi GLLC mf FLLC <90%	fi GLLC mf FLLC <10% mf FLLC/mf TILL <10%
	5	mf TILL (13) 76% mf FLLC (2) 12% mf GLLC/mf TILL (1) 6% mf FLLC (1) 6%	mc FLLC/mf TILL <80% me FLUC <60% mf TILL <15% mf FLLC <10% ------------------------ mf FLLC <90% fi GLLC <70% fine var. <10%	mf TILL <90% mf FLLC <50% mf FLLC/mf TILL <15%	mf FLLC/mf TILL <80% mf FLLC <30%
	6	fi GLLC (13) 76% fi GLLC/mf TILL (2) 12% fi GLLC/fi TILL (2) 12%	mf FLLC <90% co.var. <40% fine var. <10%	mf FLLC <70% mf TILL <40% me FLLC/vc GLFL <30%	mf FLLC <70% me FLLC/vc GLFL <40%

Table C-17. Parent materials and textures of the sampled areas in Tp27 R3 W5.

Twp	No.	Transect	Landscape	Top-down	SIL3 1:50 000
27-3	1	mf TILL (10) 59% me GLLC (1) 6% mf GLLC (2) 12% mf GLLC/mf TILL (3) 18% me TILL/BDRK (1) 6%	mf TILL fi GLLC/mf TILL <10%	mf TILL -------------------- mf TILL	mf TILL fi GLLC <15%
	2	mf TILL (15) 88% mf GLLC/mf TILL (2) 12%	mf TILL fi GLLC/mf TILL <10%	mf TILL	mf TILL fi GLLC <10%
	3	mf GLLC/mf TILL (8) 47% mf TILL (3) 18% mf GLLC (5) 29% mf FLLC (1) 6%	mf TILL -------------------- fi GLLC	mf TILL -------------------- mf TILL -------------------- fi GLLC	mf TILL fi GLLC <15%
	4	mf TILL (9) 53% fi GLLC (2) 12% fi FLLC/fi GLLC (1) 6% me COLL/mf TILL (2) 12% me EOLI/mf TILL (2) 12% me TILL (1) 6%	mf TILL	mf TILL	mf TILL <95% mf GLLC <65% fi GLLC <30%
	5	mf TILL (15) 88% fi GLLC (1) 6% me COLL/fi GLLC (1) 6%	mf TILL	mf TILL	mf TILL fi GLLC <15%
	6	mf TILL (10) 59% mf GLLC (2) 12% fi GLLC (3) 18% me EOLI/mf TILL (1) 6% me EOLI/mf GLLC (1) 6%	mf TILL	mf TILL	mf TILL <95% mf GLLC <65% fi GLLC <30%

Table C-18. Parent materials and textures of the sampled areas in Tp22 R27 W4.

Twp	No.	Transect	Landscape	Top-down	SIL3 1:50 000
22-27	1	mf TILL (8) 47% mf GLLC/mf TILL (6) 35% mf GLLC (3) 18%	mf TILL mf GLLC/mf TILL <70%	mf TILL	mf TILL mf GLLC/mf TILL <70% fi LACU/mf TILL <20%
	2	mf GLLC/mf TILL (5) 29% me GLLC/mf TILL (2) 12% mf GLLC (6) 35% mf TILL (4) 24%	mf TILL mf GLLC/mf TILL <70%	mf TILL <80% mf GLLC/mf TILL <50%	mf TILL mf GLLC/mf TILL <70% fi LACU/mf TILL <20%
	3	mf GLLC/mf TILL (7) 41% mf TILL (6) 35% mf GLLC (2) 12% me GLLC (1) 6%	mf TILL mf GLLC/mf TILL <70%	mf TILL	mf TILL mf GLLC/mf TILL <70% fi LACU/mf TILL <20%
	4	mf TILL (16) 94% mf GLLC (1) 6%	mf TILL mf GLLC/mf TILL <70%	mf TILL <80% mf GLLC/mf TILL <50%	mf TILL mf GLLC/mf TILL <70% fi LACU/mf TILL <20%
	5	mf TILL (16) 94% me TILL (1) 6%	mf TILL mf GLLC/mf TILL <70%	mf TILL	mf TILL mf GLLC/mf TILL <60%
	6	mf TILL (17) 100%	mf TILL mf GLLC/mf TILL <85%	mf TILL	mf TILL <80% mf GLLC/mf TILL <60% fi LACU/mf TILL <40%

Table C-19. Drainage characteristics of the sample locations in Tp47 R14 W4.

Twp.	No.	Transect	Landscape	Top-down	SIL3 1:50 000
47-14	1	MW 88% I 12%	MW GgW <20%	MW GgW <20%	MW GgW <15%
	2	MW 100%	MW GgW <20%	MW GgW <20%	MW GgW <35%
	3	MW 65% P 24% I 12%	MW GgW <50% -------------------- MW GgW <20%	MW GgW <20%	MW GgW <35%
	4	MW 76% P 18% I 6%	MW GgW <50%	MW GgW <20%	MW GgW <35%
	5	MW 35% P 59% I 6%	MW GgW <40% -------------------- MW GgW <20%	MW GgW <20%	MW GgW <35%
	6	MW 88% W 12%	MW GgW <20%	MW	MW GgW <15%

Table C-20. Drainage characteristics of the sample locations in Tp51 R19 W4.

Twp	No.	Transect	Landscape	Top-down	SIL3 1:50 000
51-19	1	MW 41% W 59%	MW GgW <10%	MW	MW GgW <15%
	2	MW 71% P 29%	MW GgW <10% ---------- MW GgW <30%	MW <95% GgW <10%	MW W <15% GgW <10%
	3	MW 100%	MW GgW <10%	MW GgW <10%	MW W <10% GgW <10%
	4	MW 82% P 18%	MW GgW <30%	MW GgW <10% ---------- MW <85% GgW <25%	MW W <10% GgW <10%
	5	MW 65% I 24% P 12%	MW GgW <10%	MW GgW <10%	MW W <15% GgW <10%
	6	MW 47% P 24% W 18% I 12%	MW GgW <30%	MW <90% GgW <25%	MW GgW <10%

Table C-21. Drainage characteristics of the sample locations in Tp2 R16 W4.

Twp	No.	Transect	Landscape	Top-down	SIL3 1:50 000
2-16	1	MW 47% W 53%	W <85% MW <35%	MW <85% W <35%	MW <90%
	2	W 88% I 12%	MW W <30%	W	W MW <10%
	3	MW 65% W 24% VW 6% I 6%	MW GgW <35%	W <85% GgW <20% MW <15%	W
	4	MW 59% W 41%	MW <95% W <50%	MW GgW <10%	W <70% MW <40%
	5	MW 100%	MW W <10%	MW GgW <10%	MW
	6	W 100%	W MW <20%	W	W MW <10%

Table C-22. Drainage characteristics of the sample locations in Tp6 R20 W4.

Twp	No.	Transect	Landscape	Top-down	SIL3 1:50 000
6-20	1	MW 100%	MW	MW	MW
	2	MW 100%	MW	MW	MW
	3	MW 100%	MW	MW	MW
	4	MW 82% P 12% I 6%	MW GgW <10%	MW GgW <10%	MW
	5	MW 100%	MW ---------------------- MW GgW <10%	MW	MW
	6	MW 76% P 24%	MW <90% W <40% GgW <10%	MW	MW

Table C-23. Drainage characteristics of the sample locations in Tp27 R3 W5.

Twp	No.	Transect	Landscape	Top-down	SIL3 1:50 000
27-3	1	MW 94% I 6%	MW GgW <10%	MW --- MW GgW <15%	MW GgW <15%
	2	MW 94% P 6%	MW GgW <10%	MW GgW <15%	MW GgW <15%
	3	MW 76% P 24%	MW GgW <10% --- GgW	MW --- MW GgW <15% --- GgW	MW GgW <15%
	4	MW 88% P 12%	MW GgW <30%	MW GgW <20%	MW GgW <30%
	5	MW 88% P 6% I 6%	MW GgW <30%	MW GgW <20%	MW GgW <15%
	6	MW 71% P 29%	MW GgW <30%	MW GgW <20%	MW GgW <30%

Table C-24. Drainage characteristics of the sample locations in Tp22 R27 W4.

Twp	No.	Transect	Landscape	Top-down	SIL3 1:50 000
22-27	1	MW 100%	MW GgW <10%	MW <90% GgW <10%	MW GgW <40%
	2	MW 94% P 6%	MW GgW <10%	MW <85% GgW <15%	MW GgW <40%
	3	MW 100%	MW GgW <10%	MW <90% GgW <10%	MW GgW <40%
	4	MW 94% P 6%	MW GgW <10%	MW <85% GgW <15%	MW GgW <40%
	5	MW 88% P 6% I 6%	MW GgW <10%	MW <85% GgW <10%	MW GgW <40%
	6	MW 100%	MW GgW <25%	MW <85% GgW <20%	MW GgW <60%

Table C-25. Subgroup composition of sample locations in Tp47 R14 W4.

Twp	No.	Transect	Landscape	Top-down	SIL3 1:50 000
47-14	1	O.BL (6) 35% BL.SS (3) 18% CA.BL (1) 6% SZ.BL (1) 6% BL.SZ (1) 6% GgW (5) 29%	BL.SS 60-90% SZ.BL <20% BL.SO <20% O.BL <10% GgW <20%	BL.SO 20-40% BL.SS 20-40% GgW 15-20% BL.SZ 10-20% SZ.BL 5-15%	BL.SS BL.SO <40% GgW <15%
	2	BL.SS (7) 41% SZ.BL (3) 18% O.BL (3) 18% CA.BL (1) 6% R.BL (1) 6%% BL.SZ (1) 6% BL.SO (1) 6%	BL.SS 60-90% SZ.BL <20% BL.SO <20% O.BL <10% GgW <20%	BL.SS 20-40% BL.SZ 30-40% BL.SO 15-20% GgW 15-20%	BL.SS BL.SO <40% GgW <35%
	3	BL.SS (4) 24% O.BL (3) 18% SZ.BL (2) 12% CA.BL (1) 6% BL.SZ (1) 6% GgW (6) 35%	BL.SS 30-60% O.BL 15-30% SZ.BL 10-30% BL.SO 10-30% GgW 15-50% -------------------- BL.SS 30-60% O.BL 15-30% SZ.BL 10-30% BL.SO 10-30% GgW <20%	BL.SO 20-40% BL.SS 20-40% BL.SZ 10-20% SZ.BL 5-15% GgW 15-20%	BL.SS BL.SO <40% GgW <35%
	4	O.BL (6) 35% CA.BL (1) 6% R.BL (2) 12% BL.SS (1) 6% BL.SZ (1) 6% BL.SO (1) 6% GgW (5) 29%	BL.SS 30-60% O.BL 15-30% SZ.BL 10-30% BL.SO 10-30% GgW 15-50%	BL.SO 20-40% BL.SS 20-40% BL.SZ 10-20% SZ.BL 5-15% GgW 15-20%	BL.SS BL.SO <40% GgW <35%
	5	GgW (11) 65% O.BL (2) 12% CA.BL (1) 6% SZ.BL (2) 12%	BL.SS 30-60% O.BL 15-30% SZ.BL <10% BL.SO <10% GgW 15-40% -------------------- BL.SS 30-60% O.BL 15-30% SZ.BL 10-30% BL.SO 10-30% GgW <20%	BL.SO 20-40% BL.SS 20-40 BL.SZ 10-20% SZ.BL 5-15% GgW 15-20%	BL.SS BL.SO <40% GgW <15%
	6	O.BL (14) 82% BL.SS (3) 18%	BL.SS 40-70% BL.SO 20-50% O.BL <20% SZ.BL <20% GgW <20%	BL.SS 40-70% BL.SO 15-30% BL.SZ 15-30%	SZ.BL 60% BL.SS <40% BL.SO <40% GgW <15%

Table C-26. Subgroup composition of sample locations in Tp51 R19 W4.

