A GUIDE TO SOIL CAPABILITY AND LAND INVENTORY MAPS IN SASKATCHEWAN

(Second Edition)

J.A. Shields, H.P.W. Rostad and J.S. Clayton

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Saskatchewan Institute of Pedology,
University of Saskatchewan,
Saskatoon, Saskatchewan.

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THE CANADA LAND INVENTORY

The Canada Land Inventory is designed to provide a comprehensive survey of land assessment according to its capabilities for different uses as interpreted from the present information available. It is being undertaken as a co-operative Federal-Provincial project under A.R.D.A. covering the agriculturally settled portions of rural Canada, and adjoining areas where questions of alternative uses of land have a strong bearing on rural development.

In the past, the co-operative Soil Survey organizations of Canada have been classifying and mapping soils according to their inherent characteristics and their qualities as natural bodies. Most of the agricultural areas of Canada have been mapped at varying scales and degrees of classification intensity. These Surveys have resulted in published maps and reports which are the source of much of the fundamental information on the soils of Canada. These maps and reports, therefore, form the framework for the interpretations required by the Inventory which is divided into five sectors: Agriculture, Forestry, Wildlife, Recreation and Present Land Use. The land resources are then rated according to their suitability for agricultural use, for the growth of commercial forest, as a wildlife habitat and as recreation sites. On completion, the Inventory will provide information concerning the relative suitability of each land area for each of four uses listed above, therefore, decisions concerning alternative uses will be made more confidently.

SOIL CAPABILITY FOR AGRICULTURE

The Soil Capability Classification and Land Use Inventory of the Soils of Saskatchewan was initiated in 1963 as an A.R.D.A. Research Project under the direction of J.S. Clayton and the late W.L. Hutcheon. This project involved the preparation of maps for local distribution showing the Soil Association, textural type, capability classification and land use of the area within each Rural Municipality and Local Improvement District. These maps form the basis for the soil capability maps published by the Canada Land Inventory in Map Sheet Areas at a scale of 1 inch equals 4 miles.

Soil Capability Classification

The soil capability classification is one of a number of groupings which can be made from Soil Survey or Land Assessment data. It represents an interpretive classification of soils based on limitations affecting their agricultural use, and is supplemented by information concerning their general productive capacity for common field crops. The interpretations are based on existing information and have not involved any major degree of field inspection for this specific purpose.

The limitations for agricultural use are categorized according to their degree and their kind. The degree of limitation is represented by the capability class which forms the broadest category of the classification. The kind of limitation is represented by the capability subclass of which there are fourteen in all. The capability class level is, therefore, determined by the degree of limitation imposed by a particular capability subclass.

Capability Class - Degree of Limitation

The mineral soils of Saskatchewan are grouped into seven capability classes (Table 1). Soils within Classes 1, 2 and 3 are considered suitable for the sustained production of common field crops; Class 4 soils are physically marginal for the sustained production of field crops; Class 5 soils are suited only to permanent pasture where improvement practices are feasible; Class 6 soils are suited only to native pasture where improvement practices are not feasible; and Class 7 soils are unsuitable for either field crops or permanent pasture.

Some of the important factors on which the classification is based are outlined below:

1. The soils will be managed and cropped under a largely mechanized system.
2. Distance to market, kind of roads, location, size of farm, characteristics of land ownership, cultural patterns and the skill or resources of individual operators and hazard of crop damage by storms are not criteria for capability groupings.
3. Soils considered feasible for improvement by practices that can be made economically by the farmer himself are classified according to their limitations after the improvements are made. Land requiring improvement beyond the means of the individual farmer is classed according to its present condition.
4. The soil capability classification has been applied to virgin as well as cultivated areas. However, it has not been applied to National or Provincial Parks, Provincial Forest or other areas which have not been covered by reconnaissance soil surveys.

Soil Capability Classes - Degree of Limitation

CLASS 1: SOILS IN THIS CLASS HAVE NO SIGNIFICANT LIMITATIONS THAT RESTRICT THEIR USE FOR CROPS.

Class 1 soils have level or gently sloping topography, they are deep, well to moderately drained and have good water-holding capacity. These soils are naturally well supplied with plant nutrients and also respond well to additional inputs of fertilizer. They are easily maintained in good tilth and fertility. Erosion damage (wind and water) is low. They are moderately high to high in productivity for a wide range of field crops. In terms of wheat, they may be expected to give average yields of 20-25 bushels per acre with an estimated potential average yield of 30-35 bushels per acre (7). They occur in areas having no significant climatic limitations for soil management and use within the Prairie Region and are mainly confined to the medium to moderately fine textured soils of the Thick Black and Dark Gray soil zones and to the moderately fine textured soils of the Black soil zone.

CLASS 2: SOILS IN THIS CLASS HAVE MODERATE LIMITATIONS THAT REDUCE THE CHOICE OF CROPS OR REQUIRE MODERATE CONSERVATION PRACTICES.

Class 2 soils require careful soil management including conservation practices to prevent soil deterioration or to improve air and water relationships when the soils are cultivated. The limitations are not severe and the practices are easy to apply.

Soils in this class have good water-holding capacity and are either well supplied with plant nutrients or are highly responsive to inputs of fertilizer. They are moderately high to high in productivity for a fairly wide range of crops. Average wheat yields are 15.5-20 bushels per acre and their estimated potential average yield is 24-30 bushels per acre (7).

With favorable years and application of good tillage, management, and moisture conservation practices, these soils will frequently compare in productivity to Class 1 soils.

In the Thin Black soil zone, soils of loam texture are considered as Class 2 because of insufficient moisture-holding capacity. The clay and heavy clay soils occurring in the Dark Brown soil zone and the heavy clay soils in the Brown soil zone are also considered as Class 2 soils, their only limitation being due to insufficient precipitation.

CLASS 3: SOILS IN THIS CLASS HAVE MODERATELY SEVERE LIMITATIONS THAT REDUCE THE CHOICE OF CROPS OR REQUIRE SPECIAL CONSERVATION PRACTICES.

Class 3 soils have more severe limitations than those in Class 2 and conservation practices are usually more difficult to apply and maintain. Limitations adversely affect the timing and ease of tillage, planting and harvesting, the choice of crops, the application of conservation practices, or some combination of these limitations.

Soils in this class are medium to moderately high in productivity for a moderate range of crops. In terms of wheat, their average yield ranges from 11.0-15.5 bushels per acre, and the estimated potential average yield is 19-24 bushels per acre (7). Even with good management practices, Class 3 soils in the Brown and Dark Brown soil zones show wide variability in yields due to the variations in climatic conditions.

In the Brown soil zone, Class 3 soils include those with higher than average moisture storage capacities (clay loam or clay textures) and in the Dark Brown soil zone their textures range from very fine sandy loam to clay loam. They also include Gray Wooded soils with inferior structural characteristics.

CLASS 4: SOILS IN THIS CLASS HAVE SEVERE LIMITATIONS THAT RESTRICT THE CHOICE OF CROPS OR REQUIRE SPECIAL CONSERVATION PRACTICES OR BOTH.

Class 4 soils have such limitations that they are suited only for a few crops, or the yield for a range of crops may be low, or the risk of crop failure is high.

Class 4 soils are low to medium in productivity for a narrow range of crops but may have higher productivity for a special crop. Average wheat yields range from 9.0-11.0 bushels per acre with a high incidence of variability. The estimated potential average yield of these soils is 13-15 bushels per acre (7).

Class 4 soils in Saskatchewan include most of the sandy soils of low moisture storage capacity in the Dark Brown, Black and Dark Gray soil zones, and those of loam or coarser texture in the Brown soil zone. They also include all soils on moderately rolling and strongly sloping topography and local soils of low inherent fertility and those with a significant incidence of alkalinity, or poor structure and physical conditions. The high incidence of low crop yields or disastrous failures throughout their cropping history suggests that some of these soils should be removed from continued use for grain production.

CLASS 5: SOILS IN THIS CLASS ARE CAPABLE ONLY OF PRODUCING PERENNIAL FORAGE CROPS AND IMPROVEMENT PRACTICES ARE FEASIBLE.

Class 5 soils have serious soil or landscape limitations which make them unsuited for the production of annual cultivated field crops. However, they may be improved by the use of farm machinery for the production of native or tame species of perennial forage crops. Feasible improvement practices may include clearing of bush, cultivation, seeding to perennial forage crops, fertilizing, herbicide application and water

control. The productivity of these soils for improved or native pasture is moderately high to high (1).

Most pasture land throughout the province may be considered as Class 5 lands except those on coarse textured soils in the drier portions of the Brown soil zone, or where exceptionally steep or excessively arid slopes make improvement practices unfeasible.

CLASS 6: SOILS IN THIS CLASS ARE CAPABLE ONLY OF PRODUCING NATIVE PERENNIAL FORAGE PLANTS AND IMPROVEMENT PRACTICES ARE NOT FEASIBLE.

Class 6 soils have some natural sustained grazing capacity for farm animals but have such serious soil or landscape limitations as to make impractical the application of improvement practices which can be carried out on Class 5 soils.

Soil areas may be placed in this class because their physical nature prevents the use of farm machinery to improve them, or because the soils are not responsive to improvement practices, or because of a short grazing season, or because stock watering facilities are inadequate. Improvement practices which may be effected by seeding and fertilizing by hand or by aerial methods, will not change the classification of these soil areas. These soils have low to moderate productivity for unimprovable native pasture (1). These lands include exceptionally rough upland pasture and meadow areas generally too wet to be utilized for hay but which provide some native grazing for livestock. Where costly clearing is required to change Class 7 areas to Class 6 areas, those areas will remain as Class 7.

CLASS 7: SOIL AND LANDS IN THIS CLASS HAVE NO CAPABILITY FOR ARABLE AGRICULTURE OR PERMANENT PASTURE.

Land areas not included in Classes 1 to 6 or classified as Organic Soils shall be placed in this class. It will include bodies of water too small to delineate on maps, townsites, parks, airports, railroads, roads and lands used by industry.

ORGANIC SOILS: Unimproved or virgin organic soils including muskeg and peat are not included in Classes 1 to 7, but are designated by the letter O.

TABLE 1. SUMMARY OF THE GUIDING CRITERIA FOR CAPABILITY CLASSES IN SASKATCHEWAN

Class	Degree of Limitations	Range of Adaptability	Productivity
1	No significant limitations.	Wide range of field crops.	Moderately high to high, 20-25 bu/acre* (30-35 bu/acre)**
2	Moderate limitations due to climate, soil or landscape.	Fairly wide range of field crops.	Moderately high to high, 15.5-20 bu/acre* (24 to 30 bu/acre)**
3	Moderately severe limitations due to climate, soil or landscape.	Moderate range of field crops.	Medium to moderately high, 11-15.5 bu/acre* (19-24 bu/acre)**
4	Severe limitations due to climate, soil or landscape.	Physically marginal for field crops.	Low to medium, 9-11 bu/acre* (13-15 bu/acre)**
5	Serious soil or landscape limitations make them unsuitable for the production of annual crops.	Suited for the production of adapted grasses and legumes for improved pasture.	Moderately high to high.
6	Very serious soil or landscape limitations restrict their use to native grazing.	Suited only to native pasture.	Low to moderate.
7	Prevent agricultural use.	Unsuited for agricultural use.	Non productive.

*,** Productivity of arable Classes 1-4 is expressed in terms of long-time (1932-1961) average wheat yields in bu/acre and estimated potential average productivity (7) respectively.

The characteristics of the capability classes are summarized in Table 1. It should be emphasized that the soils within a capability class are similar only with respect to degree, but not to kind of limitation. Each class may include many different kinds of soil and many of the soils within any one class may require unlike management and treatment. It is also important to note that while the soil areas in Classes 1 to 4 are suited for cultivated crops, they are also suited for perennial forage crops. Soil areas in all classes may also be suited for forestry, wildlife or recreation.

It is realized that soil capability classes based on limitations for use, are not necessarily synonymous with classes based solely on productivity, if such a classification were available. Nevertheless, in an area such as Saskatchewan, it is generally considered that the limiting effect of climate and associated moisture relationships tend to govern productivity.

Soil Capability Subclasses - Kinds of Limitation

The capability subclass represents a grouping of soils which have the same kind of limitation for agricultural use. Each subclass limitation is represented by an appropriate symbol (see page 10) which is written immediately behind the capability class number except in the case of Class 1 soils which do not have any significant limitations. For example, 3m represents a soil area rated as Class 3 due to insufficient moisture-holding capacity (m). It is not practical to show more than two subclasses for each capability class and they are listed in order of their importance.

Fourteen different kinds of limitations are recognized as a result of the climate, the soil, or the landscape, evaluated in that

order. The limiting effects of climate are considered first as they affect the initial capability class of soils on a broad subregional basis. These are followed by the limitations characteristic of the Soil Association and textural types within a subregion. Limitations imposed by the local landscape complete the evaluation. The subclass limitations are outlined below:

CAPABILITY SUBCLASSES - KIND OF LIMITATIONS

Climatic limitations - expressed on the basis of adverse subregional climate where there are no other limitations except climate.

