

Understanding The Manitoba Soil Survey: Part I - Reconnaissance Maps and Reports

Soils and Geology

January 2021

REPORT OF
RECONNAISSANCE SOIL SURVEY
OF
GRANDVIEW MAP SHEET AREA

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With a Soil Map covering Townships 23
to 33 in Ranges 19 to 23 and Townships
23 to 30 in Ranges 24 to 29 (inclusive) west
of the Principal Meridian, prepared by the
Manitoba Soil Survey.

MANITOBA SOIL SURVEY
CANADA DEPARTMENT OF AGRICULTURE,
MANITOBA DEPARTMENT OF AGRICULTURE AND CONSERVATION,
DEPARTMENT OF SOILS, THE UNIVERSITY OF MANITOBA

*Report published by the Manitoba Department of Agriculture and Conservation.
Map published by Canada Department of Agriculture.*

Here is the Manitoba Soil Survey Report for the Grandview Mapsheet area, from the Canadian Soil Information Service website:

<https://sis.agr.gc.ca/cansis/publications/surveys/mb/index.html>

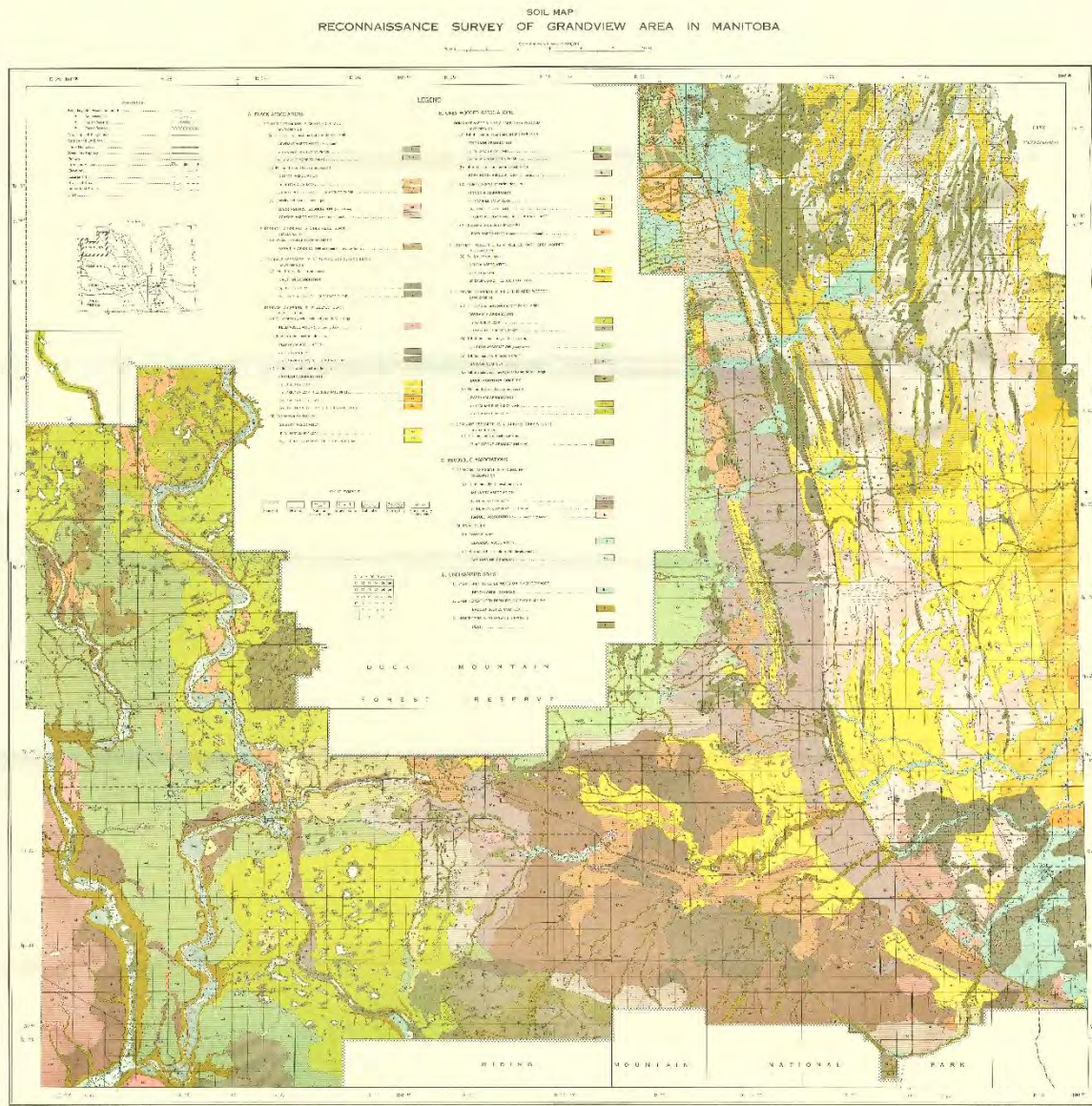
We are lucky that we now have electronic access to scanned physical documents of the Soil Survey.

There are two levels of Manitoba Soil Survey:

Reconnaissance is more general, has covered more area of the province, and is primarily composed of soil groups called Associations. They are issued at 1:100,000, 1:125,000 or 1:126,720 scale.

Detailed is an expansion or supplementation of the Reconnaissance, using more intensive field surveys; it results in more subdivision of soil groups (e.g. Associations divided into Series). It overwrites the Reconnaissance level where available. It is a lot of work to make a Detailed Survey, so their distribution is limited and they can be small in area. They are issued at 1:20,000, 1:40,000, or 1:50,000 scale.

This study guide focusses on the Reconnaissance level.