Twp	No.	Transect	Landscape	Top-down	SIL3 1:50 000
51-19	1	O.DG (10) 59% CA.BL (1) 6% BL.SS (4) 24% O.BL (1) 6% E.BL (1) 6%	E.BL GgW <10%	E.BL	BL.SS BL.SO <40% GgW <15%
	2	E.BL (4) 24% BL.SO (2) 12% SZ.DG (2) 12% SZ.BL (1) 6% GgW (5) 29% R.BL (1) 6% O.BL (1) 6% O.DG (1) 6%	E.BL 50-80% O.BL 20-40% GgW <10% ---------------------- E.BL 30-50% O.DG 20-40% GgW 15-30% O.BL <20%	E.BL 60-80% GgW 5-10% O.BL <15%	E.BL 70% O.BL 20% GgW 10% Solonetzic
	3	E.BL (12) 71% O.BL (5) 29%	E.BL 50-80% O.BL 20-40% GgW <10%	E.BL 60-80% GgW 5-10% O.BL <15% Solonetzic	E.BL 70% O.BL 20% GgW 10% Solonetzic
	4	BL.SS (3) 18% SZ.BL (2) 12% SZ.DG (2) 12% BL.SO (2) 12% O.BL (2) 12% O.DG (1) 6% E.BL (1) 6% GgW (4) 24%	E.BL 40-70% O.BL 10-30% GgW 15-30% O.DG <20%	E.BL 60-95% GgW 5-10% O.BL <15% Solonetzic ---------------------- E.BL 50-70% GgW 15-25% O.BL <15%	E.BL 70% O.BL 20% GgW 10% Solonetzic
	5	BL.SS (3) 18% SZ.BL (3) 18% DG.SO (1) 6% SZ.DG (1) 6% E.BL (4) 24% O.BL (1) 6% D.GL (1) 6% GgW (3) 18%	E.BL 50-80% O.BL 20-40% O.DG <20% GgW <10%	E.BL 60-95% GgW 5-10% O.BL <15% Solonetzic	E.BL 70% O.BL 20% GgW 10% Solonetzic
	6	D.GL (4) 24% O.DG (4) 24% E.BL (1) 6% O.BL (1) 6% GgW (7) 41%	D.GL 50-70% GgW 15-30% O.GL <20% O.DG <20%	O.GL 30-50% GgW 15-25% D.GL 15-25% O.DG <15%	D.GL O.GL 30%

Table C-27. Subgroup composition of sample locations in Tp2 R16 W4.

Twp	No.	Transect	Landscape	Top-down	SIL3 1:50 000
2-16	1	O.B (10) 59% R.B (7) 41%	O.DB 30-75% R.DB 15-45% CA.DB 15-35%	O.DB 55-90% R.DB <15%	O.DB 60-90%
	2	O.DB (14) 82% GL.DB (2) 12% CA.DB (1) 6%	O.DB 50-80% R.DB 30-50%	O.B	O.DB
	3	B.SS (4) 24% B.SO (4) 24% O.B (6) 35% E.B (1) 6% CA.B (1) 6% GL.B (1) 6%	CU.R 15-35% O.HR 15-35% Regosols 15-25% Solonetz 15-25%	CU.R 40-70% O.B 5-15% GGW 5-20%	CU.R 60-80 O.R 10-30%
	4	O.DB (15) 88% R.DB (1) 6% GL.DB (1) 6%	O.DB	O.DB 60-90% GgW 0-10% R.DB 0-10%	O.DB
	5	O.B (12) 71% E.B (1) 6% R.B (4) 24%	O.DB 45-85% R.DB 15-40%	O.B 40-80% R.B 20-40% GgW 5-10%	O.DB 50-70% R.DB 20-40%
	6	O.DB (16) 94% SZ.DB (1) 6%	O.DB 30-75% R.DB 15-45%	O.B	O.DB

Table C-28. Subgroup composition of sample locations in Tp6 R20 W4.

Twp	No.	Transect	Landscape	Top-down	SIL3 1:50 000
6-20	1	O.DB (9) 53% R.DB (5) 29% SZ.DB (3) 18%	O.DB Solonetzic 15-25% R.DB 0-10%	O.DB	O.DB
	2	O.DB (16) 94% R.DB (1) 6%	O.DB Solonetzic 0-10% R.DB 0-10%	O.DB	O.DB
	3	O.DB (17) 100%	O.DB Solonetzic 15-25% R.DB 0-10%	O.DB	O.DB
	4	O.DB (9) 53% SZ.DB (3) 18% R.DB (1) 6% E.DB (1) 6% GgW (3) 18%	O.DB R.DB 0-10% CA.DB 0-10% GgW 0-10% Solonetzic 0-10%	O.DB GgW 5-10%	O.DB
	5	O.DB (9) 53% R.DB (8) 47%	O.DB 35-95% O.B 15-40% Solonetzic 0-10% R.DB 0-10% CA.DB 0-10% -------------------- O.DB R.DB 0-10% CA.DB 0-10% GgW 0-10% Solonetzic 0-10%	O.DB	O.DB
	6	R.DB (11) 65% GgW (4) 24% O.DB (2) 12%	O.DB R.DB 0-10% CA.DB 0-10% GgW 0-10% Solonetzic 0-10%	O.DB	O.DB

Table C-29. Subgroup composition of sample locations in Tp27 R3 W5.

Twp	No.	Transect	Landscape	Top-down	SIL3 1:50 000
27-3	1	O.BL (11) 65% CA.BL (4) 24% GL.BL (2) 12%	O.BL 50-90% R.BL 5-20% GgW 0-10%	O.BL 80% CA.BL 0-10% ---------------------- O.BL 90% GgW 0-15% CA.BL 0-15%	O.BL R.BL 20-40% GgW 0-15%
	2	O.BL (16) 94% GgW (1) 6%	O.BL R.BL 5-20% GgW 0-10%	O.BL 90% GgW 0-15% CA.BL 0-15%	O.BL R.BL 5-20% GgW 0-15%
	3	O.BL (13) 76% GgW (4) 24%	O.BL GgW 0-10% ---------------------- GgW	O.BL 80% CA.BL 0-10% ---------------------- O.BL GgW 0-15% ---------------------- GgW	O.BL R.BL 20-40% GgW 0-15%
	4	O.BL (9) 53% CA.BL (2) 12% E.BL (1) 6%% R.BL (2) 12% GgW (3) 18%	O.BL 40-80% GgW 15-30% R.BL 15-30% CA.BL 0-10%	O.BL GgW 20% CA.BL 0-10%	O.BL 30-70% CA.BL 10-30% GgW 10-30%
	5	O.BL (13) 76% GgW (4) 24%	O.BL 40-80% GgW 15-30% R.BL 15-30% CA.BL 0-10%	O.BL GgW 20% CA.BL 0-10%	O.BL 60-80% R.BL 20-40% GgW 0-15%
	6	O.BL (9) 53% E.BL (2) 12% R.BL (1) 6% GgW (5) 29%	O.BL 40-80% GgW 15-30% R.BL 15-30% CA.BL 0-10%	O.BL GgW 20% CA.BL 0-10%	O.BL 40-70% CA.BL 10-30% GgW 10-30%

Table C-30. Subgroup composition of sample locations in Tp22 R27 W4.

Twp	No.	Transect	Landscape	Top-down	SIL3 1:50 000
22-27	1	O.BL (16) 94% R.BL (1) 6%	O.BL E.BL 15-30% GgW 0-10%	O.BL 80% CA.BL 0-10% GgW 0-10%	O.BL R.BL 0-20% BL.SS 0-20% GgW 0-20%
	2	O.BL (15) 88% E.BL (1) 6% GgW (1) 6%	O.BL E.BL 15-30% GgW 0-10%	O.BL 70% GgW 15% Solonetzic 15%	O.BL R.BL 0-20% BL.SS 0-20% GgW 0-20%
	3	O.BL (16) 94% R.BL (1) 6%	O.BL E.BL 15-30% GgW 0-10%	O.BL 80% CA.BL 0-10% GgW 0-10%	O.BL R.BL 0-20% BL.SS 0-20% GgW 0-20%
	4	O.BL (13) 76% R.BL (1) 6% SZ.BL (1) 6% GgW (2) 12%	O.BL E.BL 15-30% GgW 0-10%	O.BL 70% GgW 15% Solonetzic 15%	O.BL R.BL 0-20% BL.SS 0-20% GgW 0-20%
	5	O.BL (14) 82% GgW (3) 18%	O.BL E.BL 15-30% GgW 0-10%	O.BL 80% CA.BL 0-10% GgW 0-10%	O.BL 40-80% GgW 20-40% R.BL 0-20%
	6	O.BL (15) 88% R.BL (1) 6% GL.BL (1) 6%	O.BL GgW 15-25% E.BL 15-30%	O.BL 75% GgW 20% CA.BL 5-10%	O.BL 40-80% GgW 20-40% R.BL 0-20% BL.SS 0-20%

APPENDIX D: FIELD DATA

This appendix contains the field data collected and used in the analysis and calculation of "percent correct" and "percent similar" results for each township and mapping method. The same set of field data was used for all three mapping methods.

Table D-1. Field data used in the analysis of township 47-14-W4.