- SUBCLASS Cm: moisture deficiency due to insufficient precipitation.
- SUBCLASS Cs: heat deficiency expressed in terms of length of growing season and frost-free period.

Soil limitations - are caused by unfavorable inherent soil characteristics.

- SUBCLASS m: insufficient soil moisture-holding capacity.
- SUBCLASS d: poor structure and/or permeability.
- SUBCLASS f: low inherent soil fertility.
- SUBCLASS n: excessive soil salinity.
- SUBCLASS s: unfavorable soil characteristics. This subclass is used in a collective sense in place of subclasses m, d, f, and n where more than two of them are present or where two of these limitations are present in addition to some other limitation.

Landscape limitations -

- SUBCLASS t: unfavorable topography.
- SUBCLASS w: excess water - applies to soils where excess water, apart from that brought about by inundation is a limitation in their use for agriculture.
- SUBCLASS p: excess stoniness.
- SUBCLASS e: erosion damage.
- SUBCLASS i: inundation - applies to soils subjected to flooding due to overflow.
- SUBCLASS r: shallowness to bedrock.
- SUBCLASS x: moderate limitation due to accumulative minor adverse characteristics which singly are not serious enough to affect the class rating.

Figure I. CLIMATIC SUBREGIONS

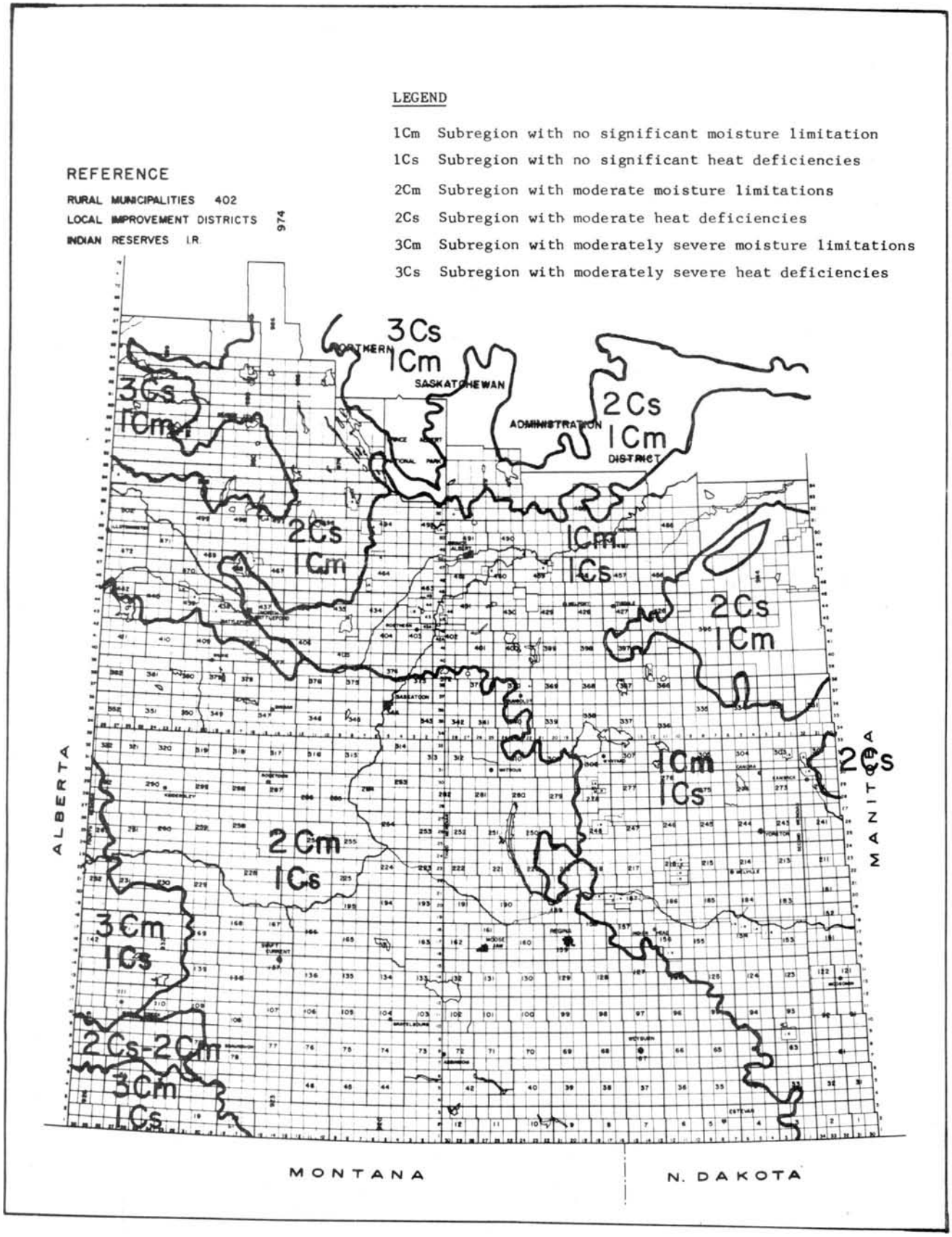
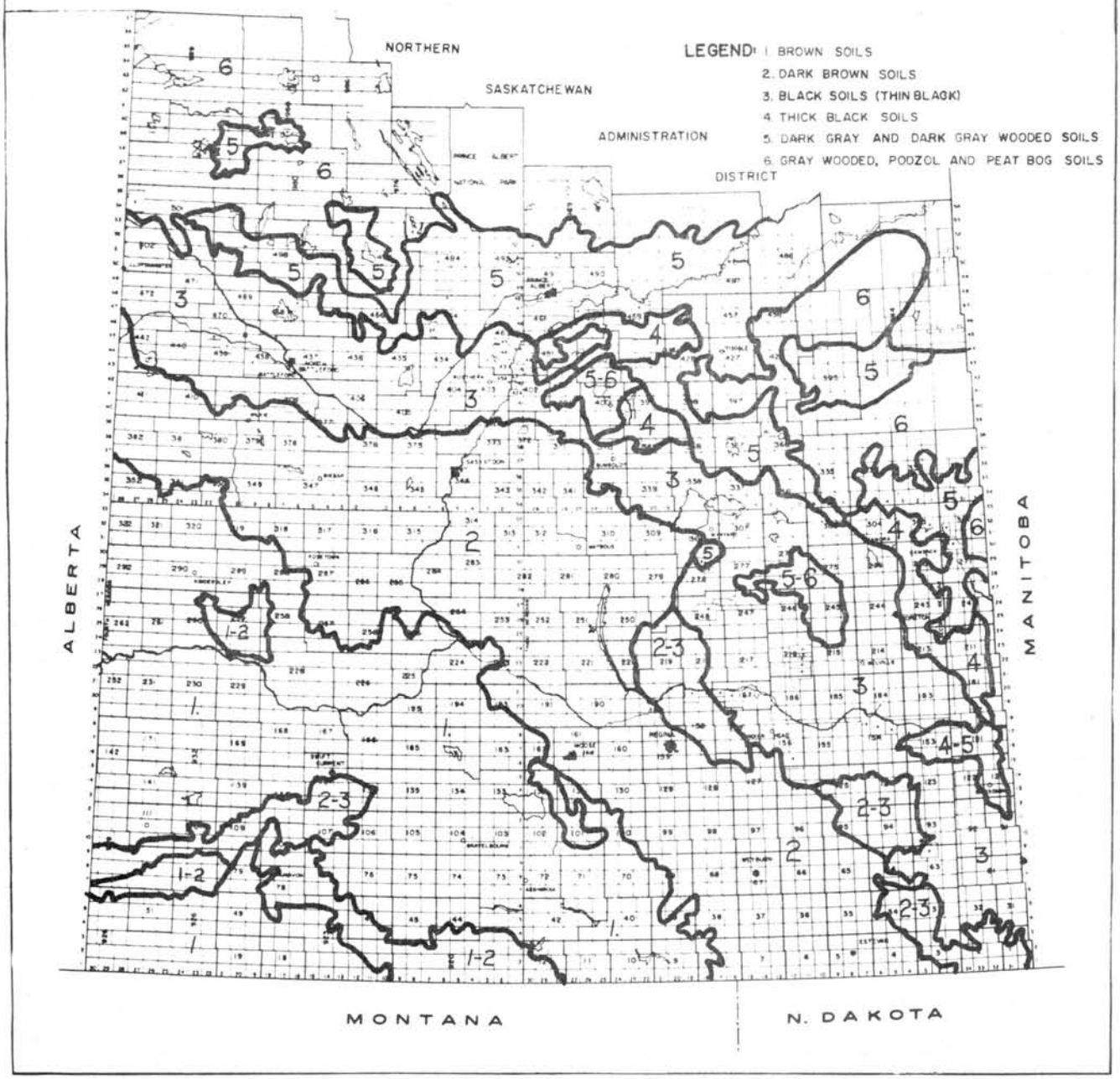


Figure 2. SOIL ZONES OF SASKATCHEWAN



Climatic Limitations

The climate of an area is a major factor in determining the productivity and the range of crops that can be satisfactorily matured. Limitations due to climatic deficiencies are determined on a regional and subregional basis. Within the western Canadian prairie region we are primarily concerned with the amount and distribution of precipitation, length of growing season, frost-free period, and the amount of heat units available for plant growth. In consideration of these climatic characteristics the agricultural region of Saskatchewan has been divided into six climatic subregions as shown in Figure 1. These subregions usually correspond to relatively well defined soil areas or physiographic sections. Their boundaries represent a transition rather than a sharply defined change in climatic characteristics.

SUBCLASS Cm: Depicts a moisture deficiency due to insufficient precipitation. Three climatic subregions designated as 1Cm, 2Cm, 3Cm have been recognized on the basis of increasing aridity (Fig. 1). The climatic data characteristic of these subregions are given in Table 2 (see page 15).

Subregion 1Cm: This subregion includes most of the Black and Dark Gray soil zones (Fig. 1) which generally receive sufficient precipitation to permit crops to be grown on the same land each year without a high risk of crop failure.

Subregion 2Cm: Lack of precipitation is a moderate limitation to crop growth in this subregion (see Table 2), therefore, the highest capability class that the best soils within this subregion can attain is 2Cm. It includes the Dark Brown and most of the Brown soil zone where it is recommended that farming practices be adopted

which are best suited to the conservation and storage of soil moisture.

Subregion 3Cm: This subregion is confined to the more arid southwestern part of the Brown soil zone lying immediately north and south of the Cypress Hills. The highest capability that soils can attain in this subregion is 3Cm due to a moderately severe precipitation deficiency coupled with high rates of evaporation. Consequently the suitability of cropping is generally recommended for soils with above average moisture-holding capacity.

SUBCLASS Cs: Depicts a heat deficiency expressed in terms of length of growing season and frost-free period. Three climatic subregions designated as 1Cs, 2Cs, 3Cs have been recognized on the basis of frost incidence and heat units expressed as degree days (Fig. 1). The climatic data for these subregions is given in Table 2.

Subregion 1Cs: This area has a frost-free period exceeding 90 days and is considered to have sufficiently high growing season temperatures to bring common field crops to maturity without risk of damaging frost. This subregion includes all of the Brown and most of the Dark Brown, Black and Dark Gray soil zones (Fig. 2).

Subregion 2Cs: These areas are characterized by a moderate limitation in length of growing season with an average frost-free period ranging from 75 to 90 days. All crops suited to the region can usually be matured, however, wheat may be damaged by frost. This subregion includes parts of the Black, Dark Gray, and Gray Wooded soil zones as well as the highest part of Cypress Hills within the Dark Brown soil zone.

Subregion 3Cs: This area is confined to the northwestern part of the Gray Wooded soil zone. It has a moderately severe heat deficiency with a frost-free period ranging from 60-75 days. Coarse grains can be expected to mature without frost damage, however, there is a very high risk involved in the growing of wheat.

TABLE 2. AGROCLIMATIC DATA FOR THE CLIMATIC SUBREGIONS OF SASKATCHEWAN*

Climatic Subregion (See Map Fig. 1 for Location)	Moisture Data (Cm)			Heat Data (Cs)		
	Precipitation (inches)		Water Deficit	Growing Season		
	Annual	May-Sept.	(in/4ft)	No. of Days >42° F	Degree-days >42° F	Frost-Free Period Days 32° F
1Cm, 1Cs Subregion (East-Central part)	15-18	9-12	4-6	160-172	2200-3000	>90
2Cm, 1Cs Subregion (West-Central part)	12-16	7-11	6-10	169-179	2400-3000	>90
3Cm, 1Cs Subregion (South-West part)	11-14	7-9	9-11	>179	2400-3000	90-120
2Cs, 1Cm Subregion (North-East part)	16-20	10-12	4-5	154-164	1800-2200	75-90
2Cs, 1Cm Subregion (North-West part)	14-16	8-10	5-7	159-169	2000-2400	75-90
2Cs, 1Cm Subregion (Northern part)	15-16	10-11	4-6	159-169	2000-2200	75-90
3Cs, 1Cm Subregion (North-Western part)	15-16	10-11	4-6	154-159	1800-2000	<75

*Based on information prepared by the Ontario Research Foundation and the Meteorological Branch, Department of Transport (c.f. Fig. 1).

