Soil Series Descriptions

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This document provides morphological descriptions, and physical and chemical characteristics for 739 soil series or approximately 70% of the soil series found in Manitoba. Updates to this document will occur as new information is collected and compiled.

Manitoba
Agriculture, Food
and Rural Initiatives

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Acidic Bedrock (aR) or ($AR)

The acidic bedrock consists dominantly of granite rock outcrop. Most of the mineral soils at the edge of the bedrock outcrop have been developed on loamy to clayey lacustrine sediments over bedrock. The topography varies from steeply sloping to irregular gently sloping. Native vegetation varies mainly with drainage and consists of jack pine on the rocky knolls, mixed stands of aspen, jack pine, white spruce, balsam fir and white birch on the more moist mineral soil sites and black spruce and tamarack on wet organic soils.

Adelpha Series (APH)

The Adelpha series consists of moderately well drained Calcareous Black Chernozem soils of the Bernice Association, developed on thin (25 to 100 cm) moderately to strongly calcareous, coarse textured gravelly deltaic deposits overlying strongly calcareous medium to moderately fine textured glacial till. The surface texture may vary from medium and moderately fine to coarse. These soils occur on nearly level topography with long, simple slopes, usually in areas between glacial tills and the deeper outwash deposits. Glacial till generally occurs within 100 cm of the surface.

These soils are characterized by a thin (0 to 10 cm) black Ap horizon, a well developed dark brown Bmk horizon, 10 to 25 cm thick, and a light brownish gray IIC horizon. The upper part of the Bmk horizon may be non-calcareous and show strong prismatic structure with clay cutans on the peds. The lower part of the Bmk horizon generally extends into the coarse textured gravel. The Adelpha series resembles the Broomhill series in the Bede Association. The only difference being the Adelpha series is underlain by glacial till.

Agassiz Series (ASZ)

The Agassiz series consists of well to excessively drained Orthic Black Chernozem soils developed on strongly calcareous, stratified, sandy skeletal (S, GrS, GrLS) beach deposits. These soils occur in upper and middle positions of gentle to moderate slopes on ridged landscapes and have rapid permeability and a low water table during the growing season. Agassiz soils are slightly eroded, slightly stony, and non-saline. They have a low available water holding capacity, medium organic matter content, and low natural fertility. Native vegetation includes prairie grasses, shrubs and bur oak. The majority of these soils are currently excavated as a source of sand and gravel for road construction.

In a representative profile the solum is approximately 40 cm thick. The profile is characterized by a very dark gray Ah horizon, 7 to 15 cm thick, with single grain to weak granular structure, a brownish gray Bm horizon, 15 to 25 cm thick which is weakly developed, and a very pale brown Ck horizon, with stratified sand and gravel. Agassiz soils are similar to Leary soils by having a well drained profile in beach sands but differ from them in having a more weakly developed profile. Agassiz soils were mapped as Blackearth associates of the Agassiz Association in the Carberry (1957) soil report.

Agnew Series (AGW)

The Agnew series consists of imperfectly drained Gleyed Black Chernozem soils of the Pipestone Association, developed on weakly to moderately calcareous, fine textured (SC, SiC, C) lacustrine sediments. These soils generally occur in areas of nearly level topography with the water table at approximately 1.8 to 2.1 metres during the growing season. This soil has a dominantly clay surface texture, occasionally stratified parent materials, low permeability and slow surface runoff cause these soils to be imperfectly drained.

The Agnew series closely resembles the Desford series of the Croll Association. The main difference is that the Desford series is underlain by glacial till (Soils of the Boissevain - Melita Area, 1978).

Alexander Series (AXD)

The Alexander series consists of imperfectly drained, carbonated Gleyed Rego Black Chernozem soils of the Newstead Association developed on thin (25 to 96 cm) strongly calcareous, medium to moderately fine) textured lacustrine sediments overlying strongly calcareous, medium to moderately fine textured (VFSL, L, SiL to SCL, CL, SiCL) glacial till. A coarse textured (FS, LCoS, LFS) layer (5 to 76 cm) of gravel and sand occurs at the contact. Alexander soils are characterized by gently undulating topography, fine sandy loam surface texture, moderately slow surface runoff and moderately rapid permeability. The underlying glacial till restricts downward drainage and the coarse layer at the till contact allows for some lateral flow of water. Both conditions cause this soil to be imperfectly drained. Some iron staining and mottling occurs in the soil profile which is usually associated with restricted drainage. The occurrence of salinity in these soils is rare. It is occasionally cultivated, but most often it is left as native land or pasture. Alexander soils occur in areas of complex surface deposits usually in the transition areas between glacial till and lacustrine deposits.

Algar Series (ALG)

The Algar series consists of well drained Rego Black Chernozem soils of the Reaper association, developed on thin (<100 cm), moderately to strongly calcareous, coarse textured (FS, LCoS, LS, LFS) material overlying weathered coarse textured sandstones of the Boissevain Formation. These soils usually have a sandy loam surface texture, complex, gently sloping topography, moderate

permeability and moderate surface runoff. These soils when tilled are moderately susceptible to erosion by wind and water. Many of these soils, under cultivation, have already lost much of the Ah horizon. Algar soils usually occur on the upper slope and knoll position in the landscape and are easily recognized by their light or buff coloured surfaces. They occur locally in a small area southwest of Deloraine.

Almasippi Series (ASS)

The Almasippi series consists of imperfectly drained Gleyed Rego Black Chernozem soils developed on moderately calcareous, uniform, sandy (FS, LFS) lacustrine sediments over a lacustrine clay substrate usually within 3 metres of the surface which impedes downward water movement. These soils occur in middle to lower slope positions of level to very gentle slopes on undulating landscapes and have rapid permeability, low surface runoff, and a high water table during the growing season. Almasippi soils are moderately eroded, non-stony, and occasionally saline. They have low available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation includes trembling aspen, bur oak and tall prairie grasses. The majority of these soils are currently used for crop production.

In a representative profile of Almasippi soil the solum is approximately 20 cm thick. The profile is characterized by a very dark gray Apk horizon, 15 to 20 cm thick, a light brownish gray AC horizon, 10 to 15 cm thick and a yellowish brown Ckgj horizon, with prominent mottles. A typical profile also contains a light coloured Cca horizon below the AC horizon.

Almasippi soils occur in close association with Skelding Longplain and Lelant soils. They are similar to Willowcrest soils by having a Gleyed Black Chernozem profile developed in sands but differ from them in having no Bm horizon. Almasippi soils were previously mapped as Black Meadow associates of the Almasippi in the Carberry (1957) soil report.

Alonsa Series (AOS)

The Alonsa series consists of moderately well drained Rego Black Chernozem soils developed on thin deposits (50 to 100 cm) of extremely calcareous, medium textured (VFSL, L SiL), stony glacial till overlying limestone bedrock. While the dominant surface texture is loam, textures range from very fine sandy loam to clay due to the water working of the surface and inclusion of soils with a very thin mantle of lacustrine deposition. The topography is level to very gently sloping; runoff is moderate and permeability is moderate in the till materials. These soils are usually excessively stony and bouldery due to their slightly higher position in the landscape. These soils were developed under mixed prairie grass vegetation but now support sparse stands of stunted aspen and bur oak.

The solum of the Alonsa soils is thin (7 to 20 cm). They have a thin leaf and sod mat underlain by a thin, very dark gray to black Ah horizon, usually free of carbonates and mildly alkaline in reaction. A thin gray transitional AC horizon separates the Ah from the extremely calcareous C horizon. The upper solum of these soils is similar to the Isafold series but the properties of the subsoil differ in that limestone bedrock occurs between 50 and 100 cm of the surface. Areas of normal Alonsa soils may contain minor inclusions of Hilbre or Mulvihill soils.

Altamont Series (ATN)

The Altamont series consists of well to moderately well drained Orthic Dark Gray Chernozem soils developed on a mantle (25 to 100 cm) of weakly to moderately calcareous, uniform, fine loamy (L, CL, SiCL), lacustrine sediments over moderately to strongly calcareous, deep, uniform fine loamy (L, SiL, CL) mixed till deposits. These soils occur in middle to upper slope positions of very gentle slopes on undulating landscapes and have moderate permeability, moderate surface runoff and a low water table during the growing season. Altamont soils are non-stony and non-saline. They have high available water holding capacity, medium organic matter content, and high natural fertility. Native vegetation often includes tall prairie grasses interspersed with aspen-oak groves. The majority of these soils are currently used for crop production.

In a representative profile the solum is approximately 60 cm thick. The profile is characterized by a dark gray Ap or Ah horizon, 5 to 15 cm thick, a dark gray Ahe or AB horizon, 10 to 30 cm thick, a brown to pale brown BM horizon, 10 to 25 cm thick, a transition pale brown II BC horizon 10 to 20 cm thick, and occasionally a white II Cca horizon 4 to 6 cm thick. The parent material is typically pale brown to very pale strongly calcareous mixed till.

Altamont soils occur in close association with Kingsley, Knudson and Tellier soils. They are similar to Firdale soils by having Orthic Dark Gray Chernozem profile development in fine loamy lacustrine deposits but differ from Firdale soils which are developed in deep lacustrine deposits. Altamont soils were previously mapped as the dominant associate of the Altamont Association in the reconnaissance soil survey of South-Central Manitoba (1943).

Anderson Point Series (APT)

The Anderson Point series consists of imperfectly drained Gleyed Gray Luvisol, shallow lithic phase soils developed on thin, moderately calcareous, clayey lacustrine deposits underlain by weakly to extremely calcareous, loamy glacial till. Limestone bedrock generally occurs within 50 to 100 cm of the surface. Topography varies from level to gently sloping. Permeability is slow due largely to the clay surface texture of these soils. Runoff ranges from moderate to slow.

Anderson Point soils generally have a thin LFH organic layer, underlain by a grayish brown Ae horizon. The moderately developed B horizon has a higher clay content, is leached of carbonates, and commonly extends to the contact with the underlying glacial till. The till (II Ckg horizon) is generally weakly calcareous and coarse loamy in particle size within this map area. The Anderson Point series occurs in a few near shoreline map units near Blacks Point and Little Grindstone Point, and on Anderson Point itself.

Aneda Series (AND)

The Aneda series consists of well to moderately well drained Orthic Dark Gray Chernozem soils developed on very strongly to extremely calcareous, stony glacial till. The surface texture ranges from a sandy loam to loam. The topography is irregular, very gently to gently sloping. Surface runoff is moderate and permeability is medium to moderately slow. The vegetation consists mainly of aspen with occasional bur oak.

The Aneda soil is characterized by a thin neutral slightly acid partially decomposed leaf mat, and a dark gray Ahe horizon of 3 to 10 cm thick and underlain by a dark yellowish brown Bt horizon of 6 to 12 cm thick. The extremely calcareous ($CaCO_3$ > 50%) C horizon is very pale brown and may be somewhat platy.

The Aneda, clay till variant, AND1, has similar solum properties as the normal Aneda series but differs in composition and texture of the underlying parent material. This material consists of a heterogenous mixture of moderately to strongly calcareous clayey and extremely calcareous, loamy stony materials. Surface stones are less prominent that in the normal Aneda. The Aneda, gravel substrate variant, AND2, has similar solum properties as the normal Aneda series but differs by having a gravel substrate.

Angusville Series (ANL)

Angusville series is characterized by a Gleyed Eluviated Black Chernozem soil profile developed on moderately to strongly calcareous, slightly stony, fine loamy (L, CL) morainal till of limestone, granitic and shale bedrock origin. These soils are imperfectly drained and occur in lower to mid slope positions of undulating to hummocky landscapes, in close association with the well drained Newdale, Rufford and Cordova soils, the imperfectly drained Varcoe series, and the poorly drained Drokan and Penrith series. Surface runoff is slow to moderately slow; permeability is moderately slow to slow within the solum and moderately slow in the subsoil. Vegetation on non-cultivated lands consists of trembling aspen.

The average thickness of the soil profile is 83 cm and varies from 45 to 100 cm. The A horizon has a thickness of 32 cm and ranges from 20 to 50 cm. The very dark gray to gray Ap horizon is 15 to 20 cm thick, and the dark gray to gray Ahe horizon, 5 to 30 cm thick. The dark brown to dark yellowish brown Btjgj or Btgj horizon is 25 to 35 cm thick. A carbonate enriched layer of 10 to 20 cm is usually present. The Ckg horizon is light olive brown with yellowish brown mottles. The Angusville soil profile is more strongly developed, deeper and free of carbonate as compared to the closely associated, shallower, carbonated Gleyed Rego Black Chernozem, Varcoe series.

Antler River Series (ATV)

The Antler River series consists of well to moderately well drained Black Solod soils developed on weakly to moderately calcareous, moderately fine to fine textured (SCL, CL, SiCL to SiC, C), saline alluvial sediments which are usually underlain by shaley clay or soft loose shale bedrock. Antler River soils occur in the channels adjacent to the Pembina River and Pelican Lake. These soils are characterized by a clay surface texture, nearly level to gently undulating topography, moderate to slow internal drainage, moderate surface runoff and slow permeability. The depth of groundwater was not determined for these soils but it is estimated to be in the range of 0.9 to 2 metres. Antler River soils are occasionally cultivated but have generally low productivity. The native vegetation generally consists of mesophytic grasses.

This soil is characterized by a very dark gray Ah horizon, 10 to 30 cm thick, a dark grayish brown Ae horizon, 5 to 7 cm thick, a very dark brown to very dark grayish brown AB horizon, 15 to 18 cm thick. The AB horizon is not always present. The Bnt horizon is very dark grayish brown, 12 to 15 cm thick and overlies a dark grayish brown Csk horizon, 12 to 25 cm thick. Dark grayish brown shale bedrock commonly occurs within 0.9 metres of the surface.

Arborg Series (ABG)

The Arborg series consists of imperfectly drained, Gleyed Solonetzic Dark Gray Chernozem soils developed on slightly to moderately calcareous, saline lacustrine clay deposits. These soils, together with poorly drained Fyala soils, occupy the flat, lower portion of the Icelandic River Lowland. While most of this soil area is now cultivated, small uncleared areas support a mixed stand of aspen, black poplar and spruce. Surface stones occur only on the till substrate phase of this series and are of little hindrance to cultivation.

The dominant feature of the Arborg soil profile is the very tough columnar structure of the Bn horizon. There is a thin, light gray, platy-structured Ae horizon at the surface and this leached material extends down the sides of the columns. The columnar aggregates are dark gray in color, extremely firm when moist and extremely hard when dry. They grade into massive clay in the lower part of the B horizon. Gypsum crystals and salt pseudomycelium are usually present in the upper portion of the Ckgj horizon. The soil is slightly acid in the A horizon, neutral to mildly alkaline in the B horizon and moderately alkaline below. The exchangeable cations in the Bn horizon are dominantly magnesium and sodium. A description of a representative Arborg clay soil is presented:

L-H - 8 to 0 cm, very dark grayish brown (10YR3/2 dry), leaf and sod mat; slightly acid, a clear, smooth boundary.

Ae - 0 to 3 cm, gray (10YR6/1 dry), clay; moderate fine granular; hard when dry, firm when moist; slightly acid; grades through a clear, irregular boundary.

BA - 3 to 20 cm, grayish brown (10YR5/2 dry), clay; strong medium to coarse columnar structures break into medium blocky aggregates; columns are round-topped and are coated with grey, leached material; very hard when dry, very firm when moist; medium acid; grades though a clear smooth boundary.

Bnt - 20 to 33 cm, dark grayish brown (10YR4/2 dry), clay; strong medium blocky; extremely hard when dry, extremely firm when moist; medium acid; grades through a gradual, smooth boundary.

BC - 33 to 51 cm, grayish brown (10YR5/2 dry), clay; massive; very hard when dry; very firm when moist; neutral; diffuse, irregular boundary.

Ckg - 51 to 69 cm, light brownish gray (10YR6/2 dry), clay; massive; hard when dry, firm when moist; moderately calcareous, moderately alkaline; iron stained; grades through a gradual, irregular boundary.

Cksg - 69 to 91 cm, grayish brown (10YR5/2 dry), clay; massive; hard when dry, firm when moist; contains gypsum and carbonate concretions; moderately calcareous, moderately alkaline; iron stained.

Argue Series (ARG)

The Argue series consists of well drained Rego Black Chernozem soils of the Cameron Association, developed on deep (>100 cm), strongly calcareous, medium textured (VFSL, L, SIL) lacustrine sediments. These soils are moderately well drained and occur in areas of level to very gently sloping topography. Surface runoff is generally slow with moderately slow permeability. Argue soils are typically non-stony and cultivated. The water table usually occurs at approximately 2.4 metres during the growing season. These soils are occasionally eroded to the extent that cultivation occurs into the Ck and Cca horizons, thereby incorporating lime into the Ap. As a result of erosion and cultivation, Argue soils can sometimes be recognized by a light or buff colored soil pattern in the field and on air photographs. The Apk horizon in cultivated soils is usually very dark gray to dark gray and 7 to 15 cm thick while in the uncultivated state the Ahk may be 20 to 30 cm thick and very dark grayish brown to light yellowish brown in color. The Ck horizon is usually dark grayish brown to light yellowish brown in color. In the native condition the vegetation consists of brome grass, willows and small shrubs. A representative profile description for the Argue series is presented below.

Apk - 0 to 13 cm, black (10YR 2/1 moist), dark gray (10YR 4/1 dry) silt loam; moderately fine granular; firm, moist; slightly hard when dry; abrupt, wavy boundary; strongly calcareous; mildly alkaline.

Ck1 - 13 to 20 cm, light gray (10YR 7/2 moist), white (10YR 3/2 dry) silty clay loam; moderately coarse granular; firm, moist, hard, dry; clear, irregular boundary; extremely calcareous; moderately alkaline.

Ck2 - 20 to 50 cm, light olive brown (2.5Y 5/4 moist), light gray (2.5Y 7/2 dry) silt loam; weak, fine granular; very friable, moist; soft, dry; clear, smooth boundary; very strongly calcareous; moderately alkaline.

Ck3 - 50 cm +, light olive brown (2.5Y 5/4 moist); light gray (2.5Y7/2 dry); silt loam; weak, fine granular; very friable.

Arizona Series (AIZ)

The Arizona series consists of moderately well to well drained Orthic Regosol soils developed on weakly to moderately calcareous, sandy (FS, LS, LFS), lacustrine and deltaic deposits. These soils occur in upper slope and knoll positions of gentle slopes on hummocky landscapes and have rapid permeability, low surface runoff, and a low water table during the growing season. Arizona soils are severely wind eroded, non-stony, and non-saline. They have low available water holding capacity, low organic matter content, and low natural fertility. Native vegetation includes scrub oak, black spruce and prairie grasses. The majority of these soils are currently wooded or used for natural grazing.

In a representative profile of Arizona soil there is no solum. The profile is characterized by a gray to light gray Ah horizon, 5 to 15 cm thick, and a brown to very pale brown Ck horizon, with faint reddish brown mottles.

Arizona soils occur in close association with Cactus and Stockton soils and are similar to Shilox soils by having a Regosolic profile in sand deposits but differ from them by having deposits of lacustrine origin while Shilox soils are eolian. Arizona soils were previously mapped as eroded phases of the Stockton Association in the Carberry (1957) soil report.

Armit Series (AMT)

The Armit series consists of well and moderately well drained Eluviated Eutric Brunisol soils developed on strongly calcareous (16 to 25%) calcareous, moderately coarse to medium textured (VFS, LVFS, SL, L) lacustrine and deltaic deposits. Dominant surface texture is very fine sandy loam. The Armit soils occur in irregular, gently sloping topography. Drainage is good except where the till substrate is near the surface and the internal drainage is impeded. A few stones occur in areas where the till is near the surface.

The Armit soils occur in the north-western portion of the Red Deer River Plain. The deposits adjacent to the Red Deer River are deep (about 9 m thick). South of the Red Deer River, the deposit thickness decreases to a shallow overlay on till. North of the Red Deer River, a clay textured till lies under these deposits.

The solum of the Armit soils is thin (46 cm). In most cases, carbonates have been removed from the upper 46 to 60 cm and weak eluvial (Aej) and illuvial (Btj or Bm) horizons are present. A description of the series is provided:

L-H - 3 to 0 cm, dark brown to brown (10YR 4/3 dry) leaf and sod mat; slightly acid; abrupt, smooth boundary.

Aej - 0 to 13 cm, grayish brown (10YR 5/2 dry) very fine sandy loam; single grain structure; loose when moist and dry; slightly acid; gradual, smooth boundary.

Bm1 - 13 to 20 cm, light yellowish brown (10YR 6/4 dry) very fine sandy loam; single grain structure; loose when moist and dry; medium acid; gradual, smooth boundary.

Bm2 - 20 to 33 cm, brownish yellow (10YR 6/6 dry) very fine sandy loam; single grain structure; loose when moist and dry; medium acid; abrupt, smooth boundary.

Ck1 - 33 to 60 cm, very pale brown (10YR 7/4 dry) very fine sandy loam; single grain structure; loose when moist and dry; mildly alkaline and moderately calcareous.

Ck2 - 60 to 90 cm, very pale brown (10YR 7/4 dry) very fine sand; single grain structure; loose when moist and dry; mildly alkaline and moderately calcareous.

Arnes Series (ARS)

The Arnes series is a moderately well to well drained, Dark Gray Luvisol soil developed on a thin mantle of lacustrine clay over moderately to extremely calcareous, loam to clay loam glacial till. The surface clay layer may be up to 75 cm thick but is usually 15 to 50 cm in thickness. The topography is level to irregular gently sloping. Native vegetation is mainly aspen with some birch, balsam poplar, balsam fir and white spruce; shrubs such as hazelnut, rose, raspberry, saskatoon, dogwood, snowberry; and some herbs and grasses.