Township-Range	Site No.	Drainage	PM 1 Texture	PM 1 Type	PM 2 Texture	PM 2 Type	Soil Subgroup	Soil Series	Soil Phase
47-14-W4	1.01	MW	mf	TILL			O.BL	EOR	sa
	1.02	MW	mf	TILL			BL.SS	KLM	
	1.03	MW	mf	TILL			GL.BL	EOR	gl
	1.04	MW	mf	TILL			GL.BL	EOR	gl
	1.05	MW	mf	TILL			O.BL	EOR	
	1.06	I	mf	TILL			HU.LG	COR	
	1.07	I	mf	TILL			GL.BL	EOR	gl; sa
	1.08	MW	mf	TILL			O.BL	EOR	sa
	1.09	MW	mf	TILL			CA.BL	EOR	sa; ca
	1.10	MW	mf	TILL			O.BL	EOR	
	1.11	MW	mf	TILL			BL.SS	KLM	
	1.12	MW	mf	TILL			O.BL	EOR	
	1.13	MW	mf	TILL			O.BL	EOR	sa
	1.14	MW	mf	TILL			BL.SZ	LOG	
	1.15	MW	mf	TILL			BL.SS	KLM	
	1.16	MW	mf	TILL			GL.BL	EOR	gl
	1.17	MW	mf	TILL			SZ.BL	HER	
	2.01	MW	mf	TILL			CA.BL	EOR	ca
	2.02	MW	mf	TILL			BL.SS	KLM	
	2.03	MW	mf	TILL			BL.SS	KLM	
	2.04	MW	mf	TILL			O.BL	EOR	sa
	2.05	MW	mf	TILL			SZ.BL	HER	
	2.06	MW	me	TILL			R.BL	EOR	er
	2.07	MW	mf	TILL			BL.SZ	LOG	
	2.08	MW	mf	TILL			O.BL	EOR	
	2.09	MW	mf	TILL			SZ.BL	HER	
	2.10	MW	mf	TILL			BL.SO	DYD	
	2.11	MW	mf	TILL			SZ.BL	HER	
	2.12	MW	mf	TILL			BL.SS	KLM	
	2.13	MW	mf	TILL			BL.SS	KLM	
	2.14	MW	mf	TILL			BL.SS	KLM	
	2.15	MW	mf	TILL			BL.SS	KLM	
	2.16	MW	mf	TILL			BL.SS	KLM	
	2.17	MW	mf	TILL			O.BL	EOR	
	3.01	MW	mf	TILL			O.BL	EOR	sa
	3.02	MW	mf	TILL			SZ.BL	HER	
	3.03	P	mf	TILL			HU.LG	COR	
	3.04	P	mf	TILL			O.HG		
	3.05	MW	mf	TILL			CA.BL	EOR	ca
	3.06	MW	mf	TILL			BL.SS	KLM	
	3.07	MW	mf	TILL			BL.SS	KLM	
	3.08	MW	mf	TILL			BL.SZ	LOG	
	3.09	MW	mf	TILL			SZ.BL	HER	
	3.10	MW	mf	TILL			O.BL	EOR	sa
	3.11	I	mf	TILL			GL.BL	EOR	gl; sa
	3.12	I	mf	TILL			GL.BL	EOR	gl
	3.13	MW	mf	TILL			O.BL	EOR	sa
	3.14	MW	mf	TILL			BL.SS	KLM	
	3.15	MW	mf	TILL			BL.SS	KLM	
	3.16	P	mf	TILL			SZ.LG	FMN	ze
	3.17	P	mf	TILL			SZ.LG	FMN	ze; sa

continued ...

Table D-1. Concluded.

Township-Range	Site No.	Drainage	PM 1 Texture	PM 1 Type	PM 2 Texture	PM 2 Type	Soil Subgroup	Soil Series	Soil Phase
47-14-W4	4.01	MW	mf	TILL			CA.BL	EOR	ca
	4.02	MW	mf	TILL			O.BL	EOR	cr
	4.03	I	mf	TILL			GL.BL	EOR	gl
	4.04	P	fi	TILL			HU.LG	COR	
	4.05	P	fi	TILL			HU.LG	COR	
	4.06	MW	mf	TILL			R.BL	EOR	zr
	4.07	MW	fi	TILL		(bfr)	BL.SZ	LOG	
	4.08	MW	mf	TILL			BL.SS	KLM	
	4.09	MW	mf	TILL			O.BL	EOR	sa
	4.10	P	fi	TILL			HU.LG	COR	
	4.11	MW	mf	TILL			O.BL	EOR	
	4.12	MW	mf	TILL			BL.SO	DYD	
	4.13	MW	mf	TILL			O.BL	EOR	
	4.14	MW	mf	TILL			O.BL	EOR	
	4.15	MW	mf	TILL			O.BL	EOR	
	4.16	MW	mf	TILL			R.BL	EOR	zr
	4.17	MW	fi	TILL			HU.LG	COR	
	5.01	P	mf	TILL			HU.LG	COR	
	5.02	P	mf	TILL			HU.LG	COR	
	5.03	I	mf	TILL			GL.BL	EOR	gl
	5.04	P	mf	TILL			O.HG		
	5.05	P	fi	TILL			HU.LG	COR	
	5.06	P	fi	TILL			HU.LG	COR	
	5.07	MW	mf	TILL			CA.BL	EOR	ca
	5.08	MW	mf	TILL			SZ.BL	HER	
	5.09	MW	mf	TILL			O.BL	EOR	
	5.10	P	fi	TILL			HU.LG	COR	
	5.11	P	fi	TILL			HU.LG	COR	
	5.12	MW	mf	TILL			O.BL	EOR	
	5.13	P	mf	TILL			HU.LG	COR	
	5.14	MW	mf	TILL			O.BL	EOR	
	5.15	MW	mf	TILL			SZ.BL	HER	
	5.16	P	fi	TILL			O.HG		
	5.17	P	fi	TILL			HU.LG	COR	
	6.01	MW	mf	TILL			O.BL	EOR	
	6.02	MW	me	TILL			O.BL	EOR	
	6.03	MW	mf	TILL			O.BL	EOR	
	6.04	MW	mf	TILL			O.BL	EOR	
	6.05	MW	mf	TILL			O.BL	EOR	
	6.06	MW	mf	TILL			O.BL	EOR	
	6.07	MW	mf	TILL			O.BL	EOR	
	6.08	MW	mf	TILL			O.BL	EOR	
	6.09	MW	mf	TILL			BL.SS	KLM	
	6.10	MW	mf	TILL			O.BL	EOR	
	6.11	MW	mf	TILL			BL.SS	KLM	
	6.12	MW	mf	TILL			O.BL	EOR	
	6.13	MW	mf	TILL			O.BL	EOR	sa
	6.14	W	vc	GLFL			O.BL	RED	
	6.15	W	vc	GLFL			O.BL	RED	
	6.16	MW	mc	GLFL	mf	TILL	O.BL	ROS	
	6.17	MW	mf	TILL			BL.SS	KLM	

Table D-2. Field data used in the analysis of township 51-19-W4.

Township-Range	Site No.	Drainage	PM 1 Texture	PM 1 Type	PM 2 Texture	PM 2 Type	Soil Subgroup	Soil Series	Soil Phase
51-19-W4	1.01	W	mc	FLEO			O.DG	RDW	
	1.02	MW	mc	FLEO	mf-fi	TILL	O.DG	RDW	xt
	1.03	MW	mf	TILL			O.BL	BVH	
	1.04	MW	mf	TILL			E.BL	AGS	
	1.05	MW	mf	TILL			BL.SS	CMO	sa
	1.06	W	mc	FLEO			CA.DG	RDW	ca
	1.07	MW	mf	TILL			BL.SS	CMO	sa
	1.08	MW	mf	TILL			BL.SS	CMO	sa
	1.09	MW	mf	TILL			BL.SS	CMO	sa
	1.10	W	mc-mf	FLEO			O.DG	RDW	
	1.11	W	mc-mf	FLEO			O.DG	RDW	
	1.12	W	mc-mf	FLEO			O.DG	RDW	
	1.13	W	mc	FLEO	mf	TILL	O.DG	RDW	xt
	1.14	W	mc-mf	FLEO			O.DG	RDW	
	1.15	W	mc-mf	FLEO			O.DG	RDW	
	1.16	W	mc	FLEO			O.DG	RDW	
	1.17	W	mc	FLEO			O.DG	RDW	
	2.01	MW	mf	TILL			E.BL	AGS	
	2.02	P	mf	TILL			HU.LG	DMY	zh
	2.03	MW	mf	TILL			R.BL	EDG	
	2.04	MW	mf	TILL			E.BL	AGS	
	2.05	MW	mf	TILL			O.BL	BVH	
	2.06	MW	mf	TILL			BL.SO	TFD	
	2.07	MW	mf	TILL			SZ.BL	NRM	
	2.08	MW	mf	TILL			BL.SO	TFD	
	2.09	P	mf	TILL			HU.LG	DMY	zh
	2.10	MW	mf	TILL			E.BL	AGS	
	2.11	MW	mf	TILL			SZ.DG	LNN	
	2.12	MW	mf	TILL			E.BL	AGS	
	2.13	MW	mf	TILL			SZ.DG	LNN	
	2.14	P	mf	TILL			HU.LG	DMY	zh
	2.15	P	mf	TILL			HU.LG	DMY	zh
	2.16	P	fi	GLLC			O.HG	HGT	
	2.17	MW	mf	TILL			O.DG	RLV	
	3.01	MW	mf	TILL			E.BL	AGS	
	3.02	MW	mf	TILL			O.BL	BVH	
	3.03	MW	mf	TILL			E.BL	AGS	
	3.04	MW	mf	TILL			E.BL	AGS	
	3.05	MW	mf	TILL			O.BL	BVH	
	3.06	MW	mf	TILL			O.BL	BVH	
	3.07	MW	mf	TILL			E.BL	AGS	
	3.08	MW	mf	TILL			E.BL	AGS	
	3.09	MW	mf	TILL			E.BL	AGS	
	3.10	MW	mf	TILL			E.BL	AGS	
	3.11	MW	mf	TILL			O.BL	BVH	
	3.12	MW	mf	TILL			E.BL	AGS	
	3.13	MW	mf	TILL			O.BL	BVH	
	3.14	MW	mf	TILL			E.BL	AGS	
	3.15	MW	mf	TILL			E.BL	AGS	
	3.16	MW	mf	TILL			E.BL	AGS	
	3.17	MW	mf	TILL			E.BL	AGS	

continued ...

Table D-2. Concluded.