Explanation of Agroclimatic Information

Moisture Data

- The total annual precipitation (inches) in any year is the sum of the total rainfall and the water equivalent of the total snowfall for that year. Usually a specific gravity of 0.1 is assumed for freshly fallen snow.

- May to September precipitation (inches) was selected as a measure of growing season precipitation.

- Potential evapotranspiration (inches) is regarded as the amount of water used by evaporation from the soil and transpiration from the plants when there is a dense cover of vegetation and continuously moist soil. Simply, it is an estimate of water need.

- Average annual water deficit (inches) was computed assuming that soil holds 4 inches of water available for crops. In Saskatchewan, potential evapotranspiration exceeds summer precipitation. If it were not more than 4 inches greater than precipitation during the growing season there is no deficiency. It is assumed that evapotranspiration proceeds at the potential rate until the 4 inches of available soil moisture is used, then only precipitation is used until precipitation again exceeds potential evaporation. During this period the difference between potential evapotranspiration and precipitation is computed as water deficiency.

Heat Data

- Length of growing season above 42° F refers to the number of days between the dates in the spring and fall corresponding to a mean daily temperature of 42° F.

- Degree-days above 42° F combines the length of the growing period with mean daily temperatures above 42° F. This index is used as a cumulative measure of the growing period expressed in a single figure.

- Mean frost-free period refers to the number of days between the average spring and fall dates when the temperature drops to 32° F or lower.

Soil Limitations

After consideration of the climatic characteristics prevalent in an area it is then necessary to evaluate the inherent properties of the soil which affect its agricultural capability. The subclass limitations arising due to adverse physical, chemical and/or morphological soil properties include: insufficient soil moisture-holding capacity (m), poor structure (d), low natural fertility (f), or excessive salinity (n).

SUBCLASS m: adverse soil moisture-holding capacity, due to the combined effects of the textural characteristics of the top four feet and the climate as expressed by the organic matter or zonal characteristics of the surface horizon.

Differences in the moisture-holding capacity of soils are most commonly attributed to variations in soil texture, however, moisture storage is also affected by the structure and organic matter content of the soil. Consequently, the limitations arising due to deficiencies in moisture-holding capacity are not solely proportional to the decrease in clay content. It may generally be concluded that soils of fine texture are essential for sustained productivity in the more arid climatic subregions, whereas this characteristic is not as critical to productivity in subregions of higher precipitation and greater moisture efficiency.

Moisture limitations may also arise due to complex landforms where the steepness of the slopes are not solely responsible for establishing the capability class. However, the degree of slope is responsible for causing variability in moisture distribution due to run-off from upper slope positions. The aridity of the upper slope is also increased by greater evaporation from unshaded aspects. The

effect of slope and aspect on the moisture limitation becomes of greater significance in the more arid climatic subregions.

SUBCLASS d: adverse soil structure. In general, soils dominated by Orthic, Calcareous, or Rego Chernozemic subgroup profiles (12) have no significant structural limitations. Structural limitations are exhibited by soils characterized by the occurrence of pronounced elluvial and illuvial horizons. The structure of the well developed eluviated A horizon is unstable and when cultivated the clods tend to be easily pulverized. Moderately severe structural limitations occur in soils where the eluviated horizon makes up all or nearly all of the cultivated surface horizon as in Gray Wooded and Solod soils. When wet the surface of these soils tend to flow and puddle, when dry it bakes. The latter condition results in surface crusting which may cause poor aeration, restrict plant emergence and prevent tillering. These structural deficiencies are accentuated by moderately sloping topography which increases the susceptibility of erosion of the surface horizon on upper slopes.

The B horizons of some soils may also present structural and permeability limitations that restrict root growth and penetration. These conditions occur in Solonetzic, Podzolic-Solonetz and some Gleysolic (poorly drained) soils in Saskatchewan, and the severity of the condition is dependent upon the degree of profile development. Severe structural limitations are exhibited by Solodized Solonetz soils, particularly in the more arid parts of the province. The difficulty of maintaining a good state of tilth and the "tough" compact nature of the B horizons adversely affect the yields of crops. This is particularly true where a significant proportion of the area is occupied

by eroded pits more commonly referred to as "burn-outs", (12).

Structural limitations are also manifested in some very heavy textured soils which possess the characteristic to shrink markedly upon drying, forming an extremely hard massive structure which absorbs moisture slowly on rewetting. Such soils although having a relatively high water-holding capacity may be unable to provide an adequate quantity of available moisture for plant growth because of this unfavorable structure. These conditions are found in many of the poorly drained clay soils of alluvial river flats and local lacustrine deposits.

Soils of heavy clay texture in the Dark Gray soil zone are considered to have a moderate limitation in permeability which arises following periods of heavy rain or sudden spring thaw.

SUBCLASS f: adverse fertility characteristic of soil having naturally low inherent fertility due to lack of available nutrients, high acidity or alkalinity, high calcium carbonate content or inadequate cation exchange capacity.

In Saskatchewan, consideration of inherent soil fertility is rarely the dominant subclass limitation determining the capability class level. Moderate to severe limitations of fertility are mainly confined to highly leached and acidic Podzolic soils developed on sandy materials.

SUBCLASS n: excessive soil salinity - applies to soils with a sufficient content of soluble salts or of high alkalinity to adversely affect crop growth or the range of crops which can be grown. This subclass is most significant in the classification of saline alluvial areas and salt flats. Significant areas of salinity occurring within normally non-saline Soil Associations may also result in a reduction

of the capability class.

SUBCLASS s: adverse soil characteristics. It is used in a collective sense in place of subclasses m, d, f, and n where more than two of them are present or where two of these occur in addition to some other limitation. For example, areas of dune sand are characterized by limitations due to insufficient moisture-holding capacity (m) and low fertility (f) coupled with erosion damage (e). The capability for these areas is expressed as 6^{s}_{e}.

Landscape Limitations

The final group of limitations to be evaluated in determining the agricultural capability of an area are those arising within a given landscape.

SUBCLASS t: adverse topography - applies to land where the topography is a limitation in agricultural use. It includes not only the hazards to cultivation and cropping imposed by increasing degree of slope, but also those limitations due to irregularity of field pattern and lack of soil uniformity imposed by complexity of landform pattern. For example, many areas of roughly undulating or rolling topography with numerous knolls and poorly drained pot holes have accumulative limitations, which not only significantly limits the percentage of arable land per unit but also increases the difficulties of uniform seeding, cultivation and harvesting.

SUBCLASS w: excess water - applies to soils where excess water, apart from that brought about by inundation (flooding) is a limitation in their use for agriculture. Excess water may be the result of poor soil drainage, high water table, seepage, or run-off from surrounding areas. Usually soils needing drainage have some permanent limitation

that precludes them from Class 1 even after drainage.

SUBCLASS p: excess stoniness - applies to soils sufficiently stony as to significantly increase the difficulty of tillage, planting and harvesting.

SUBCLASS e: erosion damage - applies to soils where actual damage from erosion is a limitation to agricultural use. Damage is assessed on the loss in productivity and/or the difficulties in farming the eroded soil areas.

SUBCLASS i: inundation - applies to soils subjected to inundation (flooding) by lakes or streams, but does not include local ponding in undrained semi-permanent depressions. In Saskatchewan this limitation is mainly found in the alluvial flood plains of large river valleys such as the Beaver and Assiniboine.

SUBCLASS r: shallowness to solid bedrock - applies to soils where the rooting zone is restricted by solid bedrock. This limitation has little application within the agricultural area of Saskatchewan as most soils are developed on various forms of unconsolidated glacial deposits or on weathered shale and sandstone.

SUBCLASS x: Soils having a moderate limitation due to the accumulative effect of two or more adverse characteristics of the soil and the landscape which singly are not serious enough to affect the class rating. This subclass is used only for soils that have no other single significant limitation except subregional climate. Hence soils in this subclass may only be reduced one capability class from the best possible class that soils can attain within a climatic subregion.

SOIL CAPABILITY AND LAND INVENTORY MAPS IN SASKATCHEWAN

Sources of Information

A Basic Soil Index* and an Initial Capability Class have been assigned to each of the common Soil Associations and textural types mapped in Saskatchewan. The assigned Index and Class represent the optimum soil characteristics expected to occur within a particular Soil Association and textural type with respect to soil moisture, structure or fertility. They do not represent any additional limitations or condemnation factors due to unfavorable landscape characteristics. The Index and Initial Class for the Soil Associations and textural types shown on the soil capability maps are listed in Table 5 (see page 25). A brief description of these Soil Associations are listed on pages 32-42 of the Appendix.

Except for the areas covered by the new soil surveys, the information concerning the occurrence and extent of the soils within the various Soil Associations and textural types as well as the physical characteristics of the landscape were obtained from the field sheets prepared by the personnel of the Assessment Branch of the Saskatchewan Department of Municipal Affairs. The system used by the Assessors is based on recognition and mapping of Soil Associations which are nearly similar or identical to those used by the Soil Survey (8, 9, 14) and on the use of a field symbology which is also readily correlative with that of the survey. The task of examining the assessment field sheets for

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* Based on a modification of a soil rating system developed by H.C. Moss (10).

this inventory was carried out by a technical staff under the supervision of Mr. W. Houston formerly employed with the Assessment Branch.

The capability classification of an area of land usually involved reducing the basic index or initial capability class of the particular soil according to the degree of limitations interpreted from the Assessors field sheets (Appendix C). The point deductions recorded by the Assessors were interpreted in terms of their limitations for agricultural use and therefore assisted in establishing the capability class for the area. The existing information was then edited on a Municipal basis by members of the Saskatchewan Institute of Pedology and areas of similar capability were delineated and designated by a map symbol.

In the case of areas covered by the new soil surveys (Regina, Willow Bunch Lake, Rosetown and Saskatoon map sheet areas), the information shown on the field sheets prepared by members of the soil survey was also used to evaluate the capability of a particular area. The soil capability map for Rural Municipality 256 is shown in Fig. 3.

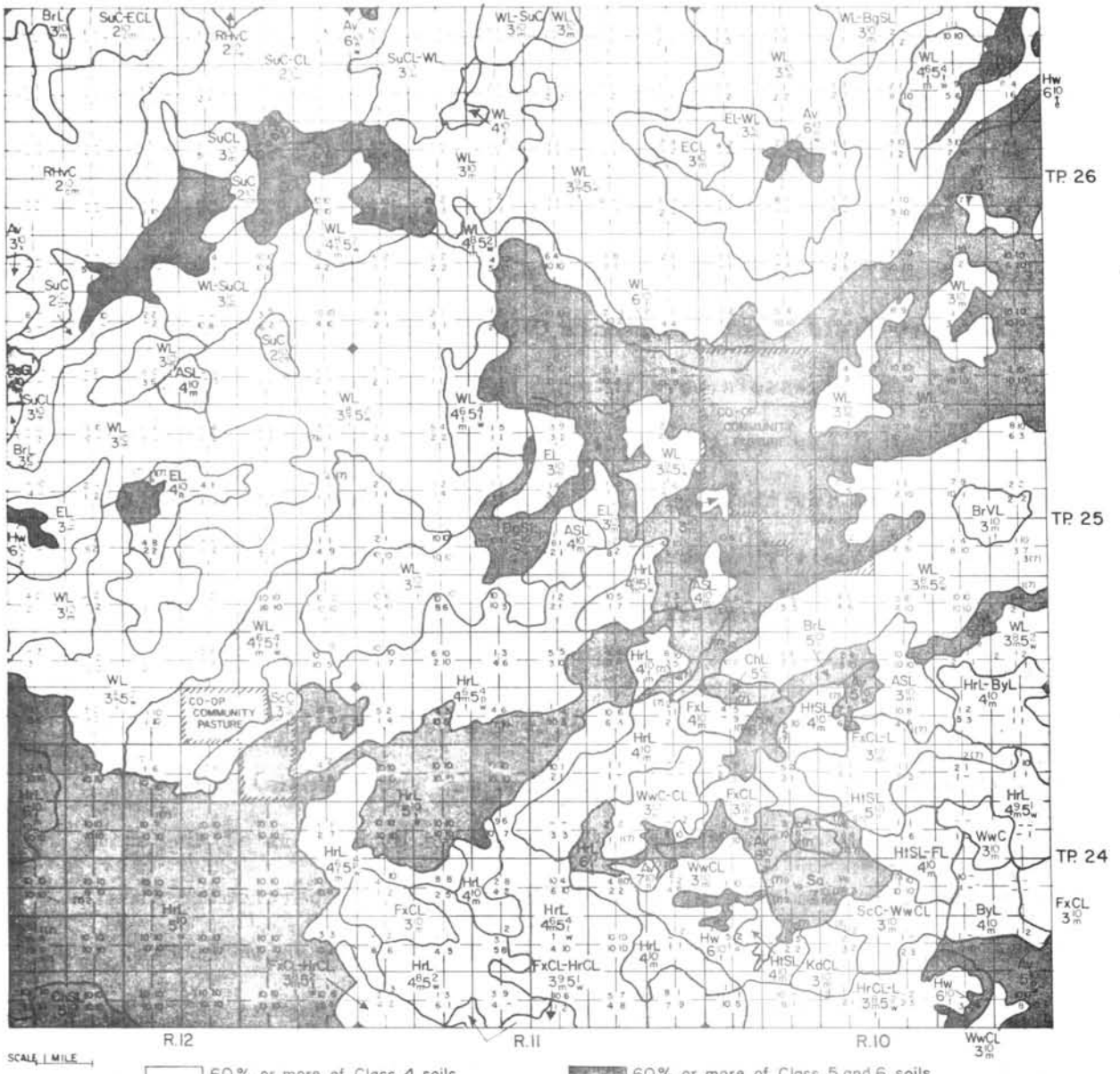
An acreage inventory of the soil capability classes characteristic of the different Soil Associations occurring within Rural Municipality 256 is shown in Table 4.