They are moderately fertile, possess a favourable reaction, and have good structure and water-holding capacity. Stoniness may be a minor problem in some areas. The Arnes soils have a light gray to gray Ae horizon which gives rise to a dark gray Ap layer when cultivated, and a moderately to strongly developed Bt horizon. The BC horizon extends down to the contact of the clay mantle and the underlying till. A representative Arnes soil profile is described below:

L-H - 5 to 0 cm, very dark gray (10YR 2/2 dry), partially to moderately decomposed, leaf, forb and grass litter; medium acid; abrupt, smooth, lower boundary.

Ae - 0 to 8 cm, light gray (10YR 7/1 dry), loam; moderate medium platy; very friable when moist, soft when dry; medium acid; abrupt, wavy, lower boundary.

BA - 8 to 15 cm, light brownish gray (10YR 6/2 dry), clay; strong coarse granular to medium subangular blocky; firm when moist, hard when dry; medium acid; clear, wavy, lower boundary.

Bt - 15 to 30 cm, brown to dark grayish brown (10YR 4/3 to 4/2 dry), clay; weak medium columnar which breaks readily to strong medium blocky; very firm when moist, very hard when dry; slightly acid; gradual, wavy, lower boundary.

BC - 30 to 40 cm, dark yellowish brown to yellowish brown (10YR 4/4 to 5/4 dry), silty clay; strong coarse granular; firm when moist, very hard when dry; mildly alkaline and calcareous; gradual, irregular, lower boundary.

II Ck - 40 to 60 cm, very pale brown (10YR 7/3 to 8/3, dry), silty clay loam glacial till; moderate coarse platy to fine subangular blocky; mildly alkaline and strongly calcareous.

Aronet Series (ARN)

The Aronet series consists of moderately well drained Cumulic Regosol soils developed on weakly to moderately calcareous, sandy (FS, LS, LFS), eolian deposits. Aronet soils are found along fence rows, adjacent to woodlots and in similar areas where wind blown sand can accumulate. These soils occur in upper slope positions of gentle to moderate slopes on ridged landscapes and have rapid permeability, minimal surface runoff, and a slow water table during the growing season. Aronet soils are highly eroded, non-stony, and non-saline. They have low available water holding capacity, low organic matter content, and low natural fertility. Native vegetation includes tall prairie grasses. The majority of these soils are currently in native vegetation.

In a representative profile of Aronet soil has no soil solum. The profile is characterized by a light brown Ap horizon, 5 to 20 cm thick, with single grain structure. The profile is also characterized by a number of alternating dark brown and light brown layers. The darker layers are mostly buried Ah horizons. The overblown layers usually overlie a Chernozem like profile at depth. The parent material is typically mottled at depths of 75 cm or more.

Aronet soils occur in close association with Skelding, Longplain and Willowcrest soils. They are similar to Skelding soils by having no soil development but differ from them in having buried Ah horizons. Aronet soils were previously mapped as eroded inclusion of the Almasippi Association in the Carberry (1957) soil report.

Arrow Hills Series (AWH)

The Arrow Hills series is characterized by an Orthic Black Chernozem profile, developed on weakly to noncalcareous, shaly sand and gravel fluvial deposits. This material is derived predominantly from shale rock mixed with minor amounts of material of limestone and granitic rock origin. These soils are moderately well to rapidly drained and occur on the mid-slope to apex positions of ridged landscapes. Surface runoff is minimal; permeability is moderately rapid to rapid. Vegetation of non-cultivated lands consists of bur oak, aspen and hazel.

The Arrow Hills soil profile normally has a thin leaf mat of 2 to 4 cm thick and a very dark gray Ah horizon, 12 to 18 cm thick. Surface soil colors of cultivated fields may appear grayish due to the presence of a high amount of loose shale fragments. A dark yellowish brown Bm horizon of 20 to 25 cm thick, and a transitional BC horizon of variable thickness from 25 to 40 cm. The C horizon is gray to dark gray and usually has a low carbonate content. Where some mixtures of limestone materials are present, the depth and properties of the solum are more distinct. In the Russell area, the average depths to the base of the B horizon is 56 cm and ranges from 35 to 70 cm. The A horizon is usually 26 cm thick and varies from 20 to 40 cm.

These soils are often found in association with the Lenore series which contain a greater proportion of fines (loam to clay loam texture). The Arrow Hills soils differ from the Dorset soils in having considerably less limestone in the parent material.

Arrow River Series (ARO)

The Arrow River series is characterized by an Orthic Black Chernozem solum developed on thin (25 to 90 cm), weakly to moderately calcareous, loamy (L, CL) fluvial or lacustrine sediments over weakly calcareous sandy to gravelly materials of predominantly shale origin. These soils are moderately well to well drained and occur on mid to upper slope positions of very gently to gently undulating outwash fans or former glacial stream scrolls. Surface runoff is moderate; permeability is moderate in the upper loamy sediments and rapid in the underlying coarser materials. Vegetation is dominantly trembling aspen.

The Arrow River soil profile has a very dark gray Ah horizon, 25 to 30 cm thick, a dark brown to dark yellowish brown Bm horizon, 10 to 30 cm thick and a transitional BC horizon of variable thickness. The solum usually extends into the coarser underlying strata where the loam to clay loam textured overlay is less than 60 to 70 cm thick. A Cca horizon is common where the lacustrine overlay is thicker. The underlying shaly sands and gravelly sands are gray to dark gray and are usually low in carbonates. These layers are not uniform in texture and may contain strata or pockets of modified or softened shaly materials with textures of sandy loam to loam.

Arrow River soils differ from the very similar Croyon series in having less limestone in its parent material. It is less droughty and less permeable in its surface horizons than the coarser textured Arrow Hills and Dorset soils.

Ashbury Series (AHY)

The Ashbury series consists of imperfectly drained, Gleyed Black Chernozem soils of the Mentieth Association, developed on thin (25 to 100 cm), moderately calcareous, coarse to moderately coarse to medium textured (FS, LCoS, LFS, VFS, LVFS, FSL) lacustrine sediments overlying strongly calcareous medium to moderately fine textured (VFSL, L SiL to SCL, CL, SiCL) glacial till. The profile may contain a very thin (less than 5 cm) pebble line at the till contact. Ashbury soils generally occur on lower slope positions in areas of gently sloping topography. They have moderate permeability and slow surface runoff. The proximity of the underlying till causes these soils to be imperfectly drained. The occurrence of salinity is rare in these soils. The surface texture is usually loamy very fine sand.

This soil is characterized by a dark gray Ap horizon 10 to 15 cm thick, occasionally a dark gray Ah horizon, 5 to 10 cm thick, a gray brown to brown Bmg horizon, 20 to 25 cm thick and a white Cca horizon, 18 to 25 cm thick, immediately overlying a yellowish brown II Ckg horizon. The depth of the coarse textured surface soil is quite variable but glacial till commonly occurs within a depth of 100 cm. A representative profile of the Ashbury series is described below.

Ap - 0 to 13 cm, very dark gray (10YR 3/1 moist), dark gray (10YR 4/1 dry) very fine sandy loam; single grained; very friable, moist; abrupt, smooth boundary; pH 7.6.

Ah - 13 to 20 cm, very dark gray (10YR 3/1 moist), dark gray (10YR 4/1 dry) very fine sandy loam; single grained; friable, moist; clear, wavy boundary; pH 7.6.

Bmgj - 20 to 46 cm, dark grayish brown to very dark grayish brown (10YR 3.5/2 moist), brown to grayish brown (10YR 5/2.5 dry), very fine sandy loam; moderate, very coarse prismatic breaking to moderate medium subangular blocky; friable, moist; gradual, irregular boundary; pH 7.6.

Ckgj - 46 to 76 cm, light brownish gray to pale brown (10YR 6/2.5 moist), white (10YR 8/1 dry) loam; friable, moist; gradual, irregular boundary; very strongly calcareous; pH 8.1.

II Ckg - 76 cm +, yellowish brown to light yellowish brown (10YR 5.5/4 moist), white (10YR 8/2 dry) silt loam; very friable, moist; very strongly calcareous; pH 8.1.

Ashdown Series (AHW)

The Ashdown series consists of imperfectly drained Gleyed Black Chernozem soils of the Terence Association, developed on thin (25 to 100 cm) weakly to moderately calcareous, coarse textured (FS, LCoS, LS, LFS), lacustrine sediments overlying strongly

calcareous, medium to moderately fine textured, glacial till. A very thin (0 to 5 cm) gravelly stratum may occur at the contact. These soils occur on gently undulating topography. They are generally non-saline, moderately permeable and have moderate surface runoff. The water table is usually within 1.5 metres of the surface during the growing season. The surface texture is usually loamy fine sand. The less permeable underlying till causes these soils to be periodically saturated because of the restricted downward drainage.

The Ashdown series is similar to the Eramosh series from the Carniege Association, except that the Eramosh series has a very coarse gravelly stratum at the contact between the coarse textured lacustrine sediments and the medium to moderately fine textured glacial till. A representative profile of the Ashdown series is described below.

Ah - 0 to 18 cm, black (10YR 2/1 moist), very dark gray (10YR 3/1 dry) loamy fine sand; granular; loose, moist; clear, wavy boundary; pH 6.9.

Bmgj - 18 to 40 cm, dark brown (10YR 3.5/3 moist) loamy fine sand; granular; loose, moist; clear, smooth boundary; pH 7.6.

Ccasg - 40 to 50 cm, gray brown (2.5Y 5/2 moist); very fine sandy clay loam; loose, moist; clear, smooth boundary; moderately calcareous; pH 8.1.

Cskg - 50 to 64 cm, light olive brown (2.5Y 5/3 moist) fine sandy loam; loose, moist; clear, smooth boundary; moderately calcareous; pH 8.2.

II Ckg - 64 cm +, light olive brown to light yellowish brown (2.5Y 5.5/4 moist) clay loam; friable moist; very strongly calcareous; pH 8.3.

Ashmore Series (AHO)

The Ashmore series consists of moderately well to well drained Rego Black Chernozem soils developed on a thin mantle (25 to 50 cm) of moderately to strongly calcareous sediments of VFS, LVFS, FSL and SL texture overlying moderately to strongly calcareous medium sand to gravelly; glaciofluvial deposits. These soils occur in irregularly sloping terrain ranging from gently undulating to strongly rolling. They have moderately rapid permeability in the upper sediments and very rapid permeability in the gravelly deposits; runoff is moderate to rapid depending on the degree of slope. The stoniness varies from few to very stony land. The native vegetation consists of bur oak and aspen.

A very dark gray Ahk horizon 10 to 17 cm thick and a thin AC horizon characterize the soil. A lime accumulation layer (Cca) may be present. Cultivated soils on the gently undulating and undulating slopes may be slightly eroded.

Askandigau Series (AKD)

The Askandigau series are poorly drained Rego Gleysol soils developed on moderately to strongly calcareous, clayey glacial till. Topography of Askandigau areas is depressional to nearly level. Usually a very thin 0 to 15 cm layer of mesic peat covers the surface of these soils. The clay texture of the surface contributes to very slow internal percolation of water. Also, because of their topographic position, the surface runoff is minimal. Generally the surface is relatively stone free. The native vegetation of the Askandigau series is dominantly black spruce with some willows. The ground cover is mainly composed of mixed mosses with sedges and reed grasses in some areas. A representative profile of an Askandigau, soil is described below:

Om - 15 to 0 cm, moderately decomposed woody and herbaceous materials; medium acid; abrupt, smooth boundary.

II Ahg - 0 to 7.5 cm, gray (10YR 4/1 moist), silty clay; strong, medium subangular blocky; slightly acid; gradual, wavy boundary.

II Cg - 7.5 to 28 cm, gray to grayish brown (10YR 5/1 to 5/2 dry), dark gray (5Y 4/1 moist), clay; strong, coarse granular; neutral; gradual, irregular boundary.

II Ckg1 - 28 to 48 cm, light brownish gray to gray (10YR 6/2 to 6/1 dry), gray (5Y 5/1 moist), clay; moderate, coarse granular; mildly alkaline; moderately calcareous; gradual, irregular boundary.

II Ckg2 - 48 to 68 cm, light gray to gray (10YR 6/1 dry), gray to grayish brown (10YR 5/1 to 5/1 moist), clay; amorphous; mildly alkaline; moderately calcareous.

The Askandigau soils usually have a layer of moderately decomposed peat on the surface, and a thin grayish Ahg or AC horizon overlying a gleyed Cg horizon. Numerous isolated pockets of extremely calcareous, loamy till occur within the clayey matrix of the parent material.

The Askandigau, peaty phase soils of the Low Boreal climatic zone correlate with the Sagemace, peaty phase soils of the High Boreal-temperate climatic zone, located in the south-western portion of the map sheet. The Askandigau and Askandigau peaty phase soils are commonly associated with the Warpath and Davis Point series and also with the Molson and Orok organic soil complexes. Askandigau Series (As), Areas consist dominantly of normal Askandigau series with small amounts of Askandigau, peaty phase soils. Askandigau peaty phase (As(P)) These areas consist dominantly of Askandigau soils having 15 to 40 cm of mesic peat materials on the surface.

Assiniboine Series (ASB)

The Assiniboine series consists of imperfectly drained Gleyed Cumulic Regosol soils developed on moderately to strongly calcareous, stratified, clayey (SiC, C) alluvium deposits. These soils occur in lower slope positions of very gentle slopes on flood plain landscapes and have moderately slow permeability, slow surface runoff, and a medium water table during the growing season. Assiniboine soils are slightly water eroded, non-stony, and non-saline. They have high available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation includes ash, elm, tall prairie and meadow grasses. The majority of these soils are currently cultivated.

In a representative profile of Assiniboine soil there is no solum. The profile is characterized by a dark gray to gray Ah horizon, 5 to 20 cm thick, and a dark gray Ckgj horizon, many prominent mottles. The parent material is typically stratified and may contain dark strata representing former surfaces.

Assiniboine soils have a similar profile as the Levine soils, but differ from them by having finer textured deposits. These soils were mapped as inclusions of the Assiniboine Complex in the Carberry (1957) soil report.

Athapap Series (AHP)

The Athapap series consists of imperfectly drained, Gleyed Dystric Brunisol, lithic phase soils developed on thin, non-calcareous moderately coarse (VFS, LVFS, CoSL, SL, LFS) textured glacial till derived from granitic and volcanic rocks overlying Precambrian bedrock. The topography is moderately to strongly sloping and the dominant vegetation is black spruce. A generalized profile description is given.

LF - 4 to 0 cm, very dark gray (10YR 3/1 moist); forest litter of needles and small branches; extremely acid; abrupt, smooth boundary.

Bm - 0 to 10 cm, dark brown (10YR 4/3 moist); sandy loam; single grained; loose when wet and dry; non-sticky; non-plastic; very strongly acid; clear, smooth boundary.

Cg - 10 to 36 cm, olive (5Y 5/3 moist); sandy loam; single grained; loose when wet and dry; non-sticky; non-plastic; strongly acid; abrupt, smooth boundary.

R - 36 cm +, basaltic bedrock.

Atik Complex (ATK)

The Atik Complex consists of poorly drained Terric Mesisols developed on weakly acidic, shallow (40 to 160 cm), forest peat overlying weakly calcareous, clayey lacustrine sediments. These soils occur on horizontal and veneer bogs, have moderately slow permeability in the substrate and a very high (0.3 m) water table. The native vegetation often comprises dominantly black spruce and significant tamarack; some aspen may also occur. Dominant shrubs are usually alder, willow and ericaceous shrubs. Feathermosses are the dominant herbaceous plants.

In a representative profile of Atik Complex, the peat is generally 60 to 120 cm thick. The profile is characterized by an OF (30 to 60 cm thick) horizon overlying a 40 to 80 cm thick Om horizon, and a Cg horizon. The organic parent material is typically fibric over mesic. The mineral substrate is typically a neutral dark gray lacustrine clay.

Atik soils occur in close association with Medard soils. They are similar to Reed Lake soils by having a fibric sphagnum surface tier, and clay textured substrate, but differ from Reed Lake soils in having a mesic forest peat layer instead of mesic fen peat overlying the mineral lacustrine substrate. Atik Complex correlates with the Atik Complex mapped and described in the previously published Cormorant Lake soil report.

In the Flin Flon area the clay substrate is less calcareous. Atik Complex may overlie loamy to clayey till in some areas. In this study Atik soils also vary slightly from the norm in that its organic parent material is less fibrous (or more decomposed) and has been mapped as a classification variant. Atik Complex sometimes occurs in seepage areas.

Atikameg Series (AKG)

The Atikameg series consists of moderately well and well drained Eluviated Eutric Brunisol soils developed on extremely calcareous, loamy till. Dominant surface textures vary from loam to clay loam. Topography is gently undulating to undulating. The Atikameg soils usually occur in the well drained positions in drumlinized or ridge and swale ground moraine. Runoff and permeability are generally moderate. In areas with little or no lacustrine overlay and where severe water working has been experienced, these soils are exceedingly stony. The surface may be only moderately stony, however, in areas of less waterworking. Spruce, jack pine and aspen constitute the major native tree cover on Atikameg soils. A representative profile of the Atikameg series is outlined below.

L-H - 5 to 0 cm, leaf and grass mat; slightly acid; abrupt, smooth boundary.

Aej - 0 to 2 cm, pale brown (10YR 6/3 dry), brown (10YR 5/3 moist), clay loam; fine granular; friable when moist, soft when dry; neutral; abrupt, smooth boundary.

Btj - 2 to 6 cm, light yellowish brown to brown (10YR 6/4 to 5/3 dry), dark brown to brown (10YR 4/3 moist), loam; weak, fine subangular blocky breaking to weak, fine granular; friable when moist, slightly hard when dry; neutral; moderately calcareous; abrupt, smooth boundary.

BC - 6 to 12 cm, gray to light brownish gray (10YR 5/1 to 6/2 dry) brown to pale brown (10YR 5/3 to 6/3 moist), gravelly silt loam; single grained; loose when moist; loose when dry; mildly alkaline; extremely calcareous; abrupt, smooth boundary.

Ck1 - 12 to 18 cm, light gray (10YR 7/2 dry), light brownish gray (10YR 6/2 moist), silt loam; weak, fine, pseudo platy; friable when moist, hard when dry; mildly alkaline, extremely calcareous; clear, smooth boundary.

Ck2 - 18 to 38 cm, white (10YR 8/2 dry), very pale brown (10YR7/2 moist) silt loam, weak, fine pseudo platy; friable when moist, hard when dry; mildly alkaline; extremely calcareous; clear, smooth boundary.

Ck3 - 38 to 58 cm, white (10YR 7.5/2 moist), silt loam; weak, pseudo platy; friable when moist, hard when dry; mildly alkaline; extremely calcareous.

The solum of the Atikameg soils is generally less than 20 cm thick, characterized by a thin light colored, often discontinuous Ae or Aej horizon overlying a thin, weakly developed textural Btj horizon. Minor areas of the Westray series, an Orthic Gray Luvisol with more pronounced profile development, may occur in areas of Atikameg series. The Westray soils cannot be mapped separately due to the limited ground truth and the reconnaissance scale of the survey. These soils occur most frequently in areas with bedrock near the surface, where soil drainage is better and more rapid downward movement of water occurs. The Atikameg soils often occur in complex association with soils of the Chitek, Limestone Point, and Cedar Lake series. The Atikameg series, mapped in the Low Boreal climatic zone, correlates with the Fairford series of the High Boreal-temperate climatic zone.

Aubrey Series (ABY)

The Aubrey series are poorly drained, carbonated Rego Humic Gleysol soils developed on thin (25 to l00 cm) moderately to strongly calcareous, moderately fine to fine textured (SCL, CL, SiCL to SiC, C) sediments overlying weakly to moderately calcareous shaly clay till. A water-worked gravelly and cobbly lens 25 to 90 cm in thickness may occur between the two materials. The texture of the surface horizon varies from clay loam to clay but clay is dominant. These soils are found in the southwest portion of the Dauphin Lake Plain in a narrow belt parallel to and immediately below the Manitoba Escarpment. In this area, the lacustrine and till surface deposits are very thin so that in many instances, the underlying shale bedrock or shaly clay till is exposed or is found within the control section. The Aubrey soils are found in poorly drained depressional sites and may occur behind gravelly beaches and ridges running parallel to the Riding Mountain. These soils generally occur under native vegetation consisting of meadow grasses and sedges with clumps of willow and balsam poplar.

The Aubrey soils have a thin dark coloured surface horizon (<15 cm) which is usually calcareous. A thin dark gray transitional AC horizon occurs at the top of the water- worked lens. The water-worked layer between the lacustrine overlay and the underlying till or bedrock is extremely variable in depth and composition. This lens contains large rounded granitic boulders and/or interlaced flat-lying limestone cobbles at the bottom of the overlay. These lenses may occur as nearly pure gravelly and sandy materials or as cobbly, gravelly clay loam textured materials. All of these layers are usually high in iron compounds (strongly colored, orange, yellow, brown, red) but may or may not be calcareous. Cca horizons may occur at varying depths in this layer. The underlying shaly clay material occurs at depths varying from the surface to 1.5 to 1.8 metres.

Pure areas of Aubrey soils may contain minor amounts of the imperfectly drained Merridale or Norgate soils. Although salinity was not found to be severe in the Aubrey soil areas, sporadic occurrence of salts was noted. One area was mapped as a complex with Norgate series.

Axford Series (AXF)

The Axford series consists of well to moderately well drained Orthic Regosol soils (that have weak profile development) on a variable depth (50 to 90 cm) of calcareous stratified sand and gravel (glaciofluvial) overlying strongly calcareous silty glaciolacustrine (dominantly SiL to SiCL) sediments. The surface texture is loamy fine sand to fine sand. These soils occur adjacent to the Minnedosa River near the junction to the Assiniboine River. These soils occur in the upper slope positions of undulating topography; the native vegetation consists of trembling aspen, bur oak, chokecherry, rose and grasses.