Township-Range	Site No.	Drainage	PM 1 Texture	PM 1 Type	PM 2 Texture	PM 2 Type	Soil Subgroup	Soil Series	Soil Phase
51-19-W4	4.01	MW	mf	TILL			SZ.BL	NRM	
	4.02	MW	mf	TILL			BL.SO	TFD	
	4.03	MW	fi	TILL			GLE.BL	AGS	gl
	4.04	P	fi	TILL			O.HG	ONW	
	4.05	P	fi	TILL			HU.LG	ONW	zl
	4.06	MW	fi	TILL			O.BL	BVH	
	4.07	MW	mf	TILL			SZ.BL	NRM	
	4.08	MW	mf	TILL			BL.SS	CMO	er
	4.09	MW	mf	TILL			BL.SS	CMO	er
	4.10	MW	mf	TILL			BL.SS	CMO	er
	4.11	MW	mf	TILL			SZ.DG	LNN	
	4.12	P	mf	GLLC	mf	TILL	O.HG	HGT	
	4.13	MW	mf	TILL			SZ.DG	LNN	
	4.14	MW	mf-fi	GLLC	fi	TILL	O.BL	CCB	xt
	4.15	MW	fi	GLLC	mf	TILL	BL.SO	MLS	xt
	4.16	MW	mf	TILL			O.DG	RLV	
	4.17	MW	mf	TILL			E.BL	AGS	
	5.01	I	mf	TILL			BL.SS	CMO	er
	5.02	MW	mf	TILL			D.GL	UCS	
	5.03	MW	mf	TILL			E.BL	AGS	
	5.04	MW	mf	TILL			E.BL	AGS	
	5.05	P	fi	GLLC	mf	TILL	R.HG	BOA	zh
	5.06	MW	mf	TILL			SZ.BL	NRM	
	5.07	I	mf	TILL			BL.SS	CMO	
	5.08	MW	mf	TILL			SZ.BL	NRM	
	5.09	MW	mf	TILL			E.BL	AGS	
	5.10	MW	mf	TILL			SZ.BL	NRM	
	5.11	MW	mf	EOL		TILL	O.BL	BVH	ob
	5.12	P	mf	TILL			HU.LG	DMY	zh
	5.13	I	mf	TILL			BL.SS	CMO	er
	5.14	MW	mf	TILL			DG.SO	TBY	
	5.15	MW	mf	TILL			SZ.DG	LNN	
	5.16	I	mf	TILL			GLE.BL	AGS	gl
	5.17	MW	mf	TILL			E.BL	AGS	
	6.01	MW	mc	FLEO	mf	TILL	D.GL	GBL	
	6.02	I	mc-mf	GLFL			O.HG	RCS	
	6.03	MW	mc	EOL	mf	TILL	D.GL	GBL	
	6.04	MW	mf	TILL			O.DG	RLV	
	6.05	P	mf	TILL			HU.LG	aaCOR	
	6.06	MW	mc	FLEO	mf	TILL	O.DG	RDW	xt
	6.07	MW	mf	TILL			O.DG	RLV	
	6.08	MW	mf	TILL			E.BL	AGS	
	6.09	P		ORGA	mf	GLLC	T.M		
	6.10	I	mc	FLEO	mf	TILL	GL.DG	RDW	xt; gl
	6.11	-		-		-	water	ZZZ	
	6.12	P		ORGA	mf	GLLC	T.M		
	6.13	MW	mf	TILL			O.BL	LFD	
	6.14	W	mc	FLEO			D.GL	ELP	
	6.15	W	mc	FLEO			D.GL	ELP	
	6.16	W	mc	GLFL			O.DG	RDW	
	6.17	MW	mc	GLFL			O.HG	RCS	

Table D-3. Field data used in the analysis of township 2-16-W4.

Township-Range	Site No.	Drainage	PM 1 Texture	PM 1 Type	PM 2 Texture	PM 2 Type	Soil Subgroup	Soil Series	Soil Phase
2-16-W4	1.01	MW	me	GLFL	mf	TILL	R.B	HMS	er
	1.02	MW	me	GLFL	mf	TILL	O.B	ANO	
	1.03	W	mc	GLFL	mf	TILL	O.B	ANO	
	1.04	W	mc	GLFL	mf	TILL	O.B	ANO	
	1.05	W	mc	GLFL	mf	TILL	O.B	ANO	
	1.06	MW	me	GLFL	mf	TILL	R.B	HMS	er
	1.07	W	mc	GLFL	mf	TILL	O.B	ANO	
	1.08	W	mc	GLFL	mf	TILL	R.B	ANO	er
	1.09	MW	mf	GLFL	mf	TILL	R.B	HMS	er
	1.10	W	mc	GLFL			O.B	BVL	
	1.11	W	mc	GLFL	mf	TILL	O.B	ANO	
	1.12	MW	mc	GLFL	mf	TILL	O.B	ANO	er
	1.13	W	mc	GLFL	mf	TILL	O.B	ANO	
	1.14	MW	mc	GLFL	mf	TILL	R.B	HMS	er
	1.15	MW	mc	GLFL	mf	TILL	R.B	HMS	er
	1.16	MW	mc	GLFL	mf	TILL	R.B	HMS	er
	1.17	W	mc	GLFL			O.B	ANO	
	2.01	W	vc	GLFL			O.DB	HRK	
	2.02	W	vc	GLFL			O.DB	HRK	
	2.03	W	vc	GLFL			O.DB	HRK	
	2.04	W	vc	GLFL			O.DB	HRK	
	2.05	W	vc	GLFL			O.DB	HRK	
	2.06	W	vc	GLFL			O.DB	HRK	
	2.07	W	vc	GLFL			O.DB	HRK	
	2.08	W	vc	GLFL			O.DB	HRK	
	2.09	W	vc	GLFL			O.DB	HRK	
	2.10	W	vc	GLFL			CA.DB	HRK	ca
	2.11	W	vc	GLFL			O.DB	HRK	
	2.12	W	vc	GLFL			O.DB	HRK	
	2.13	W	vc	GLFL			O.DB	HRK	
	2.14	I	vc	GLFL			GL.DB	HRK	gl
	2.15	I	vc	GLFL			GL.DB	HRK	gl
	2.16	W	vc	GLFL	me	GLLC	O.DB	HRK	
	2.17	W	vc	GLFL	me	GLLC	O.DB	HRK	
	3.01	MW	mf	FLLC			E.B	TIY	cr
	3.02	W	mc	GLFL			CA.B	BVL	ca
	3.03	W	vc	FLLC			O.B	RIR	
	3.04	W	vc	FLLC			O.B	RIR	
	3.05	MW	me	FLLC			B.SS	RRD	
	3.06	MW	mf	FLLC			B.SO	KBD	ca
	3.07	MW	me	FLLC			B.SS	WDW	ca
	3.08	MW	me	FLLC			O.B	BUT	
	3.09	W	vc	GLFL			O.B	BVL	
	3.10	MW	mf	FLLC			B.SO	KBD	
	3.11	MW	me	FLLC			B.SS	WDW	
	3.12	MW	mf	FLLC			B.SO	KBD	cr
	3.13	VW	vc	EOL			O.B	CVD	
	3.14	MW	fi	FLLC			B.SO	KBD	sa; ca
	3.15	MW	fi	FLLC			B.SS	WDW	sa; ca
	3.16	MW	mf	FLLC			O.B	CHN	sa; ca
	3.17	I	fi	FLLC			GL.B	SPS	gl; ca; co

continued ...

Table D-3. Concluded.

Township-Range	Site No.	Drainage	PM 1 Texture	PM 1 Type	PM 2 Texture	PM 2 Type	Soil Subgroup	Soil Series	Soil Phase
2-16-W4	4.01	MW	me	GLFL	mf	TILL	O.DB	MGR	
	4.02	MW	mc	GLFL	mf	TILL	O.DB	MGR	
	4.03	W	mc	GLFL			O.DB	LUP	co
	4.04	W	mc	GLFL	mf	TILL	O.DB	MGR	
	4.05	MW	mf	FLLC			GL.DB	LUP	gl
	4.06	MW	mc	GLFL	mf	TILL	O.DB	MGR	
	4.07	MW	me	GLFL	mf	TILL	O.DB	MGR	
	4.08	W	mc	GLFL	mf	TILL	O.DB	MGR	
	4.09	W	mc	GLFL			O.DB	LUP	co
	4.10	W	mc	GLFL	mf	TILL	O.DB	MGR	
	4.11	W	me	GLFL			O.DB	LUP	
	4.12	MW	mf	TILL			R.DB	WID	er
	4.13	W	mf	GLFL	mf	TILL	O.DB	MGR	
	4.14	MW	mf	TILL			O.DB	PUR	
	4.15	MW	mf	TILL			O.DB	PUR	
	4.16	MW	mf	GLFL	mf	TILL	O.DB	MGR	
	4.17	MW	me	GLFL	mf	TILL	O.DB	MGR	
	5.01	MW	mf	TILL			R.B	CLR	er
	5.02	MW	mf	TILL			O.B	MSN	
	5.03	MW	mf	TILL			O.B	MSN	
	5.04	MW	mf	TILL			O.B	MSN	
	5.05	MW	mf	TILL			O.B	MSN	
	5.06	MW	me	TILL			R.B	CLR	er
	5.07	MW	mf	TILL			R.B	CLR	er
	5.08	MW	mf	TILL			O.B	MSN	er
	5.09	MW	mf	TILL			O.B	MSN	
	5.10	MW	mf	TILL			O.B	MSN	
	5.11	MW	mf	TILL			O.B	MSN	
	5.12	MW	mf	TILL			O.B	MSN	
	5.13	MW	mf	TILL			E.B	MSN	ze
	5.14	MW	mf	TILL			O.B	MSN	
	5.15	MW	mf	TILL			O.B	MSN	
	5.16	MW	mf	TILL			O.B	MSN	
	5.17	MW	mf	TILL			R.B	CLR	er
	6.01	W	mc	GLFL			SZ.DB	HRK	zt; fi
	6.02	W	vc	GLFL			O.DB	HRK	fi
	6.03	W	vc	GLFL			O.DB	HRK	fi
	6.04	W	vc	GLFL			O.DB	HRK	
	6.05	W	vc	GLFL			O.DB	HRK	fi
	6.06	W	vc	GLFL			O.DB	HRK	
	6.07	W	vc	GLFL			O.DB	HRK	
	6.08	W	vc	GLFL			O.DB	HRK	
	6.09	W	vc	GLFL			O.DB	HRK	
	6.10	W	vc	GLFL			O.DB	HRK	
	6.11	W	vc	GLFL			O.DB	HRK	
	6.12	W	vc	GLFL			O.DB	HRK	
	6.13	W	vc	GLFL			O.DB	HRK	
	6.14	W	vc	GLFL			O.DB	HRK	fi
	6.15	W	vc	GLFL			O.DB	HRK	fi
	6.16	W	vc	GLFL			O.DB	HRK	
	6.17	W	vc	GLFL			O.DB	HRK	

Table D-4. Field data used in the analysis of township 6-20-W4.