Soil capability maps and inventory information have been prepared on a similar basis for each of the Rural Municipalities and Local Improvement Districts within the agricultural region of Saskatchewan. They are available on request from the Saskatchewan Institute of Pedology.

RURAL MUNICIPALITY Nº 256
KING GEORGE

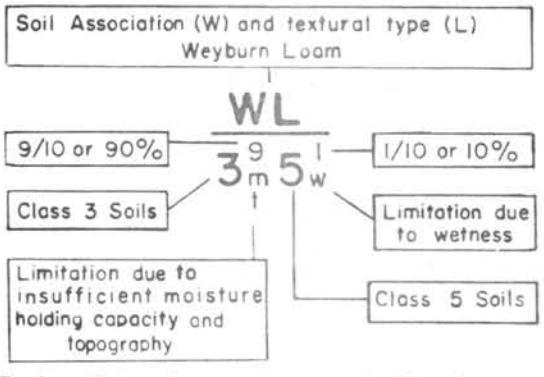
FIGURE 3.

CANADA LAND INVENTORY W. of 3rd ASSESSMENT DATE 1957



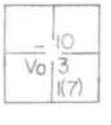
60% or more of Class 4 soils

60% or more of Class 5 and 6 soils.



Explanation - An area represented by the map symbol shown above may be described as follows: The soil area was mapped as Weyburn Loam, and is considered to have a final capability grouping of $3^{9}_{m\ t}\ 5^{1}_{w}$ which means that 90% of the area was placed in Class 3 because of limitations in moisture holding capacity and topography and the remaining 10% in Class 5 because of wetness.

Land Use - The number appearing in adjacent corners of each quarter section unit indicate the proportion of uncultivated land within the quarter section expressed as a total of 10 as recorded in the year of Assessment. The symbol Va indicates that the land is vacant Crown land or Crown land leased for grazing and as such has no been assessed. An example of the land use information is shown in the following diagram of a section.



NW quarter - less than 10% uncultivated (0-9 acres)
NE quarter - 100% uncultivated land (151-160 acres)
SW quarter - Crown land that was not assessed
SE quarter - 30% uncultivated land (41-56 acres)
- 10% Class 7 land

Acreage Summary Forms - Acreage summary forms have been prepared for each rural municipality. These summaries (see Table 4) show the number of acres of each capability class within each Soil Association or complex of Soil Associations occurring in the rural municipality. The total cultivated acreage is also shown.

Table 3. The Initial Capability Grouping and Basic Soil Index for the Soil Associations and Textural Types in R.M. No. 256

Symbol	Soil Association and Textural Type	Soil Zone	Initial Capability	Basic Soil Index
RHvC	Regina Heavy Clay	Dark Brown	2Cm	80
SuC	Sutherland Clay	Dark Brown	2Cm	73
SuCL	Sutherland Clay Loam	Dark Brown	3m	64
ECL	Elstow Clay Loam	Dark Brown	3m	64
EL	Elstow Loam	Dark Brown	3m	59
WL	Weyburn Loam	Dark Brown	3m	58
BrL	Bradwell Loam	Dark Brown	3m	57
BrVL	Bradwell Very Fine Sandy Loam	Dark Brown	3m	55
ASL	Asquith Sandy Loam	Dark Brown	4m	46
BgSL	Biggar Sandy Loam	Dark Brown	4m	39
ScC	Sceptre Clay	Brown	3m	67
FxCL	Fox Valley Clay Loam	Brown	3m	56
FxL	Fox Valley Loam	Brown	4m	51
WwC	Willows Clay	Brown	3m	68
WwCL	Willows Clay Loam	Brown	3m	58
KdCL	Kindersley Clay Loam	Brown	3m	57
HrCL	Haverhill Clay Loam	Brown	3m	55
HrL	Haverhill Loam	Brown	4m	50
ByL	Birsay Loam	Brown	4m	51
HtFL	Hatton Fine Sandy Loam	Brown	4m	42
HtSL	Hatton Sandy Loam	Brown	5m	36
ChL	Chaplin Loam	Brown	4m	45
ChSL	Chaplin Sandy Loam	Brown	5m	32
Av	Alluvium	-	-	-
Hw	Hillwash	-	-	-
Sa	Saline	-	-	-

Table 4. Soil Capability Inventory* for the Soil Associations in R.M. No. 256

Soil Association	Capability Classes (Acres) 1	2	3	4	5	6	7	Total Acreage	Total Acres Cultivated
Regina		6670						6670	6560
Sutherland		6220	1960					8180	6970
Sutherland-Elstow Complex		1260						1260	1210
Sutherland-Weyburn Complex			2070					2070	2070
Sutherland-Willows Complex			1240					1240	840
Elstow			2960	950				3910	2710
Elstow-Weyburn Complex			1400					1400	1170
Weyburn			57530	6910	30130	2940		97510	52230
Weyburn-Sutherland Complex			2430					2430	1610
Weyburn-Biggar Complex			820					820	770
Bradwell			970		480			1450	990
Asquith				2680				2680	1370
Biggar				200	1040			1240	570
Sceptre			700					700	160
Fox Valley			4210	480				4690	3950
Fox Valley-Haverhill Complex			1020		210			1230	960
Willows			3800					3800	2870
Kindersley			760					760	580
Haverhill			1890	16900	28000	1480		48270	17180
Haverhill-Birsay Complex				1490				1490	1110
Birsay				1240				1240	1130
Hatton				2500	350			2850	1230
Chaplin					1130			1130	330
Alluvium			390		1420	3380		5190	1100
Hillwash						3480		3480	1260
Saline							1670	1670	
Total for Municipality		14150	84150	33350	62760	11280	1670	207360	110930
Co-op Pastures			Interpreted from 1957 Assessment.					6720	

*Acreage information for each soil area is available on request.

TABLE 5. BASIC SOIL INDEXES AND CAPABILITY CLASS GROUPING FOR SOIL ASSOCIATIONS AND TEXTURAL TYPES

B R O W N S O I L S

Soil Association and Textural Type	Basic Soil Index	Initial Capability
Sceptre		
ScHvC	72	2cm
ScC	67	3m
Fox Valley		
FxC-SiC	66	3m
FxCL-SiCL	56	3m
FxL-SiL	51	4m
FxLL-SCL	49	4m
Willows		
WwC	68	3m
WwCL	58	3m
Kindersley		
KdC-SiC	66	3m
KdCL-SiCL	57	3m
Fife Lake		
FCL	55	3m
FL	50	4m
FSL	37	4m
FGSL	34	5m
Haverhill		
HrCL	55	3m
HrL	50	4m
HrLL	44	4m
Ardill		
AdCL	57	3m
AdL	50	4m
Wood Mountain		
WmC	65	3m
WmCL	55	3m
WmSiL	52	3m
WmL	50	4m
WmSCL-LL	48	4m
WmFL	42	4m
WmSL	37	4m
Birsay		
ByL	51	4m
BySCL	49	4m
ByVL	48	4m
ByFL	43	4m
Hatton		
HtL	50	4m
HtLL-VL	48	4m
HtFL	42	4m
HtSL	36	5m
HtLS	33	5m
Chaplin		
ChL	45	4m
ChLL	39	4m
ChGL	37	5m
ChSL	32	5m
ChLS	29	5m
Kelstern		
KnC-SiC	61	3m-4d
KnCL-SiCL	52	3m-4d
KnL-SiL	47	4m
Echo		
EcC	55	3m-4d
EcCL	45	3m-4d
EcL	40	4md
Robsart		
RoC	61	3m
RoCL	51	3m
RoL	46	4m
Gilroy		
GyL	48	4m
GySCL	46	4m
GyVL	45	4m
GyFL	40	4m
Flaxcombe		
FcCL	53	3m
FcL	48	4m

DARK BROWN SOILS

Soil Association and Textural Type	Basic Soil Index	Initial Capability
Regina		
RHvC	80	2cm
RC	75	2cm
Allan		
AnHvC	77	2cm
AnC	73	2cm
AnCL	64	3m
Sutherland		
SuC	73	2cm
SuCL	64	3m
Elstow		
EC-SiC	73	2cm
ECL-SiCL	64	3m
EL-SiL	59	3m
ELL	56	3m
EVL	55	3m
Wyandotte		
WyCL	64	3m
WyL	59	3m
Weyburn		
WCL	63	3m
WL	58	3m
WSCL	55	3m
WLL	50.	4m
WSL	50	4m
Amulet		
AmCL	61	3m
AmL	55	3m
Claybank		
CkCL	60	3m
CkL	55	3m
Brooking		
BkCL	59	3m
BkL	54	3m

Soil Association and Textural Type	Basic Soil Index	Initial Capability
Cypress		
CyCL	63	3m
CyL	58	3m
CyLL	52	4m
CyFL	50	4m
Bradwell		
BrL	57	3m
BrVCL	57	3m
BrFCL	57	3m
BrSCL	57	3m
BrVL	55	3m
BrFL	52	3m
BrSL	51	3m
Asquith		
ALL	53	3m
AFL	50	4m
ASL	46	4m
ALS	43	5m
AS	27	5m
Biggar		
BgL	48	4m
BgLL	46	4m
BgGL	44	4m
BgSL	39	4m
BgGSL	35	4m
BgLS	32	5m
Keppel		
KpCL	61	3m
KpL	56	3m
Alert		
AtL	56	3m
AtVL	55	3m
AtFL	49	4m
AtSL	44	4m
AtLS	43	5m
Bear Hills		
BeC	72	2cm
BeCL	62	3m

DARK BROWN SOILS

Soil Association and Textural Type	Basic Soil Index	Initial Capability
Tuxford		
TuC	65	3d-4d
TuCL	55	3m-4d
TuL	51	3m-4d
Hanley		
HyCl-SiCL	56	3m-4d
HyL-SiL	51	3m-4d
Trossachs		
TC	56	3d-4d
TCL	51	3m-4d
TL	46	3m-4d
Rosemae		
RmCL	55	3m-4d
RmL	50	3m-4d
Estevan		
EsCL	59	3m
EsL	54	3m
EsSCL	52	3m
EsLL	48	4m
Wingello		
WgL	54	3m
WgFCL-VCL	53	3m
WgFL	46	4m
Grandora		
GdFL	44	4m
GdSL	41	4m
GdLS	37	5m

THIN BLACK SOILS

Soil Association and Textural Type	Basic Soil Index	Initial Capability
Indian Head		
IHvC	83	1
IC	86	1
ICL	83	1
Balcarres		
BaC	86	1
BaCL-SiCL	83	1
BaL-SiL	78	2m
Blaine Lake		
BC	85	1
BCL-SiCL	82	1
BL-SiL	78	2m
BLL	76	2m
Keatley		
KtC-SiC	87	1
KtCL	83	1
KtL	78	2m
Craigmore		
CmCL	81	1
CmL	76	2m
CmFL	68	3m
Krydor		
KrCL-SiCL	81	1
KrL-SiL	76	2m
Hamlin		
HmFCL-VCL	77	2m
HmL	78	2m
HmVL	76	2m
HmFL	68	3m
HmSL	65	3m
Waseca		
WaCL	80	2d
WaL	76	2d
WaLL	68	3m

THIN BLACK SOILS

Soil Association and Textural Type	Basic Soil Index	Initial Capability
Cudworth		
CdCL-SiCL	81	2x
CdL-SiL	76	2m
CdLL	74	2m
Oxbow		
OCL	82	1
OL	78	2m
OLL	69	3m
OSL	69	3m
Mayfair		
MfCL	82	1
MfL	78	2m
MfSL	70	3m
Edgeley		
EgCL	81	1
EgL	79	2m
Ryerson		
RyL	75	2m
RyLL	67	3m
Onion Lake		
OnHvC	80	2d
OnC	78	2d
OnCL	74	2d
OnL	70	2d
Meota		
MeLL-VL	76	2m
MeFL	65	3m
MeSL	55	3m
MeLS	50	4m
Whitesand		
WsL	70	3m
WsLL	67	3m
WsGL	63	3m
WsFL	58	3m
WsSL	53	4m
WsGSL	48	4m
WsLS	47	4m
Speers		
SsCL-SiCL	78	2d
SsL-SiL	74	2d