The soil is characterized by dark gray to gray Ah or Ahk horizons of 6 to 10 cm thick, a thin Cca 4 to 6 cm thick; the depth is usually dependent on the depth of loamy sand to sand over the coarser sand and gravel. The depth of gravel varies from 50 to 90 cm. The underlying sediments consists of stratified pale brown to very pale brown silt loam to silty clay loam textured lacustrine sediments.

They occur as a complex with Boswell and Marringhurst soils in gently to moderately rolling (hummocky) topography. These soils occupy the intermediate slope positions while the Marringhurst soils occupy the upper slope and apex position.

Badger Series (BDG)

The Badger series consists of well drained Brunisolic Gray Luvisol soils developed on weakly calcareous, fine sand deposits. These sand deposits are frequently stratified and may contain thin lenses of coarse sand and gravel. These soils occupy small areas in the irregular, moderately sloping, Bedford Hills and support a mixed stand of jack pine, aspen and birch.

The dominant features of the Badger soil profile is the occurrence of a brunisolic sequence of horizons with an Ae horizon overlying a continuous textural (Bt) horizon at depths of less than 76 cm from the surface. The Bfj horizon is weakly developed and the underlying Ae and Bt horizons are usually weakly to moderately well developed. Textures of the surface horizons vary from fine sand to loamy fine sand. Texture of the Bt horizon varies from gravelly sandy loam to fine sandy clay loam. The weakly calcareous, sandy parent material usually is stratified and as a consequence the Bt horizon frequently is found in a coarse sand to gravel lens. The brunisolic solum sometimes exceeds 46 cm in depth but rarely merges with the Bt horizon of the Gray Luvisol solum. The Cca horizon usually is absent but sometimes occurs as a weakly developed, broken and irregular horizon in association with limestone pebbles. The soil is very strongly to strongly acid in the brunisolic sequence and strongly acid to neutral in the underlying Grey Wooded solum.

These soils are droughty, low in natural fertility and are not suitable for the production of grain and forage crops. The Badger series forms a catenary group with Wintergreen (Gleyed Gray Luvisol) and Malonton (Peaty, Rego Humic Gleysol) series. The following profile description is representative of Badger loamy fine sand:

L-H - 5 to 0 cm, very dark brown (10YR 2/2, dry), partially to well decomposed leaf, herb and grass-litter; medium acid; abrupt, smooth, lower boundary.

Aej - 0 to 8 cm, light gray (10YR 6/1 to 7/1, dry), loamy fine sand; structureless; loose when moist or dry; very strongly acid; abrupt, wavy, lower boundary.

Bfj - 8 to 38 cm, light yellowish brown (10YR 6/4, dry), very fine sand; structureless; loose when moist or dry; medium acid in reaction; clear, wavy, lower boundary.

Ae - 38 to 61 cm, light gray (I0YR 7/2, dry), very fine sand; structureless; loose when moist or dry; medium acid; mottled with small yellowish brown (10YR 5/6, dry), blotches of iron; abrupt, wavy, lower boundary.

Bt - 61 to 76 cm, brown (7.5YR 5/4, dry), very fine sandy loam; weak medium granular; friable when moist, slightly hard when dry; strongly acid; stained with yellowish brown (10YR 5/6), iron mottles; clear, irregular, lower boundary.

BC - 76 to 122 cm, very pale brown (10YR 7/4, dry), fine sand; structureless; loose when moist or dry; neutral; stained with dark brown (2.5YR 4/4, dry), mottles of iron; gradual, irregular, lower boundary.

C - 122 cm +, very pale brown (10YR 7/3, dry), loamy very fine sand; structureless; loose when moist or dry; mildly alkaline; weakly calcareous; stained with dark brown (7.5YR 4/4, dry), iron mottles.

Badger Creek Series (BDC)

The Badger Creek series is the imperfectly drained, carbonated, Gleyed Black Chernozem member of the Wawanesa Association and is developed on thin (25 to 100 cm), moderately to strongly calcareous, medium textured (VFSL, L, SiL) lacustrine sediments overlying strongly calcareous, coarse textured (FS, LCoS, LFS) lacustrine deposits. This soil has a silt loam to loam surface texture, gently undulating topography, moderate permeability and slow surface runoff. The depth to water table is estimated at between 1 and 2 metres during the growing season. The proximity of the sandy subsoil causes the surface soil to remain saturated for longer periods, after rains than would normally be expected from this type of soil. The majority of these soils are cultivated.

Badger Creek soils occur in close association with Wawanesa and Mather soils. They are similar to Underhill soils by having a Gleyed Black Black Chernozem profile and loamy surface mantle but differ from them in having a sandy substrate.

Baldy Series (BDY or By(P))

The Baldy series consists of poorly drained Rego Gleysol soils developed on noncalcareous glacio-fluvial, and deposits. They occupy small level to depressional areas where surface drainage is very slow and internal drainage is impeded because of high water table. Usually a thin (15 to 40 cm) layer of medic peat covers the surface of these soils. Black spruce is the dominant tree cover, with a Labrador tea, Sphagnum, and feathermoss ground cover.

The solum of Baldy soils is medium to fine sand, and these soils are characterized by a thin, acid, mesic peat surface (16 to 40 cm) layer which is underlain by a strongly iron stained Cg horizon. Frequently in very wet sites, the Cg horizon is strongly gleyed and lack mottling. The Baldy peaty phase soils are found in the Mid Boreal climatic zone around Playgreen Lake.

Baldur Series (BXF)

The Baldur series is a moderately well drained Orthic Regosol soil developed on a thin veneer (25 to 90 cm) of moderately to strongly calcareous, loamy (L, CL) glacial till of shale limestone and granitic rock origin overlying non to weakly calcareous shale bedrock. These soils occur on the tops of hummocky topography where the soil development has been minimal or the former soil has been eroded to the extent that no original horizons can be recognized. Slope classes may vary from 6 percent or more. Surface runoff is rapid; permeability is slow.

The Baldur soil has a very thin Ah horizon under native or cultivated conditions, a carbonated gray to light gray Ap horizon 15 to 20 cm thick underlain by the parent till material (eroded knolls). A lime carbonate layer may be present below the Ap horizon.

Balmoral Series (BAM)

The Balmoral series consists of Rego Humic Gleysol soils developed on strongly calcareous, moderately fine textured (SCL, CL, SiCL) sediments under the influence of poor natural drainage. Surface texture varies from loam to silty clay loam. The parent material is extremely calcareous. The topography is level to depressional and drainage is poor to very poor. In most areas, there has been some improvement of the natural drainage with installation of drainage ditches. The native vegetation consists of meadow grasses, reeds, sedges; some clumps of willows and black poplar may also occur.

In its natural state, the Balmoral soil is characterized by a thin (less than 15 cm) layer of moderately decomposed fen peat; a very dark gray granular, Ah horizon 7.5 to 15 cm thick, usually clay loam to silty clay loam in texture, and a thin gray carbonated transition AC horizon and a very pale brown, very strongly to extremely calcareous C horizon. In cultivated areas, the peaty surface layer is either absent due to burning prior to breaking or has been incorporated with the Ah horizon. Balmoral peaty phase soils consist of Balmoral soils having 15 to 40 cm of mesic herbaceous peat surface.

Banks Series (BAX)

The Banks series consists of well drained Orthic Dark Gray Chernozem soils developed on strongly to very strongly calcareous, shallow (20 to 100 cm), uniform coarse loamy lacustrine sediments overlying very strongly calcareous, loamy morainal deposits. These soils occur on crest and upper slope positions of level to very gently sloping lacustrine veneer deposits and have moderate permeability slow surface runoff and a moderately low water table during the growing season. Banks soils are slightly stony. The native vegetation often comprises mixed wood forest of aspen and white spruce with occasional oak. The majority of these soils are currently used for crop production.

In a representative profile of Banks soil, the solum is generally 35 cm thick. The profile is characterized by a dark gray, loamy fine sand textured Ap horizon overlying a dark brown to brown fine sandy loam textured Bm horizon, and a grayish brown loamy fine sand Ck horizon. The parent material is typically light brownish gray loamy fine sand underlain by compact, light gray, loam to clay loam strongly calcareous till.

Banks soils occur in close association with Rose Ridge soils. They are similar to Rose Ridge soils by having similar horizon development, but differ in having deeper profiles and lower amounts of stones and cobbles on the surface. Banks soils have medium available water holding capacity, medium organic matter levels, and high natural fertility. Banks soils correlate with Onanole till substrate phase soils previously published in the West Lake soil report (Soil Report No. 8).

Bankton Series (BAO)

The Bankton Series consists of well to moderately well drained Rego Black Chernozem soils developed on moderately to strongly calcareous silty clay to clay lacustrine deposits. They occur adjacent to the creeks in a level to very gently sloping topography. Permeability is slow; runoff is moderately slow. The natural vegetation consists of tall prairie grasses.

The soil is characterized by a very dark gray to black Ah horizon 16 to 22 cm thick and a calcareous, dark gray AC horizon of irregular thickness (due to past cracking and in-filling) grading to the grayish brown C horizon. Some mottles and duller colors occur below the 75 cm depth.

Bannerman Series (BNM)

The Bannerman series consists of Gleyed Eluviated Black Chernozem soils of the Newstead Association developed on thin (25 to 95 cm), strongly calcareous, medium to moderately fine textured, lacustrine sediments overlying strongly calcareous, medium to moderately fine textured, glacial till. A coarse textured layer (5 to 75 cm) occurs at the contact. Bannerman soils are generally found in depressional areas. The topography is nearly level with simple slopes. The permeability is moderate; surface runoff is moderate and drainage is imperfect to poor. The water table is estimated to be within 1.5 m of the surface during the growing season.

Bannerman soils are characterized by a very dark gray Ah horizon 5 to 12 cm thick, a weakly stained gleyed gray Aeg horizon 5 to 7.5 cm thick, and a gleyed dark brown Btg horizon 10 to 15 cm thick. A prominently stained, gleyed, coarse textured IIC horizon 5 to 75 cm thick occurs between the profile and the underlying gleyed gray brown IIIC horizon. Glacial till generally occurs within 100 cm of the surface of these soils. The Bannerman series resembles the Glenlorne series with the exception of the very coarse gravelly stratum which occurs at the contact between the overlay and the glacial till.

Barager Series (BAA)

The Barager series consists of imperfectly drained, carbonated, Gleyed Rego Black Chernozem soils developed on a variable mantle (30 to 90 cm) of moderately to strongly calcareous outwash and glacio-fluvial sediments of medium sand to gravel texture overlying very strongly calcareous loamy glacial till. Strongly calcareous loam to clay loam till of shale, limestone and granitic origin usually occurs within a two meter depth. The soils occur in a level to gently undulating topography. The soil drainage is imperfect because of a perched water condition above the slowly permeable till and to lateral flow and seepage from adjacent upland areas. The permeability of the upper sediments is rapid.

The Barager soil is characterized by a black to very dark gray Ah horizon 12 to 18 cm thick; and an AC horizon which grades to a carbonate accumulation (Cca) horizon. The solum is relatively shallow and varies with depth from loamy sand to sand. Yellowish brown mottles occur above the contact of the coarse materials and the till.

Barren Series (BAE)

The Barren series is an Orthic Regosol soil found on well to rapidly drained, strongly to very strongly calcareous, fine loamy (SCL, SiCL, CL), lacustrine sediments. This soil occurs above the escarpment in association with Ramada, Carroll, Charman, Prodan and Tadpole soils in the upper slope and knoll positions of gently undulating to moderately rolling topography. Surface runoff is moderate to rapid, and permeability is moderate to moderately slow. Originally, Barren soils had a dark surface horizon and a weak B horizon, but erosion has removed virtually all of the original solum. Wind and water erosion continues to be a problem for these soils.

The Barren soil profile has a gray to light gray, calcareous Ap horizon, 10 to 15 cm thick, and a light yellowish brown to pale brown Ck horizon.

Barrows Series (BRW)

The Barrows series consists of imperfectly drained Gleyed Regosols developed on moderately fine to fine textured (SCL, CL, SiCL, SiC, C) weakly to moderately calcareous shaly deposits. Surface runoff is moderate on the sloping terrain and very slow in the depressional areas. Internal drainage is impeded by the nature of the fine textured deposits. The profile is characterized by 15 to 20 cm of un-decomposed to well decomposed L-H horizon underlain by very dark gray to black heavy clay C horizon.

These soils occur on the northern slopes of the Porcupine Mountain on a series of wave-cut terraces between 327 and the 381 m contours. These shaly deposits are a complex of shaly clay till, outwash and alluvium derived from the shale bedrock. The topography is gently sloping, falling about 30 m per 1.6 km through a series of step-like terraces. The terraces fall initially at a 10 to 15 % slope and then level off through long, gentle slopes to the point where the next terrace begins. Associated with the summit of each terrace are beach deposits that vary from thin discontinuous deposit of sand and gravel to large, well developed, stratified sand and gravel beaches.

Barwood Series (BWO)

The Barwood series consists of imperfectly drained Gleyed Rego Black Chernozem soil developed on strongly to extremely calcareous (~40 % $CaCO_3$), deep uniform, fine loamy (L, CL, SiCL), boulder till of limestone and granitic origin. These soils occur in toe and lower slope positions of strong slopes on hummocky landscapes and have moderately slow permeability moderately slow surface runoff and a medium water table during the growing season. Barwood soils are non-eroded, slightly stony and occasionally slightly saline. They have medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes tall prairie grasses. The majority of these soils are currently used for improved pasture and grain crop production.

In a representative profile of Barwood soil the solum is approximately 20 cm thick. The profile is characterized by a very dark gray to black Ap or Ah horizon, 10 to 15 cm thick, a thin transitional, calcareous AC horizon, 15 to 20 cm thick and a very pale brown extremely calcareous Ck horizon, with iron stains. A typical profile also contains lime and manganese concretions at depth.

Barwood soils occur in close association with Hilton and Tiger Hills soils. They are similar to Ferris soils by having a Gleyed Rego Black profile developed in calcareous till but differ from Ferris soils because of the extreme calcareous nature of Hilton till material and its relatively shallow profile. Barwood soils were previously mapped as imperfectly drained inclusions of the Hilton Association in the reconnaissance soil survey of South-Central Manitoba (1943).

Basker Series (BKR)

The Basker series consists of poorly to very poorly drained Rego Humic Gleysol soil developed on moderately to strongly calcareous, stratified, loamy (FSL, VFSL, L, SiL, SiCL), recent alluvial deposits. These soils occur in depressional positions of nearly level slopes on flood plain landscapes and have slow permeability, very slow surface runoff, and a high water table during the growing season. Basker soils are slightly water eroded, non-stony, and occasionally slightly saline. They have a high available water holding capacity, medium organic matter content, and low natural fertility. Native vegetation includes sedges, rushes and willows. The majority of these soils are currently in native vegetation because they are subject to flooding and saturated conditions in the spring.

In a representative profile of Basker soil there is no soil solum. The profile is characterized by light grayish brown Ahk horizon, 5 to 20 cm thick, with iron stains, and a stratified, olive brown Ckg horizon, with prominent iron mottles in the sandy strata. A typical profile also contains thin organic layers indicating former surfaces.

Basker soils occur in close association with Levine soils. They are similar to Kerran soils by having a poorly drained profile developed in recent alluvium but differ from them in having mostly loam rather than clay textures. Basker soils were previously mapped as Meadow associates of the Assiniboine Complex in the South-Central (1943) and Carberry (1957) reports.

Baynham Series (BYH)

The Baynham series consists of very poorly drained Typic Mesisol soils developed on deep (>160 cm) mesic forest peat overlying undifferentiated materials. These soils occur in depressions and in low lying areas of nearly level landscapes and have slow permeability, very slow surface runoff and a very high water table during the growing season. Baynham soils are generally deficient in phosphorous, potassium and copper. They also have a significantly colder microclimate than adjacent mineral soils. Native vegetation often includes black spruce, shrubs, labrador tea and mixed mosses. The majority of these soils remain as natural grazing and as moderately productive woodland.

In a representative profile of Baynham soil the organic material is generally more than 160 cm thick. The profile is characterized by layered, light brown sphagnum and dark brown feather moss, an 0f horizon 15 to 30 cm thick, overlying a thick dark brown, moderately decomposed 0m horizon, 60 to 120 cm thick, with numerous inclusions of woody fragments. The underlying mineral soil is strongly reduced as indicated by the dark gray colours. A well-decomposed humic layer of variable thickness commonly occurs at the contact of the mineral soil. The parent material is typically moderately decomposed forest peat. A typical profile often contains a series of layers of organic materials in various stages of decomposition.

Baynham soils often occur in close association with Okno and Rat River soils. They are similar to both these soils by having a similar origin and composition of organic materials but differ from both soils because of the greater thickness of organic deposits. Okno soils are underlain by clay within 160 cm of the surface while Rat River soils are underlain by sand within 160 cm of the surface. Baynham soils were mapped in the soil survey of the Grahamdale Area.

Bayton Series (BYT)

The Bayton series, a Terric Fibric Mesisol with 15 to 65 cm. of fibric, Sphagnum moss peat overlying mesic fen peat, and the Cayer series, a Terric Mesisol with 0 to 15 cm of fibric Sphagnum moss overlying mesic fen peat, are commonly associated with mapping units of the Howell series.

Bearford Series (BEF)

The Bearford series consists of well drained Orthic Black Chernozem soils of the Croll Association, developed on thin (25 to 100 cm), strongly calcareous, moderately fine textured, lacustrine deposits overlying strongly calcareous, medium to moderately fine textured glacial till. A very thin (less than 5 cm) pebble line may be evident at the contact. This soil has simple very gently sloping topography, a loam to clay loam surface texture, moderate permeability and moderate surface runoff. The depth to water table is estimated to be 3 metres during the growing season. This soil is non-stony and is generally cultivated. An increase in the concentration of soluble salts near the contact zone of the underlying till is an occasional feature of these soils.

A detailed morphologic description and analytical data for a weakly saline profile of the Bearford series is presented:

Ap - 0 to 18 cm, black (10YR 2/1 moist), very dark gray to dark gray (10YR 3.5/1 dry) clay loam; amorphous; friable, moist; abrupt, smooth boundary; pH 7.4.

Bm - 18 to 43 cm, very dark grayish brown(10YR 3/2 moist), grayish brown to dark grayish brown (10YR 4.5/2 dry) silty clay loam; moderate medium prismatic breaking to moderate medium subangular blocky; friable, moist; clear, wavy boundary.

BC - 43 to 53 cm, grayish brown to dark grayish brown (10YR4.5/2 moist), brown to pale brown (10YR 5.5/3 dry) clay loam; moderate medium prismatic breaking to moderate medium subangular blocky; friable when moist; clear, wavy boundary; moderately calcareous; pH 8.0.

Ccas - 53 to 71 cm, brown to pale brown (10YR 5.5/3 moist), light gray (10YR 7/2 dry) clay loam; amorphous; friable when moist; gradual wavy boundary; strongly calcareous; pH 8.1.

II Csk1 - 71 to 109 cm, light olive brown (2.5Y 5/4 moist), very pale brown (10YR 7/3 dry) clay loam; amorphous; friable when moist; strongly calcareous; pH 9.2.

II Csk2 - 109 cm +, light olive brown (2.5Y 5/4 moist), light gray (10YR 6.5 dry) clay loam; amorphous; friable when moist; strongly calcareous; pH 8. 1.

Beaverdam Series (BVR)

The Beaverdam series consists of imperfectly drained Gleyed Dark Gray soils developed on thin, moderately to strongly calcareous, sandy skeletal outwash deposits overlying extremely calcareous and stony, loamy glacial till. The surface texture ranges from loamy fine sand to loam. A gravelly layer from 10 to 50 cm thick is present above the extremely calcareous till. The topography is level to very gently sloping. Soil drainage is imperfect because of perched water table conditions above the slowly permeable till and lateral flow and seepage of water from adjacent upland areas. The vegetation consists of dominantly trembling aspen, with some dogwood and occasional bur oak.

The soil is characterized by a dark gray Ahe horizon of 10 to 18 cm thick, and a dark grayish brown Bmgj or Btgj within the coarse gravelly layer; the Btgj if present commonly occurs at the contact of the gravelly layer and the till; yellowish brown mottles of iron are present at this contact. The underlying, extremely calcareous loamy till is usually quite compact and often very slowly permeable.

The BVR1 variant differs from the modal Beaverdam series by having a clay till substrate.

Bede Series (BED)

The Bede series consists of well drained Orthic Black Chernozem soils of the Bede Association, developed on strongly calcareous, coarse textured (sand and gravel) deltaic, beach and outwash deposits. This soil commonly has complex, very gently sloping topography, good drainage, very rapid permeability and minimal surface runoff. The depth of water table is estimated to be at about 3 metres during the growing season. This soil is non-saline and when cropped, tends to be droughty for most of the growing season. Most cereal crops and even some deep rooting forage crops can be severely affected by early summer heat and lack of moisture because of the low water holding capacity of the soil.

The surface texture of this soil ranges from a sandy loam to loamy sand grading to coarser materials with depth. The soil profile usually consists of a black Ah horizon 5 to 10 cm thick, a very dark brown Bm horizon 15 to 20 cm thick and a pale brown, very coarse textured C horizon. The Bm horizon is usually well developed as indicated by the strong prismatic to sub-angular blocky structure. A transitional BC and a prominent Cca horizon are also common in these soils. A representative Bede soil is described below (Soils of the Boissevain - Melita Area, 1978).

Ah - 0 to 13 cm, black (10YR 2/1 moist), very dark gray (10YR 3/1 dry) loamy sand; structureless single grained to weak medium granular; loose; abrupt, smooth boundary; non-calcareous; pH 7.3.

Bm - 13 to 30 cm, dark brown (10YR 3/3 moist), dark brown to brown (10YR 4/3 dry) sandy loam; weak, medium prismatic breaking to medium subangular blocky; very friable, moist; loose, dry; abrupt, smooth boundary; non-calcareous; pH 7.1.