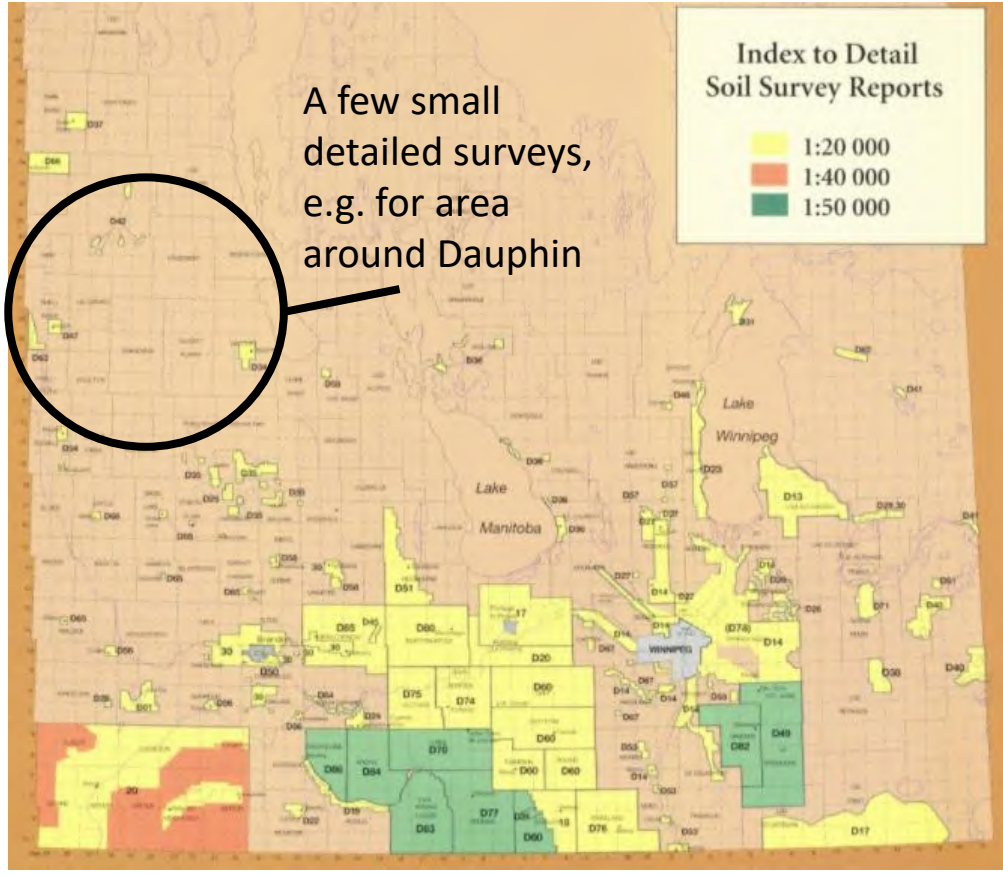


And this is the map of the Manitoba Soil Survey for the Grandview Area, from the Canadian Soil Information Service website: <https://sis.agr.gc.ca/cansis/publications/surveys/mb/index.html>

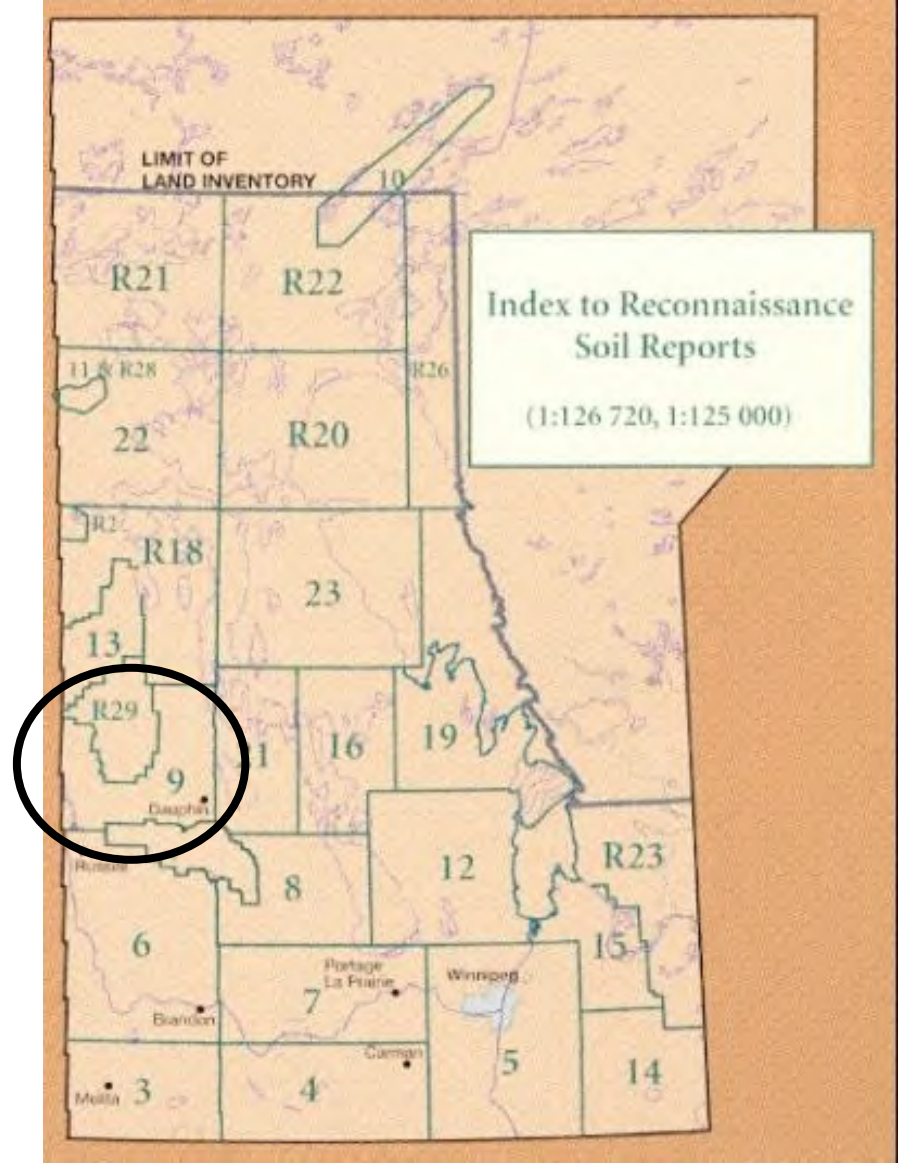
Drawn and Published by Soil Research Institute, Research Branch, Canada Department of Agriculture, Ottawa 1959, from Base map compiled by Manitoba Soil Survey, Winnipeg Manitoba.

These indexes at <https://sis.agr.gc.ca/cansis/publications/surveys/mb/index.html> help you find the right Report number. There are separate sections on the website for Detailed versus Reconnaissance. Other Soil/Biophysical Surveys are available on this page but we haven't examined them in Envirothon.