THICK BLACK SOILS

Soil Association and Textural Type	Basic Soil Index	Initial Capability
Melfort		
MSiCL-SiC	98	1
ML-SiL	93	1
Hoey		
HL-SiL	93	1
Canora		
CaSiCL	97	1
CaSiL-CL	93	1
CaL-LL	90	1
Naicam		
NL-LL	92	1
Yorkton		
YCL	93	1
YL	90	1
YLL	83	1-2x
Meadow Lake		
MdC-SiCL	90	2cs
MdCL	88	2cs
MdL	85	2cs
Lloydminster		
LyL	87	2cs
LyLL	82	2cs

DARK GRAY SOILS

Soil Association and Textural Type	Basic Soil Index	Initial Capability
Paddockwood		
PwCL	88	1
PwL	84	1
PwLL	75	2m
Weirdale		
WeHvC	84	2d
WeSiC-SiCL	91	1
WeC-CL	89	1
WeSiL-L	85	1
WeLL	80	2m
WeFL	70	3m
Carrot River		
CrL	84	1
CrLL-VL	80	2m
CrFL	70	3m
Etomami		
EtC-CL	89	2cs
EtHvC	83	2cs

TRANSITION DARK GRAY AND DARK GRAY WOODED SOILS

Soil Association and Textural Type	Basic Soil Index	Initial Capability
Kamsack		
KSiCL-SiC	94	1
KL	88	1
KLL	79	2m
Tisdale		
TiSiCL-SiC	92	1
TiCL	90	1
TiSiL	88	1
TiHvC	84	2d
Pelly		
PCL	90	1
PL	86	1
Nipawin		
NpCL-C	89	1
NpL	85	1
Kelsey		
KyCL-SiCL	87	1
KyL	82	2d
Makwa		
MaCL	85	2cs
MaL	80	2cs
MaLL	70	2m
Shellbrook		
SbL	84	1
SbLL-VL	79	2m
SbFL	70	3m
SbSL	63	3m
SbLS	53	4m
Whitewood		
WhCL	83	2d
WhL	79	2m-2d
WhLL	70	2m
Lorenzo		
LzCL	83	2d
LzL	79	2m-2d
Rocanville		
RvCL	83	2d
RvSCL-L	79	2d
Beaver		
BvCL	82	2d
BvL	78	2d
Horsehead		
HoCL	81	2d-3d
HoL	77	2d-3d
HoLL	68	2m-3d
White Fox		
WfVL-LL	78	2m
WfFL	69	3m
Glenbush		
GbLL	68	3m-3d
GbGL-SL	54	3m
GbGSL	48	4m
GbLS	47	4m

G R A Y W O O D E D S O I L S

Soil Association and Textural Type	Basic Soil Index	Initial Capability
Dorintosh		
DoCL-C	73	2d-3d
DoL	63	3d
Arborfield		
ArCL-SiC	72	2d
ArC	70	2d
ArHvC	67	3d
Garrick		
GaCL-SiC	73	2d
GaL	63	3md
Kelvington		
KeC	71	2d-3d
KeHvC	68	3d
Waitville		
WvCL	70	3d
WvL	60	3d
WvLL	50	4md
Meeting Lake		
MtCL	70	3d
MtL	60	3d
MtSL	52	3d
Loon River		
LnCL	68	3d
LnL	58	3d
LnLL	47	3md-4md
Duck Mountain		
DmHvC	63	3d
DmC	65	3d
DmCL	68	3d
La Corne		
LcLL-VL	63	3m
LcFL	55	3m
Sylvania		
SyLL-VL	58	3m
SyFL	50	4m
SyLS	40	5mf
SySL	45	4m
Smeaton		
SmL	57	3md
SmSCL-VL	54	3md
SmFL	46	4f-4mf
Bodmin		
BdLL	44	4mf
BdSL	40	4mf
BdGSL	36	4mf
Pine Sand		
PnLS-S	35	5mf

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APPENDIX A

A brief description of the Soil Associations as interpreted for their agricultural capability and shown on the ARDA Soil Capability Maps are outlined below. The surface textures listed are those which are dominant within the particular Soil Association, however, additional surface textures may be of minor occurrence in certain cases.

BROWN SOILS

Sceptre Association - A group of Brown Chernozemic soils developed on uniform fine textured lacustrine clay.
Surface textures - clay, heavy clay.

Fox Valley Association - A group of Brown Chernozemic soils developed on medium to moderately fine textured calcareous silty glacio-lacustrine deposits.
Surface textures - loam, silt loam, clay loam, silty clay loam.

Willows Association - A group of Brown Chernozemic soils developed on moderately calcareous, moderately fine to fine textured glacio-lacustrine deposits.
Surface textures - clay loam, clay.

Kindersley Association - A group of Brown Solonetzic soils on moderately calcareous, moderately fine to fine textured glacio-lacustrine deposits which are variable in composition and often underlain by till.
Surface textures - heavy clay loam, silty clay, clay.

Fife Lake Association - A group of Brown Chernozemic soils developed on medium to moderately fine textured, moderately calcareous glacial till containing Upper Cretaceous and Tertiary sediments such as sands, silts, clays and quartzites.
Surface textures - sandy loam, loam, clay loam.

Haverhill Association - A group of Brown Chernozemic soils developed on medium to moderately fine textured, moderately calcareous glacial till.
Surface textures - loam, sandy clay loam, light clay loam.

Ardill Association - A group of Brown Chernozemic soils developed on moderately fine textured calcareous and gypsiferous till which may contain clay fragments of Upper Cretaceous origin.
Surface textures - clay loam, loam, heavy clay loam, light clay.

Wood Mountain Association - A group of Brown Chernozemic soils developed on a complex of exposed and glacially modified Tertiary deposits and recent colluvial materials.
Surface textures - loam, clay loam.

Birsay Association - A group of Brown Chernozemic soils developed on medium to moderately fine textured slightly to moderately calcareous sandy glacio-lacustrine deposits.
Surface textures - fine sandy loam, very fine sandy loam, loam, sandy clay loam (greater than 15% clay).

Hatton Association - A group of Brown Chernozemic soils developed on coarse to moderately coarse textured slightly calcareous glacio-fluvial and lacustrine deposits.
Surface textures - loamy sand, sandy loam, fine sandy loam, very fine sandy loam.

Chaplin Association - A group of Brown Chernozemic soils developed on coarse to moderately coarse textured glacio-fluvial deposits.
Surface textures - loamy sand, sandy loam (gravelly).

Kelstern Association - A group of Brown Solonetzic soils developed on medium to moderately fine textured silty glacio-lacustrine possibly saline deposits.
Surface textures - loam, silt loam, silty clay loam, clay loam.

Echo Association - A group of Brown Solonetzic soils developed on moderately fine textured gypsiferous and saline glacial till containing Upper Cretaceous shales.
Surface textures - clay, clay loam and loam.

Robsart Association - A group of Brown Solonetzic soils developed on thin glacial till which is modified by the underlying shales.
Surface textures - loam, clay loam and clay.

Gilroy Association - A group of Brown Solonetzic soils developed on medium to moderately fine textured, slightly to moderately calcareous sandy glacio-lacustrine deposits.
Surface textures - fine sandy loam, very fine sandy loam, loam, sandy clay loam (greater than 15% clay).

Flaxcombe Association - A group of Brown Solonetzic soils developed on light colored sandy clay loam to clay loam glacial till. Not as well developed as Echo. The main area of Flaxcombe soils lies west of Teo Lake Valley and northeast of Kindersley.
Surface textures - loam, sandy clay loam, clay loam.

DARK BROWN SOILS

Regina Association - A group of Dark Brown Chernozemic soils developed on uniform fine textured moderately calcareous glacio-lacustrine deposits.
Surface textures - heavy clay and clay.

Allan Association - A group of Dark Brown Chernozemic soils developed on fine textured glacio-lacustrine and lake modified till deposits which are moderately calcareous and may be gypsiferous.
Surface textures - clay loam, clay and heavy clay, silty phases may also occur.

Sutherland Association - A group of Dark Brown Chernozemic soils developed on variable fine textured, frequently varved, calcareous glacio-lacustrine deposits.
Surface textures - clay loam, clay, siltyclay.

Elstow Association - A group of Dark Brown Chernozemic soils developed on medium to moderately fine textured, moderately calcareous silty glacio-lacustrine deposits.
Surface textures - loam, silt loam, clay loam, silty clay loam.

Wyandotte Association - A group of Dark Brown Chernozemic soils developed on a complex of moderately fine to fine textured glacial till and glacio-lacustrine deposits.
Surface textures - clay loam, clay.

Weyburn Association - A group of Dark Brown Chernozemic soils developed on medium to moderately fine textured glacial till.
Surface textures - loam, sandy clay loam, light clay loam.

Amulet Association - A group of Dark Brown Chernozemic soils developed on moderately fine textured calcareous and gypsiferous till which may contain clay fragments of Upper Cretaceous origin.
Surface textures - clay loam, loam, light clay, heavy clay loam.

Claybank Association - A group of Dark Brown Chernozemic and Solonetzic soils developed on medium textured, mixture of residual and sorted glacial till.
Surface textures - sandy clay loam, loam, light clay loam.

Brooking Association - A group of Dark Brown Solonetzic soils developed on moderately fine textured, moderately calcareous, gypsiferous and saline glacial till containing Upper Cretaceous clays and shales.
Surface textures - loam, clay loam, light clay.

Cypress Association - A group of Dark Brown Chernozemic soils developed on a complex of exposed and glacially modified Tertiary deposits and recent colluvial materials.
Surface textures - clay loam, loam, fine sandy loam.

Bradwell Association - A group of Dark Brown Chernozemic soils developed on medium to moderately fine textured calcareous sandy glacio-fluvial and lacustrine deposits.
Surface textures - fine sandy loam, very fine sandy loam, loam, sandy clay loam.

Asquith Association - A group of Dark Brown Chernozemic soils developed on coarse to moderately coarse glacio-fluvial and lacustrine deposits.
Surface textures - sandy loam, fine sandy loam, very fine sandy loam (less than 15% clay).

Biggar Association - A group of Dark Brown Chernozemic soils developed on coarse to moderately coarse textured glacio-fluvial deposits.
Surface textures - loamy sand, sandy loam, gravelly phases also occur.

Bear Hills Association - A group of Dark Brown Chernozemic soils developed on variable fine textured, moderately calcareous, glacio-lacustrine deposits associated with rolling morainic landforms.
Surface textures - clay loam, clay, silty clay.

Alert Association - A group of shallow Dark Brown Chernozemic soils developed on sandy modified glacial till and sand and sandy glacio-fluvial and/or lacustrine deposits.
Surface textures - loam, sandy loam, fine sandy loam, very fine sandy loam - usually with heavier subsoil.

Keppel Association - A group of Dark Brown Chernozemic soils developed on silty glacio-lacustrine deposits which have been pushed and contorted by glacial action. In some cases there is a surface mantle of stones but these stones do not persist throughout the solum - rather there are pieces of granites, limestones and disintegrating gneiss and schists.
Surface textures - loam, clay loam, silty clay loam, light clay.

Tuxford Association - A group of Dark Brown Solonetzic soils developed on variable fine textured, occasionally varved, moderately calcareous, occasionally saline glacio-lacustrine deposits.
Surface textures - clay loam, clay, silty clay.

Hanley Association - A group of Dark Brown Solonetzic soils developed on medium to moderately fine textured, moderately calcareous, silty glacio-lacustrine deposits.
Surface textures - loam, silt loam, clay loam, silty clay loam.

Trossachs Association - A group of Dark Brown Solonetzic soils developed on moderately fine textured gypsiferous and saline glacial till containing Upper Cretaceous shales.
Surface textures - loam, clay loam, light clay.

Rosemae Association - A group of Dark Brown Solonetzic soils developed on medium to moderately fine textured, moderately calcareous, sometimes gypsiferous and saline, glacial till.
Surface textures - loam, sandy clay loam, clay loam.

Estevan Association - A group of Dark Brown Solonetzic soils developed on medium to moderately fine textured glacial till which contains inclusion of clay shales of Upper Cretaceous origin. The till is moderately calcareous and may be gypsiferous.
Surface textures - loam, clay loam.

Wingello Association - A group of Dark Brown Solonetzic soils developed on medium to moderately fine textured sandy glacio-fluvial and lacustrine deposits.
Surface textures - loam, very fine sandy loam, fine sandy loam, sandy clay loam (greater than 15% clay).

Grandora Association - A group of Dark Brown Solonetzic soils developed on coarse to moderately coarse textured fluvial and/or glacio-lacustrine deposits.
Surface textures - loamy sand, sandy loam, fine sandy loam, very fine sandy loam (less than 15% clay).