BC - 30 to 38 cm, reddish brown (5YR 4/4 moist), yellowish brown (10YR 5/6 dry) gravelly sandy loam; weak medium prismatic breaking to weak, medium subangular blocky; very friable, moist; loose, dry; clear, smooth boundary; moderately calcareous; pH 7.4.

Cca - 38 to 48 cm, grayish brown to light brownish gray (10YR 5/2 to 6/2 moist), light gray (10YR 7/2 dry) gravelly, sandy loam; weak, fine granular; very friable, moist; loose, dry; clear, smooth boundary; strongly calcareous; pH 7.5.

Ck - 48 cm +, yellowish brown (10YR 5/4 moist), light gray (10YR7/2 dry) gravelly coarse sand; structureless to amorphous; loose; moderately calcareous; pH 7.6.

Bell Creek Series (BEC)

The Bell Creek series is a poorly drained Orthic Humic Gleysol of the Souris Association, developed on deep, weakly to moderately calcareous, coarse textured (FS, LCoS, LS,LFS), lacustrine sediments. This soil is characterized by a loamy fine sand surface texture, nearly level to depressional topography, slow surface runoff, moderate permeability and a water table at an estimated depth of 1.5 metres during the growing season. As a result of the high water table and because it occupies a depressional position in the landscape, this soil is poorly drained. Bell Creek soils are non-saline and support native hydrophytic vegetation.

A typical profile of the Bell Creek series consists of a thick black Ah horizon overlying a dull very dark brown Bmg horizon. Structural development in the Bmg horizon is usually weak.

Bell River Series (BEV)

The Bell River series consists of imperfectly drained Gleyed Cumulic Regosol soils developed on moderately to strongly calcareous, deep stratified, coarse loamy to sandy, fluvial (alluvial) deposits. These soils occur on upper to middle slopes of gently sloping, undulating landscapes and have rapid permeability, moderate surface runoff and a generally low water table during the growing season. Bell River soils may be slightly water eroded. The native vegetation often comprises of mixed hardwood forest with an understory of low shrubs herbs and grasses. The majority of these soils are currently used for improved pasture.

In a representative profile of cultivated Bell River soil, the solum is generally 15 cm thick. The profile is characterized by a thin, 15 cm grayish brown loamy very fine sand Ap horizon overlying a light brownish gray to pale brown fine sand CKgj horizon. The parent material is typically variably stratified, loamy very fine sand textures with thin bands of silt loam and dark coloured organic rich layers and many weak, fine mottles.

Bell River soils occur in close association with Homestead soils. They are similar to Homestead soils by having similar profile characteristics, but differ from the Homestead soils because of dominantly coarser textured soil materials. Bell River soils have low available water holding capacity, medium organic matter levels, and medium natural fertility. Bell River soils correlate with the Bell River soils previously published in the Swan River soil report.

Bella Lake Series (BEL)

Bella Lake series consists of poorly drained, Rego Humic Gleysol carbonated soils of the Newstead Association developed on thin (25 to 95 cm), strongly calcareous, medium to moderately fine textured lacustrine sediments overlying strongly calcareous, medium to moderately fine textured glacial till. A coarse textured layer (5 to 75 cm) occurs at the contact. This soil is characterized by a fine

sandy loam surface texture, nearly level to depressional topography, a water table at approximately 1.5 m during the growing season, slow surface runoff and moderate permeability. The proximity of the less permeable underlying till and the depressional topography cause this soil to be poorly drained for most of the year. This weakly carbonated soil is rarely saline. The natural vegetation is hydrophytic. Bella Lake soils commonly occur in drainage channels of creeks and streams.

The Bella Lake series closely resembles the Deloraine series of the Waskada Association. The major difference from the Deloraine series is the presence of the coarse gravelly layer at the till contact.

Bellsite Series (BLT)

The Bellsite series consists of poorly drained, peaty, calcareous Gleysol soils developed on moderately calcareous, coarse to moderately coarse textured alluvial deposits. Surface textures range from fine sand to fine sandy loam; the fine sand texture is dominant. The Bellsite soil has an organic horizon up to 30 cm thick, a weakly developed Ah horizon less than 5 cm thick and a moderately calcareous, coarse textured substratum. The mineral section of the profile is stratified with thin layers of gravel, assorted sands, silt and clay. In some localized areas the bedding of silt and clay is sufficient to produce over-all textures of fine sandy loam. The entire mineral profile is strongly mottled and moderately alkaline in reaction.

This soil occupies two small areas in the northeastern corner of Twp 41, Range 26W and in the north-central portion of Twp 41, Range 25W. Both areas have a number of intermittent streams which, in the spring and wet seasons, often overflow their banks. The topography is very gently to gently sloping and is marked by channels and low levees. Native vegetation is aspen, balsam poplar, spruce and willow. Some tamarack, sedges and reeds occur on small areas of shallow peat associated with these soils.

Benchlands Complex (BCH)

The Benchlands complex is characterized by Calcareous or Orthic Black Chernozem soil profiles developed on parent material composed of a thin mantle (25 to 60 cm) of loamy sediments, over a variable thickness (10 to 40 cm) of medium sand to gravelly strata which overlay a strongly to very strongly calcareous, loamy (L, CL, SiCL) morainal till of limestone, shale and granitic origin. These soils occur adjacent to streams and channels. They are moderately well to well drained. Runoff is moderate; permeability is moderate to rapid in the upper loamy and coarser strata, and moderately slow in the underlying till. Some seepage from the adjacent slopes may occur through the gravelly strata above the till during periods of snowmelt and following heavy rains.

In the Binscarth area, the solum usually extends to the contact of the coarser strata, and has a very dark gray Ah or Ap horizon, 15 to 20 cm thick, a dark grayish brown Bmk horizon, 8 to 12 cm thick; and a thin BC, transitional horizon. A lime accumulation (Cca) horizon commonly occurs at the contact of the loamy and coarser strata.

Benton Series (BEO)

The Benton series is characterized by pedons which occur in the LBs2 ecoregion, have a Dark Gray Solonetz solum, moderately well to well soil drainage, and materials on either a thin veneer of clay, or weathered shale, overlying non-to-weakly calcareous shale bedrock (commonly on Millwood member). These soils have a hard columnar structure due to the presence of sufficient sodium in solution and the exchange complex; sodium salts are also associated with some shale beds of the Pembina member. They occur in gently sloping to hummocky dissected landscapes or along the upper slopes of the escarpment area; slopes of 3 to 9 percent are common. Runoff is moderate to rapid; permeability is very slow.

The solum has a thin LH horizon 2 to 4 cm thick, a dark gray Ahe horizon 3 to 10 cm thick, a very thin Ae immediately above the columnar Bn or Bnt horizon. The Bn(t) horizon may be subdivided into a Bn1 and Bn2 based on structure. The Bn1 is 15 to 30 cm thick, strong columnar and very hard when dry, very plastic when moist. The Bn2 has a massive to weak angular blocky structure and very plastic when moist; thickness of the Bn2 varies from 10 to 25 cm; a BC or C horizon of variable thickness is usually present above the shale bedrock. The solum depth may vary from 55 to 75 cm; depth to the shale varies within the various topographic positions, but usually within 90 cm. Gypsum (selenite) and jarosite are commonly found in the shale bedrock. These beds have considerable pyrite present; they undergo considerable expansion when exposed to oxidative and moist conditions.

Most of these soils have been utilized as natural grazing areas. Under cultivation the Ahe, Ae and Bn1 horizons become incorporated into the plow layer; the plow layer may have a massive to angular blocky structure that becomes quite difficult to work when moist and very hard when dry (Soils of the RM of Grey, Dufferin, Roland, Thompson and part of Stanley, Report D60).

Beresford Series (BSF)

The Beresford series consists of imperfectly drained Gleyed Rego Black, carbonated soils developed on a thin mantle (<1 m) of loamy (L, SiL, CL, SiCL) lacustrine sediments over strongly to very strongly calcareous, loam to clay loam glacial till of shale, limestone and granitic origin. These soils occur on near level to undulating topographic landscapes in association with the Clementi (Orthic Black Chernozem) soils. They occur in landscapes which are considered to be in a discharge to weak recharge (groundwater) area and may have soluble salts within the rooting zone or subsoil. The runoff is slow, and permeability is moderately slow to slow.

The Beresford soils are characterized by a very dark gray to black Ah horizon 20 to 30 cm, a dark gray ACk horizon of 6 to 12 cm thick. A lime accumulation zone may occur in the loamy lacustrine sediments if the overlay is thick; the underlying strongly calcareous till of shale limestone and granitic origin is generally more compact.

Berlo Series (BLO)

The Berlo series consists of imperfectly drained Gleyed Dark Gray Luvisol soils developed on strongly calcareous deltaic sediments. Surface textures are fine sand to fine sandy loam. These soils occur in small scattered areas, generally bordering gravel beaches or on the margin of lacustrine plains. The topography is level to irregular, very gently sloping. Soil permeability is rapid, but internal drainage is impeded by finer textured substrate of clay or glacial till generally below one metre. A perched water table is present in wet seasons and often reaches the surface during the spring thaw or after prolonged summer rains. The native vegetation consists of aspen-black poplar woods with an undergrowth of willow, meadow-prairie grasses and herbs.

The soils are weakly to moderately degraded. The A horizon consists of a thin dark gray Ah horizon of 5 to 7 cm, and a light gray Ae horizon. The B horizon is dark grayish brown, fine granular and contains a slight accumulation of clay and humus. The lower portion of the A and B are mottled with iron. The soil may be weakly alkaline in reaction or contain lime carbonate due to recharge with lime by period saturation with lime charged water.

Bermont Series (BMN)

The Bermont series consists of well drained Rego Black Chernozem soils developed on a thin mantle (50 to 75 cm) of very strongly to extremely calcareous loamy glacial till of limestone and granitic origin overlying strongly calcareous loam to clay loam glacial till of shale, limestone and granitic origin. These soils occur in the upper slope and knoll positions of gently undulating to moderately rolling topography. Runoff is rapid; permeability is moderate to moderately slow in the upper till and slow in the lower till, which generally is more compact and weakly fissile.

The Bermont soil is characterized by a shallow Ah or a Ahk horizon 10 to 16 cm thick and an AC horizon of 4 to 8 cm. This soil profile is similar to the Stewart series. It is associated with the well drained, Hilton and Tiger Hills soils; the imperfectly drained, Barwood series and the poorly drained Hickson series.

Bernice Series (BIC)

The Bernice series consists of well drained Orthic Black Chernozem soils of the Bernice Association, developed on thin (25 to 100 cm) moderately to strongly calcareous, coarse textured (FS, LCoS, LS, LFS), gravelly deltaic and outwash deposits overlying strongly calcareous, medium to moderately fine textured, glacial till. These soils occur in transition areas between the deep outwash deposits and glacial tills mainly in the western portion of the Boissevain-Melita map area near the western edge of the Souris Basin. The topography is gently undulating, permeability is moderately rapid, and surface runoff is low. Bernice soils are well drained although the proximity of the underlying glacial till restricts downward drainage.

Berry Island Series (BYD)

The Berry Island series consists of poorly drained carbonated, Rego Humic Gleysol soils developed on moderately to strongly calcareous sandy and gravelly outwash or beach deposits overlying extremely calcareous glacial till. The surface textures are variable and range from loamy fine sand to clay loam depending on the amount of in-washing from surrounding areas. The topography is level to depressional; runoff is very slow; permeability is slow. Vegetation consists of sedges, willow, meadow grasses and some black spruce and tamarack.

A partially decomposed organic layer 10 to 15 cm. thick is underlain by a carbonated dark gray Ah horizon 5 to 15 cm. thick. A lime enrichment layer (Cca) may be present below the Ah horizon, depending on the depth of occurrence of the gravelly layers; the sandy and gravelly deposits are stratified and usually have yellowish brown iron mottles. The underlying loamy till deposits are usually light gray and may have fine to medium yellowish brown mottles. A description of a Berry Island soil is given below.

L-H - 3 to 0 cm, very dark gray (10YR 3/1 dry, 2.5YR 2/0 moist), partially decomposed sedge, grasses and leaves; mildly alkaline, very strongly calcareous.

Ahk - 0 to 5 cm, dark gray (10YR 4/1 dry, 5.0Y 2/1 moist), clay loam; weak fine granular; sticky when wet, friable when moist, plastic; mildly alkaline; extremely calcareous; clear smooth boundary.

AC1 - 5 to 17 cm, light gray to gray (10YR 6/1 dry, 5YR 4/2 moist), loam; weak to moderate coarse prismatic breaking to weak to moderate fine platy; slightly sticky when wet, friable when moist; slightly plastic; moderately alkaline; very strongly calcareous; clear, smooth boundary.

AC2 - 17 to 22 cm, light brownish gray (2.5Y 6/2 dry, 5Y 5.5/3.5 moist), sandy clay loam; weak, fine granular; slightly sticky when wet, friable when moist, slightly plastic; moderately alkaline; very strongly calcareous; many, coarse, distinct yellowish brown (10YR 5/8 moist), mottles; abrupt, smooth boundary.

II Ckg1 - 22 to 50 cm, light gray (2.5Y 7/2 dry, 5.0Y 6.5/2 moist), gravelly sand; single grained; loose when moist; moderately alkaline; extremely calcareous; clear, smooth boundary.

II Ckg2 - 50 to70 cm, light gray (2.5Y 7/2 dry, 5Y 6.5/2.5 moist), gravelly sand; single grained; loose when moist; moderate alkaline; extremely calcareous; common, medium, distinct reddish yellow (7.5YR 6/6 moist), mottles, abrupt, smooth boundary.

III Ckg - 75 to 100 cm, white (2.5Y 8/2 dry, 2.5Y 5.5/4.5 moist), sandy clay; weak fine platy to fine granular; moderately alkaline; extremely calcareous.

Berry Island, peaty phase, is similar to the Berry Island but has a thicker peat layer (15 to 40 cm. of mixed peat) on the surface.

Bethany Series (BHY)

The Bethany series consists of imperfectly drained carbonated, Gleyed Rego Black Chernozem soils developed on shallow (25 to 100 cm) uniform, strongly calcareous, sandy fluvial outwash deposits. These soils occur in lower slope positions of undulating landscapes and have rapid permeability, moderate to slow surface runoff and a medium high water table during the growing season. Bethany soils are non-eroded, slight to moderately stony and non-saline. They have low available water holding capacity, and medium to low organic matter content. Native vegetation often includes meadow grasses, shrubs, and willows. The majority of these soils are currently used for forage and some for annual crop production.

In a representative profile of Bethany soil, the solum is approximately 28 cm thick. The profile is characterized by a black, sandy, strongly calcareous, Ahk (Apk) horizon, 15 to 25 cm thick, overlying a strongly calcareous, sandy transitional AC horizon, 5 to 10 cm thick, a very strongly calcareous, coarse sandy (CoS, MS, LCoS, LS), Cca horizon, 5 to 10 cm thick with few fine faint mottles, and a few coarse fragments; and a strongly calcareous, sandy Ckg horizon, 30 to 50 cm thick with many strong prominent mottles. The parent material is typically sandy to gravelly deltaic, beach and outwash deposits. Bethany soils occur in close association with Katherine and Seech soils. They are similar to these soils by having the same parent material but differ from Seech soils because of poorer drainage and from Katherine soils by the presence of carbonates throughout the profile. Bethany soils also have a higher and more persistent water table than either of these soils. Bethany soils were previously mapped as minor inclusions in the Seech Deep Phase association in the reconnaissance survey of soils in the Rossburn and Virden map sheet areas.

Big Eddy Series (BGE) drained phase

This soil is equivalent to the better drained Le Pas sand substrate phase in the Soil Survey of the "Pasquia Map Area", Report No11. These soils are carbonated, Rego Gleysols developed on 20 to 60 cm of clay, abruptly terminated by a sand substrate. These soils are moderately calcareous, moderately alkaline throughout and generally slightly saline. The topography is level, and the vegetation consists of reeds and sedges. Some organic matter in the form of peat and/or muck is present on the surface and in bands within the soil profile. Where mixing by cultivation has occurred, the surface soils have a dark colour much like the grassland soils in the southern part of Manitoba. This soil is found in the Saskatchewan River delta of the map area.

Big Lake Series (BGA)

The Big Lake series consists of poorly to very poorly drained Rego Gleysol, carbonated phase soils developed on recent alluvium. The texture of the solum varies from very fine sandy loam to silty clay loam with moderate amounts of lime carbonate. Bands of organic matter and layers of fine sand to clay textured sediments are common in these soils. All of the Big Lake soils are covered by a thin layer of peat. The topography is level, and the vegetation is dominantly reeds, sedges and willows. This soil is only found in the Saskatchewan River delta.

Om1 - 34 to 0 cm, dark reddish brown (5YR 3/2 moist) black (10YR 2/1 dry) moderately decomposed fen peat, medium to fine fiber, non-woody, slightly acid, abrupt smooth boundary.

IICkg1 - 0 to 15 cm, very dark grayish brown (10YR 3/2 moist) dark grayish brown (10YR 4/2 dry) silty clay; few fine prominent dark reddish brown (5YR 3/3) mottles; weak fine pseudo-platy breaking to weak fine granular; moist friable, dry soft; mildly alkaline; moderately calcareous; abrupt smooth boundary.

IICkg2 - 15 to 54 cm, very dark grayish brown (10YR 3/2 moist) dark grayish brown (10YR 4/2 dry) silty clay with thin very fine sandy loam layers; few fine faint brown to dark brown (10YR 4/3) mottles; weak fine pseudo-platy breaking to weak fine granular; moist very friable; dry soft; mildly alkaline; moderately calcareous; clear smooth boundary.

IICkg3 - 54 to 88 cm, dark gray (5YR 4/1 moist) brown (10YR 5/3 dry) silty clay loam; few fine faint dark reddish brown (5YR 3/4) mottles; moderate fine granular; moist friable, dry slightly hard; mildly alkaline, moderately calcareous.

The drained phase of Big Lake series occurs on slightly higher ground along the west and north shorelines of Pasquia Lake. Surface runoff is moderately good due to the slightly elevated position of these soils in relation to the adjacent soils. In spite of this favourable relief a high water table in the spring and often in the summer or fall imparts a severe soil drainage problem. Native vegetation consists of sedges with clumps of willow. Some upper slope areas of Big Lake drained phase soils have been cultivated and grow improved forage or annual crops.

The modal soil phase is the most extensive of the units mapped in Pasquia Lake. The largest block occurs in the level to depressional central and southern portion of the study area. These soils are similar to the Big Lake drained phase soils differing only in their naturally poor surface drainage.

The range of drainage condition associated with the modal phase is described by three drainage variants based on estimated periods of inundation and saturation: Big Lake 1 variant is poorly drained with a subaquic moisture regime in which surface water is seldom present. The surface soil is saturated for extended periods throughout the growing season but usually not in excess of 4 months. The native vegetation is hydrophytic, consisting of continuous cover of sedge and whitetop; clumps of willow also occur. Harvest of native hay occurs on these soils during late summer to early fall. Big Lake 2 variant is very poorly drained variant and has an aquic moisture regime. The soils are seasonally flooded for extended periods early in the growing season but surface water is absent by the end of the grow ing season in most years. If surface water is absent the soil is at or near saturation for moderately long periods. The native vegetation is hydrophytic consisting of mixed stands of bullrush, cattail, sedge and willow. There is no present agricultural use of these soils.

Big Lake 3 variant is very poorly drained with a peraquic moisture regime. The soils are semi-permanently flooded as surface water persists through the growing season in most years. When surface water is absent, the soil surface is saturated or nearly saturated for very long periods (>10 months). Native vegetation on these soils consists of continuous cattail with patches of phragmites and bullrush. There is no present agriculture use of these soils.

Birch Bay Series (BHB)

These soils are imperfectly drained Gleyed Eluviated Eutric Brunisol soils developed on 20 to 100 cm of extremely calcareous loamy till over limestone bedrock. Due to the thin veneer of till they are developed on, these soils are considered shallow and very shallow lithic phases. Areas of Birch Bay soils have nearly level to gently sloping topography. Surface texture varies from fine sandy loam to clay loam. The solum of Birch Bay soils is generally less than 20 cm thick, characterized by a thin, light colored, often discontinuous Ae or Aej horizon overlying a thin, weakly developed textural Btj horizon. Birch Bay soils have slow to moderate surface runoff and slow internal percolation of water. These soils are very stony due to the nature of the till and the proximity of the limestone bedrock. Vegetative cover is dominantly spruce, aspen, jack pine and some willow.

The Birch Bay soils are often associated in mapping units with soils of the Limestone Point shallow phase, Biscuit Point, and Chitek series. The Birch Bay soils of the Low Boreal climate zone correlate with the Faulkner series in the High Boreal-temperate climatic zone, and with the Inwood series, rock substrate phase, as mapped in the Grahamdale Area (Soils Report No. 16).

Birch Point Series (BHP)

The Birch Point series consists of well drained Dark Gray Luvisol soils developed on moderately to very strongly calcareous medium textured (VFSL, L, SiL) alluvial and lacustrine sediments. Surface textures range from very fine sand to silt loam; the under-lying stratified material usually has layers of fine sand to silty clay loam. They occur on level to gently sloping topography. Runoff is moderate to moderately slow and permeability is moderate, but may be moderately slow in some soils with layers of silty clay loam.

The Birch Point soil is characterized a thin very dark gray Ah horizon and a thicker Ae horizon. The soils with a thicker sandy surface usually have a deeper and better developed Ae horizon up to 10 cm thick. A well developed fine blocky Bt horizon is present; the texture varies from clay loam to silty clay loam. Variable strata from very fine sandy loam to silty clay loam occur in the subsoil. A representative profile of the Birch Point soils is given below.