Township-Range	Site No.	Drainage	PM 1 Texture	PM 1 Type	PM 2 Texture	PM 2 Type	Soil Subgroup	Soil Series	Soil Phase
6-20-W4	1.01	MW	mf	TILL			SZ.DB	CRD	zt
	1.02	MW	mf	TILL			R.DB	VEB	er
	1.03	MW	mf	TILL			O.DB	CRD	er
	1.04	MW	mf	TILL			SZ.DB	CRD	zt
	1.05	MW	mf	TILL			SZ.DB	CRD	zt
	1.06	MW	mf	TILL			O.DB	CRD	
	1.07	MW	mf	TILL			O.DB	CRD	er
	1.08	MW	mf	TILL			O.DB	CRD	
	1.09	MW	mf	TILL			O.DB	CRD	er
	1.10	MW	mf	TILL			O.DB	CRD	
	1.11	MW	mf	GLLC	mf	TILL	O.DB	CRD	
	1.12	MW	me	TILL			R.DB	VEB	er
	1.13	MW	me	TILL			R.DB	VEB	er
	1.14	MW	mf	TILL			R.DB	VEB	er
	1.15	MW	mf	TILL			R.DB	VEB	er
	1.16	MW	mf	TILL			O.DB	CRD	
	1.17	MW	mf	TILL			O.DB	CRD	er
	2.01	MW	mf	TILL			O.DB	CRD	sa
	2.02	MW	mf	TILL			O.DB	CRD	
	2.03	MW	mf	TILL			O.DB	CRD	
	2.04	MW	mf	TILL			O.DB	CRD	
	2.05	MW	mf	TILL			O.DB	CRD	
	2.06	MW	mf	TILL			O.DB	CRD	
	2.07	MW	mf	TILL			O.DB	CRD	
	2.08	MW	mf	TILL			O.DB	CRD	
	2.09	MW	mf	TILL			O.DB	CRD	
	2.10	MW	mf	TILL			O.DB	CRD	
	2.11	MW	mf	TILL			O.DB	CRD	
	2.12	MW	mf	TILL			O.DB	CRD	
	2.13	MW	mf	TILL			R.DB	VEB	er
	2.14	MW	mf	TILL			O.DB	CRD	
	2.15	MW	mf	TILL			O.DB	CRD	
	2.16	MW	mf	TILL			O.DB	CRD	
	2.17	MW	mf	TILL			O.DB	CRD	
	3.01	MW	mf	TILL			O.DB	CRD	
	3.02	MW	mf	TILL			O.DB	CRD	
	3.03	MW	mf	TILL			O.DB	CRD	
	3.04	MW	mf	TILL			O.DB	CRD	
	3.05	MW	mf	TILL			O.DB	CRD	
	3.06	MW	mf	TILL			O.DB	CRD	
	3.07	MW	mf	TILL			O.DB	CRD	
	3.08	MW	mf	TILL			O.DB	CRD	
	3.09	MW	mf	TILL			O.DB	CRD	
	3.10	MW	mf	TILL			O.DB	CRD	
	3.11	MW	mf	TILL			O.DB	CRD	
	3.12	MW	mf	TILL			O.DB	CRD	
	3.13	MW	mf	TILL			O.DB	CRD	
	3.14	MW	mf	TILL			O.DB	CRD	
	3.15	MW	mf	TILL			O.DB	CRD	
	3.16	MW	mf	TILL			O.DB	CRD	
	3.17	MW	mf	TILL			O.DB	CRD	

continued ...

Table D-4. Concluded.

Township-Range	Site No.	Drainage	PM 1 Texture	PM 1 Type	PM 2 Texture	PM 2 Type	Soil Subgroup	Soil Series	Soil Phase
6-20-W4	4.01	MW	mf	GLLC	mf	TILL	SZ.DB	LET	zt
	4.02	MW	mf	GLLC			O.DB	LET	
	4.03	MW	mf	GLLC			O.DB	LET	
	4.04	P	mf	GLLC			O.HG	MNH	zh
	4.05	P	mf	GLLC			O.HG	MNH	zh
	4.06	MW	mf	GLLC			O.DB	LET	
	4.07	MW	mf	GLLC			SZ.DB	LET	zt
	4.08	MW	mf	GLLC			O.DB	LET	
	4.09	MW	mf	GLLC			E.DB	LET	ze
	4.10	MW	mf	GLLC			O.DB	LET	
	4.11	MW	mf	GLLC			O.DB	LET	
	4.12	MW	mf	GLLC			R.DB	DIM	
	4.13	I	mf	GLLC			GLR.DB	DIM	gl
	4.14	MW	mf	GLLC			O.DB	LET	
	4.15	MW	mf	GLLC			O.DB	LET	
	4.16	MW	mf	GLLC			O.DB	LET	
	4.17	MW	mf	GLLC			SZ.DB	LET	zt
	5.01	MW	mf	FLLC	mf	TILL	R.DB	WNY	er
	5.02	MW	mf	TILL			O.DB	CRD	
	5.03	MW	mf	TILL			O.DB	CRD	
	5.04	MW	mf	GLLC	mf	TILL	O.DB	WNY	
	5.05	MW	mf	TILL			O.DB	CRD	
	5.06	MW	mf	TILL			R.DB	VEB	er
	5.07	MW	mf	FLLC			O.DB	LET	
	5.08	MW	mf	TILL			O.DB	CRD	
	5.09	MW	mf	FLLC	mf	TILL	O.DB	WNY	
	5.10	MW	mf	TILL			R.DB	VEB	er
	5.11	MW	mf	TILL			O.DB	CRD	
	5.12	MW	mf	TILL			R.DB	VEB	er
	5.13	MW	mf	TILL			O.DB	CRD	
	5.14	MW	mf	TILL			R.DB	VEB	er
	5.15	MW	mf	TILL			R.DB	VEB	er
	5.16	MW	mf	TILL			R.DB	VEB	er
	5.17	MW	mf	TILL			R.DB	VEB	er
	6.01	MW	fi	GLLC			R.DB	BKE	er; sa
	6.02	MW	fi	GLLC			R.DB	BKE	er
	6.03	MW	fi	GLLC			R.DB	BKE	er
	6.04	MW	fi	GLLC	mf	TILL	R.DB	BKE	er; xt
	6.05	MW	fi	GLLC	fi	TILL	O.DB	CLD	xt
	6.06	MW	fi	GLLC	fi	TILL	R.DB	BKE	er; sa; xt
	6.07	MW	fi	GLLC			R.DB	BKE	er
	6.08	MW	fi	GLLC			O.DB	CLD	
	6.09	MW	fi	GLLC			R.DB	BKE	er
	6.10	MW	fi	GLLC			R.DB	BKE	er
	6.11	MW	fi	GLLC	mf	TILL	R.DB	BKE	er; xt
	6.12	MW	fi	GLLC			R.DB	BKE	er
	6.13	MW	mf-fi	GLLC			R.DB	BKE	er; sa
	6.14	P	fi	GLLC			CA.HG	SGY	sa
	6.15	P	fi	GLLC			CA.HG	SGY	
	6.16	P	fi	GLLC			CA.HG	SGY	sa
	6.17	P	fi	GLLC			CA.HG	SGY	

Table D-5. Field data used in the analysis of township 27-3-W5.

Township-Range	Site No.	Drainage	PM 1 Texture	PM 1 Type	PM 2 Texture	PM 2 Type	Soil Subgroup	Soil Series	Soil Phase
27-3-W5	1.01	MW	mf	TILL			O.BL	DVG	
	1.02	MW	mf	GLLC	mf	TILL	O.BL	MFT	xt
	1.03	MW	mf	GLLC	mf	TILL	CA.BL	MFT	ca; xt
	1.04	MW	mf	GLLC	mf	TILL	CA.BL	MFT	ca; xt
	1.05	I	mf	TILL			GL.BL	DVG	gl
	1.06	MW	mf	TILL			O.BL	DVG	
	1.07	MW	mf	TILL			GL.BL	DVG	ta; gl
	1.08	MW	mf	TILL			O.BL	DVG	
	1.09	MW	mf	TILL			CA.BL	DVG	ca
	1.10	MW	mf	TILL			O.BL	DVG	
	1.11	MW	mf	TILL			O.BL	DVG	
	1.12	MW	mf	TILL			O.BL	DVG	
	1.13	MW	me	TILL		BDRK	O.BL	OKY	
	1.14	MW	me	GLLC			O.BL	MFT	
	1.15	MW	mf	GLLC			O.BL	MFT	
	1.16	MW	mf	GLLC			CA.BL	MFT	ca
	1.17	MW	mf	TILL			O.BL	DVG	
	2.01	MW	mf	TILL			O.BL	DVG	ta
	2.02	MW	mf	TILL			O.BL	DVG	er
	2.03	MW	mf	TILL			O.BL	DVG	
	2.04	MW	mf	TILL			O.BL	DVG	er; co
	2.05	MW	mf	TILL			O.BL	DVG	er
	2.06	MW	mf	TILL			O.BL	DVG	
	2.07	MW	mf	TILL			O.BL	DVG	
	2.08	MW	mf	TILL			O.BL	DVG	
	2.09	MW	mf	TILL			O.BL	DVG	
	2.10	MW	mf	TILL			O.BL	DVG	
	2.11	MW	mf	TILL			O.BL	DVG	ta; er
	2.12	MW	mf	TILL			O.BL	DVG	er
	2.13	MW	mf	TILL			O.BL	DVG	ta; er
	2.14	MW	mf	TILL			O.BL	DVG	
	2.15	MW	mf	TILL			O.BL	DVG	
	2.16	MW	mf	GLLC	mf	TILL	O.BL	MFT	xt
	2.17	P	mf	GLLC	mf	TILL	HU.LG		
	3.01	MW	mf	GLLC	mf	TILL	O.BL	MFT	xt
	3.02	MW	mf	GLLC	mf	TILL	O.BL	MFT	xt
	3.03	MW	mf	GLLC	mf	TILL	O.BL	MFT	xt
	3.04	MW	mf	TILL			O.BL	DVG	
	3.05	MW	mf	TILL			O.BL	DVG	
	3.06	MW	mf	GLLC	mf	TILL	O.BL	MFT	xt
	3.07	MW	mf	TILL			O.BL	DVG	ta
	3.08	MW	mf	GLLC	mf	TILL	O.BL	MFT	xt
	3.09	P	mf	FLLC			R.HG	POT	zr
	3.10	MW	mf	GLLC	mf	TILL	O.BL	MFT	xt
	3.11	P	mf	GLLC	mf	FLLC	R.HG	POT	zr
	3.12	P	mf	GLLC			R.HG	POT	zr
	3.13	P	mf	GLLC			R.HG	POT	zr
	3.14	MW	mf	GLLC			O.BL	MFT	
	3.15	MW	mf	GLLC			O.BL	MFT	
	3.16	MW	mf	GLLC	mf	TILL	O.BL	MFT	xt
	3.17	MW	mf	GLLC	mf	TILL	O.BL	MFT	xt

continued ...

Table D-5. Concluded.