BLACK SOILS

Indian Head Association - A group of Black Chernozemic soils developed on fine textured lacustrine clay.
Surface textures - heavy clay and clay. (The Indian Head clay on variable deposits, the silty clay loam, clay loam and loam are now in Balcarres).

Balcarres Association - A group of Black Chernozemic soils developed on variable moderately fine to fine textured glacio-lacustrine deposits.
Surface textures - clay loam, silty clay loam, clay, silty clay.

Blaine Lake Association - A group of Black Chernozemic soils developed on medium to moderately fine textured, moderately calcareous silty glacio-lacustrine deposits.
Surface textures - loam, silt loam, clay loam, silty clay loam.

Keatley Association - A group of Black Chernozemic soils developed on variable fine textured, moderately calcareous glacio-lacustrine deposits.
Surface textures - clay loam, clay, silty clay.

Cudworth Association - A group of Black Chernozemic soils developed on medium to moderately fine textured, moderately to highly calcareous silty glacio-lacustrine deposits.
Surface textures - loam, silt loam, clay loam, silty clay loam.

Oxbow Association - A group of Black Chernozemic soils developed on medium textured, moderately calcareous glacial till.
Surface textures - loam, sandy clay loam, light clay loam.

Mayfair Association - A group of Black Chernozemic soils developed on moderately fine textured, slightly to moderately calcareous glacial till.
Surface textures - loam, sandy clay loam, clay loam.

Edgeley Association - A group of Black Chernozemic soils developed on medium to moderately fine textured, moderately calcareous, occasionally saline glacial till.
Surface textures - loam, clay loam.

Ryerson Association - A group of Black Chernozemic soils developed on highly calcareous, light colored, resorted glacial till.
Surface textures - loam, plus gritty phases.

Craigmore Association - A group of Black Chernozemic soils developed on medium to moderately fine textured resorted till.
Surface textures - loam, clay loam.

Krydor Association - A group of Black Chernozemic soils developed on medium to moderately fine textured, moderately calcareous, silty glacio-lacustrine deposits associated with rolling landscapes.
Surface textures - loam, silt loam, clay loam and silty clay loam.

Hamlin Association - A group of Black Chernozemic soils developed on medium to moderately fine textured sandy glacio-lacustrine deposits.
Surface textures - fine sandy loam, very fine sandy loam, loam, sandy clay loam (greater than 15% clay).

Waseca Association - A group of Black Solonetzic soils developed on a mixture of undifferentiated glacial till and local till derived from underlying Cretaceous sediments.
Surface textures - loam.

Onion Lake Association - A group of Black Solonetzic soils developed on medium to fine textured glacial till which is modified by inclusions of Cretaceous shale which are soft, general acidic and weather to sticky clay. The shales are also the source of alkali salts.
Surface textures - heavy clay, clay, clay loam, loam.

Meota Association - A group of Black Chernozemic soils developed on coarse to medium textured fluvial lacustrine deposits.
Surface textures - loamy sand, sandy loam, fine sandy loam, very fine sandy loam (less than 15% clay).

Whitesand Association - A group of Black Chernozemic soils developed on moderately coarse textured glacio-fluvial deposits.
Surface textures - loamy sand, sandy loam, and their gravelly phases.

Speers Association - A group of Black Solonetzic soils developed on medium to moderately fine textured, moderately calcareous, silty lacustrine deposits.
Surface textures - loam, silt loam, silty clay loam, clay loam.

THICK BLACK SOILS

Melfort Association - A group of thick Black Chernozemic soils developed on fine textured lacustrine clays.
Surface textures - clay, heavy clay.

Hoey Association - A group of thick Black Chernozemic soils developed on medium to moderately fine textured, moderately calcareous silty glacio-lacustrine deposits.
Surface textures - loam, silt loam, clay loam, silty clay loam.

Canora Association - A group of thick Black Chernozemic soils developed on highly calcareous, silty, glacio-lacustrine deposits.
Surface textures - loam, silty loam, clay loam, silty clay loam.

Naicam Association - Consists of a group of thick Black Chernozemic soils developed on resorted glacial till which appears to be of ground morainic origin and is interspersed with some local areas of shallow lacustrine deposits.
Surface textures - loam.

Yorkton Association - A group of deep Black Chernozemic soils developed on medium textured, highly calcareous glacial till.
Surface textures - clay loam, loam.

Meadow Lake Association - A group of thick Black Chernozemic soils (possibly some solonetz-like) developed on silty glacio-lacustrine deposits.
Surface textures - clay loam, clay, silty clay loam, silty clay.

Lloydminster Association - A group of thick Black Chernozemic soils developed on modified glacial till overlying Cretaceous bedrock. (Possibly some solonetz may occur).
Surface textures - loam.

DARK GRAY SOILS

Paddockwood Association - A group of Dark Gray Chernozemic soils developed on highly calcareous modified or resorted glacial till.
Surface textures - loam and clay loam.

Weirdale Association - A group of Dark Gray Chernozemic soils developed on light colored, highly calcareous moderately fine textured glacio-lacustrine deposits.
Surface textures - loam, silty clay loam, clay, silty clay, silt loam.

Carrot River Association - A group of Dark Gray Chernozemic soils developed on calcareous sandy alluvial deposits.
Surface textures - fine sandy loam, loamy sand, very fine sandy loam.

Etomami Association - A group of Dark Gray Chernozemic soils developed on light colored, heavy textured, highly calcareous till with a pinkish coloration derived from weathered dolomitic limestone.
Surface textures - heavy clay and clay.

TRANSITION DARK GRAY AND DARK GRAY WOODED SOILS

Kamsack Association - A group of Dark Gray Chernozemic and Dark Gray Wooded soils developed on moderately fine textured, moderately to highly calcareous silty glacial deposits.
Surface textures - silt loam, loam, clay loam, silty clay loam.

Tisdale Association - A group of Dark Gray Chernozemic and Dark Gray Wooded soils developed on moderately fine to fine textured glacio-lacustrine deposits.
Surface textures - clay loam, silty clay loam, silty clay, clay and heavy clay.

Pelly Association - A group of Dark Gray Chernozemic and Dark Gray Wooded soils developed on resorted glacial till.
Surface textures - loam and clay loam.

Nipawin Association - A group of Dark Gray Chernozemic and Dark Gray Wooded soils developed on medium to moderately fine textured glacio-lacustrine deposits.
Surface textures - loam and clay loam, local areas of clay.

Kelsey Association - A group of Dark Gray Chernozemic and Dark Gray Wooded soils developed on lake modified glacial till which appears to be sorted by water and in part to be mixed with lacustrine deposits.
Surface textures - clay loam and loam.

Makwa Association - A group of Dark Gray Chernozemic and Dark Gray Wooded soils developed on highly modified glacial till which in some places is associated with glacial lake deposits.
Surface textures - loam and clay loam.

Shellbrook Association - A group of dominantly Dark Gray Chernozemic and Dark Gray Wooded soils developed on medium to moderately fine textured, slightly to moderately calcareous, sandy glacio-lacustrine.
Surface textures - fine sandy loam, very fine sandy loam, loam, sandy clay loam (greater than 15% clay).

Whitewood Association - A group of Dark Gray Chernozemic and Dark Gray Wooded soils developed on medium to moderately fine textured, moderately calcareous glacial till.
Surface textures - loam, sandy clay loam, light clay loam.

Lorenzo Association - A group of Dark Gray Chernozemic soils developed on moderately fine textured, slightly to moderately calcareous glacial till.
Surface textures - loam, sandy clay loam, clay loam.

Rocanville Association - A group of Dark Gray Chernozemic and Dark Gray Wooded soils developed on thin shale till deposits which appear to consist of glacial till composed of local shale mixed with transported glacial material.
Surface textures - loam, clay loam, sandy clay loam.

Beaver River Association - A group of Dark Gray Chernozemic and Dark Gray Wooded soils developed on silty clay glacio-lacustrine deposits.
Surface textures - loam, clay loam, clay.

Horsehead Association - A group of Dark Gray Chernozemic and Dark Gray Wooded soils developed on slightly calcareous glacial till.
Surface textures - loam and clay loam.

Glenbush Association - A group of Dark Gray Chernozemic and Dark Gray Wooded soils developed on coarse to moderately coarse textured glacio-fluvial deposits.
Surface textures - loamy sand, sandy loam (gravelly).

White Fox Association - A group of Dark Gray and Dark Gray Wooded soils developed on sandy glacio-lacustrine and glacio-fluvial deposits.
Surface textures - sandy loam, very fine sandy loam, fine sandy loam.

GRAY WOODED SOILS

Dorintosh Association - A group of Podzolic soils developed on silty glacio-lacustrine deposits.
Surface textures - loam, clay loam.

Arborfield Association - A group of Podzolic soils developed on fine textured glacio-lacustrine deposits.
Surface textures - heavy clay, clay, silty clay, silty clay loam, clay loam.

Kelvington Association - A group of Podzolic soils developed on fine textured glacio-lacustrine deposits which occur chiefly on rolling upland topography.
Surface textures - heavy clay, clay.

Garrick Association - A group of Podzolic soils developed on lake modified glacial till.
Surface textures - clay loam, loam.

Waitville Association - A group of Podzolic soils developed on medium to moderately fine textured, moderately calcareous glacial till.
Surface textures - loam, sandy clay loam, light clay loam.

Loon River Association - A group of Podzolic soils developed on slightly calcareous glacial till.
Surface textures - loam, clay loam.

Meeting Lake Association - A group of Podzolic soils developed on moderately fine textured, slightly to moderately calcareous glacial till.
Surface textures - loam, sandy clay loam, clay loam.

Duck Mountain Association - A group of Podzolic soils developed on fine textured, stony, banded clays containing bands of shale.
Surface textures - clay loam, loam, heavy clay.

La Corne Association - A group of Podzolic soils developed on moderately coarse to moderately fine textured sandy glacio-fluvial and lacustrine deposits, some of which have been reworked by wind.
Surface textures - fine sandy loam, very fine sandy loam, sandy clay loam (more than 15% clay).

Sylvania Association - A group of Podzolic soils developed on medium to moderately fine textured sandy glacio-lacustrine deposits.
Surface textures - fine sandy loam, very fine sandy loam (less than 15% clay).

Smeaton Association - A group of Podzolic soils developed on coarse to medium textured glacio-fluvial deposits sometimes mixed with heavy lake modified glacial till.
Surface textures - loam, light loam, fine sandy loam, sandy loam.

Bodmin Association - A group of Podzolic soils developed on coarse sandy and gravelly glacio-fluvial deposits.
Surface textures - gravelly loam, sandy loam, loamy sand, gritty loam.

Pine Association - A group of Podzolic soils developed on coarse glacio-fluvial and lacustrine sands some of which have been reworked by the wind.
Surface textures - loamy sand, and sand (usually fine sand).

AZONAL SOILS

Wascana Association - A group of Chernozemic and Regosolic soils together with their salinized and gleyed phases developed on medium to moderately fine textured stratified alluvial deposits.
Surface textures - clay loam, loam, clay.

Saline - A mapping complex of gleyed, saline regosols developed on variable deposits associated with local intermittently flooded areas.

Rouleau Association - A group of Gleysolic soils developed on fine textured, occasionally saline alluvial deposits.
Surface textures - heavy clay and clay.

Runway - A mapping complex of soils developed on variable deposits of glacial meltwater channels.

Hillwash - A mapping complex of Regosolic and weakly developed Chernozemic and Podzolic soils developed on variable deposits of valley slopes and eroding escarpments.

Exposure - A mapping complex of variable textured Regosolic soils and bedrock exposures.

Dune Sand Association - A group of Regosolic soils developed on coarse textured aeolian or wind worked deposits.
Surface textures - sand, loamy sand.

Dissected Plateau - A complex of Chernozemic, Podzolic, and Regosolic soils developed on Tertiary and Cretaceous deposits associated with the Cypress Hills and Wood Mountain Uplands.

Caron Association - A group of Regosolic soils developed on coarse textured stratified alluvial deposits.
Surface textures - loamy sand, sandy loam.

Big Muddy Association - A group of Gleysolic soils developed on fine textured, saline alluvial deposits.
Surface textures - clay, heavy clay.

Alluvium - A group of soils developed on undifferentiated alluvial deposits.
Surface textures - variable and mixed.

Eroded - A group of eroded or truncated profiles occurring on steep valley slopes, escarpments, and rough broken uplands.

APPENDIX B

GUIDING CRITERIA FOR THE SOIL CAPABILITY SUBCLASSES AT THE DIFFERENT CLASS LEVELS

The guiding criteria for determination of the soil capability subclasses used in Saskatchewan are given as follows. Some of these criteria are specific within defined limits, others are subjective in various degrees and must be used as general guides and with cautious judgement.

It should be understood that research data, recorded observation and experience are used as the basis for placing soils in their classes and subclasses. In areas where information is lacking, soils are placed in their classes and subclasses by interpretation of soil characteristics in accord with experience gained or observed on similar soils elsewhere. Capability groupings are also subject to change as new information about the behavior and responses of the soils becomes available.