Ap - 0 to 10 cm, grayish brown (10YR 5/2 dry), very fine sandy loam; weak fine granular; very friable when moist, soft when dry; neutral; abrupt, smooth, lower boundary.

Ae - 10 to 15 cm, light brownish gray to light gray (10YR 6/2 to 7/2 dry), very fine sandy loam; weak fine to medium platy; very friable when moist, soft when dry; neutral; abrupt, smooth, lower boundary.

AB - 15 to 20 cm, dark grayish brown to grayish brown (10YR 4/2 to 5/2 dry), very fine sandy clay loam; moderate fine to medium granular; friable when moist, slightly hard when dry; neutral; clear, smoother lower boundary.

Bt - 20 to 33 cm, brown to dark brown (10YR 4/3 dry), clay loam; strong fine blocky; firm when moist, hard when dry; neutral; clear, wavy, lower boundary.

BC - 33 to 45 cm, brown to pale brown (10YR 4/3 to 5/3 dry), silty clay loam; weak to moderate medium granular; firm when moist, hard when dry; mildly alkaline; strongly calcareous; clear, wavy, lower boundary.

Ck - 45 to 60 cm, pale brown to very pale brown (10YR 6/3 to 7/3 dry), silt loam; weak fine to medium granular; friable when moist; slightly hard to weakly cemented when dry; moderately alkaline; extremely calcareous.

Birkenhead Series (BKA)

The Birkenhead series is a Calcareous Black Chernozem soil developed on moderately well drained, moderately to strongly calcareous, stratified sandy (LS, S, CoS) and gravelly deposits. There is usually a surface mantle ranging in texture from loamy fine sand to sand over the coarser textured materials. These soils occur on gently sloping, stone-free, northwest-southeast trending beach ridges formed by glacial Lake Agassiz below the Manitoba Escarpment. Surface runoff is minimal, and permeability is rapid. These soils are strongly to severely affected by droughtiness as a result of their rapid permeability and low water-holding capacity. The native prairie grasses once associated with these soils have been mostly replaced by cultivated grasses and legumes such as brome grass and alfalfa.

The Birkenhead soil profile has a very dark gray Ah horizon, 15 to 30 cm thick; a weakly calcareous, stratified, brown Bm horizon, 10 to 20 cm thick, and a pale brown, moderately to strongly calcareous C horizon. This soil differs from the similar Willowcrest series in having coarser textures, more rapid drainage and having a calcareous Bm horizon.

Biscuit Point Series (BCP)

The Biscuit Point series consists of Rego Gleysol soils developed on 20 to 100 cm of extremely calcareous, loamy, very stony till deposits over limestone bedrock. Due to the thin veneer of till these soils are developed on, they are considered as Rego Gleysols, carbonated, shallow and very shallow lithic phases. These poorly drained soils have depressional to level topography and are overlain with a thin (15 to 60 cm) surface layer of peat. Runoff is very slow and internal drainage is impeded by a high groundwater table. The most common vegetation associated with these soils is black spruce with an understory of Labrador tea and feathermosses.

Bishop Series (BIP)

The Bishop series consists of imperfectly drained Gleyed Rego Black Chernozem soil developed on a mantle (60 to 100 cm) of moderately calcareous, shallow, uniform, clayey (SiC, C) deposits containing shale fragments over non to weakly calcareous weathered, Odanah, siliceous, shale bedrock. These soils occur in middle to lower positions of moderate slopes on the Manitoba Escarpment where soil parent material is derived from shale bedrock. They have slow to very slow permeability, moderate surface runoff, and a high water table during the growing season. Bishop soils are moderately water eroded, non-stony, and frequently slightly saline. They also have a high available water holding capacity, low organic matter content, and low natural fertility. Native vegetation includes shrubs, willows, ash and oak. The majority of these soils are currently in native vegetation.

In a representative profile the solum is approximately 30 cm thick. The profile is characterized by a dark gray to very dark gray Ah horizon, 25 to 35 cm thick, usually with carbonates and salts, a transitional AC horizon, 30 to 40 cm thick with carbonates, mottles and gypsum crystals, and shale bedrock at a depth of 75 to 90 cm. A typical profile also is influenced by seepage from upper slopes resulting in carbonated and saline profiles.

Black Duck Series (BCD)

The Black Duck series are well drained Orthic Gray Luvisol, shallow and very shallow lithic phase soils, developed on 20 to 100 cm of weakly to moderately calcareous, sandy to loamy-skeletal glacial till overlying limestone bedrock. These soils are slightly to moderately stony, and occur in areas of level to gently sloping topography. Permeability is moderate to high, and surface runoff is moderate to low.

These soils generally have a thin, light colored, loamy sand to sand, eluvial Ae horizon overlying a darker, sandy loam to loam textured Bt horizon. Where the parent material is relatively thin, 50 cm or less for example, the carbonates have frequently been removed as far down as the lithic contact.

The Black Duck, shallow phase soils are well drained Orthic Gray Luvisols, developed on less than 20 cm of weakly to moderately calcareous, sandy to loamy-skeletal glacial till overlying limestone bedrock. These soils are considered extremely shallow lithic phases according to soil family criteria. They are moderately stony, and occur in areas of level to gently sloping topography. Profile development is similar to that of the normal Black Duck series, consisting of a thin light colored, Ae horizon overlying a darker, sandy loam textured B horizon. This Bt horizon frequently extends to the lithic contact, although it is commonly underlain by a thin fragmental layer of limestone cobbles overlying the bedrock.

Black Duck, shallow phase soils occur in the higher, well drained bedrock plateau areas in the central portion of the map area, as well as on Anderson Point and south of Little Grindstone Point. They usually occur in association with the Namew series, shallow phase, the soils of the Cross Bay complex, and the Namew and Black Duck series. Black Duck soils occur in the higher, well drained areas in the central portion of the map area. They usually occur in conjunction with the similar but imperfectly drained Namew series, and the shallow phases of both these series.

Black Lake Series (BCK)

The Black Lake series consists of well drained Cumulic Regosol soil developed on moderately to strongly calcareous, deep stratified, clayey, fluvial deposits. These soils occur in upper positions of gentle slopes on terrace landscapes and have moderately slow permeability, moderate surface runoff and a low to medium water table during the growing season. They have medium to high available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes elm, maple, box elder, cottonwood and some oak. The majority of these soils are currently used for agriculture or are in their native treed state and are subject to flooding.

In a representative profile of Black Lake soil the solum is approximately 15 cm thick. The profile is characterized by a gray, weakly calcareous, SiC, Ah horizon, 0 to 15 cm thick, with a gray (10YR 5/1dry), weakly calcareous, SiC, Ck1 horizon, 15 to 30 cm, a gray to light gray, moderately calcareous, SiC, Ck2 horizon, 30 to 50 cm with SiL to SiCL strata and a brownish gray, moderately calcareous, SiC, Ck3 horizon 50 to 90 cm. The parent material is typically stratified.

Black Lake soils occur in close association with Seine River and Hodgson soils. They are similar to Hodgson soils by having a similar position and mode of deposition but differ from Hodgson soils because of a heavier texture. Black Lake soils were previously mapped as Riverdale in the Morris Map Sheet, Report No. 5, 1953.

Blackdale Series (BLC)

The Blackdale series consists of moderately well to well drained Orthic Black Chernozem soils developed on moderately to strong calcareous, dominantly moderately fine textured (SiC, C) lacustrine deposits. The topography is very gently sloping, runoff is moderate and permeability is moderate. Most of the soil area is under cultivation; native vegetation consists of tall prairie grasses with scattered bur oak and trembling aspen.

The soil is characterized by a dark gray to very dark gray, granular, Ah horizon 15 to 25 cm. thick, a grayish brown Bm horizon 15 to 20 cm. thick with moderate medium granular structure and a light gray, moderately to strongly calcareous C horizon. This soil has a solum similar to the Eigenhof clay loam in the Portage La Prairie and Morden-Winkler Reports, but contains more carbonates in the parent material.

Blackstone Series (BCS)

The Blackstone series comprises well to moderately well drained Orthic Gray Luvisol soils developed from weakly to moderately calcareous, stone-free, clayey glacio-lacustrine sediments. Topography varies from gently sloping to hummocky. Permeability is slow due to the fine texture of the parent material. The origin of these deposits has been described in previous soil reports (West Lake Soils Report No. 8, Grandview Soils Report No. 10) as boulder clay till derived from local shale outcrops in areas along the margins of the escarpment. In the morainal upland environment of the Duck Mountain study areas this parent material appears to be of glacio-lacustrine origin. No shale or other rock fragments are incorporated within the massive, silty clay to clay textured matrix.

Blackstone soils exhibit a Luvisolic profile with a solum consisting of a thin leaf mat (LFH) 5 to 10 cm thick, a loamy sand textured (Ae) horizon 10 to 15 cm in thickness, and a well developed clay textured Bt horizon. The unaltered silty clay textured C horizon is dark in color and normally begins at a depth of 40 to 50 cm. This characteristic color of the parent material imparts a relatively dark color to the A and B horizons as well. The lower C horizon frequently exhibits light colored varves, and occasionally, has a concentration of small pebbles which increase with depth, likely indicating a proximity to unaltered glacial till at depths greater than one meter. Blackstone soils usually support mixed woods vegetation similar to that of the regional till.

Blackstone soils occur throughout the map areas, most notably towards the north end of Wellman Lake, east of Glad Lake, and along the southwestern shoreline of Childs Lake. These soils are often found in association with the imperfectly drained Verrall Lake series and the poorly drained Breckon series, all of which are developed from the same parent material.

Blue Wing Series (BWG)

The Blue Wing series consists of well drained Dark Gray Luvisol soils developed on deep (>100 cm) moderately to strongly calcareous, uniform, sandy lacustrine deposits. These soils occur in upper to middle positions of gently sloping, hummocky landscapes and have rapid permeability, low to moderate surface runoff and a low (>2 m) water table during the growing season. Blue Wing soils are susceptible to erosion and may be moderately eroded, non-stony and non-saline. They have low available water holding capacity, and low organic matter content. Native vegetation often includes white spruce, aspen, shrubs, and grasses. The majority of these soils are currently used for improved pasture and forage.

In a representative profile of Blue Wing soil, the solum is approximately 67 cm thick. In the natural condition the profile is characterized by a thin slightly acidic leaf mat (LFH) 3 to 5 cm thick, a dark gray Ahe horizon, 7 to 12 cm thick, and a light gray Ae horizon, 10 to 25 cm thick, with weak fine platy structure; a brown to dark brown, sandy loam textured Bt horizon, 18 to 25 cm thick with weak medium subangular blocky structure and a loamy sand transitional BC horizon, 25 to 30 cm thick, grading into a moderately calcareous, yellowish brown sandy Ck horizon. The parent material is typically stone free sand.

Blue Wing soils occur in close association with Davidson and Rackham soils. They are similar to Davidson by having similar parent materials, but differ from Rackham soils because of a lighter sandier texture. Blue Wing soils were previously included in the Rackham sandy loam association in the reconnaissance survey of soils in the Rossburn and Virden map sheet areas.

Blumenfeld Series (BNF)

The Blumenfeld series consists of poorly drained Rego Humic Gleysol soil developed on moderately to strongly calcareous, loamy (VFSL, L, SiL, SiCL, CL), fluvial and lacustrine deposits. These soils occur in level to depressional positions of level slopes on level landscapes and have moderately slow permeability, very slow surface runoff, and ponding or a high water table during the growing season. Blumenfeld soils are non-eroded, non-stony, and frequently slightly saline. They have a medium available water holding capacity, medium organic matter content, and low natural fertility. Native vegetation includes sedges, reeds, rushes and meadow grasses. The majority of these soils are currently in native vegetation.

In a representative profile of Blumenfeld soil the solum is approximately 40 cm thick. The profile is characterized by a carbonated, very dark gray Ah horizon, 25 to 40 cm thick, a thin, dark grayish brown AC horizon, 10 to 15 cm thick with prominent mottles, and a light gray Ck horizon with prominent iron mottles. A typical profile also contains a Cca horizon of lime accumulation.

Blumenfeld soils occur in close association with Gnadenthal and Reinfeld soils. They are similar to Edkins soils by having a poorly drained profile in loamy deposits but differ from them in having loamy substrate while Edkins soils are clayey at depth. Blumenfeld soils were previously mapped as meadow associates of the Altona Association in the Morris Map Sheet, Report No. 5, 1953.

Blumengart Series (BMG)

The Blumengart series consists of imperfectly drained Gleyed Cumulic Regosol soil developed on weakly to moderately calcareous, clayey (SiC, C), recent fluvial deposits. Blumengart soils have been prone to flooding, but improved drainage has decreased the flooding hazard in recent years. These soils occur in level to depressional positions of level slopes on floodplain landscapes and have slow to very slow permeability, slow surface runoff, and a high water table during the growing season. Blumengart soils are non-eroded, non-stony, and frequently slightly saline. They have a high available water holding capacity, low organic matter content, and medium natural fertility. Native vegetation includes tall prairie grasses, willows and shrubs. The majority of these soils are currently cultivated.

In a representative profile of Blumengart soil there is no solum. The profile is characterized by a dark gray Ah horizon, 10 to 18 cm thick, and a gray to dark gray Ck horizon, with prominent iron mottles. A typical profile also contains thin strata of lighter textured former Ah horizons in the subsoil.

Blumengart soils occur in close association with Blumenort soils. They are similar to Assiniboine soils by having an imperfectly drained Regosol profile but differ from them in occurring below the escarpment in a warmer and moister climatic area. Blumengart soils were previously mapped as immature associates of the Gretna Association in the South-Central (1943) soil report.

Blumenort Series (BUM)

The Blumenort series consists of poorly drained Rego Humic Gleysol soil developed on moderately calcareous, deep, stratified, clayey (SiC, C), recent alluvial deposits in flood prone areas along stream channels at the base of the Manitoba Escarpment. These soils occur in depressional positions of nearly level slopes on level landscapes and have very slow permeability, slow surface runoff, and a high water table during the growing season. Blumenort soils are non-eroded, non-stony, and frequently saline. They have a high available water holding capacity, high organic matter content, and low natural fertility. Native vegetation includes sedges, rushes, reeds and willows. The majority of these soils are currently drained to reduce the hazard of flooding and used for cereal crop production.

In a representative profile of Blumenort soil the solum is approximately 20 cm thick. The profile is characterized by a very dark gray, calcareous Ah horizon, 10 to 18 cm thick, with slight salinity, a thin transitional AC horizon, 5 to 10 cm thick, and a dark olive gray Ck horizon, with numerous fine distinct mottles. A typical profile also contains light gray gypsum crystals in the C horizon.

Blumenort soils occur in close association with Blumengart soils. They are similar to Osborne soils by having a poorly drained profile in clayey soil. Blumenort soils were previously mapped as Meadow associates of the Gretna Association in the South-Central (1943) soil report.

Bone Series (BNE)

The Bone series consists of imperfectly drained Gleyed Dark Gray Chernozem soil developed on weakly calcareous, deep, stratified, coarse loamy and coarse silty (VFS, LVFS, FSL) lacustrine deposits. These soils occur in middle positions of very gentle to gentle slopes on hummocky landscapes and have slow permeability, low surface runoff, and a medium water table during the growing season. Bone soils are slightly eroded, non-stony, and non-saline. They have a medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation includes aspen, oak, shrubs and prairie grasses. The majority of these soils are currently cultivated for grain production.

In a representative profile of Bone soil the solum is approximately 90 cm thick. The profile is characterized by a dark gray to very dark gray Ah horizon, 20 to 30 cm thick, a grayish brown to brown Bmg or Bmgj horizon, 40 to 55 cm thick, a dark grayish brown Btjg or Btgj horizon, 5 to 10 cm thick, a transitional BC horizon, 5 to 10 cm thick, and a light gray, silty textured Ck horizon. A typical profile also contains layers of LVFS to SiL within a meter of the surface.

Bone soils occur in close association with Halstead, soils. They are similar to Danlin soils by having a Gleyed Dark Gray profile but differ from them in having dominantly coarser textured sediments. Bone soils were previously mapped as loamy Degraded Black associates of the Firdale Association in the Carberry (1957) soil report.

Bornett Series (BOR)

The Bornett series consists of poorly drained Rego Humic Gleysol, carbonated soils developed on a thin mantle (25 to 90 cm) of moderately to strongly calcareous very fine sand to sandy loam sediments overlying moderately to strongly calcareous medium sand to gravelly textured deposits. These soils occur in a level to depressional topographic landscape and are closely associated with the imperfectly drained Wytonville and Kilmury series and the well drained Miniota series. Runoff is slow to negligible; permeability is rapid, but restricted by a high water table throughout the growing season.

The soil is characterized by a thin, moderately decomposed organic layer of 2 to 3 cm thick, a very dark gray to black Ahk horizon of 15 to 24 cm thick, a dark gray ACkg 4 to 6 cm thick, and lime accumulation layer. The subsoil is light olive brown to olive with yellowish brown mottles of iron. Bornett soils are more permeable than the similar, finer textured Carvey series.

Bosshill Series (BSH)

The Bosshill series consists of poorly drained Carbonated Rego Humic Gleysols of the Bernice Association, developed on thin (25 to 100 cm), moderately to strongly calcareous, coarse textured, unsorted gravelly deltaic and outwash deposits overlying strongly calcareous, medium to moderately fine textured, glacial till. These soils have a very coarse surface texture, nearly level to depressional topography, high water table (less than 1.5 metres), moderately rapid permeability. As a result of the low topographic position and high water table this soil is poorly drained. It is also non-saline, non-stony and not cultivated. It generally supports a thick growth of native hydrophytic vegetation and is commonly used as pasture or left as native grassland. It generally occurs in and along the creek channels that drain the tills in the northwest section of the Boissevain-Melita map area.

Boswell Series (BSW)

The Boswell series consists of imperfectly drained carbonated, Gleyed Rego Black Chernozem soils developed on a thin mantle (30 to 90 cm) of moderately to strongly calcareous outwash and glaciofluvial sediments of sand to gravel texture overlying very strongly calcareous clay loam to silty clay loam lacustrine sediments. These soils occurr in the lower positions of undulating to moderately rolling topography in association with the Marringhurst, Oxford or Barren soils. Runoff is moderately rapid; permeability is rapid in the surface coarser sediments and moderately slow in the lower fine sediments. These soils are subject to perched water conditions above the more slowly permeable subsoil and to a lateral flow and seepage from the adjacent upland areas.

The soil is characterized by a variable Ah horizon 10 to 20 cm thick, depending on the thickness of sand and occurrence of the coarser gravelly particles. A thin AC may be present at this contact. Yellowish brown iron mottles are present in the coarser sediments above the silty clay loam lacustrine sediments.

Bower Series (BOW)

The Bower series consists of imperfectly drained Gleyed Black Chernozem soils of the Newstead Association, developed on thin (25 to 100 cm), strongly calcareous, medium to moderately fine textured, lacustrine sediments overlying strongly calcareous, medium to moderately fine textured, glacial till. A coarse textured layer (5 to 75 cm) thick occurs at the contact. Bower soils are characterized by a fine sandy loam surface texture, gently undulating topography, moderately slow permeability and slow surface runoff. Bower soils are imperfectly drained and generally occur in areas adjacent to creeks and ephemeral stream channels. The coarse textured layer may impede downward percolation and facilitate lateral water flow both of which will affect the moisture status of this soil. Although many of these soils are used for cereal crops, crop growth is more variable than on soils of uniform texture. This variability is attributed to the presence of the coarse textured layer which may inhibit root development and thereby render the plants more susceptible to moisture stress during dry periods. The degree to which the crops are affected will likely increase with increasing thickness of this coarse stratum.

Boxner Series (BOX)

The Boxner series is characterized by pedons which occur in the Gt4 ecoregion in proximity to the Manitoba Escarpment, have a Rego Humic Gleysol (carbonated) solum, poor soil drainage, and parent material sequence of shallow (less than 90 cm) loamy (L, SiL, VFSL, CL, SiCL), moderately to strongly calcareous, fluvial and lacustrine sediments over strongly calcareous stony water modified glacial till. The change from the loamy textured overlay to the water modified till is abrupt; a gravelly or cobbly strata usually occurs at the contact. These soils occur in the western part of the Red River Plain and lower slopes of the Escarpment; they are influenced by seepage and considerable ponding. A thin peaty layer may be present within the mapped areas. The solum has a variable mucky or peaty layer of 5 to 15 cm thick and a black, carbonated Ah horizon 10 to 15 cm thick. The underlying parent material (Ckg) is dark olive gray.

Breadon Series (BRO)

The Breadon series consists of well drained Calcareous Black Chernozem soils of the Dromore Association, developed on thin (25 to 100 cm), strongly calcareous, medium textured (VFSL, L, SiL), lacustrine sediments overlying course textured, gravelly, deltaic beach and outwash deposits. Breadon soils are characterized by a dominantly loam surface texture, nearly level to gently undulating topography, moderate permeability, and low surface runoff. The average depth to water table during the growing season is estimated to be greater than 2.1 metres. As a result of their drainage characteristics and topographic position, these soils tend to be non-saline and moderately susceptible to drought during periods of low precipitation. However, they are less droughty and more fertile than the very similar Broomhill Series because they have a significantly thicker and finer textured surface layer.

Breckon Series (BKO)

The Breckon series consists of poorly drained Rego Humic Gleysol soil developed on deep, (>100 cm) uniform, moderately calcareous, clay textured glacio-lacustrine deposits. These soils occur in depressional positions of nearly level to undulating landscapes and have very low permeability, very slow surface runoff and a medium-high water table during the growing season. Breckon soils are non-eroded, non to slightly stony and non-saline. They have high available water holding capacity, and medium organic matter content. Native vegetation often includes sedges, reeds, willows, and meadow grasses. The majority of these soils are currently used for natural grazing and some for improved pasture.