Detailed:



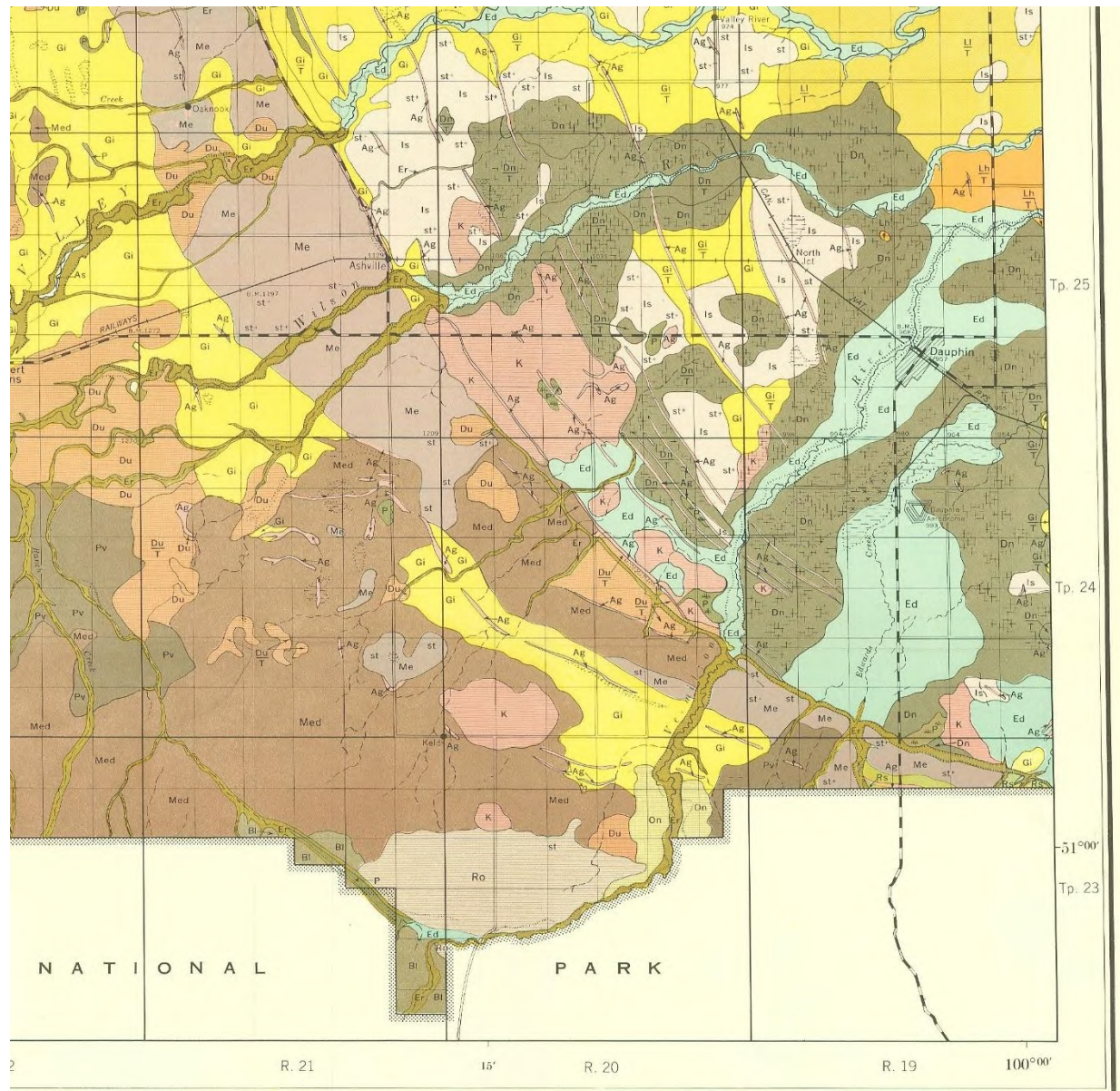
Reconnaissance:



This is the lower right hand portion of the Soil Survey Map for Grandview Map Sheet. There are two systems of location on this map:

1) Latitude and Longitude:
Near the bottom right corner is 51°N of latitude and 100°W of longitude. There are 60 minutes in a degree, so just past the top of the page on the right hand side would be 15' past 51° or $\text{W}51^{\circ} 15'$, and along the bottom is 15' past 100° , or $\text{N}100^{\circ} 15'$. The area of Dauphin is located at approximately $\text{N}51^{\circ} 09'$, $\text{W}100^{\circ} 03'$. In Canada, the numbers always get higher the further north or west you go.

2) The Dominion Land Survey System (or Legal Land Location/Description) is complicated and described on the next 2 pages. It is indicated by the grid, the R numbers on the bottom of the map and Tp numbers on the right margin of the map.