Township-Range	Site No.	Drainage	PM 1 Texture	PM 1 Type	PM 2 Texture	PM 2 Type	Soil Subgroup	Soil Series	Soil Phase
27-3-W5	4.01	MW	mf	TILL			O.BL	DVG	
	4.02	MW	mf	TILL			O.BL	DVG	ta
	4.03	MW	mf	TILL			O.BL	DVG	
	4.04	MW	mf	TILL			R.BL	DVG	zr
	4.05	MW	mf	TILL			R.BL	DVG	zr
	4.06	MW	mf	TILL			O.BL	DVG	
	4.07	MW	mf	TILL			O.BL	DVG	
	4.08	P	fi	GLLC			R.HG	POT	zr
	4.09	MW	me	TILL			CA.EB	DVG	ta; ca
	4.10	MW	me	EOL	mf	TILL	O.BL	PPE	
	4.11	MW	mf	TILL			CA.BL	DVG	ca
	4.12	MW	fi	GLLC			GL.BL	FSH	gl
	4.13	P	fi	FLLC	fi	GLLC	R.HG	POT	zr
	4.14	MW	me	slp wash	mf	TILL	O.BL	DVG	
	4.15	MW	me	slp wash	mf	TILL	O.BL	PPE	
	4.16	MW	mf	TILL			O.EB	DVG	ta
	4.17	MW	me	EOL	mf	TILL	E.BL	DVG	ze
	5.01	MW	mf	TILL			O.BL	DVG	
	5.02	MW	mf	TILL			O.BL	DVG	
	5.03	MW	mf	TILL			O.BL	DVG	
	5.04	I	me	slp wash	fi	GLLC	O.HG	POT	
	5.05	P	fi	GLLC			O.HG	POT	
	5.06	MW	mf	TILL			O.BL	DVG	ta
	5.07	MW	mf	TILL			O.BL	DVG	
	5.08	MW	mf	TILL			O.BL	DVG	
	5.09	MW	mf	TILL			O.BL	DVG	
	5.10	MW	mf	TILL			O.BL	DVG	
	5.11	MW	mf	TILL			O.BL	DVG	ta
	5.12	MW	mf	TILL			O.BL	DVG	
	5.13	MW	mf	TILL			O.BL	DVG	
	5.14	MW	mf	TILL			GL.BL	DVG	gl
	5.15	MW	mf	TILL			GL.BL	DVG	gl
	5.16	MW	mf	TILL			O.BL	DVG	
	5.17	MW	mf	TILL			O.BL	DVG	
	6.01	MW	mf	TILL			O.BL	DVG	
	6.02	MW	me	EOL	mf	TILL	O.BL	PPE	
	6.03	MW	me	EOL/slp	mf	GLLC	O.BL	PPE	
	6.04	MW	mf	TILL			O.BL	DVG	
	6.05	MW	mf	TILL			O.BL	DVG	
	6.06	MW	mf	TILL			O.BL	DVG	
	6.07	P	mf	GLLC			O.HG	POT	
	6.08	P	fi	GLLC			O.HG	POT	
	6.09	P	fi	GLLC			HU.LG	POT	ze
	6.10	MW	mf	TILL			O.BL	DVG	ta
	6.11	MW	mf	TILL			O.BL	DVG	
	6.12	P	fi	GLLC			O.HG	POT	
	6.13	MW	mf	TILL			O.BL	DVG	
	6.14	MW	mf	TILL			E.BL	DVG	ze
	6.15	MW	mf	TILL			E.BL	DVG	ze
	6.16	P	mf	GLLC			O.HG	POT	
	6.17	MW	mf	TILL			R.BL	DVG	er

Table D-6. Field data used in the analysis of township 22-27-W4.

Township-Range	Site No.	Drainage	PM 1 Texture	PM 1 Type	PM 2 Texture	PM 2 Type	Soil Subgroup	Soil Series	Soil Phase
22-27-W4	1.01	MW	mf	TILL			O.BL	DEL	
	1.02	MW	mf	GLLC	mf	TILL	O.BL	RKV	
	1.03	MW	mf	GLLC			O.BL	LTA	
	1.04	MW	mf	GLLC			O.BL	LTA	
	1.05	MW	mf	GLLC	mf	TILL	O.BL	RKV	
	1.06	MW	mf	TILL			O.BL	DEL	
	1.07	MW	mf	TILL			O.BL	DEL	st
	1.08	MW	mf	GLLC	mf	TILL	O.BL	RKV	
	1.09	MW	mf	TILL			O.BL	DEL	
	1.10	MW	mf	GLLC			O.BL	LTA	
	1.11	MW	mf	GLLC	mf	TILL	O.BL	RKV	
	1.12	MW	mf	GLLC	mf	TILL	O.BL	RKV	
	1.13	MW	mf	TILL			R.BL	DEL	er
	1.14	MW	mf	TILL			O.BL	DEL	
	1.15	MW	mf	TILL			O.BL	DEL	
	1.16	MW	mf	GLLC	mf	TILL	O.BL	RKV	
	1.17	MW	mf	TILL			O.BL	DEL	
	2.01	MW	mf	TILLL			O.BL	DEL	
	2.02	MW	mf	TILL			E.BL	DEL	ze
	2.03	MW	mf	TILL			O.BL	DEL	
	2.04	MW	mf	GLLC	mf	TILL	O.BL	RKV	
	2.05	MW	me	GLLC	mf	TILL	O.BL	RKV	
	2.06	MW	mf	TILL			O.BL	DEL	
	2.07	MW	mf	GLLC			O.BL	LTA	
	2.08	P	mf	GLLC			HU.LG		
	2.09	MW	mf	GLLC	mf	TILL	O.BL	RKV	
	2.10	MW	me	GLLC	mf	TILL	O.BL	RKV	
	2.11	MW	mf	GLLC	mf	TILL	O.BL	RKV	
	2.12	MW	mf	GLLC	mf	TILL	O.BL	RKV	
	2.13	MW	mf	GLLC			O.BL	LTA	
	2.14	MW	mf	GLLC			O.BL	LTA	
	2.15	MW	mf	GLLC			O.BL	LTA	
	2.16	MW	mf	GLLC			O.BL	LTA	
	2.17	MW	mf	GLLC		TILL	O.BL	RKV	
	3.01	MW	mf	GLLC	mf	TILL	O.BL	RKV	
	3.02	MW	mf	GLLC	mf	TILL	O.BL	RKV	
	3.03	MW	mf	TILL			O.BL	DEL	
	3.04	MW	mf	GLLC	mf	TILL	O.BL	RKV	
	3.05	MW	mf	TILL			O.BL	DEL	
	3.06	MW	mf	TILL			O.BL	DEL	
	3.07	MW	mf	TILL			O.BL	DEL	
	3.08	MW	mf	TILL			O.BL	DEL	
	3.09	MW	mf	GLLC	mf	TILL	O.BL	RKV	
	3.10	MW	mf	GLLC			O.BL	LTA	
	3.11	MW	me	GLLC			O.BL	LTA	
	3.12	MW	mf	GLLC			O.BL	LTA	
	3.13	MW	mf	TILL			R.BL	DEL	er
	3.14	MW	mf	GLLC	mf	TILL	O.BL	RKV	
	3.15	MW	mf	GLLC	mf	TILL	O.BL	RKV	
	3.16	MW	mf	GLLC	mf	TILL	O.BL	RKV	
	3.17	MW	me	GLLC	mf	TILL	O.BL	RKV	

continued ...

Table D-6. Concluded.

Township-Range	Site No.	Drainage	PM 1 Texture	PM 1 Type	PM 2 Texture	PM 2 Type	Soil Subgroup	Soil Series	Soil Phase
22-27-W4	4.01	MW	mf	TILL			O.BL	DEL	sa
	4.02	MW	mf	TILL			O.BL	DEL	sa
	4.03	MW	mf	TILL			O.BL	DEL	
	4.04	MW	mf	TILL			O.BL	DEL	
	4.05	MW	mf	TILL			O.BL	DEL	
	4.06	MW	mf	TILL			O.BL	DEL	
	4.07	P	mf	GLLC			HU.LG		
	4.08	MW	mf	TILL			O.BL	DEL	
	4.09	MW	mf	TILL			R.BL	DEL	er
	4.10	MW	mf	TILL			O.BL	DEL	
	4.11	MW	mf	TILL			SZ.BL	DEL	zt; sa
	4.12	MW	mf	TILL			O.BL	DEL	
	4.13	MW	mf	TILL			GL.BL	DEL	gl
	4.14	MW	mf	TILL			O.BL	DEL	
	4.15	MW	mf	TILL			O.BL	DEL	
	4.16	MW	mf	TILL			O.BL	DEL	
	4.17	MW	mf	TILL			O.BL	DEL	
	5.01	MW	mf	TILL			O.BL	DEL	
	5.02	MW	mf	TILL			O.BL	DEL	sa
	5.03	MW	mf	TILL			O.BL	DEL	
	5.04	I-P	mf	TILL			HU.LG	IND	
	5.05	MW	mf	TILL			O.BL	DEL	
	5.06	MW	mf	TILL			O.BL	DEL	sa
	5.07	MW	mf	TILL			O.BL	DEL	
	5.08	MW	mf	TILL			O.BL	DEL	
	5.09	MW	mf	TILL			O.BL	DEL	
	5.10	P-I	me	TILL			HU.LG	IND	
	5.11	MW	mf	TILL			O.BL	DEL	
	5.12	MW	mf	TILL			O.HG	IND	er
	5.13	MW	mf	TILL			O.BL	DEL	sa
	5.14	MW	mf	TILL			O.BL	DEL	
	5.15	MW	mf	TILL			O.BL	DEL	sa
	5.16	MW	mf	TILL			O.BL	DEL	
	5.17	MW	mf	TILL			O.BL	DEL	
	6.01	MW	mf	TILL			O.BL	DEL	
	6.02	MW	mf	TILL			O.BL	DEL	
	6.03	MW	mf	TILL			O.BL	DEL	
	6.04	MW	mf	TILL			O.BL	DEL	
	6.05	MW	mf	TILL			O.BL	DEL	
	6.06	MW	mf	TILL			O.BL	DEL	
	6.07	MW	mf	TILL			O.BL	DEL	
	6.08	MW	mf	TILL			O.BL	DEL	
	6.09	MW	mf	TILL			GL.BL	DEL	gl
	6.10	MW	mf	TILL			O.BL	DEL	
	6.11	MW	mf	TILL			O.BL	DEL	sa
	6.12	MW	mf	TILL			O.BL	DEL	
	6.13	MW	mf	TILL			O.BL	DEL	
	6.14	MW	mf	TILL			O.BL	DEL	
	6.15	MW	mf	TILL			O.BL	DEL	
	6.16	MW	mf	TILL			R.BL	DEL	er
	6.17	MW	mf	TILL			O.BL	DEL	sa

APPENDIX E: RESULTS

Appendix E contains the detailed results of the analyses conducted for the comparison of Landscape, Top-down, and SIL3 1:50 000 mapping methods.

Table E-1. Cartometric analysis of maps compiled using top-down mapping.

Top-Down Mapping Method					
Location (Twp - Range)	Number of delineations	Number of observations	Minimum size (ha)	Maximum size (ha)	Average size (ha)
6 - 20	47	15	10	1400	198
2 - 16	51	19	10	901	183
27 - 3 - W5	66	14	7	1936	141
22 - 27 - W4	59	4	5	1668	158
47 - 14	42	19	24	2354	222
51 - 19	29	16	16	4716	322

Table E-2. Cartometric analysis of maps compiled using landscape mapping.