In a representative profile the solum is approximately 38 cm thick. The profile is characterized by a black, moderately calcareous, clayey Ahk horizon, 10 to 30 cm thick, overlying a massive, moderately calcareous, grayish brown Ckg horizon, with many medium prominent reddish brown mottles. The parent material is typically stone free. Breckon soils occur in close association with the well drained, Meadowbrook and Blackstone soils and the imperfectly drained, Wellman and Verrall soils. Breckon soils were previously mapped in the Meadowbrook Association in the Rossburn and Virden Report No. 6, 1956.

Broomhill Series (BOH)

The Broomhill series consists of well drained Calcareous Black Chernozem soils of the Bede Association, developed on strongly calcareous, deep coarse textured (FS, LCoS, LS, LFS) gravelly deltaic, beach and outwash deposits. A thin (0 to 25 cm) variable textured material may be present on the surface. These soils occur in areas of nearly level topography usually at the outflow of prominent creeks and intermittent stream channels. These soils have moderately rapid permeability, and low surface runoff. They are well drained with an estimated depth of water table of 3 metres during the growing season. Most Broomhill soils are used for native hay and pasture and some are left undisturbed with xerophytic native vegetation.

Broomhill soils are characterized by a dark gray Ap horizon 13 to 18 cm thick, a dark grayish brown Bmk horizon 8 to 13 cm thick with a grayish brown Cca horizon 5 to 8 cm thick occurring at or above the grayish brown IIC horizon. In some soils the very thin profiles are almost wholly developed in the surface 25 cm; in other soils the profile may extend well into the coarse gravel parent material.

The Broomhill series resembles the Adelpha series of the Bernice Association. The only difference being the Adelpha series is underlain by glacial till (Soils of the Boissevain - Melita Area, 1978). A description of a representative profile for the Broomhill series is given below.

Ap - 0 to 15 cm, very dark grayish brown (10YR 3/2 moist), dark gray (10YR 4/1 dry) loam; weak fine granular; very friable, moist; clear, smooth boundary; weakly calcareous.

Bmk - 15 to 25 cm, dark grayish brown (10YR 4/2 moist), grayish brown to grayish brown (10YR 4.5/2 dry) loam; moderate medium prismatic breaking to weak: fine granular; friable, moist; clear, wavy boundary; moderately, calcareous.

II Cca - 25 to 33 cm, grayish brown (10YR 5/2 moist), light brownish gray (10 R 6/2 dry) loamy gravel; structureless; loose; diffuse boundary; very strongly calcareous.

II Ck - 33 cm + , dark grayish brown, to grayish brown (10YR 4.5/2 moist), grayish brown to light brownish gray (10YR 5.5/2 dry) loamy gravel, structureless; loose; strongly calcareous.

Brownridge Series (BWD)

The Brownridge series consists of well to moderately well drained Orthic Regosol soils on weakly to moderately calcareous, moderately coarse textured (VFS, LVFS, FSL) lacustrine and deltaic sediments. These soils occur in association with the Halstead (Orthic Dark Gray) or Pleasant (Gleyed Rego Black, carbonated) soils and occupy the upper slope and knoll positions. Originally, these soils had a dark surface and profile development, but have been sufficiently eroded that little of the original horizons remain. These soils have moderately rapid permeability; runoff is moderately rapid to rapid depending on the slope gradient. The topography is undulating to moderately rolling. The soil is characterized by a 10 to 15 cm light gray to light brownish gray calcareous plow layer and a light yellowish brown to very pale brown C horizon.

Brundis Series (BNI)

The Brundis series is characterized by an Orthic Black Chernozem solum; soil drainage is moderately well to well, and a veneer of non to weakly calcareous clayey deposits or weathered (altered) shale overlies non to weakly calcareous shale bedrock. These soils occur in the upper slopes of the Escarpment area or in local areas above the Escarpment that have had considerable erosion and dissection; slopes may vary from 3 to 15 percent. Runoff is slope-related and varies from moderate to rapid. Permeability is slow to very slow when soils are moist to wet, but may vary with the structure of the soil. These soils have a high shrink-swell property. Brundis soils were previously included with the Benton Association in the South-Central (1943) soil report.

Buffalo Bay Series (BFY)

The Buffalo Bay soils are poorly drained Typic Humisols developed on deep deposits (> 130 cm) of moderately well to well decomposed forest peat overlying a thin layer of mesic fen peat; underlain by medium textured lacustrine sediments. The Buffalo Bay soils occur in very gently sloping mesic swamp landforms in the eastern parts of the Roseau River watershed. Poorly to very poorly drained sites receive laterally flowing minerotrophic waters. Undisturbed sites are characterized by eastern white cedar in various proportions with black spruce and tamarack. Ground cover consists of Labrador-tea, pitcher plant, wild lily-of-the-valley, swamp cranberry, twin flower, bunchberry, sedges, fire-weed, three-leafed Solomon's-seal, sphagnum mosses, feather-mosses, Bishop's-cap, and glaucous grass-of-Parnassus.

Bullhead Complex (BLA) or (BHX)

The Bullhead complex consists of a group of organic soils developed on deep (60 to 160 cm), fibric sphagnum moss peat usually underlain by significant amounts of moderately decomposed peat (sedge or moss) overlying limestone bedrock. These soils occur in low nutrient, very poorly drained areas adjacent to outcroppings of bedrock in the northeastern portions of the Grahamdale map sheet. The topography is level to very gently sloping away from the adjoining uplands. The vegetation on these soils is stunted stands of black spruce and tamarack with an understory of Sphagnum moss and ericaceous shrubs.

Bullhead series, a Lithic Mesic Fibrisol is the dominant soil in this complex. It has a fibric sphagnum peat surface tier. Where the lithic contact occurs in the middle tier the organic section consists of dominantly fibric sphagnum peat with a subdominant layer or layers of mesic forest or fen peat. If the lithic contact occurs in the bottom tier, the organic section consists of dominantly fibric sphagnum peat in the middle tier with a subdominant layer or layers of mesic forest or fen peat below the surface tier. Other soils in this complex are Doghead series and Steeprock series.

The soils of the Bullhead Complex are similar to those of the Molson Complex differing only with respect to the underlying mineral substrata. Bullhead complex usually occurs in association with soils of Janora Complex, Holditch Complex and Meleb Series, rock substrate peaty phase.

Bunclody Series (BCY)

The Bunclody series consists of poorly drained, Humic Luvic Gleysols of the Elva Association. They have developed on deep, strongly calcareous, moderately fine textured (SCL, CL, SiCL) lacustrine deposits. Bunclody soils are characterized by nearly level to depressional topography, moderately slow permability, and very slow surface runoff. This soil usually has a clay loam surface texture, poor drainage and hydrophytic vegetation. Polygonum Persicaria (lady's thumb) is a common natural indicator of the eluviated (leached) profiles in the Bunclody series. The estimated depth to water table during the growing season is less than 1 meter. Surface water-ponding is very common in the early spring and after periods of significant rainfall.

The profile characteristics of this soil indicate that much of the surface water infiltrates to the water table. These soils are usually dry by early August and can be traversed with tillage and harvesting equipment. Crop production is limited on these soils due to their high susceptibility to flooding. Bunclody soils are indicative of local ground water recharge. Bunclody soils are never saline but may occasionally be associated with narrow annular bands of weakly salinized Cranmer soils, particularly in areas with complex gentle slopes and depressions (Soils of the Boissevain - Melita Area, 1978).

Burntwood Complex (BTW)

The Burntwood complex consists of well to imperfectly drained Gray Luvisol soils developed on calcareous, non to moderately stony, stratified clayey to sandy glaciolacustrine and/or fluvial deposits. The topography of the Burntwood soil areas varies from gently sloping blankets to steeply sloping terraces. Permeability is moderate to moderately rapid and largely depends on depth to and extent of clay layers in the solum. Surface runoff is slow in the growing season but is significant and rapid during spring snowmelt when the soil is still frozen.

The vegetation varies with drainage but often consists of jack pine and black spruce stands mixed with trembling aspen. The ground cover is largely low ericaceous shrubs and feathermosses. Because of the variability of the Burntwood soil materials, soil profile development varies from Orthic Gray Luvisols to Eutric Brunisols. Some Burntwood soils resemble Sipiwesk soils with a sand cap, while others resemble Pipun soils with a sandy subsoil.

The Burntwood soils are associated with Sipiwesk, Roe Lake and Pipun soils in the Snow Lake area.

Butler Series (BUR)

The Butler series consists of well drained, Orthic Dark Gray Chernozem soils of the Butler Association, developed on strongly calcareous, coarse textured, gravelly deltaic outwash deposits. This soil is found in localized areas mainly above the 550 m elevation in the Turtle Mountain area. These soils have undulating topography, rapid permeability, and slow surface runoff. Butler soils are well drained and are generally left undisturbed. Some of these soils are mined as a source of gravel for road construction.

Butler soils have formed on similar material to the Bede soils but under cooler climate at higher elevations in the Turtle Mountains.

Cactus Series (CCS)

The Cactus series consists of well drained Rego Black Chernozem soil developed on moderately calcareous, deep, stratified, sandy (FS, LFS, LS), lacustrine and deltaic deposits. These soils occur in upper slope and crest positions of gentle slopes on undulating duned landscapes and have moderately rapid to rapid permeability, minimal surface runoff, and a low water table during the growing season. Cactus soils are highly prone to wind erosion, and are non-stony, and non-saline. They have a low available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation includes aspen, bur oak and tall prairie grasses. The majority of these soils are currently used for natural grazing.

In a representative profile of Cactus soil the solum is approximately 15 cm thick. The profile is characterized by a very dark gray Ah horizon, 12 to 16 cm thick, a dark gray AC horizon, 4 to 8 cm thick which is calcareous, a thin Cca horizon, 5 to 10 cm thick with lime accumulation and a light gray to pale brown Ck horizon. Cactus soils occur in close association with Stockton, Arizona and Sewell soils. They are similar to Stockton soils by having a well drained profile developed in sandy deposits but differ from them in having no Bm horizon. Cactus soils were previously mapped as minor Blackearth associates of the Stockton Association in the Carberry (1957) soil report.

Caliento Series (CIO)

The Caliento series consists of imperfectly drained Gleyed Gray Luvisol soils developed on a mantle of weakly to strongly calcareous sandy sediments overlying very strongly to extremely calcareous loamy glacial till. Surface textures vary from fine or medium sand to loamy fine sand. These soils occur on irregular, gently sloping terrain. Permeability is rapid in the upper sandy sediments and moderate to moderately slow in the till; runoff is slow. A perched water condition exists above the till for short periods in the spring and following heavy rains. These soils are slightly to moderately stony; the degree of stoniness is dependent on the depth of sandy sediments over the till. Native vegetation consists of trembling aspen, rose, wild strawberry, and grasses. The soils are characterized by an LH, Ahe, Aeg, Btg, IIBCkg and IICkg horizon sequence. The iron stained Aeg varies in thickness depending on the depth of sandy sediments over the till. The Btg occurs in the base of the sandy layer if the sandy sediments are deep or in the upper till if the sandy sediments are shallow.

Cameron Series (CMR)

The Cameron series consists of well drained, Orthic Black Chernozem soils of the Cameron Association, developed on deep, strongly calcareous, loamy lacustrine sediments. These soils have dominantly a loam surface texture, very gently sloping to gently undulating topography, moderately rapid permeability, and moderate surface runoff. This soil is moderately to well drained with an estimated depth to water table of 3 m during the growing season. These soils are non-saline, non-stony, fertile agricultural soils.

Cameron soils generally occupy slightly higher landscape positions than the Hartney and Denbow soils and are commonly found in close association with Lyleton soils. Cameron soils with low amounts of crop residue are quite susceptible to erosion.

A modal Cameron soil has a black Ap horizon 5 to 15 cm thick, a very dark gray Ah horizon 5 to 12 cm thick, a dark grayish brown Bm horizon 15 to 20 cm thick, a light gray Cca horizon 7 to 12 cm thick and an olive yellow Ck horizon. In MBT2 climatic subregion these soils equal the Fairland series.

Cantyre Series (CYE)

The Cantyre series consists of very poorly drained, Terric Mesisols, sphagnic phase, developed on shallow (40 to 130 cm) fen or forest-fen transitional peat, underlain by medium textured (VFSL, L SiL) lacustrine sediments within 130 cm of the surface. The soils usually have a very thin (15 to 60 cm) surface layer of fibric sphagnum peat.

The Cantyre soils occur in the Sundown peatland on very poorly drained hydric lowland swamp landforms that support open, stunted stand of tamarack with an understory of swamp birch, leatherleaf, and mixed mosses in which sphagnum species are dominant. The soils are similar to the Howell soils, which differ only in the texture of the underlying mineral substrate, and to the Katimik soils, which differ only in the depth of organic peat accumulation.

Capell Series (CXT)

The Capell series consists of imperfectly drained Gleyed Rego Black Chernozem soils developed on a mantle (25 to 100 cm) of moderately to strongly calcareous, stratified, loamy (SiL, L, CL), lacustrine sediments over moderately to strongly calcareous, deep stratified, sandy to sandy-skeletal (GrS, GrLS), glaciofluvial deposits. These soils occur in lower slope positions of gentle to moderate slopes on hummocky landscapes and have moderate to rapid permeability, moderate surface runoff and a medium water table during the growing season. Capell soils are occasionally slightly saline. They have medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes tall prairie and meadow grasses. The majority of these soils are currently used for grain crop production.

In a representative profile of Capell soil the solum is approximately 25 cm thick. The profile is characterized by a very dark gray to black Apk or Ahk horizon, 15 to 25 cm thick, a dark gray to gray, calcareous AC horizon, 5 to 15 cm thick, a light gray IICca horizon, 5 to 10 cm thick with secondary carbonate accumulation and a light yellowish brown IICk horizon with common, distinct iron mottles. The Capell Shaly Variant (CXT1) series is characterized by a Gleyed Rego Black Chernozem (carbonated) solum on an imperfectly

drained thin mantle (25 to 90 cm) of moderately to strongly calcareous loamy (L, CL, SiCL, SCL) sediments overlying moderately to strongly calcareous sand and gravel deposits intermixed with varying amounts of shaly fragments.

Capell soils occur on level to very gently sloping topography or on the lower slope positions of undulating topography. These soils have moderately slow permeability in the upper sediments and rapid permeability in the lower coarser sediments, or restricted permeability during periods of subsoil saturation due to a perched condition or high water level. In some areas, where the water contains appreciable soluble salts, a sufficient concentration of salts may occur to inhibit or retard the growth of grasses or cereals. The solum has a very dark gray to black Ahk horizon, 15 to 24 cm thick, a dark gray to gray AC horizon, 5 to 15 cm thick. A lime accumulation horizon (Cca), 8 to 12 cm thick extends to or into the coarser materials. Brownish yellow mottles are common in the coarser sediments below. Capell soils occur in close association with Croyon and Carvey soils. Capell soils were mapped as an imperfectly drained associate of the Agassiz Association in the reconnaissance soil survey of South-Central Manitoba (1943).

Carbonate Bedrock ($CR) or (CRC)

Areas with less than 10 cm of unconsolidated mineral material over bedrock were mapped as Carbonate Bedrock. The rocks are flat-bedded dolostones and limestones of Paleozoic age. These sites are normally very arid because the rocks are pitted and fractured. Topography varies from nearly level to gently sloping in these areas. Native vegetation on Carbonate Bedrock areas consists of stunted aspen and jack pine with a sparse growth of lichens, grasses and herbs. Surface outcroppings are mainly Silurian dolomites. These often occur in association with the Limestone Point and Limestone Point shallow phase series.

Carniege Series (CRG)

The Carniege series consists of imperfectly drained Gleyed Rego Black Chernozem soils developed on thin (25 to 100 cm), weakly to moderately calcareous coarse textured lacustrine sediments overlying strongly calcareous, medium to moderately fine textured glacial till. A coarse textured gravelly layer (5 to 75 cm) occurs at the contact of the lacustrine and till deposits. This soil usually has a fine sandy surface texture and occurs in areas of mixed surface deposits adjacent to creeks and ephemeral streams. The topography is gently undulating, permeability is moderate and surface runoff is slow. Its lower slope position and the proximity of the underlying till impedes drainage and results in gleyed, dull colored, iron stained profiles.

Carrick Series (CRK)

Carrick series are well drained Orthic Gray Luvisol soils developed on strongly calcareous, very stony glacial till. Surface texture of the plow layer, which consists of a mixture of material from A,B, and C horizons is generally fine sandy clay loam, but ranges from fine sandy loam to clay. This wide range in surface texture is due to the inclusion of soils developed on a very thin (0 to15 cm) lacustrine deposit over the till. Carrick soils occupy the well drained till ridges. The topography varies from smooth, very gently sloping to irregular, gently sloping. Surface runoff is moderate and permeability is medium. All Carrick soils are very stony. Although Carrick soils are characterized by strongly developed Orthic Gray Luvisol features, their horizons are thin. The solum is normally less than 30 cm thick and in some places does not exceed 15 cm. Cultivated Carrick soils are neutral to mildly alkaline in the plow layer and often contain free lime carbonate.

Carroll Series (CXF)

The Carroll series is a Rego Black Chernozem soil developed on moderately well to well drained, strongly to very strongly calcareous, fine loamy (CL, SiCL), lacustrine deposits. These soils occur in the Upper Assiniboine Delta and Brandon Lakes Plain on very gently sloping to undulating topography, in association with Ramada, Charman, Prodan and Tadpole soils. Surface runoff is moderately slow, and permeability is moderate. Careful management is required to reduce wind and water erosion, especially in undulating topography.

The Carroll soil profile has a very dark gray to black Ah or Ahk horizon, 15 to 20 cm thick; a dark gray AC horizon, 10 to 15 cm thick and a Cca horizon of lime carbonate accumulation, 8 to 14 cm thick. The silty textured, pale brown Ck horizon is very erosive. This soil differs only slightly from the Ramada soil in not having a prominent Bm horizon. Carroll soils were previously mapped as the well drained associate of the Carroll Association in both the South-Central (1943) and Carberry (1957) soil reports.

Carrot Series (CRR)

The Carrot series consists of imperfectly drained Gleyed Cumulic Regosols soils developed on moderately calcareous, loamy recent alluvium. The topography is level and vegetation is balsam poplar, aspen, elm, ash, white birch and white and black spruce. The Carrot soils have a thin Ah horizon which distinguishes it from the Nels series. This weak horizon development is the result of the slightly higher elevation providing a favourable environment for tree growth and decomposition of organic matter. The organic matter content is high on the surface and occurs in thin bands throughout the soil section. Silt loam is the dominant texture but stratification with layers of different textures ranging from fine sand to clay is characteristic. Iron mottling within 15 cm of the surface is characteristic. The Carrot soils are only found within the Saskatchewan River delta. A typical Carrot series is described below.

> **Ahgj1** - 0 to 15 cm, very dark gray (10YR 3/2 moist) grayish brown (10YR 5/2 dry) silty clay loam; moderate fine granular; moist friable, dry slightly hard; neutral; weakly calcareous; abrupt smooth boundary.

Ckgj1 - 15 to 39 cm, gray (10YR 5/1 moist) brown (10YR 5/3 dry) silt loam; few fine faint yellowish brown (10YR 5/6) mottles; weak fine pseudo-platy breaking to weak fine granular; moist very friable, dry soft; mildly alkaline; moderately

Ckgj2 - 30 to 47 cm, dark gray (10YR 4/1 moist) brown (10YR5/3 dry) silty clay loam, few fine faint dark brown to brown (7.5YR4/2) mottles; moderate fine granular; moist friable, dry slightly hard; mildly alkaline; moderately calcareous; abrupt wavy boundary.

Ckgj3 - 47 to 66 cm, dark grayish brown (10YR4/2 moist) light brownish gray (10YR6/2 dry) silt loam; weak fine pseudo-platy breaking to weak fine granular; moist very friable, dry soft; mildly alkaline, moderately calcareous; abrupt wavy boundary.

Ckgj4 - 66 to 74 cm, very dark brown (10YR3/2 moist) grayish brown (10YR5/2 dry) silty clay loam; weak fine granular; moist friable, dry slightly hard; mildly alkaline; moderately calcareous; abrupt wavy boundary.

Ckgj5 - 74 to 98 cm, gray (10YR5/1 moist) brown (10YR5/3 dry) silt loam; weak fine pseudo-platy breaking to weak fine granular; moist very friable, dry soft; mildly alkaline; moderately calcareous.

Cartwright Series (CWG)

The Cartwright series consists of imperfectly drained Gleyed Black Chernozem soils of the Bede Association developed on strongly calcareous, deep, coarse textured (FS, LCoS, LS, LFS), gravelly, deltaic, beach and outwash deposits. The solum is usually developed in a thin coarse sandy loam to loamy sand surface layer. The soil has gently undulating topography, rapid permeability and very slow surface runoff. These soils have imperfect drainage as a result of a high water table which is estimated at less than 1 metre for much of the growing season. These soils commonly occur in level areas of large kettled, outwash deposits or in stream channels. Some of these soils are cultivated but most are used for native hay and pasture (Soils of the Boissevain - Melita Area, 1978). A representative profile description is presented below.

Ah - 0 to 23 cm, very dark gray (10YR 3/1 moist), very dark grayish brown to dark grayish brown (10YR 3.5/2 dry) sand; weak, fine granular; loose; mildly alkaline; non-calcareous; clear, smooth boundary.

Bmgj - 23 to 46 cm, dark grayish brown (10YR 4/2 moist), dark yellowish brown (10YR 4/4 dry) gravelly, sand; weak, fine granular; loose; some dark brown (7.5YR 4/4 dry) iron concretions; moderately alkaline; non-calcareous; clear, smooth boundary.

BC - 46 to 61 cm, brown (10YR 5/3 moist), light gray (10YR7/2 dry) gravelly sand; structureless single grained; loose; moderately alkaline; moderately alkaline; moderately calcareous; diffuse, wavy boundary.