CLASS 1 SOILS - No significant limitations.

Climatic Limitations (c.f. Figure 1)

1Cm - This subregion has no serious moisture deficiency due to external climate as characterized by a combination of the following criteria:

- Annual precipitation, usually more than 15 inches, with more than 9 inches of precipitation from May to September.
- A potential evapotranspiration of less than 21 inches.
- Less than 7 inches of water deficiency in the top 4 feet.

Only limited use of summerfallow is required for moisture storage.

1Cs - No serious heat deficiency for crop growth and infrequent risk of damaging frost occurs within this subregion as characterized by a combination of the following criteria:

- Frost-free period usually exceeding 90 days with temperature above 32° F.
- Length of growing season usually in excess of 159 days and with mean temperature above 42° F.
- More than 2200 day degress above 42° F.

CLASS 2 SOILS - are characterized by at least one of the following subclass limitations.

Climatic Limitations (c.f. Figure 1)

2Cm - Soils within this subregion have a moderate moisture deficiency due to the external climate which is characterized by a combination of the following criteria:

- Annual precipitation, usually less than 15 inches, and usually less than 8-10 inches precipitation from May to September.
- A potential evapotranspiration of greater than 22 inches.
- A water deficiency of 6½ to 10 inches in the top 4 feet.

The soil areas considered to have a 2Cm limitation include all of the Dark Brown and most of the Brown soil zone (c.f. Figure 2).

2Cs - This subregion has heat deficiency as characterized by a combination of the following criteria:

- Frost-free period of 75-90 days (with temperature above 32° F.)
- Length of growing season usually less than 169 days with a mean temperature above 42° F.
- A range of 1900-2200 day degrees above 42° F.

Risk of frost damage should be considered in selecting varieties expected to reach maturity without a significant decrease in quality or grade.

Soil Limitations

2m - Moderate moisture limitations due to droughtiness and deficiencies in soil moisture-holding capacity as expressed in a combination of textural characteristics of the soil to 4 feet and organic characteristics of the surface horizon. The textural types considered to exhibit Class 2 moisture limitations within the different soil zones of Saskatchewan are suggested as follows:

- Black soil zone - VL, SCL, L, SiL.
- Dark Gray and Dark Gray Wooded soil zone - L, VL, LL, SCL.

2d - Moderate limitations in structure and permeability resulting in minor tillage difficulties and/or in moderate handicap to germination, emergence and plant growth. Soils with such limitations may include those with hard cloddy surface structures or those with unstable surface structures which are susceptible to puddling on wetting and crusting on drying. When dry, the surface horizon of these soils lacks porosity and granulation, and consequently crush to a structureless condition. Subsoils may have slow permeability and may be relatively hard when dry. Soils characterized by these limitations include:

- Eluviated Chernozem soils (Solodic type).
- Moderately degraded Black (Dark Gray Wooded).
- Weakly to moderately developed Solonetz resulting in minor cultural problems associated with the structure of the B horizon.

Landscape Limitations

2t - Include moderate limitations in topography which result in an increase in profile complexity, variability in moisture distribution due to run-off and irregularity of field pattern as compared to Class 1. Examples of such topography include:

- Moderately sloping topography of simple slopes ranging from 6-9%.
- Gently sloping topography ranging from 2-5% slopes on complex landform patterns.

2w - Moderate limitations due to wetness resulting from early spring ponding which may occur in low or depressional areas. Such limitations may result in temporary nutrient deficiencies particularly in wet and cool springs, and in delay in maturity and ripening of grain crops.

2i - Moderate limitations due to occasional flooding where the damaging overflow usually occurs in less than 2 in 10 years.

2p - Moderate limitations due to stones which cause some interference with cultivation. Some removal of stones may be necessary or desirable.

2e - Moderate susceptibility to erosion or moderate damage from the erosion of cultivated soils.

2r - Moderate limitations to root growth where the depth to bedrock is less than 4 feet.

CLASS 3 SOILS - are characterized by at least one of the following subclass limitations.

Climatic Limitations (c.f. Figure 2)

3Cm - Soils within the subregion have a moderately severe moisture deficiency due to external climate which is characterized by a combination of the following criteria:

- Annual precipitation, usually less than 13 inches, and with less than 8½ inches precipitation from May to September.
- A potential evapotranspiration of over 22-24 inches.
- A water deficiency in the top 4 feet of 9-11 inches.

These moisture limitations restrict cropping to soils with

above-average moisture storage capacity. This subregion is generally confined to the more arid portions of the Brown soil zone.

3Cs - This subregion has a severe heat deficiency which is characterized by the following criteria:

- Frost-free period ranging from 60 to 75 days with temperatures above 32° F.
- Length of growing season usually less than 159 days with a mean temperature above 42° F.
- A range of 1750 to 1900 day degrees above 42° F.

Frequent risk of frost restricts the choice of crop varieties which can be grown to maturity. Very little of the present agricultural area is considered to have this severity of seasonal climate but local areas may occur in the Thickwood Hills. The majority of the Northern Provincial Forest area beyond the limits of general settlement is characterized by the outlined criteria which have generally retarded agricultural development except for that found in localized areas adjacent to larger lakes where less severe climatic conditions occur.

Soil Limitations

3m - Moderately severe moisture limitations due to drought and deficiencies in soil moisture-holding capacity as expressed in a combination of textural characteristics of the soil to 4 feet and the organic characteristics of the surface horizon. The textural types considered to have a Class 3 moisture limitation within the various soil zones are outlined below:

- Brown soil zone - CL, SiCL, C, SiC.
- Dark Brown soil zone - VL, SCL, L, SiL, CL, SiCL.
- Black soil zone - FL, SL, GL.
- Dark Gray and Dark Gray Wooded soil zone - FL, SL, GL.
- Gray Wooded soil zone - VL, LL, FL.

3d - Moderately severe limitations due to soil structure or very slow permeability. These limitations include those described for Class 2d, except they are developed to a stronger degree and consequently necessitate the use of correct and timely cultural operations. Soils exhibiting these limitations include:

- Strongly developed massive and/or loose top grumic type of profiles. Such soils require timely tillage operations in order to prepare a good seed bed. On drying, these soils shrink and consequently cause cultural difficulties due to wide cracks being formed.
- Solod soils with platy Ae horizons result in lack of porosity, puddling, and crusting when cultivated. Deep Solonetz soils with B horizons occurring below the depth of cultivation exhibit similar characteristics.

- Cultivated Gray Wooded profiles which lack a well developed granular structure within the A horizon. When wet, the surface clods of these soils become unstable and puddle; when dry, the soil bakes and forms a surface crust which presents a moderately severe limitation in germination, seedling emergence and tillering. Gray Wooded soils are subject to temporary poor drainage (pseudo gleying) above the textural B horizon which is frequently characterized by slow permeability.

3f - Moderately severe deficiencies in fertility status and/or soils moderately responsive to fertilizer and amendments but may exhibit nutrient unbalance. Such soils include:

- Chernozemic soils with strong concentration of lime carbonate occurring at less than 6 inches.
- Shallow eroded knolls on calcareous parent materials.

3n - Moderately severe limitation due to salinity. Crops may be moderately affected by the presence of salts which are usually visible in both surface and subsurface horizons. Salt concentrations as measured by electrical conductivity usually have a range of 4-8 mmhos/cm in the subsurface 2-4 foot depth.

Landscape Limitations

3t - Moderately severe limitations due to topography which results in an irregularity of field pattern, a complexity of profile distribution as well as a moderately severe variability in moisture distribution due to run-off. Examples of such topography include:

- Some strongly sloping topography (10-15%) of simple pattern. 5d
- Moderately sloping topography (6-9% slopes) of complex landform patterns. 4a

3w - Moderately severe limitation due to wetness. These soils are imperfectly drained resulting in delayed spring seeding and late maturity of crops. Such conditions frequently limit the choice of crops. Wetness or continued waterlogging may occur after surface drainage.

3i - Moderately severe limitations due to frequent flooding caused by overflow which causes crop damage in more than 2 in 10 years.

3p - Moderately severe difficulties due to stones which cause some interference with cultivation. Removal is necessary for improvement in tillage practices and crop production.

3e - Highly susceptible to erosion with adverse effects of past erosion. Extensive care must be taken in utilizing good tillage and agronomic practices on such soils. Consideration should be given to improvement of the structure and organic matter content of the cultivated horizon. Corrective methods of tillage operation and change in field pattern (10) are

frequently recommended where such limitations occur. Examples of such moderately severe limitations include:

- Areas where the soil has usually been eroded by wind or sheet erosion to the extent that the original A horizon has been partially removed and much of the former subsoil material has been incorporated into the cultivated horizon.
- Soil areas where water erosion has resulted in occasional shallow gullies (over 100 feet apart) which may be crossed with farm implements.

3r - Moderately severe limitation where the rooting zone is restricted by bedrock occurring at less than 3 feet.

CLASS 4 SOILS - are characterized by at least one of the following severe subclass limitations.

Soil Limitations

4m - Severe moisture limitation due to droughtiness and deficiencies in soil moisture-holding capacity as expressed in a combination of the textural characteristics of the soil to 4 feet and the organic characteristics of the surface horizon. The textural types required for Class 4 soils within the various soil zones are outlined below:

- Brown soil zone - FL, VL, SCL, L, SiL.
- Dark Brown soil zone - SL, FL, GL.
- Black soil zone - GSL, LS.
- Dark Gray and Dark Gray Wooded soil zone - LS.

Note: SiCL soils are considered to have severe moisture limitations in the more arid sections of the Brown soil zone (climatic sub-region 3Cm).

4d - Severe limitations due to structure and/or permeability resulting in major difficulties in tillage and/or hazards of waterlogging. Such soils include:

- Shallow Solonetz soils with the B horizon occurring within the depth of cultivation. These soils present serious tillage difficulties and create unfavorable conditions for plant growth because of restricted root penetration.
- Low Humic Eluviated Gleysol profiles with less than 12 inches of peat and with massive B horizons of low permeability.

4f - Low fertility status which is not easily corrected. Soils characterized by these limitations include:

- Orthic Regosols on sand, loamy sand and gravelly parent materials. These soils have either naturally, or due to erosion, no significant Ah horizon. When cultivated, it is desirable to build up the organic matter content of such soils.

- Podzol soils with little organic matter and with acidic surface horizons overlying acidic subsoils with low base status.

4n - Severe limitations due to salinity which seriously affects the crop in some years. Subsoils have salt accumulations at the surface which are easily distinguishable. Salt concentrations as measured by electrical conductivity have a range of 8-12 mmhos/cm in the surface 2 feet and up to 12 mmhos/cm in the 2-4 foot depth.

Landscape Limitations

4t - Severe topographic limitations resulting in a complexity of soil profile distribution and a severe variability in moisture distribution due to run-off. Such topography causes some difficulty in the safe and satisfactory use of farm implements. Significantly more power is required to pull farm implements on such topography.

- Severe limitations occur on strongly sloping topography (10-15% slopes) of complex landform pattern. 5a

4w - Severe limitation due to wetness which results in imperfectly to poorly drained soils coupled with continued waterlogging after drainage. The production of annual crops is usually restricted by late seeding and is therefore limited to early maturing, moisture tolerant crops.

4i - Severe crop damage due to frequent flooding caused by overflow, which occurs in more than 2 in 10 years, causing a serious hazard throughout the growing season. In some instances, such limitations may result in a number of years without crop.

4p - Severe difficulties due to stones which constitute a serious handicap to cultivation until some removal is done.

4e - Severe limitations due to high susceptibility to erosion coupled with adverse effects of past erosion. Such limitations occur where:

- The soil has been eroded to the extent that the original A horizon has been removed, and the surface cultivated layer is mostly composed of subsoil materials.
- Water erosion has resulted in frequent shallow gullies (less than 100 feet apart) which may be crossed by farm implements with difficulties.

4r - Severe limitation due to restriction of the rooting zone by bedrock occurring at less than 2 feet.

CLASS 5 SOILS - are characterized by at least one of the following very severe subclass limitations which restrict the successful production of crops on an annual basis.

Soil Limitations

5m - Very severe moisture limitations due to a combination of droughtiness and deficiencies in soil moisture-holding capacity of the soil to 4 feet such that the soils are considered unsuitable for the continued production of annual crops. The textural types considered to exhibit Class 5 moisture limitations within the different soil zones of Saskatchewan are outlined below:

- Brown soil zone - SL, GL.
- Dark Brown soil zone - LS.

Note: Soils with a FL texture are considered to have very severe moisture limitations (5m) in the more arid regions of the Brown soil zone (climatic zone 3Cm).

5d - Very severe limitations in structure and/or permeability which create conditions that are unfavorable for root penetration and growth of annual field crops. Soils exhibiting these limitations include:

- Solodized Solonetz soils with significant occurrence of eroded pits.
- Poorly drained Solodized Solonetz soils.

5f - Very severe deficiencies in fertility status which are not easily corrected. These soils include:

- Soils of the Pine Sand Association.