Landscape Mapping Method					
Location (Twp - Range)	Number of delineations	Number of observations	Minimum size (ha)	Maximum size (ha)	Average size (ha)
6 - 20	53	39	17	839	176
2 - 16	90	40	15	1234	104
27 - 3 - W5	46	20	8	1769	203
22 - 27 - W4	23	18	47	2655	406
47 - 14	50	38	18	1241	187
51 - 19	73	35	4	890	128

Table E-3. Cartometric analysis of maps compiled using traditional mapping.

Traditional SIL3 1:50 000 mapping					
Location (Twp - Range)	Number of delineations	Number of observations	Minimum size (ha)	Maximum size (ha)	Average size (ha)
6 - 20	56	136	3	1476	166
2 - 16	90	124	15	1215	104
27 - 3 - W5	70	55	15	1512	133
22 - 27 - W4	69	66	21	1010	135
47 - 14	81	170	6	707	115
51 - 19	101	76	3	829	92

Table E-4. Results of the proportional and non-proportional percent correct comparisons of observed vs. predicted soil series.

		Series - Exact Match (n/17)						Series - Exact Match (% correct)					
Location		Landscape		Top-down		SIL3 1:50 000		Landscape		Top-down		SIL 31:50 000	
Twp.	#	P	NP	P	NP	P	NP	P	NP	P	NP	P	NP
47-14	1	9	12	9	10	6	8	52.9	70.6	52.9	58.8	35.3	47.1
	2	13	13	9	9	8	8	76.5	76.5	52.9	52.9	47.1	47.1
	3	7	8	11	13	7	10	41.2	47.1	64.7	76.5	41.2	58.8
	4	10	11	7	8	5	9	58.8	64.7	41.2	47.1	29.4	52.9
	5	11	16	6	13	3	11	64.7	94.1	35.3	76.5	17.6	64.7
	6	7	13	3	3	3	3	41.2	76.5	17.6	17.6	17.6	17.6
51-19	1	1	1	0	0	4	4	5.9	5.9	0.0	0.0	23.5	23.5
	2	9	11	7	10	10	15	52.9	64.7	41.2	58.8	58.8	88.2
	3	17	17	15	17	16	17	100.0	100.0	88.2	100.0	94.1	100.0
	4	7	7	7	12	7	15	41.2	41.2	41.2	70.6	41.2	88.2
	5	6	8	9	16	9	16	35.3	47.1	52.9	94.1	52.9	94.1
	6	4	9	4	9	2	4	23.5	52.9	23.5	52.9	11.8	23.5
2-16	1	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0
	2	11	14	0	0	0	0	64.7	82.4	0.0	0.0	0.0	0.0
	3	2	8	3	3	0	0	11.8	47.1	17.6	17.6	0.0	0.0
	4	10	13	3	3	12	12	58.8	76.5	17.6	17.6	70.6	70.6
	5	0	0	16	16	0	0	0.0	0.0	94.1	94.1	0.0	0.0
	6	2	16	0	0	0	0	11.8	94.1	0.0	0.0	0.0	0.0
6-20	1	14	17	9	9	9	9	82.4	100.0	52.9	52.9	52.9	52.9
	2	12	16	15	15	12	15	70.6	94.1	88.2	88.2	70.6	88.2
	3	11	17	17	17	12	17	64.7	100.0	100.0	100.0	70.6	100.0
	4	14	16	11	12	2	10	82.4	94.1	64.7	70.6	11.8	58.8
	5	5	8	9	9	3	3	29.4	47.1	52.9	52.9	17.6	17.6
	6	4	12	0	0	0	0	23.5	70.6	0.0	0.0	0.0	0.0
27-3	1	11	14	9	9	7	7	64.7	82.4	52.9	52.9	41.2	41.2
	2	15	17	12	16	15	15	88.2	100.0	70.6	94.1	88.2	88.2
	3	6	7	7	7	7	7	35.3	41.2	41.2	41.2	41.2	41.2
	4	13	14	10	12	9	10	76.5	82.4	58.8	70.6	52.9	58.8
	5	17	17	17	17	15	15	100.0	100.0	100.0	100.0	88.2	88.2
	6	12	13	11	13	11	12	70.6	76.5	64.7	76.5	64.7	70.6
22-27	1	13	13	8	8	14	14	76.5	76.5	47.1	47.1	82.4	82.4
	2	11	12	8	11	10	10	64.7	70.6	47.1	64.7	58.8	58.8
	3	11	13	6	14	14	14	64.7	76.5	35.3	82.4	82.4	82.4
	4	13	13	12	14	12	12	76.5	76.5	70.6	82.4	70.6	70.6
	5	12	12	12	13	10	13	70.6	70.6	70.6	76.5	58.8	76.5
	6	13	14	15	17	8	14	76.5	82.4	88.2	100.0	47.1	82.4
Average		9.25	11.72	8.25	9.86	7.28	9.14	54.4	69.0	48.5	58.0	42.8	53.8
Variance		21.24	20.65	24.41	29.95	24.09	30.56	7.4	7.1	8.4	10.4	8.3	10.6

Table E-5. Results of the similarity matrix comparison of observed vs. predicted soil series.

Location		Series (n/17)			Series (% similarity)		
Twp.	#	Landscape	Top-down	SIL3 1:50 000	Landscape	Top-down	SIL3 1:50 000
47-14	1	15.51	15.03	13.55	91.2	88.4	79.7
	2	15.65	14.35	13.70	92.1	84.4	80.6
	3	15.29	15.36	14.64	89.9	90.4	86.1
	4	16.30	13.75	12.86	95.9	80.9	75.6
	5	14.82	11.59	9.96	87.2	68.2	58.6
	6	13.98	11.17	13.82	82.2	65.7	81.3
51-19	1	11.19	11.40	7.99	65.8	67.1	47.0
	2	15.15	14.60	15.15	89.1	85.9	89.1
	3	17.00	16.90	16.95	100.0	99.4	99.7
	4	14.68	15.43	15.24	86.4	90.8	89.6
	5	14.50	15.85	15.85	85.3	93.2	93.2
	6	14.70	13.46	10.27	86.5	79.2	60.4
2-16	1	12.94	13.30	11.87	76.1	78.2	69.8
	2	16.04	15.67	14.75	94.4	92.2	86.8
	3	12.03	9.14	8.10	70.8	53.8	47.6
	4	16.26	14.02	16.11	95.6	82.5	94.8
	5	16.23	16.95	16.47	95.5	99.7	96.9
	6	14.92	15.83	15.01	87.8	93.1	88.3
6-20	1	16.42	15.95	15.60	96.6	93.8	91.8
	2	16.37	16.55	16.22	96.3	97.4	95.4
	3	16.58	17.00	16.65	97.5	100.0	97.9
	4	16.75	16.23	14.63	98.5	95.5	86.1
	5	14.90	15.80	14.77	87.6	92.9	86.9
	6	12.92	11.07	10.84	76.0	65.1	63.8
27-3	1	16.03	15.90	15.84	94.3	93.5	93.2
	2	16.90	16.78	16.93	99.4	98.7	99.6
	3	16.69	16.04	16.74	98.2	94.4	98.5
	4	16.30	16.00	15.76	95.9	94.1	92.7
	5	17.00	17.00	16.76	100.0	100.0	98.6
	6	16.25	15.61	15.70	95.6	91.8	92.4
22-27	1	16.55	16.38	16.70	97.4	96.4	98.2
	2	16.48	16.39	16.28	96.9	96.4	95.8
	3	16.56	16.38	16.70	97.4	96.4	98.2
	4	16.16	16.11	15.97	95.1	94.8	93.9
	5	15.27	15.19	15.70	89.8	89.4	92.4
	6	16.21	16.53	15.94	95.4	97.2	93.8
Average		15.49	15.02	14.61	91.1	88.4	86.0
Variance		1.94	3.78	5.84	0.67	1.31	2.02

Table E-6. Results of the similarity matrix comparison of observed vs. predicted soil texture.

Location		Texture (n/17)			Texture (% similarity)		
Twp.	#	Landscape	Top-down	SIL3 1:50 000	Landscape	Top-down	SIL3 1:50 000
47-14	1	17.00	17.00	17.00	100.0	100.0	100.0
	2	17.00	17.00	17.00	100.0	100.0	100.0
	3	17.00	17.00	17.00	100.0	100.0	100.0
	4	17.00	16.50	16.90	100.0	97.1	99.4
	5	16.40	16.40	16.40	96.5	96.5	96.5
	6	16.10	16.10	16.10	94.7	94.7	94.7
51-19	1	16.30	14.40	15.30	95.9	84.7	90.0
	2	16.90	16.90	16.90	99.4	99.4	99.4
	3	17.00	17.00	17.00	100.0	100.0	100.0
	4	16.50	16.50	16.50	97.1	97.1	97.1
	5	16.95	16.95	16.95	99.7	99.7	99.7
	6	15.10	15.10	14.10	88.8	88.8	82.9
2-16	1	16.30	15.95	15.55	95.9	93.8	91.5
	2	16.80	16.40	14.30	98.8	96.5	84.1
	3	14.90	15.20	14.30	87.6	89.4	84.1
	4	16.65	15.85	16.55	97.9	93.2	97.4
	5	17.00	16.90	16.90	100.0	99.4	99.4
	6	14.50	16.50	14.40	85.3	97.1	84.7
6-20	1	16.80	16.80	16.80	98.8	98.8	98.8
	2	17.00	17.00	17.00	100.0	100.0	100.0
	3	17.00	17.00	17.00	100.0	100.0	100.0
	4	17.00	16.90	15.70	100.0	99.4	92.4
	5	16.40	17.00	17.00	96.5	100.0	100.0
	6	15.65	15.45	15.15	92.1	90.9	89.1
27-3	1	16.80	16.80	16.80	98.8	98.8	98.8
	2	17.00	17.00	17.00	100.0	100.0	100.0
	3	16.70	16.60	17.00	98.2	97.6	100.0
	4	16.40	16.40	16.80	96.5	96.5	98.8
	5	16.80	16.80	16.90	98.8	98.8	99.4
	6	16.60	16.60	16.90	97.6	97.6	99.4
22-27	1	17.00	17.00	17.00	100.0	100.0	100.0
	2	16.90	16.90	16.90	99.4	99.4	99.4
	3	16.85	16.85	16.85	99.1	99.1	99.1
	4	17.00	17.00	17.00	100.0	100.0	100.0
	5	16.90	16.90	16.90	99.4	99.4	99.4
	6	17.00	17.00	17.00	100.0	100.0	100.0
Average		16.59	16.55	16.41	97.6	97.3	96.5
Variance		0.38	0.39	0.81	0.13	0.14	0.28

Table E-7. Results of the similarity matrix comparison of observed vs. predicted parent materials.