Ckgj - 61 cm +, brown (10YR 5/3 moist), light gray (10YR7/2 dry) gravelly fine sand; structureless; loose; moderately alkaline; moderately calcareous.

Carvey Series (CAV)

The Carvey series consists of poorly drained Rego Humic Gleysol soil developed on a mantle (25 to 100 cm) of moderately to strongly calcareous, uniform, loamy (SiL, L, SL) lacustrine sediments over moderately to strongly calcareous, sandy to sandy skeletal glaciofluvial deposits. These soils occur in depressional positions of nearly level slopes on level landscapes and have moderate permeability slow surface runoff and a high water table during the growing season. Carvey soils are occasionally slightly saline. They have medium over low available water holding capacity, high organic matter content, and medium natural fertility. Native vegetation often includes sedges and meadow grasses. The majority of these soils are currently used for natural grazing. In a representative profile of Carvey soil the solum is approximately 20 cm thick. The profile is characterized by a thin (2 to 5 cm) moderately decomposed LFH horizon a very dark gray, calcareous Ah horizon, 7 to 15 cm thick and a dark gray, calcareous, transition AC horizon, 10 to 20 cm thick, and a pale brown, calcareous II Ck horizon with yellowish brown mottles. A typical profile also contains manganese concretions in the subsoil and shells at the surface.

Carvey soils occur in close association with Capell, and Croyon soils. They are similar to Tadpole soils by having a Rego Humic Gleysol profile developed in loamy lacustrine deposits, but differ from Tadpole soils by having a sandy to sandy-skeletal substrate within a meter of the mineral surface. Carvey soils were previously mapped as a Meadow associate with a loamy veneer of the Agassiz Association in the Carberry (1957) soil report.

The Carvey shaly variant, CAV1, series is characterized by a Rego Humic Gleysol (carbonated) solum on poorly drained thin mantle (25 to 90 cm) of moderately to strongly calcareous loamy (L, CL, SiCL, SCL) overlying moderately to strongly calcareous sand and gravel deposits intermixed with varying amounts of shaly fragments. They occur in level to depressional sites which have a water table at or near the surface for part of the year. Runoff is negligible; permeability of the loamy sediments is moderately slow above the saturation zone. In area where the seepage water contains soluble salts, a sufficient concentration of slats may occur in the soil to inhibit the growth of the normal sedge and meadow grasses. The solum has a moderately decomposed organic layer, 2 to 5 cm thick, a very dark gray carbonated Ahk horizon, 7 to 15 cm thick, and a thin dark gray transitional AC horizon. A lime accumulation layer (Cca) is commonly present. Yellowish brown mottles are common in the transitional AC, the Cca horizon and the subsoil.

Cauldwell Series (CDW)

The Cauldwell series is the imperfectly drained, Gleyed Carbonated Rego Black Chernozem member of the Griswold Association, developed on thin (25 to 97 cm), moderately calcareous, coarse to moderately coarse textured, lacustrine sediments overlying strongly calcareous, medium to moderately fine textured, glacial till with a coarse textured gravelly layer (5 to 76 cm) occurring at the contact. These soils have a loamy very fine sand surface texture, gently undulating topography, moderately rapid permeability and moderate surface runoff. The presence of the coarse gravel lens and the underlying till restrict downward drainage and cause water to move laterally along the surface of the till resulting in an imperfectly drained profile. These soils are non-saline, non-stony and are generally cultivated. The Cauldwell series resembles the Linklater series of the George Lake Association. The only difference is that the Cauldwell series is underlain by glacial till (Soils of the Boissevain - Melita Area, 1978).

Cayer Series (CAY)

The Cayer series consists of very poorly to poorly drained Terric Mesisols developed on 40 to 160 cm of mesic fen peat overlying moderately to strongly calcareous loamy to clayey lacustrine sediments. Little or no (less than 15 cm) Sphagnum moss mantles the mesic fen peat. Cayer soils occur in high nutrient (eutrophic), very poorly to poorly drained, depressional to level areas found throughout the map sheet. Native vegetation is dominantly sedges, reed grasses and meadow grasses and aquatic mosses; a woody herbaceous cover of willow and swamp birch occurs in areas of better drainage.

Minor areas of the Volga series, a Terric Humic Mesisol, the Howell series, a Terric Mesisol, sphagnic phase, and the Wapah series, a Terric Limno Mesisol may be included in some map units represented by the Cayer series. The Cayer series is also often associated in map units with soils of the Howell, Katimik, and Stead series. The Crane and Kircro series are similar, but are underlain by loamy till and sand respectively. A representative profile of the Cayer series is described.

Om1 - 0 to 30 cm, yellowish red (5YR 4/6 moist) moderately decomposed non woody fibrous material composed of mosses, and sedgy herbaceous remains, very strongly acid.

Om2 - 30 to 80 cm, dark reddish brown (5YR 3/2 moist); moderately decomposed, non woody fibrous material composed of mosses and sedgy herbaceous remains, strongly acid.

Om3 - 80 to 90 cm, dark reddish brown (5YR 2/2 moist) moderately decomposed nonwoody fibrous material composed of mosses and sedgy herbaceous remains, strongly acid, abrupt wavy lower boundary.

IICkg - 90 + cm, greenish gray (5GY 5/1 moist); clay; massive; sticky and very plastic when wet; mildly alkaline.

Cazlake Series (CZK)

The Cazlake series consists of poorly drained Rego Humic Gleysol soil developed on moderately to strongly calcareous (CL, L, SiCL), deep uniform till of mixed limestone granite and shale origin. These soils occur in level to depressional positions of gentle to moderate slopes on hummocky landscapes and have slow permeability very slow surface runoff and a very high water table during the growing season. Cazlake soils are non-eroded, slightly stony and slightly saline. They have a high available water holding capacity, high organic matter content, and low natural fertility. Native vegetation often includes sedges, cattails and reeds. The majority of these soils are currently in their natural state due to restricted drainage and high water tables.

In a representative profile of Cazlake soil the solum is approximately 25 cm thick. The profile is characterized by a black Ah or Ap horizon, 15 to 50 cm thick, a light olive gray carbonated AC horizon, 5 to 10 cm thick and a light gray Ck horizon, with many prominent iron mottles. A typical profile also contains up to 40 cm of wash at the surface from upslope soil erosion.

Cazlake soils occur in close association with Darlingford, Nikkel and Ferris soils. They are similar to Horose soils by having the same soil development and parent material but differ from Horose soils because Cazlake soils are associated with Black Chernozems and Horose soils are associated with Dark Gray Chernozems. Cazlake soils were previously mapped as minor poorly drained associates of the Darlingford association in the reconnaissance soil survey of South-Central Manitoba (1943).

Cedar Lake Series (CDK)

The Cedar Lake series are moderately well and well drained Orthic Gray Luvisol soils developed on moderately to strongly calcareous, clayey till. Numerous isolated pockets of extremely calcareous, loamy till occur within the clayey matrix of the parent material. Topography of these areas is gently undulating to undulating. Cedar Lake soils generally have slightly stony to moderately stony surfaces depending upon the degree of water working they have undergone. Because of their clay textured surfaces, permeability is impeded to some extent and may be slow to very slow. Runoff is slow. Spruce and aspen with some jack pine constitute the dominant vegetative cover on the Cedar Lake series. A representative profile of the Cedar Lake series is described as follows:

L-H - 5 to 0 cm, dark reddish brown (5YR 3/4 moist) semi-decomposed; leaf litter; medium acid; clear wavy boundary.

Ae - 0 to 3 cm, pale brown (10YR 6/3 moist) silt loam; moderate medium platy; friable moist; medium acid; clear wavy boundary.

Bt - 3 to 15 cm, dark reddish brown (5YR 2.5/2 moist) clay; very weak medium columnar; friable moist; neutral; clear wavy boundary.

Ck1 - 15 to 45 cm, pale brown (10YR 6/3 moist) silty clay; moderate to strong medium subangular blocky; friable moist; mildly alkaline.

Ck2 - 45 to 120 cm, brown (10YR 5/3 moist) silt loam, moderate to strong fine to medium subangular blocky; friable moist; mildly alkaline.

Cedar Lake soils commonly occur in areas just south of the Pas Moraine and along the east side of Lake Winnipegosis. These soils are commonly associated with the Warpath series, which is the imperfectly drained member of the same soil association, and the Atikameg series, due to the heterogeneous nature of the parent material. Where pockets of extremely calcareous, loamy till occur at the surface, Atikameg soils develop, while Cedar Lake soils develop on adjoining sites where the clayey textured till occurs at the surface. The Cedar Lake soils of the Low Boreal climatic zone are developed on the same parent material as the Homebrook soils described in Soils of the Red Rose-Washow Bay Area (Soils Report No. 19).

Chambers Series (CBS)

The Chambers series is a Rego Black Chernozem soil developed on moderately well to well drained loamy (L, CL, SiCL) lacustrine sediments, less than one meter in depth, overlying moderately to strongly calcareous loamy (L, CL) glacial till deposits. These soils occur in the upper slope positions of gently sloping to hummocky, moderately rolling topography. Surface runoff is moderately rapid to rapid depending on the slope gradient. Permeability is moderate in the lacustrine sediments and moderately slow to slow in the glacial till deposit. The Chambers soil profile is characterized by a very dark gray to black Ah or Ahk horizon of 10 to 15 cm thick, a thin dark gray to grayish brown AC horizon of 3 to 8 cm thick and a thin lime accumulation zone. The underlying till is a light yellowish brown color. Chambers soil series tend to be less stony than the very similar Rufford soils.

Channing Series (CNN)

The Channing series consists of well drained Eluviated Dystric Brunisol soils developed on a mantle (50 to 100 cm) of medium acidic sandy, fluvial deposits overlying fine loamy to clayey, weakly calcareous lacustrine deposits. These soils occur in lower positions of strong to steep slopes on hummocky bedrock landscapes and have restricted permeability and moderately slow surface runoff. The underlying clay may restrict drainage although no free water or mottles were observed in the profiles. Channing soils are susceptible to erosion if exposed, non to slightly stony and non saline. They have low available water holding capacity, low organic matter content, and low natural fertility. Native vegetation often includes white spruce, some aspen and ground shrubs. The majority of these soils remain under natural conditions.

In a representative profile of Channing soil the solum is approximately 55 cm thick. The profile is characterized by a very dark brown LH horizon, 3 to 4 cm thick, a brownish, strongly acidic, structureless Ae horizon, 2 to 12 cm thick, a dark yellowish brown Bm horizon, 35 to 45 cm thick with gravelly coarse fragments and a pale brown, medium acidic, sandy C horizon 15 to 25 cm thick, overlying a weakly acidic, brown clayey II C horizon. The parent material is typically coarse sandy fluvial over lacustrine clay.

Channing soils occur in close association with Partridge Crop and Cliff soils. They are similar to Partridge Crop soils by having similar drainage and surface texture but differ from Partridge Crop soils because of thickness of fluvial deposits. Channing soils have a clay substrate within 1 metre. Channing soils were previously mapped as inclusions with Partridge Crop soils in the Cormorant Lake report.

Charlton Series (CHT)

The Charlton series consists of well drained Orthic Regosols of the Reaper Association, developed on a thin (less than 100 cm), moderately to strongly calcareous, mixture of loam till and coarse textured sediments overlying weathered Boissevain sandstone. These soils usually have sandy loam surface textures, complex gently sloping to undulating topography, moderate permeability and moderate surface runoff. Most of this soil is cultivated. It is very susceptible to erosion by wind and water, and in most cases, all of the Ah and Bm horizons have been removed leaving the C horizon exposed. Charlton soils occupy knoll positions in the landscape, and occur on the west side of Turtle Mountain.

Charman Series (CXV)

The Charman series consists of imperfectly drained Gleyed Black Chernozem soils developed on strongly to very strongly calcareous, fine loamy (CL, SiCL), lacustrine deposits. In areas of seepage or discharge, soluble salts in the subsoil can be translocated near the surface in sufficient quantities to affect crop growth. These soils occur in middle positions of very gentle slopes on undulating landscapes and have moderate permeability, slow surface runoff, and a medium high water table during the growing season. Charman soils are non-eroded, non-stony, and frequently slightly saline. They have a moderately high available water holding capacity, high organic matter content, and medium natural fertility. Native vegetation includes aspen, willows, shrubs and prairie grasses. The majority of these soils are currently cultivated for crop production.

In a representative profile of Charman soil the solum is approximately 40 cm thick. The profile is characterized by very dark gray to black Ah horizon, 15 to 25 cm thick, a dark grayish brown Bmgj horizon, 12 to 30 cm thick, a transitional BC horizon, 5 to 8 cm thick and a pale brown, silty textured Ckgj horizon, with iron mottles and frequently gypsum crystals.

Charman soils occur in close association with Ramada, Carroll and Tadpole soils. They are similar to Prodan soils by having an imperfectly drained profile and fine loamy deposits but differ from them in having a Bmgj horizon. Charman soils were previously mapped as Black-Meadow associates of the Holland Association in the Carberry (1957) soil report.

Chater Series (CXW)

The Chater series is a Calcareous Black Chernozem soil developed on moderately well to well drained, moderately to strongly calcareous, sandy (S, CoS) to sandy-skeletal (GrS, GrCoS) outwash and glaciofluvial deposits, less than one meter in depth, overlying moderately to strongly calcareous loamy (L, CL) glacial till deposits. These soils occur in gently undulating to moderately rolling topography. Surface runoff is low, while permeability is rapid in the coarser deposits and moderate to moderately slow in the underlying till material. These soils are in favorable topographic positions to allow excess water above the till to flow laterally to downslope positions.

The Chater soil profile is characterized by a 12 to 18 cm thick, very dark gray Ah horizon and a grayish brown to brown Bmk horizon 8 to 15 cm thick, with a lime accumulation horizon (Cca) in the coarser stratum. Chater soils are coarser textured and tend to be droughtier than the similar Clementi soils.

Chaucer Series (CUC)

The Chaucer series consists of well drained Orthic Black Chernozem soils, developed on thin (25 to 100 cm), weakly to moderately calcareous, coarse textured (LFS, LCoS, LS, LFS), lacustrine sediments overlying very coarse textured, gravelly, deltaic beach and out-wash deposits. This soil has a loamy sand surface texture, a complex, smooth to gently undulating topography, good to excessive drainage, rapid permeability and low surface runoff. The estimated depth to water table during the growing season is 3 metres. The surface sometimes has a few small stones. Undisturbed native vegetation consists of gumweed and june grass. Most of these soils are cultivated and used for crop production with the deeper soils comparable to Stanton soils and the thin soils comparable to the Bede soils.

This soil is characterized by a black Ap horizon 5 to 13 cm thick, very dark grayish brown Bm horizon 10 to 15 cm thick, a dark gray II Cca horizon 5 to 8 cm thick and a dark grayish brown II Ck horizon (Soils of the Boissevain - Melita Area, 1978). A morphological description for a representative soil profile is presented below.

Ap - 0 to 13 cm, black (10YR 2/1 moist), very dark gray (10YR 3/1 dry) loamy coarse sand; weakly columnar breaking to coarse sub-angular blocky, friable; non-calcareous; neutral; abrupt boundary.

Bm - 13 to 25 cm, very dark grayish brown (10YR3/2 moist), dark grayish brown (10YR 4/2 dry) loamy sand; weak columnar breaking, to coarse sub-angular blocky; friable; neutral; non-calcareous; clear boundary.

BC - 25 to 30 cm, dark brown (10YR 3/3 moist), brown (10YR 4/3 dry) sandy loam; loose; friable; diffuse boundary; weakly calcareous; slightly alkaline.

II Cca - 30 to 36 cm, dark gray (10YR 4/1 moist), gray (10YR 5/1 dry) sand and gravel; loose; slightly alkaline; very strongly calcareous; clear boundary.

II Ck - 36 cm +, dark grayish brown (10YR 4/2 moist), grayish brown (10YR 5/2 dry) sand and gravel; loose; strongly calcareous; slightly alkaline.

Chesterfield Series (CHF)

The Chesterfield series consists of imperfectly drained Gleyed Black Solonetz soils of the Chesterfield Association, developed on thin (< 0.9 m) weakly to moderately calcareous, moderately fine to fine textured (SCL, CL, SiCL to SiC, C), saline sediments usually underlain by shaly clay or soft, fragmented shale bedrock. They have level to depressional topography, slow permeability and slow surface runoff. They are imperfectly drained and saline in the lower Bnt and C horizons. Salinity increases with depth. Occasionally, these soils are cultivated but in the undisturbed sites native vegetation such as alkali grass, Distichlis sp., cord grass, Spartina sp., yarrow, Achillea spp., foxtail, Hordeum jabatum and Indian paintbrush, Castillya sessiliflora is often found.

Chesterfield soils are characterized by black, occasionally eroded, Ah horizons 5 to 25 cm thick; platy, gray, Ae horizons 2 to 5 cm thick which also may be partially eroded or lost when cultivated; black to very dark gray Bnt horizons 10 to 15 cm thick; grayish brown, transitional BC horizons 10 to 15 cm thick and a dark grayish brown C horizon. A very dark gray shaley II C horizon may occur within 1 m of the surface. The ground surface is commonly pitted as in small blow out areas. Chesterfield soils are closely associated with Antler River soils which occur in better drained areas and with Lena soils which occur in poorly drained areas. The relief between these three soils is sometimes very subtle.

Chitek Series (CHK)

The Chitek series are imperfectly drained Gleyed Eluviated Eutric Brunisol soils developed on extremely calcareous, loamy till. The surface texture is dominantly loam to clay loam. The topography ranges from nearly level to gently undulating. In areas with this latter class of topography the Chitek soils occupy the intermediate to lower slope positions, whereas in the smooth nearly level areas the Chitek soils are coincident with high groundwater tables. Runoff is slow and permeability is generally low to moderate.

Stoniness may vary from moderate to exceedingly stony in severely water worked Chitek areas having little or no lacustrine overlay. The native vegetation is dominantly aspen and spruce mixed with some balsam poplar, jack pine and willows. Chitek soils have extremely thin, generally discontinuous (Ae) horizons or somewhat thicker Aej horizons overlying weakly developed Btj horizons. A thin (<15 cm) lacustrine mantle of fine loamy to clayey sediments may cover the till surface. The Chitek soils are often associated in mapping units with the Dering, peaty phase and Atikameg series, which are the poorly and well drained members of the same soil association. The following description is of a representative Chitek profile:

L-H - 7 to 0 cm, dark reddish brown (5YR 2/2 moist); moderately decomposed leaf litter; slightly acid; clear smooth boundary.

Aej - 0 to 2 cm

Bmgj - 2 to 8 cm, very dark grayish brown (10YR 3/2 moist) loam; very weak fine granular; very friable moist; neutral; clear wavy boundary.

Ckgj1 - 8 to 35 cm, very pale brown (10YR 7/3 moist) silt loam; massive; moist friable; mildly alkaline; extremely calcareous.

Chocolate Complex (CHX) or (CHO)

The Chocolate complex consists of poorly to very poorly drained Terric Mesic Fibrisol, Terric Fibric Mesisol, and Terric Fibrisol soils developed on 65 to 160 cm of fibric Sphagnum moss which may be underlain by significant amounts of mesic forest and/or fen peat. These organic soils are underlain by loamy to clayey sediments within 120 to160 cm of the surface. The topography is level to depressional. The vegetation is dominantly stunted black spruce and tamarack with an understory of Sphagnum mosses and ericaceous shrubs.

The Chocolate complex is found in the Mid Boreal climatic zone, and its equivalent in the Low Boreal climatic zone is the Molson complex also described later in this report. A description of a representative Chocolate series is given below.

Of1 - 0 to 20 cm, brown to dark brown (10YR 4/3 broken); very pale brown (10YR 7/4 pressed) dark grayish brown (10YR 4/2 rubbed) spongy fibric Sphagnum moss; medium to fine fibered, nonwoody; slightly acid; unrubbed fiber content approximately 90%; rubbing to 66%.

Of2 - 20 to 30 cm, dark yellowish brown (10YR 4/4 broken wet); dark brown (10YR 3/3 pressed moist), yellowish brown (10YR 5/6 rubbed) fibric Sphagnum moss; medium to fine fibered, nonwoody; slightly acid; unrubbed fiber content approximately 85%, rubbing to 52%, clear wavy boundary.

Of3 - 30 to 75 cm, brownish yellow (10YR 6/8 broken), reddish yellow (7.5YR 8/6 pressed) yellowish brown (10YR 5/4 rubbed) Sphagnum moss and fen peat; medium to fine fibered, nonwoody; strongly acid; unrubbed fiber content approximately 72% rubbing to 36%; clear wavy boundary.

Om1 - 75 to 120 cm, dark reddish brown (2.5YR 2/4 broken), dusky red (2.5YR 3/2 pressed), dark reddish brown (5YR 3/4 rubbed) moderately decomposed, dominantly fen peat with forest peat inclusions; medium to fine fibered, nonwoody; strongly acid; unrubbed fiber content approximately 66% rubbing to 24%; gradual wavy boundary.

Om2 - 120 to 235 cm, black (10YR 2/1 broken), reddish brown (5YR 4/4 pressed), dark reddish gray (5YR 4/2 rubbed) moderately decomposed fen peat; fine fibered; nonwoody; medium acid; unrubbed fiber content approximately 42% rubbing to 14%; clear smooth boundary.

IICkg - 235 to 250 cm, greenish gray (5YR 6/1 moist), light gray to gray (5Y 6/1 dry) silt; massive; sticky wet; mildly alkaline; moderately calcareous.