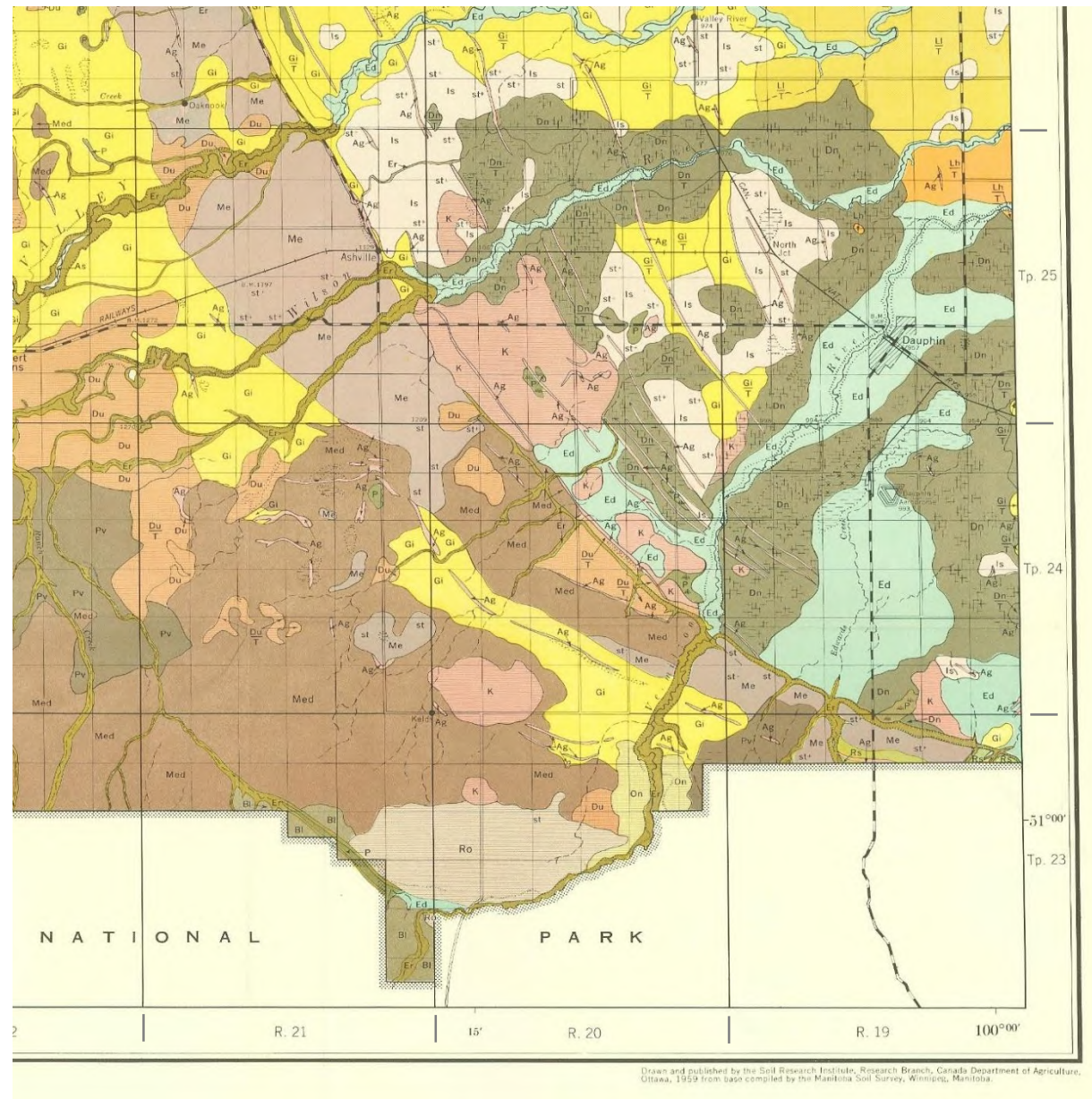
Drawn and published by the Soil Research Institute, Research Branch, Canada Department of Agriculture, Ottawa, 1959 from base compiled by the Manitoba Soil Survey, Winnipeg, Manitoba.

Dauphin is at 10-25-19 W1, (section 10, township 25, range 19, west of the principle meridian). It is easiest to understand if we describe these parts from last to first:

The last number (W1) is the closest reference meridian. In Manitoba it is the Principle Meridian that runs vertically through a spot just west of Headingly (there is a monument on Highway 1). Anything to the west of it, before you reach Saskatchewan, is W1. Anything east of the Principle Meridian but before Ontario is E1. In eastern Saskatchewan, you are west of the Second Meridian, or W2.

The 2nd and 3rd numbers (25-19) are township and range and together they refer to a 6 x 6 grid. Read the first number of this pair from the side of the map, and the second of this pair from the bottom or top of the map.

The first number is the section, and smallest square shown on this map. How to locate it is explained on the next page.



31	32	33	34	35	36
30	29	28	27	26	25
19	20	21	22	23	24
18	17	16	15	14	13
7	8	9	10	11	12
6	5	4	3	2	1

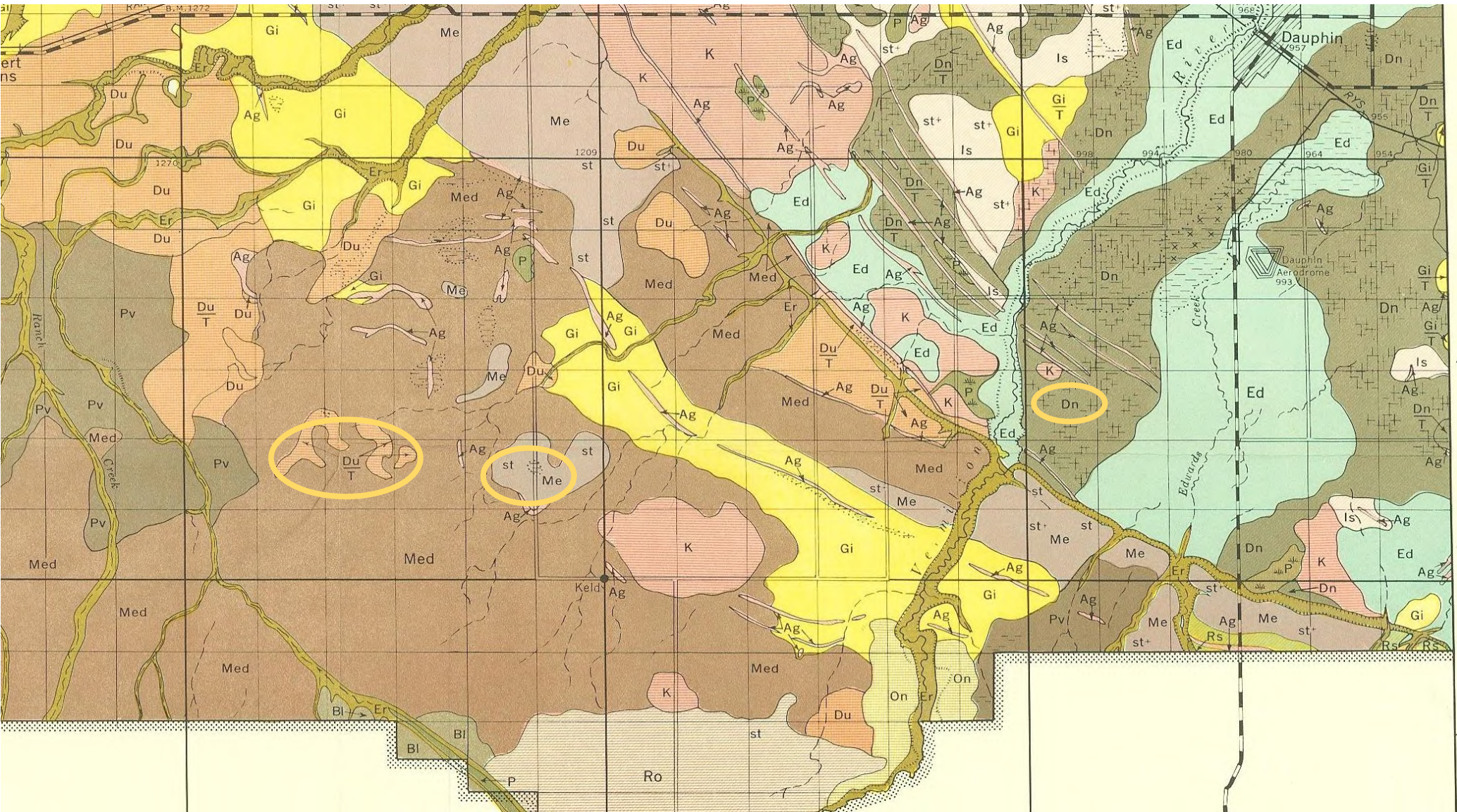
There are 36 numbers in this grid, called a Township, and they are ordered in a snake pattern from the bottom right, then to the left, up one, and right, and so on until the last one in the top right.