5n - Very severe limitations due to salinity which prevents the satisfactory growth on non-saline tolerant crops but permits the successful growth of recommended saline tolerant forage crops or saline tolerant native grasses (11). Salt accumulations are visually evident on the surface and throughout the profile, and the saline areas persist throughout the summer. The electrical conductivity of these soils range from 8-12 mmhos/cm in the upper 2 feet and is usually greater than 12 mmhos/cm within the 2-4 foot depth.

Landscape Limitations

5t - Very severe topographic limitations resulting in a complexity of soil profile pattern and a severe variability in moisture distribution due to run-off. Landforms with these limitations should have more than 20 percent of the surface area capable of permanent improvement by seeding to tame grasses and legumes in order to be retained in Class 5. Areas of Class 5 pasture should have access to adequate stock watering facilities and should not have steep escarpments which prevent the free movement of livestock.

- Very severe limitations occur on steeply sloping topography (16-30% slopes) of simple or complex landform pattern.

5w - Very severe limitations due to wetness resulting in soil areas unsuited to the continued production of annual crops but capable of improvement and use as tame or native pasture (11). Improvement may include some artificial drainage by ditching or pumping where considered feasible by the farmer.

Note: It was not possible, from the information available, to make a detailed classification of each wet area in landforms characterized by numerous sloughs of various sizes and depths. These areas were therefore placed into Class 5 or 6 based on the assessed grazing value within the different soil zones (Appendix C).

5i - Very severe limitation due to very frequent flooding caused by overflow but with effective grazing period longer than 10 weeks.

5p - Very severe limitations due to exceedingly stony land which cannot be cultivated unless considerable clearing is done.

5e - Very severe potential erosion, or past erosion which has resulted in the destruction of the soil profile. Such land is not suitable for annual cropping in its present condition, but may be improved by the establishment of permanent pastures. Such limitations occur where:

- Water erosion has resulted in an intricate pattern of moderately deep or deep gullies which prevent effective cultivation on an annual basis.
- Wind erosion has resulted in an unstable surface cultivated horizon which would deteriorate further under annual cropping.

5r - Very severe limitations due to restriction of the rooting zone by bedrock occurring at less than 12 inches.

CLASS 6 SOILS - are characterized by at least one or more of the following subclass limitations which are considered severe enough to prevent their permanent improvement by farming practices.

Soil Limitations

6m - Very serious moisture limitation due to a combination of droughtiness and deficiencies in soil moisture-holding capacity of the soil to 4 feet.

6d - Very serious limitations in structure and/or permeability where the physical nature of the soil prevents their improvement by the use of farm machinery. Such limitations are exhibited in areas where there is a dominance of Solonetz profiles with B horizons at less than 2 inches.

6f - Very serious fertility status which is not easily corrected.

6n - Very serious limitation due to salinity which prevents the use of forage crops and permits only the growing of salt tolerant

native grasses. If poisonous plants are present, the soils are placed in Class 7.

Landscape Limitations

6t - Very serious limitation due to topography with less than 20 percent of a mapping area being capable of improvement by seeding to tame grasses and legumes. Landforms with this limitation are extremely susceptible to erosion on cultivation and present very serious hazards to the operation of farm equipment. Examples of such topography include:

- Very steeply and sloping dissected topography and topography of complex landform pattern with slopes ranging from 30-60%.

6w - Very serious limitation due to wetness or very poor drainage resulting in sloughs, meadows and aspen grove meadow complexes with semi-permanent wet or frozen conditions occurring annually for periods in excess of 8 months.

6i - Very serious limitations due to very frequent flooding which reduces the effective grazing period to 5-10 weeks.

6p - Very serious limitations due to excessively stony land which is too stony to permit any cultivation.

6e - Very serious limitations due to erosion which has removed most of the soil profile. The susceptibility to wind erosion is so great that any disturbance of the surface horizon is not recommended. Blowout holes are abundant and the areas between blowouts are deeply buried by soil materials from the blowout. These limitations are exemplified by:

- Areas mapped as Dune Sand or Undifferentiated Sand.
- Areas where gullying prevents the use of farm implements.

6r - Very serious limitation due to restriction of the rooting zone by bedrock at less than 6 inches.

APPENDIX C

RELATIONSHIP OF ASSESSMENT SYMBOLOGY AND CONDEMNATION FACTORS (POINT DEDUCTIONS) TO SOIL CAPABILITY CLASSES AND SUBCLASS LIMITATIONS (2ND APPROXIMATION JAN., 1964)

T. Topographic Deductions

T1 Slope and Class maximum deductions - 0-22 points or N or Nx non-arable. See Assessment Manual for letter combinations of slope classes A to N which carry variable point deductions.

Combinations with
- 1 - 4 points - no reduction of Class
- 5 - 9 points - reduce Class 1 to Class 2
- 10 - 12 points - reduce Class 1 or 2 to Class 3
- 13 - 19 points - reduce Class 1, 2 or 3 to Class 4
- 20 points or over, and Class N or Nx - reduce to Class 5 or 6 depending on pasture value

T2 Complexity of Pattern. A further topographic deduction is allowed for hazards to arability and cropping or for irregularity of cultivation.

(Er) 3-50 points - cultivated lands cut up by eroded lands.
(WS-WSB) 1-20 points - numerous small waste sloughs and bush sloughs hindering cultivation.
(CK) and (Rv) 1-10 points - creek or ravine. Hindering farming pattern.
DW - shallow cultivated draw 1-5 points.

T1 Deductions may be used separately for reducing Class.
Combined T1 and T2 deductions are used accumulatively.
To avoid double deductions 4 points are subtracted from the combined point total before use.
e.g. accumulative topographic deduction (T1 + T2 - 4)

- 1 - 8 points - no reduction of Classes 1 or 2
- 9 - 15 points - reduce Class 1 to Class 2
- 16 - 25 points - reduce Class 1 or Class 2 to Class 3
- 25 points - reduce Class 1, 2 or 3 to Class 4

The following land classes will reduce designated areas to Class 5 or 6 based on assessed pasture values.
Class 5 - $2.00/acre or over.
Class 6 - less than $2.00 an acre.

w Wetness Deficiency Deductions and i Overflow Deductions

w1 Internal Soil Drainage. Pd and Pt (local peat) discount 2 points for every 5% of area affected.

- 0 - 4 points - no reduction in Class
- 5 - 9 points - reduce Class 1 to Class 2

10 - 19 points - reduce Class 1 or Class 2 to Class 3

20 points or over - reduce Class 3 to Class 4

(Pd)x - reduce all Classes to 5 or 6

w2 Local ponding or high water table within local areas.
A/D - slight depressional area (good structured soils) deductions 5-20 points

A/Dx - depressional (poor structured soils) deductions 10-55 points.

A/Dx - non-arable and a number of land classes.

0 - 4 points - no reduction of Class

5 - 9 points - reduce Class 1 to Class 2 soils

10 - 19 points - reduce Class 1 and Class 2 to Class 3

20 points or over - reduce all Classes to Class 4 soils

A/Dx - WS waste slough, (WS)x numerous waste sloughs.
WSK cultivated waste slough, WSB waste slough with scrub or bush, (WSB)x numerous bush sloughs, WSH hay sloughs, Mb meadow-bog. Class as 5 or 6 depending on pasture value.
In Brown and Dark Brown Zones, Class 5 - $2.50 an acre or over, Class 6 - less than $2.50 an acre.
In Black, Dark Gray, and Gray Zones, Class 5 - over $1.50 an acre, Class 6 - $1.50 an acre or less.

P. Stone Depreciation

S - stones, discount 1-18 points.
S - boulders, S(-) small stones, Sx.S(x) non-arable.

1 - 6 points - no reduction in Class

7 - 9 points - reduce Class 1 to Class 2

10 - 12 points - reduce Class 1 or Class 2 to Class 3

13 - 18 points - reduce Class 1 and 2 to Class 3 and Class 3 to Class 4

Sx and S(x) - reduce to Class 5 or 6 depending on grazing value

E. Erosion Depreciation

E1 Wind Erosion. W. Removal and accumulation. R. Removal.
T. Accumulation deductions 1-15 points
Wx. Rx. Tx. non-arable.

E2 Water Erosion. E. Sheet and gully deductions 1-15 points.
Ex. Non-arable.

1 - 4 points - no reduction in Class 1 or Class 2

5 - 7 points - reduce Class 1 or Class 2 to Class 3

8 - 11 points - reduce Class 1, 2 or 3 to Class 4

12 points or over - reduce all Classes to Class 5

Wx. Rx. Ex. Tx. - Class 5 or 6 depending on pasture value.

Accumulative Deductions

If a considerable total of deductions are indicated but with no single criteria critical, the following method is used to avoid double deductions. The accumulative deductions are discounted by 4 points. i.e. accumulative deductions (all deductions -4).

1 - 8 points	- no reduction in Class 1 or Class 2
9 - 15 points	- reduce Class 1 to Class 2
16 - 25 points	- reduce Class 1 or Class 2 to Class 3
25 points or over	- reduce to Class 4

Code to the largest depreciation factor - S. (m, d, f, n) and t.w. etc.

n Salinity Deductions

(Alk) Used to indicate local alkali in soil. . Maximum deductions, 3-55 points or (Alk)x = non-arable.

1 - 5 points	- no reduction
6 - 9 points	- reduce Class 1 to Class 2 soils
10 - 16 points	- reduce Class 1 and 2 soils to Class 3
16 - 29 points	- reduce all Classes to Class 4
30 - 55 points	- reduce all soils to Class 5
(Alk)x	- reduce to Class 5 or Class 6 depending on pasture value

f Nutrient Deficiencies or Nutrient Unbalance

Shallow phase (Sp) deductions Used for abnormally shallow soils for Association.
Maximum deductions 1-25 points

0 - 9 points	- no reduction in Class 1 or 2 soils
10 - 25 points	- reduce Class 1, 2 or 3 soils by one grade
	- no reduction in Class 4 soils

High lime (Ca) deduction Used for excess lime carbonate in surface soil, considered detrimental to crop production.
Maximum deduction 1-55 points.

0 - 4 points	- no reduction in Class 1 or 2 soils
5 - 9 points	- reduce Class 1 to Class 2 soils
10 - 29 points	- reduce Class 2 to Class 3 soils
30 points or over	- reduce to Class 4 soils

Eroded soils (Er) Used on cultivated areas affected by eroded soils. Deductions applied under topographic subclass T2.

d Physical or Structural Deficiencies

Solonetz (Sol) Used where solonetzic members occur in Chernozemic Associations, or for increased Solodization.
Maximum 25 points.

1 - 9 points	-	no reduction in Class 1 or 2 soils
10 - 25 points	-	reduce Class 1 or 2 soils by one Class
	-	no reduction of Class 3 soils

Burnout BO (BO)x deductions Based on % of burnout, eroded pits.
Maximum deduction 30 points or BOx non-arable.

1 - 3 points	-	no reduction in Class 3 soils
4 - 19 points	-	reduce Class 3 to Class 4 soils
20 - 30 points	-	reduce all Classes to 5 or 6

Loose-top (Lt) deductions Used mainly for heavy clay grumic soils.
Sceptre and Regina maximum deductions 3-50 points.

3 - 9 points	-	no reduction in Class 2 soils
10 points or over	-	reduce to Class 3 soils

Podzolic deduction (Pod) Used for increasing degradation of Eluviated Dark Gray and Dark Gray Wooded Soils.
Maximum deductions 1-12 points.

1 - 4 points	-	no reduction in Class 1 or 2 soils
5 - 12 points	-	reduce Class 1 or 2 soils by one Class

Gleization deduction (O) Based on % of Eluviated Gleysols*, bluff or slough podzols in unit area.
Maximum deductions 1-20 points.

1 - 4 points	-	no reduction in Class 1 or 2 soils
5 - 9 points	-	reduce Class 1 to Class 2 soils
10 - 20 points	-	reduce Class 1 or 2 soils to Class 3

* This factor is coded as a physical deficiency of profile under wet conditions for convenience.

s Factors of Soil Deficiencies (m, d, f, n)

Soil Moisture Deficiencies. In addition to the classification based on texture, an additional reduction may be applied for Sand (Sd) or Gravel (G), occurring locally in the solum, lowering the initial textural rating. These are used mainly for sandy and outwash soils.

Sand deductions (Sd) maximum 10 points. Sdx or DS Dune Sand.

1 - 2 points - no reduction in Class 1, 2 or 3 soils

3 - 4 points - reduce Class 1, 2 or 3 by one Class

5 - 9 points - reduce all soils to Class 4

Sdx or DS non-arable - reduce to Class 5

Gravel deductions (g) maximum 10 points or Gx.

1 - 3 points - no reduction in Class 1 or 2 soils

4 - 6 points - reduce Class 1 or 2 soils to Class 3

7 - 10 points - reduce all Class 1, 2 or 3 glacial till soils to Class 4

7 - 10 points - reduce all outwash gravelly soils to Class 5

Gx - reduce all soils to Class 5 or 6