Location		Parent Materials (n/17)			Parent Materials (% similarity)		
Twp.	#	Landscape	Top-down	SIL3 1:50 000	Landscape	Top-down	SIL3 1:50 000
47-14	1	17.00	17.00	17.00	100.0	100.0	100.0
	2	17.00	17.00	17.00	100.0	100.0	100.0
	3	17.00	17.00	17.00	100.0	100.0	100.0
	4	17.00	17.00	17.00	100.0	100.0	100.0
	5	17.00	17.00	17.00	100.0	100.0	100.0
	6	16.10	16.10	16.10	94.7	94.7	94.7
51-19	1	13.68	13.53	12.00	80.5	79.6	70.6
	2	16.90	16.90	16.90	99.4	99.4	99.4
	3	17.00	17.00	17.00	100.0	100.0	100.0
	4	16.85	16.85	16.85	99.1	99.1	99.1
	5	16.70	16.70	16.70	98.2	98.2	98.2
	6	13.00	13.00	12.00	76.5	76.5	70.6
2-16	1	14.73	15.15	13.45	86.6	89.1	79.1
	2	16.83	16.57	16.90	99.0	97.5	99.4
	3	16.59	16.85	16.59	97.6	99.1	97.6
	4	16.52	14.30	16.10	97.2	84.1	94.7
	5	17.00	17.00	17.00	100.0	100.0	100.0
	6	16.83	16.95	16.90	99.0	99.7	99.4
6-20	1	16.99	16.95	16.99	99.9	99.7	99.9
	2	16.55	17.00	16.25	97.4	100.0	95.6
	3	17.00	17.00	16.25	100.0	100.0	95.6
	4	16.90	16.95	16.99	99.4	99.7	99.9
	5	15.19	16.39	14.74	89.4	96.4	86.7
	6	16.27	16.38	15.82	95.7	96.4	93.1
27-3	1	16.15	16.05	16.35	95.0	94.4	96.2
	2	17.00	16.90	16.90	100.0	99.4	99.4
	3	16.09	16.09	16.00	94.6	94.6	94.1
	4	15.70	15.70	16.09	92.4	92.4	94.6
	5	16.60	16.60	16.80	97.6	97.6	98.8
	6	16.00	16.00	16.55	94.1	94.1	97.4
22-27	1	16.85	16.40	16.85	99.1	96.5	99.1
	2	16.70	16.70	16.70	98.2	98.2	98.2
	3	16.85	16.30	16.85	99.1	95.9	99.1
	4	16.95	16.85	16.95	99.7	99.1	99.7
	5	17.00	17.00	17.00	100.0	100.0	100.0
	6	17.00	17.00	16.85	100.0	100.0	99.1
Average		16.43	16.39	16.29	96.7	96.4	95.8
Variance		0.85	0.92	1.57	0.29	0.32	0.54

Table E-8. Results of the similarity matrix comparison of observed vs. predicted internal drainage.

Location		Drainage (n/17)			Drainage (% similarity)		
Twp.	#	Landscape	Top-down	SIL3 1:50 000	Landscape	Top-down	SIL3 1:50 000
47-14	1	17.00	17.00	17.00	100.0	100.0	100.0
	2	17.00	17.00	17.00	100.0	100.0	100.0
	3	17.00	16.80	17.00	100.0	98.8	100.0
	4	17.00	17.00	17.00	100.0	100.0	100.0
	5	16.30	15.70	15.50	95.9	92.4	91.2
	6	16.80	16.80	16.80	98.8	98.8	98.8
51-19	1	16.00	16.00	16.00	94.1	94.1	94.1
	2	16.60	16.40	16.40	97.6	96.5	96.5
	3	17.00	17.00	17.00	100.0	100.0	100.0
	4	17.00	17.00	16.80	100.0	100.0	98.8
	5	16.60	16.60	16.60	97.6	97.6	97.6
	6	16.70	16.60	15.10	98.2	97.6	88.8
2-16	1	16.80	16.70	15.20	98.8	98.2	89.4
	2	15.90	16.40	16.80	93.5	96.5	98.8
	3	16.20	16.10	15.60	95.3	94.7	91.8
	4	17.00	16.30	16.70	100.0	95.9	98.2
	5	17.00	17.00	17.00	100.0	100.0	100.0
	6	17.00	17.00	17.00	100.0	100.0	100.0
6-20	1	17.00	17.00	17.00	100.0	100.0	100.0
	2	17.00	17.00	17.00	100.0	100.0	100.0
	3	17.00	17.00	17.00	100.0	100.0	100.0
	4	16.90	16.90	16.50	99.4	99.4	97.1
	5	17.00	17.00	17.00	100.0	100.0	100.0
	6	16.60	16.20	16.20	97.6	95.3	95.3
27-3	1	17.00	16.90	17.00	100.0	99.4	100.0
	2	17.00	17.00	17.00	100.0	100.0	100.0
	3	17.00	16.80	16.80	100.0	98.8	98.8
	4	17.00	17.00	17.00	100.0	100.0	100.0
	5	17.00	17.00	17.00	100.0	100.0	100.0
	6	17.00	16.80	17.00	100.0	98.8	100.0
22-27	1	17.00	16.80	17.00	100.0	98.8	100.0
	2	17.00	16.90	17.00	100.0	99.4	100.0
	3	17.00	16.90	17.00	100.0	99.4	100.0
	4	17.00	16.90	17.00	100.0	99.4	100.0
	5	17.00	17.00	17.00	100.0	100.0	100.0
	6	17.00	16.80	17.00	100.0	98.8	100.0
Average		16.84	16.76	16.69	99.1	98.6	98.2
Variance		0.09	0.11	0.29	0.03	0.04	0.10

Table E-9. Results of the similarity matrix comparison of observed vs. predicted subgroup classification.

Location		Subgroup (n/17)			Subgroup (% similarity)		
Twp.	#	Landscape	Top-down	SIL3 1:50 000	Landscape	Top-down	SIL3 1:50 000
47-14	1	15.66	15.64	14.28	92.1	92.0	84.0
	2	16.11	14.56	14.56	94.8	85.6	85.6
	3	16.08	15.82	15.98	94.6	93.1	94.0
	4	16.16	14.24	13.46	95.1	83.8	79.2
	5	15.10	11.55	10.08	88.8	67.9	59.3
	6	15.01	12.01	15.05	88.3	70.6	88.5
51-19	1	14.30	14.30	11.30	84.1	84.1	66.5
	2	15.15	14.60	15.20	89.1	85.9	89.4
	3	17.00	16.90	16.90	100.0	99.4	99.4
	4	14.85	15.60	15.55	87.4	91.8	91.5
	5	14.95	16.30	16.30	87.9	95.9	95.9
	6	16.71	15.86	12.76	98.3	93.3	75.1
2-16	1	16.66	16.40	15.10	98.0	96.5	88.8
	2	16.44	16.36	16.70	96.7	96.2	98.2
	3	13.08	11.20	9.53	76.9	65.9	56.1
	4	16.75	17.00	16.75	98.5	100.0	98.5
	5	16.61	16.95	16.61	97.7	99.7	97.7
	6	16.15	16.56	16.90	95.0	97.4	99.4
6-20	1	16.55	15.95	15.95	97.4	93.8	93.8
	2	17.00	16.85	16.85	100.0	99.1	99.1
	3	17.00	17.00	17.00	100.0	100.0	100.0
	4	16.75	16.27	15.27	98.5	95.7	89.8
	5	16.20	15.80	15.80	95.3	92.9	92.9
	6	13.90	12.14	12.14	81.8	71.4	71.4
27-3	1	16.60	16.70	16.60	97.6	98.2	97.6
	2	17.00	17.00	17.00	100.0	100.0	100.0
	3	17.00	16.90	16.40	100.0	99.4	96.5
	4	16.95	16.65	16.65	99.7	97.9	97.9
	5	17.00	17.00	16.90	100.0	100.0	99.4
	6	16.90	16.30	16.80	99.4	95.9	98.8
22-27	1	16.90	16.70	17.00	99.4	98.2	100.0
	2	17.00	16.65	16.95	100.0	97.9	99.7
	3	16.90	16.70	17.00	99.4	98.2	100.0
	4	15.93	16.40	16.05	93.7	96.5	94.4
	5	15.30	15.23	16.10	90.0	89.6	94.7
	6	16.30	16.16	16.26	95.9	95.1	95.6
Average		16.11	15.67	15.44	94.8	92.2	90.8
Variance		0.97	2.54	3.86	0.33	0.88	1.33

Table E-10. Probability values (PV) for F-tests and t-tests to check for significant differences between results.

Comparison	F-test	t-test
Landscape mapping, % correct, P vs. NP	0.467	0.027*
Top-down mapping, % correct, P vs. NP	0.274	0.200
SIL3 1:50 000 mapping, % correct, P vs. NP	0.242	0.140
% correct, proportional, Landscape vs. Top-down	0.342	0.384
% correct, proportional, Top-down vs. SIL3 1:50 000	0.485	0.412
% correct, proportional, Landscape vs. SIL3 1:50 000	0.356	0.088
% correct, non-proportional, Landscape vs. Top-down	0.138	0.003*
% correct, non-proportional, Top-down vs. SIL3 1:50 000	0.476	0.585
% correct, non-proportional, Landscape vs. SIL3 1:50 000	0.125	0.036*
% similar, soil series, Landscape vs. Top-down	0.026	0.252
% similar, soil series, Top-down vs. SIL3 1:50 000	0.102	0.439
% similar, soil series, Landscape vs. SIL3 1:50 000	0.001	0.069
% similar, soil texture, Landscape vs. Top-down	0.462	0.773
% similar, soil texture, Top-down vs. SIL3 1:50 000	0.017	0.475
% similar, soil texture, Landscape vs. SIL3 1:50 000	0.014	0.343
% similar, parent material, Landscape vs. Top-down	0.409	0.867
% similar, parent material, Top-down vs. SIL3 1:50 000	0.057	0.698
% similar, parent material, Landscape vs. SIL3 1:50 000	0.035	0.592
% similar, drainage, Landscape vs. Top-down	0.248	0.254
% similar, drainage, Top-down vs. SIL3 1:50 000	0.003	0.551
% similar, drainage, Landscape vs. SIL3 1:50 000	0.000	0.153
% similar, subgroup, Landscape vs. Top-down	0.003	0.173
% similar, subgroup, Top-down vs. SIL3 1:50 000	0.111	0.582
% similar, subgroup, Landscape vs. SIL3 1:50 000	0.000	0.076

* - significant difference of the means at the 95% confidence level
P - proportional, NP - non-proportional
Ho (F-test): The variances are equal
Ho (t-test): The difference of the means is equal to 0
Decision rule: accept Ho if PV is less than or equal to 0.05