Townships have 36 sections of 1 mile x 1 mile each, so they are 36 square miles in size (or 92.2 square kilometers)!

For Practice, using the map on the previous page:

- What do you find in the northeast corner of 36-23-21 W1?
- Where is Ashville?

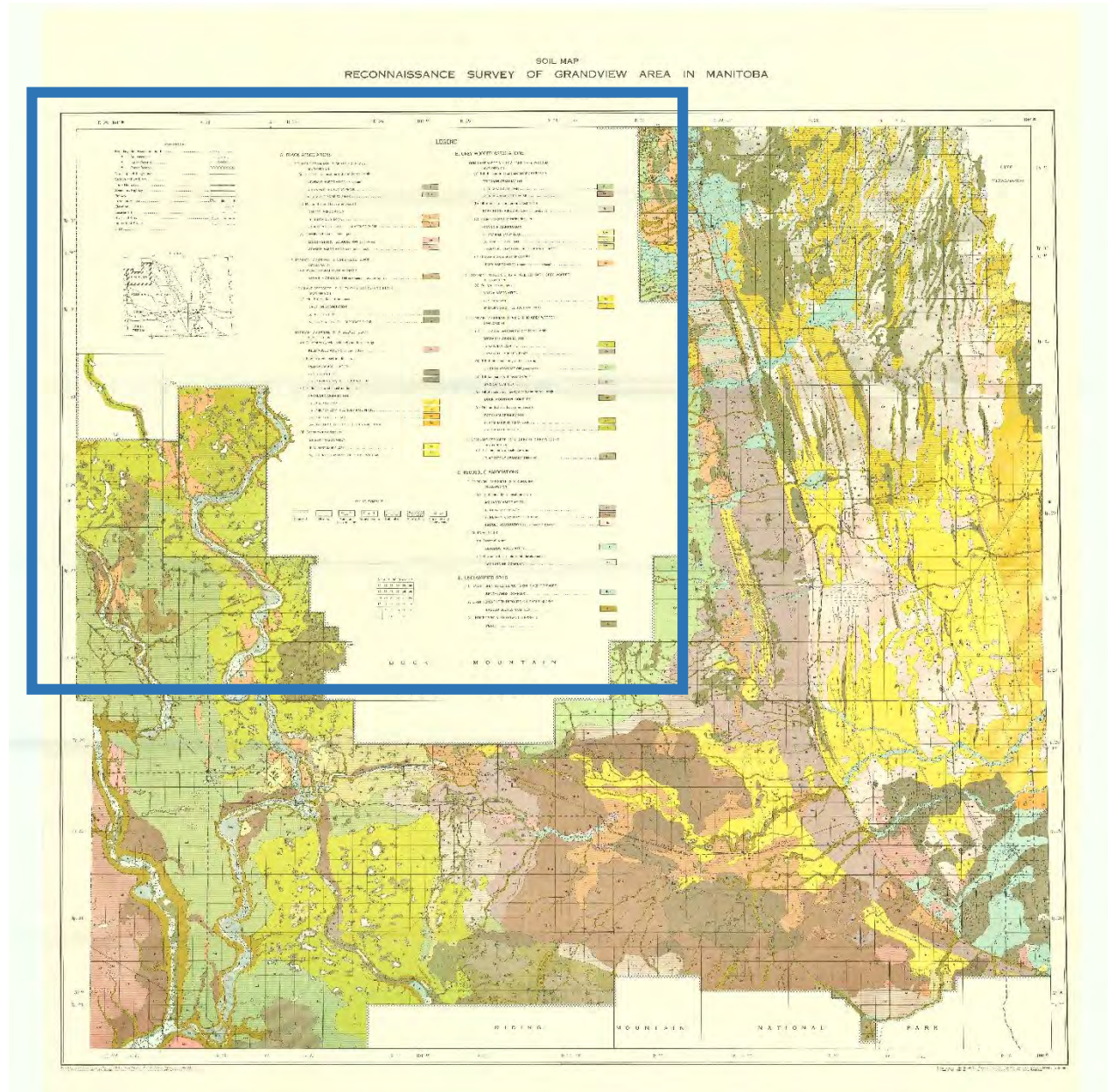
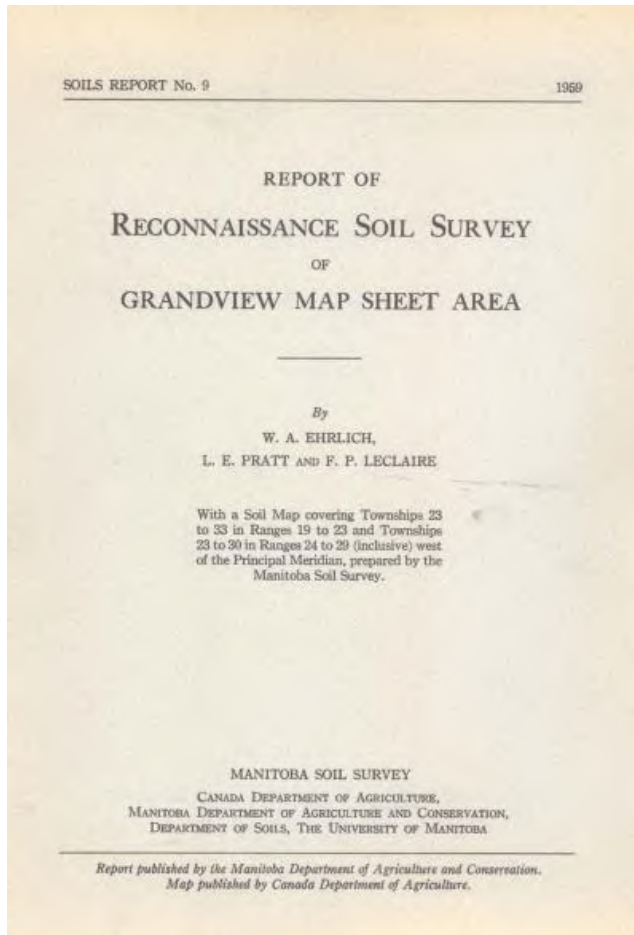
a) Keld b) 23-25-21 W1 (it is actually between sections 23 and 24 of 25-21 W1)



Now what do the numbers and letters INSIDE the map mean? Let's focus on the three items circled above...

And take a closer look the legend of the full map...

And the content of the survey report...




BLACK ASSOCIATIONS

1. DOMINANT ASSOCIATE IS AN ORTHIC BLACK DEVELOPED ON



(a) Till of shale, limestone and granitic rock origin

NEWDALE ASSOCIATION (clay loam)


- (i) NEWDALE UNDULATING PHASE..... 
- (ii) NEWDALE MODIFIED PHASE..... 


(b) Medium textured lacustrine deposits

DUTTON ASSOCIATION

- (i) DUTTON CLAY LOAM..... 
- (ii) DUTTON CLAY LOAM, TILL SUBSTRATE PHASE..... 


(c) Gravelly and coarse sandy deposits

MARRINGHURST ASSOCIATION (sandy loam)..... 

AGASSIZ ASSOCIATION (sand to fine sandy loam)..... 

2. DOMINANT ASSOCIATE IS A DEGRADED BLACK DEVELOPED ON



(a) Medium textured lacustrine deposits

KENVILLE ASSOCIATION (silt loam to heavy clay loam)..... 

3. DOMINANT ASSOCIATE IS A GLEYED SOLONETZIC BLACK DEVELOPED ON

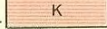
(a) Fine textured lacustrine deposits

DAUPHIN ASSOCIATION

- (i) DAUPHIN CLAY..... 
- (ii) DAUPHIN CLAY, TILL SUBSTRATE PHASE..... 


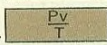
4. DOMINANT ASSOCIATE IS A GLEYED BLACK DEVELOPED ON

(a) Till of strongly acid shale and granitic rock origin

KELD ASSOCIATION (clay loam to clay)..... 



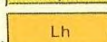
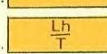
(b) Fine textured lacustrine deposits

PLAINVIEW ASSOCIATION

- (i) PLAINVIEW CLAY..... 
- (ii) PLAINVIEW CLAY, TILL SUBSTRATE PHASE..... 

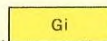
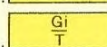
(c) Medium textured lacustrine deposits

LAKELAND ASSOCIATION

- (i) LAKELAND LOAM..... 
- (ii) LAKELAND LOAM, TILL SUBSTRATE PHASE..... 
- (iii) LAKELAND CLAY LOAM..... 
- (iv) LAKELAND CLAY LOAM, TILL SUBSTRATE PHASE..... 

(d) Coarse textured deposits

GILBERT ASSOCIATION

- (i) GILBERT SANDY LOAM..... 
- (ii) GILBERT SANDY LOAM, TILL SUBSTRATE PHASE..... 



So with these Land Suitability Classes and Subclasses and the Convention of how they are written in the map, we can figure out that our 3 circles on the map before show (from left to right):

B. GREY WOODED ASSOCIATIONS

1. DOMINANT ASSOCIATE IS A DARK GREY WOODED DEVELOPED ON

(a) Till of shale, limestone and granitic rock origin

ERICKSON ASSOCIATION

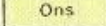
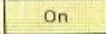
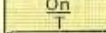
- (i) ERICKSON CLAY LOAM 
- (ii) ERICKSON MODIFIED PHASE 

(b) Till of limestone and granitic rock origin

ROSE RIDGE ASSOCIATION (loam to clay loam)

(c) Medium textured lacustrine deposits

ONANOLE ASSOCIATION

- (i) ONANOLE SANDY LOAM 
- (ii) ONANOLE CLAY LOAM 
- (iii) ONANOLE CLAY LOAM, TILL SUBSTRATE PHASE 

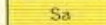
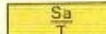
(d) Gravelly and coarse sandy deposits

LEARY ASSOCIATION (loamy sand to sandy loam)

2. DOMINANT ASSOCIATE IS A GLEYED DARK GREY WOODED DEVELOPED ON

(a) Sandy outwash deposits

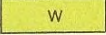
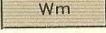
SELINA ASSOCIATION

- (i) SELINA SAND 
- (ii) SELINA SAND, TILL SUBSTRATE PHASE 

3. DOMINANT ASSOCIATE IS AN ORTHIC GREY WOODED DEVELOPED ON

(a) Till of shale, limestone and granitic rock origin

WAITVILLE ASSOCIATION

- (i) WAITVILLE LOAM 
- (ii) WAITVILLE MODIFIED PHASE 

(b) Till of limestone and granitic rock origin

GRIFTON ASSOCIATION (sandy loam)

(c) Till dominantly of limestone origin


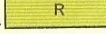
GARSON COMPLEX

(d) Till of shale clay, limestone and granitic rock origin

DUCK MOUNTAIN COMPLEX

(e) Medium textured lacustrine deposits

RACKHAM ASSOCIATION

- (i) RACKHAM FINE SANDY LOAM 
- (ii) RACKHAM CLAY LOAM 

4. DOMINANT ASSOCIATE IS A GLEYED GREY WOODED DEVELOPED ON

(a) Till dominantly of shale clay origin

BLACKSTONE ASSOCIATION (clay)

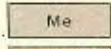
C. REGOSOLIC ASSOCIATIONS

1. DOMINANT ASSOCIATE IS A RENDZINA DEVELOPED ON

(a) Till dominantly of limestone origin

MEHARRY ASSOCIATION

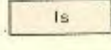
(i) MEHARRY CLAY LOAM



(ii) MEHARRY CLAY LOAM, DEEP PHASE



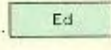
ISAFOLD ASSOCIATION (sandy loam to clay loam)



2. ALLUVIAL SOILS

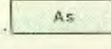
(a) Recent alluvium

EDWARDS ASSOCIATION



(b) Alluvium with variable profile development

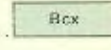
ASSINIBOINE COMPLEX



D. UNCLASSIFIED SOILS

1. UNDIFFERENTIATED DEPOSITS ON RIVER TERRACES

BENCHLANDS COMPLEX



2. UNDIFFERENTIATED DEPOSITS ON SHARP SLOPES

ERODED SLOPES COMPLEX

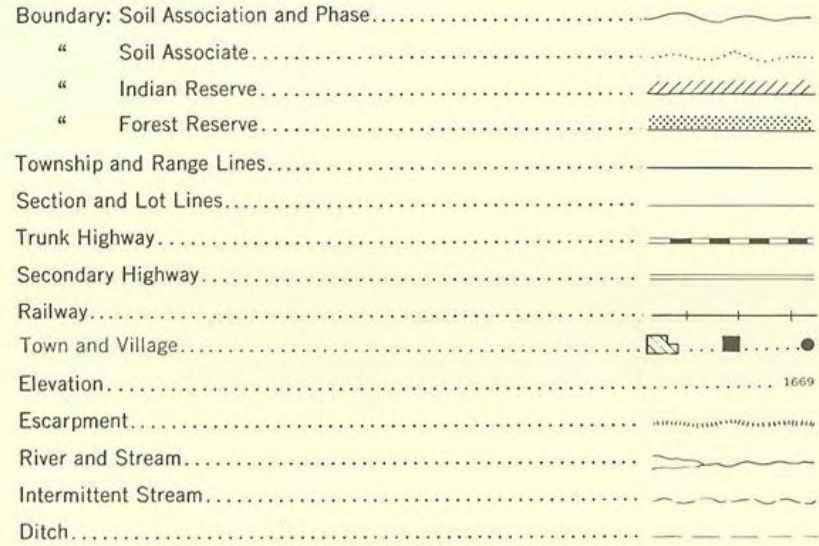


3. UNDIFFERENTIATED ORGANIC DEPOSITS

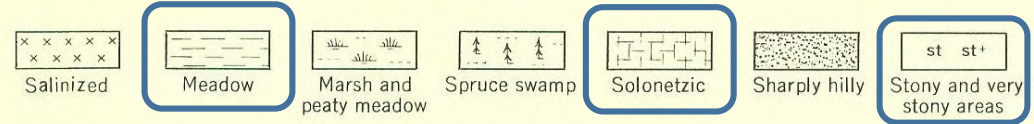
PEAT



REFERENCE



KEY TO SYMBOLS



- Du The three light brown patches indicated by the arrows are Dutton Clay Loam,
T as shown in the Black Soil legend. The legend also shows that this soil is developed from medium-textured lacustrine (lakebed) sediments. The T underneath signifies a type of Dutton soil: the Till Substrate phase.
- Me The second gray patch is Meharry clay loam, as indicated in the Regosolic Soil
st legend. The legend also shows that this soil is developing on glacial till of limestone origin. In this patch there are some stones, and a patch with meadow (wet) conditions, as indicated in the Symbols part of the legend.
- Dn The third khaki-coloured patch is Dauphin Clay, as indicated in the Black Soil legend, and developed on fine lacustrine deposits. The cross-hatching in this area indicates that it is a solonetzic (salt-affected) soil, as indicated in the Symbols part of the legend.

More information about these soils and their phases can be found in the written report, as we will see on the next page.

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Material excerpted from Report of Reconnaissance Soil Survey for Grandview Map Sheet Areas. Soils Report No. 9. (Erlich, W.A., Pratt, L.E, and LeClaire, F.P. of the Manitoba Soil Survey. 1959. Available at <https://sis.agr.gc.ca/cansis/publications/surveys/mb/index.html>

Start with the Table of Contents, and find the part where they describe soils. Find the soils that were indicated in the map. Dutton and Dauphin are on this page, Meharry is on a later page. We will use Dutton as an example (see next page).

Dutton has a general description of the soil, its classification, where it occurs, the landscape, the qualities of the soil, and what grows in it. Then it explains the specific qualities of each phase. Finally there is a section that describes the suitability of the soil for Agriculture. Sometimes there will be a photograph and/or table of the soil profile.

Interesting information about the mapsheet area is found in the introduction and later chapters – roads, settlement, surficial geology, drainage patterns, agricultural production, etc., but we haven't examined this information in Envirothon.

by the fine textured lacustrine mantle which usually overlies the glacial till.

Agriculture: The well and imperfectly drained soils of the Newdale undulating phase are highly fertile. They have a high organic matter and plant nutrient content, favourable texture and structure, neutral reaction, good water retention capacity and good tilth. The poorly drained soils, although inherently fertile, are limited in use due to the natural waterlogged condition and the difficulties of drainage improvement. Thus the agricultural value of individual parcels of land varies with the topography, which governs the distribution of the soil associates and the percentage of arable land. Soil erosion by wind and water is a hazard to these soils, particularly when farmed under a fallow-grain rotation. Valuable top soil has been lost from the upper portion of the slopes with consequent loss in productivity. Recommended conservation practices should be implemented to curtail this loss.

The soils of the modified phase are generally less fertile than those of the undulating phase, although some portions of the area where the parent material was only slightly modified are closely comparable. The coarser surface texture common to the modified phase soils renders them more susceptible to wind erosion and less retentive of moisture. Stones are generally a greater hindrance to cultivation and must be removed prior to breaking of some areas.

DUTTON ASSOCIATION (43,622 acres)

The Dutton association consists of medium textured soils developed on calcareous lacustrine sediments which range in texture from very fine sandy clay loam to silty clay loam. The lacustrine deposits from which these soils have developed are shallow and are underlain with strongly calcareous glacial till equivalent

to the parent material of the Meharry soils. The well-drained member of the association is classified as an Orthic Black soil.

The Dutton soils are located in the Valley River Plain and occur mainly to the east of Grandview in an extensive area of glacio-lacustrine deposits bordering the Valley and Wilson rivers and their tributaries. Within this area, the Dutton soils occur interspersed with soils of the Gilbert and Plainview associations. The lacustrine sediments which form the parent material of these soils occupy the axial portion of the glacial Lake Agassiz embayment and are surrounded by surface deposits of calcareous glacial till. Smaller areas of Dutton soils occur near the headwaters of the Valley River within the Valley River Indian Reserve, and bordering the Drifting and Mink rivers on the east side of the Duck Mountain Forest Reserve.

The topography of the Dutton soils is generally smooth, very gently sloping except in parts of the area where the original surface has been dissected by stream channels. Surface drainage is moderately good to good, depending on the local relief, and percolation is quite rapid through the silty lacustrine material. The native vegetation consists of mixed grasses and herbs interspersed with groves of aspen and associated shrubs.

The Dutton soils are separately described under (i) Dutton clay loam and (ii) Dutton clay loam, till substrate phase.

(i) Dutton Clay Loam (37,581 acres)

The dominant soil in the Dutton association is the moderately well-drained member developed from lacustrine materials more than 30 inches thick. A generalized profile description of this Orthic Black associate is given below:

- A—Very dark grey clay loam to silty clay loam (8 to 14 inches thick); fine to medium granular; slightly hard; neutral to mildly alkaline. Grades into:
- B—Yellowish brown silty clay loam (2 to 6 inches thick); fine to medium granular; slightly hard; mildly alkaline and slightly calcareous.
- Cca—Very pale brown silty clay loam (8 to 15 inches thick); fine granular, slightly hard; moderately alkaline and strongly calcareous. Fades into:
- C—Light yellowish brown silty clay loam, fine to medium pseudo-granular; plastic and sticky when wet, slightly hard when dry; moderately alkaline, calcareous and slightly iron stained.

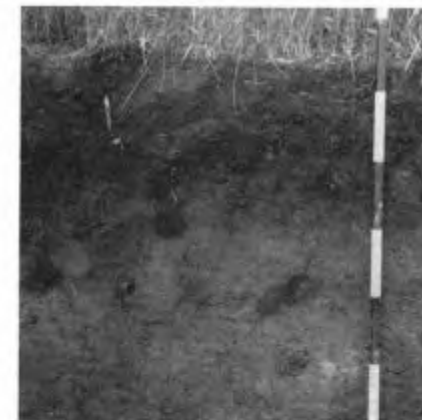


FIGURE 13

A soil profile of Dutton clay loam. An Orthic Black soil developed on moderately calcareous lacustrine deposits. (Stick interval = 6 inches)

The well-drained soils which occur adjacent to stream channels are similar in profile characteristics to that described above, but have slightly thicker A horizons. Other associated soils occurring in small areas are: Gleyed Black, Orthic Meadow, Peaty Meadow, Saline Meadow and Black Solonetz. The poorly drained members of the group generally contain a thin mucky A horizon over a gleyed, iron stained and calcareous subsoil, which is often silty clay or clay in texture.

(ii) Dutton Clay Loam, till substrate phase (6,041 acres)

The soils of the Dutton till substrate phase have strongly calcareous till within 30 inches of the surface. This non-conforming material has a significant influence on the profile and agronomic characteristics of the soil. The dominant associate is the moderately well-drained member. The topography is smooth, very gently sloping over most of the area and internal percolation of water is partially impeded by the more compact glacial till substrate. Well-drained soils occur adjacent to the stream channels. Scattered cobbles occur on the surface of these soils but do not affect tillage operations.

The profile features of these soils vary with the depth to the till substrate. In the better-drained soils, the A horizon is 8 to 12 inches thick, very dark grey clay loam to silty clay loam, fine granular, slightly hard and mildly alkaline. The B horizon of yellowish brown silty clay loam is thin and may grade directly into the D horizon of modified glacial till with a slight gravel lens at the contact of the two materials, or may be underlain by a C horizon of similar material to that from which the solum has developed. If present, the C horizon consists of light yellowish brown silty clay loam which is pseudo-granular, slightly hard, moderately alkaline and strongly calcareous. The D horizon is a very pale brown glacial till that is strongly calcareous. A thin gravel or cobble lens between the C and D horizons is a common feature.

The shallow depressions within the areas of Dutton till substrate phase generally have a thicker deposit of lacustrine sediments over the glacial till and these soils are therefore similar to the poorly drained associates of the Dutton clay loam.

Agriculture: The Dutton soils are moderately high in fertility, have favourable water retention capacity and are generally in a good state of tilth. Their nearly level topography reduces the problem of water erosion over most of the area although they are susceptible to soil drifting if preventative measures are not employed. Their lime carbonate content is higher than the optimum for cereal and some vegetable crops and affects their productivity, especially during the drier seasons.

These soils are used almost exclusively for the production of grain crops for which purpose they are well suited. However, practices should be followed that will minimize loss of productivity through soil drifting and depletion of organic matter. These practices include the use of trash cover, proper tillage methods and the inclusion of grasses and legumes in the crop rotation system. Fertilizers containing nitrogen and phosphorous applied to grain and forage crops on these soils have given profitable returns.

MARRINGHURST ASSOCIATION (5,862 acres)

The Marringhurst soils are developed on sandy and gravelly outwash deposits of shale, limestone and granitic rock origin. In these soils the surface texture is sandy loam and the underlying material is gravelly and cobbly. The well-drained associate is classified as an Orthic Black.

The topography is usually level to very gently sloping. Drainage is excessive in areas with thick deposits but the profiles show the effects of fluctuating ground water where the gravelly deposits are thin and are underlain with finer-textured material. The native vegetation on these gravelly soils consists of mixed prairie-grasses and herbs on the well and excessively drained sites and meadow grasses associated with willow and aspen on the poorly drained sites. Surface stones are rare in this association although small areas are extremely cobbly.

The soils of the Marringhurst association in the Grandview map area are thin and generally are coarser in texture than those



FIGURE 1
Soil profile of Marringhurst sandy loam. An Orthic Black soil developed on outwash gravel.
(Stick intervals = 6 inches)

occurring in other map areas. A generalized description of the well-drained member is given below:

- A—Very dark brown coarse sandy loam (3 to 7 inches thick); weakly fine granular; soft; neutral.
- B—Brown coarse sand to fine gravel (3 to 5 inches thick); structureless; loose; mildly alkaline.
- C—Light grey to yellowish brown gravel; moderately alkaline. Often cobbly and contains some shale fragments.

Associated soils are Thin Black, Gleyed Black, Orthic Meadow and Peaty Meadow. In the poorly drained sites finer-textured sediments often occur in the surface layer of these soils.

Agriculture: The Marringhurst soils are low in natural fertility and have a very low water-retention capacity. Cultivation of these soils is confined to a very small acreage and where grain cropping is attempted the yields are poor. These soils are best suited as grazing land. Some areas are used as a source of gravel for road construction.

Now you will know how to use Reconnaissance Soil Survey Maps and Reports to find a legal land location, determine its Soil Association, and find more information about that soil.