Chortitz Series (CTZ)

The Chortitz series consists of an imperfectly drained Gleyed Cumulic Regosol soil developed on moderately calcareous, deep, stratified, loamy (L, CL, SiCL), recent alluvial deposits. Lighter strata of fine sand to sandy loam or heavier strata of silty clay to clay can also occur. These soils occur in middle positions of very gentle slopes on floodplain landscapes and have moderately slow permeability, slow surface runoff, and a high water table during the growing season. Chortitz soils are flood-prone, non-stony, and occasionally slightly saline. They have medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation includes willows, shrubs, tall prairie and meadow grasses. The majority of these soils are currently in natural vegetation.

In a representative profile of the Chortitz soil the weakly developed profile is characterized by a dark gray, calcareous Ap horizon, 10 to 18 cm thick, with granular structure, and a dark grayish brown to pale brown Ckg horizon that is moderately calcareous and mildly saline. A typical profile also contains numerous fine mottles and gypsum crystals.

Chortitz soils occur in close association with Loewen soils. They are similar to Levine soils by having a Gleyed Cumulic Regosol profile developed in recent alluvium but differ from them in occurring in a warmer and moister climate below the Manitoba Escarpment. Chortitz soils were previously mapped as associates of the Riverdale Association in the Winnipeg-Morris (1953) soil report.

Clarke Series (CLK)

The Clarke series consists of well drained Eluviated Dystric Brunisol soils developed on non-calcareous, glacio-fluvial non stony sand deposits. These sediments were derived mainly from granitic rock through the action of glacial agencies. The topography is undulating to ridged in these areas. These soils have rapid internal drainage. Vegetation found on these sites is dominantly jack pine.

The Clarke soil profile has a well developed Ae horizon and a weakly developed Bm horizon with weak concentrations of iron, aluminum and organic matter. The iron and aluminum content (oxalate extractable) was found to be 0.31 and 0.20 % respectively in the Bm horizon, and 0.15, 0.10 % respectively, in the C horizon. The C horizon is acid to a depth of 1 to 1.5 m, where traces of lime carbonate are found. The fertility level of Clarke soils is low as they are lacking in organic matter and mineral nutrients necessary for good plant growth.

The Clarke soils are found in the Mid Boreal climatic zone around Playgreen Lake. They are usually found in complex map unit in association with Pawka or Baldy peaty phase series.

Clarkleigh Series (CKG)

The Clarkleigh series is a carbonated, Rego Humic Gleysol soil developed on poorly drained, extremely calcareous, loamy (L, SiL, CL), stony till deposits and includes soils developed on a thin (less than 25 cm) mantle of loamy sediments over the till. These soils occur associated with Lundar soils in irregular to depressional topography. Surface runoff is slow to very slow, and permeability is impeded by a high water table. These soils are frequently saline in areas of groundwater discharge or where lateral seepage occurs. Native vegetation consists dominantly of meadow grasses, sedges, reeds, some willow, black popular or swamp birch. In addition to being stony these soils are severely affected by wetness due to slow permeability and a high water table.

The Clarkleigh soil has a moderately to strongly calcareous, partially decomposed organic Om horizon, 5 to 10 cm thick; a strongly calcareous, very dark gray Ah horizon, 7 to 20 cm thick usually with remnant shells of aquatic organisms; a transitional AC horizon, 10 to 15 cm thick, and an extremely calcareous, light gray Ckg horizon. A thin layer of lime accumulation (Cca horizon) is also common below the transitional AC horizon.

Clarksville Series (CVE)

The Clarksville series is an Orthic Gray Luvisol soil developed on weakly to moderately calcareous medium textured shaly till of dominantly shale origin. Surface textures vary from fine sandy loam to loam. These soils occur on the northern slope of the Riding Mountain in the southwest corner of the map area. The topography is irregular, moderately rolling and the area is dissected by two pronounced eroded ravines which carry surface runoff across the area. Internal percolation is good and runoff is rapid. The native vegetation is dominantly mixed woods of aspen, black poplar and some white spruce with an understory of hazel, wild rose, saskatoon, chokecherry and associated herbs and grasses.

The Clarksville soils are characterized by a moderately thin leaf mat, a thick (15 to 20 cm) light coloured Ae horizon with well developed, medium to coarse platy structure and a well developed brownish coloured Bt horizon extending usually to around 60 to 75 cm from the surface. A diffuse lime carbonate accumulation (Cca horizon) may be present below the B horizon. The grayish brown Ck horizon is weakly calcareous and high in shale content and hematite and limonite particles. A more detailed description of the Clarksville soil is given in the Westlake Map Sheet Area (Soil Report No. 8).

The Clarksville soils in the Ste. Rose map area occur in complex association with the Wapus series. These soils are restricted to the steeply sloping portion of the Manitoba Escarpment where till deposits from the last glaciation are thin. The resultant till has a very high shale content and the shale bedrock is exposed in many places or is covered by only a thin veneer of till.

Clementi Series (CLN)

The Clementi series is characterized by an Orthic Black Chernozem profile developed on a thin overlay (25 to 90 cm) of loamy fluvial or lacustrine sediments over moderately to very strongly calcareous morainal till of limestone, granitic, and shale origin. These soils are moderately well drained and occur in mid to upper slope positions of very gently undulating or rolling topography. Runoff is moderate; permeability is moderate in the loamy overlay, and moderately slow to slow in the underlying till. The solum has a very dark gray to black Ah horizon, 10 to 20 cm thick and a dark brown to brown Bm horizon, 8 to 12 cm thick. The solum is developed dominantly within the overlay, and may extend into the till material.

Cliff Series (CLF)

The Cliff series consists of imperfect to poorly drained Gleyed Dystric Brunisol soils developed on a mantle (50 to 100 cm) of sandy, stratified, slightly acidic, fluvial deposits overlying weakly calcareous clayey lacustrine deposits. These soils occur in depressional positions of very gently sloping to level landscapes and have slow permeability in the subsoil, slow surface runoff and a high (<0.5m) water table during the growing season. Cliff soils are non eroded, non to slightly stony and non saline. They have low available water holding capacity, low organic matter content, and low natural fertility. Native vegetation often includes black spruce, willow, Labrador tea, horsetail and some birch. The majority of these soils are currently not used and remain under natural

conditions. Cliff soils are common in abandoned flow channels which connected present dry lakes during former periods of very high water levels.

In a representative profile of Cliff soil the solum is approximately 22 cm thick. The profile is characterized by a black to dark brown LH horizon, 10 to 20 cm thick, a dark brown Bmgj horizon, 2 to 20 cm thick with few, fine, distinct mottles, a brown transitional BC horizon, 5 to 15 cm thick overlying a dark gray, clayey IICkg horizon with few, prominent reddish brown mottles. The parent material typically contains coarse fragments throughout. A typical profile also contains some carbonates in the lower clay deposits.

Cliff soils occur in close association with Channing soils. They are similar to Channing soils by having similar parent materials but differ from them in having faint to distinct reddish brown mottles indicative of periodic gleying conditions. Cliff soils were previously mapped as inclusions of Partridge Crop soils in the Cormorant Lake report.

Coatstone Series (CSE)

The Coatstone series consists of imperfectly drained, Gleyed Rego Black Chernozen, carbonated soils of the Ryerson Association, developed on deep, strongly calcareous, medium to moderately fine textured, glacial till. The till is composed of material derived from shale, limestone and granitic rock. The surface 25 cm may vary slightly in texture. Coatstone soils usually have a clay loam surface texture, very gently sloping topography, moderately slow permeability, and moderate surface runoff. They are imperfectly drained and occasionally slightly stony. They may be weakly to moderately saline. The estimated depth to water table is 1.5 m. Coatstone soils usually occur in intermediate to level positions between the better drained Ryerson and Medora soils and the poorer drained Ewart, Tilston and Stoney Creek soils. Gleyed Calcareous Black Chernozem soils are closely associated with Coatstone soils and may be found in the same vicinity. In undisturbed areas where native vegetation exists aspen is quite common.

Coatstone soils are characterized by black Apk horizons 8 to 13 cm thick, dark gray AC horizons 5 to 10 cm thick, weakly mottled light brownish gray Cca horizons 10 to 13 cm thick, and gleyed prominently iron mottled, brown to yellowish brown Ckg horizons.

Cobble Beach ($CB)

These are stratified, calcareous, cobbly fragmental beach deposits of recent origin. They are composed almost entirely of rounded limestone cobbles between 8 and 25 cm in diameter. Such deposits have little or no profile development and are classified as Orthic Regosols. These beach deposits occur as low ridges in relatively exposed portions of the Lake Winnipeg shoreline, and frequently as cobbly spits jutting into the lake.

Cobfield Series (CBF)

The Cobfield series is a Gleyed Black Chernozem soil developed on imperfectly drained loamy (L, CL, SiCL) lacustrine sediments, less than one meter in depth, overlying moderately to strongly calcareous loamy (L, CL) glacial till deposits. These soils occur in the mid to lower slope position of gently sloping to undulating topography of dominantly weak recharge areas. The runoff is moderately slow with permeability being moderate in the upper lacustrine sediments and moderately slow to slow in the underlying glacial till. The Cobfield soil profile is characterized by a very dark gray to black Ah horizon 10 to 18 cm thick, a brown to dark yellowish Bm horizon of 8 to 12 cm thick, with few, yellowish brown to strong brown mottles, and a lime accumulation horizon (Cca). The underlying till is olive brown to light olive brown, which is indicative of periodic saturation and reducing conditions.

Colby Series (CBY)

The Colby series is a Gleyed Rego Black Chernozem soil developed on imperfectly drained, thin (25 to 100 cm), strongly to very strongly calcareous, sandy (LFS, FS) lacustrine sediments, overlying loamy (SiCL, CL, L) to clayey (SiC, C) extremely calcareous till. A gravelly or cobbly lens usually occurs at the sand-till contact. These soils occur on gently sloping to level topography in association with Sprague soils. Surface runoff is slow. Permeability in the sandy sediments is moderately rapid, but can be restricted by a perched water table above the till sediments in spring or after intense rainfall. The tall prairie grasses and trembling aspen native to these soils have been mostly replaced by field crops. Colby soils are subject to moderate limitations of droughtiness and if not protected are susceptible to wind erosion. Also, their very dense highly calcareous till substrate can hinder deep root penetration and reduce the availability of some nutrients.

The Colby soil profile has a very dark gray to black, carbonated Ah (Ap) horizon, 15 to 25 cm thick; a carbonated, pale brown AC horizon, 20 to 40 cm thick, a very pale brown, distinctly mottled Ckg horizon, 25 to 50 cm thick, and a prominently mottled, grayish brown, II Ckg horizon. A layer of lime accumulation (Cca horizon), 15 to 25 cm thick, is often present when the depth to till is more than 70 cm.

This soil differs from the similar Almasippi soils in having a till substrate within a metre of the soil surface. It also differs from the somewhat similar Rosebank soils in having a till, rather than lacustrine, substrate and in having a gravelly to cobbly lens at the till contact.

Copernicus Complex (COP)

The Copernicus complex consists of well to moderately well drained, Orthic Gray Luvisol soils developed on moderately calcareous, sandy, glaciofluvial outwash deposits. The parent material is usually stratified with quite variable, non pedogenic layers in evidence. A typical Copernicus soil has a solum consisting of a thin leaf mat, 3 to 5 cm thick, a light gray, a sand textured Ae horizon 5 to 15 cm thick, and a loamy sand to sandy clay loam IIBt horizon of about 20 cm thickness. These are underlain by a transitional BC and a II Ck or III Ck horizon which is dominantly loamy fine sand to coarse sand in texture. The Blue Wing series, a Dark Gray Luvisol soil with a thin, dark colored Ah or Ahe surface horizon, also occurs as an inclusion in some areas of level topography or south facing slopes.

Ridged and hummocky topography are typical of small areas of Copernicus soils, generally considered as ice contact deposits with frequent inclusions of unmodified till and sorted glaciolacustrine materials. These are common map units surrounding Glad Lake and along the east end of Singush Lake. Larger map units representing areas of nearly level to gently undulating outwash plains occur north of East Blue Lake and also southwest of Singush Lake.

Surface runoff is moderate to rapid. Permeability is rapid in the surface areas and moderate to rapid in subsurface layers. Native vegetation is generally an open stand of jack pine with lesser amounts of aspen and white spruce, and an understory of grasses and shrubs.

The variable, stratified nature of the dominantly sandy outwash material, and the presence of unspecified minor proportions of inclusions of till and glaciolacustrine materials, is indicated by the mapping of these areas as Copernicus complex rather than as pure series map units.

Cordova Series (CVA)

The Cordova series is characterized by a Calcareous Black Chernozem solum on moderately to strongly calcareous, slightly to moderately stony, loamy (L, CL) morainal till of mixed limestone, granitic and shale rock origin. These soils are well to rapidly drained and occur in the upper slope and crest positions of undulating to hummocky landscapes, in close association with the well drained Rufford and Newdale series. Surface runoff is moderately rapid to rapid, depending upon slope. Permeability is moderately slow. Native vegetation consists of mixed tall prairie grasses and herbs.

The Cordova soil profile has a thin, very dark gray Ap(k) horizon, 12 to 18 cm thick, a calcareous, yellowish brown to dark yellowish brown Bm horizon, 5 to 15 cm thick, a thin transitional BC horizon and a light gray lime carbonate accumulation layer, 25 to 35 cm thick. Secondary carbonates may be found along vertical cracks within the underlying grayish brown (dry) or dark grayish brown (moist) Ck horizon. In many areas, these soils have been altered by wind and water erosion; the crest positions have lost most of the A horizon and part of the B horizon has been cultivated. In a few areas, the Cca horizon has been incorporated into the plow layer, imparting a light gray surface color.

The Cordova series differs from the Rufford series, a carbonated Rego Black in having a Bmk horizon. Both Cordova and Rufford series differ from the Newdale series, the former having free lime carbonate present in the solum, while the latter has an A and B horizon free of carbonates.

Cormorant Lake Complex (CMK) or (CLX)

The Cormorant Lake Complex soils are Fibric Organic Cryosols developed on greater than 1.3 m of perennially frozen forest and sphagnum peat. A profile description is provided:

Of - 0 to 48 cm, very dark gray (10YR 3/1 moist), fibrous, spongy compacted Sphagnum mosses; medium acid; fiber content approximately 100 percent.

Ofz - 48 to 89 cm, dark yellowish brown (10YR 3/4 moist), frozen fibrous Sphagnum mosses with segregated ice lenses 1 to 3 mm thick; neutral; fiber content approximately 92 percent.

Coulter Series (COU)

The Coulter series consists of imperfectly drained, Gleyed Carbonated Rego Black Chernozem soils developed on deep, moderately calcareous, moderately fine to fine textured (SCL, CL, SiCL to SiC, C), recent alluvial sediments. These soils have nearly level to depressional topography, clay loam surface texture, moderately slow permeability and a moderate surface runoff. The Coulter series is associated with the poorly drained Leighton series. Drainage is imperfect and the estimated depth to water table during the growing season is 2 to 3 metres. These soils may be weakly saline and non-stony and are used for crop production. A detailed description of a representative profile is presented below (Soils of the Boissevain - Melita Area, 1978).

Apk - 0 to 23 cm, black to very dark gray (10YR 2.5/1 moist), very dark gray to dark gray (10 3.5/1 dry) clay to clay loam; weak, medium prismatic breaking to moderate medium blocky; friable when moist; clear, smooth boundary; moderately calcareous.

Ahkgj - 23 to 46 cm, black to very dark gray (10YR 2.5/1 moist), very dark gray to dark gray (10YR 3.5/1 dry); clay loam; medium prismatic breaking to moderate medium blocky; friable when moist; clear, smooth boundary; moderately calcareous.

Ccagj - 46 to 56 cm, gray to light gray (10YR 6/1 moist), very pale brown (10YR 7/3 dry) clay loam; structureless; friable when moist; clear, smooth boundary; strongly calcareous.

Ckg - 56 cm +, grayish brown (2.5Y 5/2 moist); gray (10YR 5.5/1 dry); clay loam; structureless; friable when moist; moderately calcareous; moderately alkaline.

Cowan Bay Series, peaty phase (CWB)

The Cowan Bay, peaty phase soils are poorly drained Rego Gleysols, developed on 20 to 100 cm of weakly to moderately calcareous, sandy to loamy-skeletal glacial till overlying limestone bedrock. Because these soils are developed on, a thin veneer of till they are classified as Rego Gleysols, shallow and very shallow lithic phases. The Cowan Bay soils occupy depressional to level topography and are overlain by a thin (15 to 40 cm) surface layer of peat. Runoff is very slow, and internal drainage is impeded by the impermeable bedrock. Cowan Bay soils usually occur in shallow depressions in the bedrock plateau areas of the central and northeastern portions of the map area.

The Cowan Bay, Shallow, peaty phase, soils are poorly drained Rego Gleysols developed on less than 20 cm of weakly to moderately calcareous, sandy to loamy-skeletal glacial till overlying limestone bedrock. They are similar to the normal Cowan Bay, peaty phase soils, except that the depth of till overlying the limestone bedrock is shallower. These soils are classified as extremely shallow lithic phases according to soil family taxonomy. These poorly drained soils have depressional to level topography and are characterized by a thin (15 to 60 cm) surface layer of peat. Runoff is very slow, and internal drainage is impeded by the underlying impermeable bedrock. The Cowan Bay, shallow, peaty phase soils occur in shallow depressional areas in the bedrock dominated portions of the map area.

Craigsford Series (CGD)

The Craigsford series consists of imperfectly drained carbonated Gleyed Rego Black Chernozem soils developed on strongly to very strongly calcareous, shallow, uniform, coarse loamy, lacustrine sediment underlain by very strongly calcareous loamy morainal deposits of mixed limestone and granitic rock origin. These soils occur on level lacustrine veneer deposits and have moderate permeability, very slow surface runoff and a medium water table during the growing season. Craigsford soils are slightly wind eroded and slightly stony. The native vegetation often comprises meadow grasses, sedge and willow with open stands of aspen and balsam poplar. The majority of these soils are currently used for crop production.

In a representative profile of a Craigsford soil, the solum is generally 46 cm thick. The profile is characterized by a thin (30 cm) very dark gray, very strongly calcareous, loamy to very fine sandy loam Ap horizon overlying a thin dark grayish brown, calcareous, loam to very fine sandy loam AC horizon and sometimes a grayish to light grayish brown, loam to silt loam textured Ccagj horizon. The parent material is typically light brownish gray, calcareous and weakly mottled loam to very fine sandy loam sediments. A typical profile is also underlain by a pale brown to light brownish gray very strongly calcareous, mottled loam to clay loam stony till.

Craigsford soils occur in close association with Swanford soils. They are similar to Swanford soils by having similar texture, horizons and moisture holding capacity, but differ from Swanford soils because of the presence of a clay loam textured, compact till substrate. Craigsford soils have medium available water holding capacity, high organic matter levels and high natural fertility. Craigsford soils correlate with Swanford till substrate phase soils published in the Swan River soil report (Soil Report No. 13).

Crane Series (CRN)

The Crane series is composed of organic soils developed on 40 to 160 cm of mesic fen peat with less than 15 cm. of fibric Sphagnum moss peat at the surface. Extremely calcareous, loamy, moderately stony till occurs within 160 cm of the surface. These poor to very poorly drained soils are located in high nutrient (eutrophic), depressional to level areas found throughout the map sheet. Native vegetation on these soils is sedge and reed grasses with interspersed clumps of swamp birch, brown moss, and tamarack.

The Crane series is a Terric Mesisol, composed of mesic fen peat overlying extremely calcareous glacial till. Minor areas of the Waterhen series, a Terric Humic Mesisol, the Halcrow series, a Terric Mesisol, sphagnic phase, and the Shiel series, a Terric Limno Mesisol, may be included in some map units represented by the Crane series. The Crane series is often associated in map units with soils of the Halcrow and Stead series. The soils of the Crane series differ from the Cayer and Kircro series only in the nature of the underlying mineral substrate.

Cranmer Series (CME)

The Cranmer series consists of imperfectly drained Gleyed Rego Black Chernozem (carbonated) soils, developed on deep, strongly calcareous, fine loamy lacustrine sediments. These soils usually have a clay loam surface texture, nearly level to very gently sloping topography, and slow to moderate permeability and surface runoff. This soil can be weakly to moderately saline and is imperfectly drained. The estimated depth to water table during the growing season is less than 2 m. Most of these soils are cultivated and, depending on the degree of salinity, produce good crops.

The soil is characterized by black Ap horizons 10 to 20 cm thick, black to dark gray AC horizons 18 to 25 cm thick and brown to yellowish brown Ccagj horizons. The C horizons are occasionally stratified and banded.

The Cranmer series resembles the imperfectly drained soils of the Waskada Association except that the Cranmer series is not underlain by glacial till. Cranmer is equal to the Prodan series of climatic subregion MBT2.

Crestview Series (CVW)

The Crestview series consists of well drained Orthic Gray Luvisol soils developed on strongly to very strongly calcareous, moderately coarse (VFS, LVFS, SL, FSL) to medium (VFSL, L, SiL) textured, deltaic sediments. Dominant surface texture is fine sandy loam.

The Crestview soils occur above the Kenville Escarpment on deltas with smooth, very gently sloping topography. Drainage is good, except in small areas where the till substrate near the surface results in impeded drainage. Native vegetation is mainly aspen and balsam poplar. Spruce initially was the dominant tree but has been removed by the clearing process and fires. A few stones occur in areas where the till is near the surface. Wind and water erosion occurs on sloping landscapes that are tilled.

The solum is thin, seldom exceeding 40 cm in thickness. The subsoil is silty in texture due to the high proportion of silt sized calcium carbonate. Crestview soils with a till substrate within 75 cm of the surface are identified by cobbles and boulders on the surface. Drainage of the soils with the till substrate is moderately good. A description of the modal fine sandy loam soil is provided:

L-H - 5 to 0 cm, very dark brown (10YR 2/2 dry), leaf mat, slightly acid.

Ah - 0 to 3 cm, very dark gray (10YR 3/1 dry), fine sandy loam; fine granular; very friable; neutral.

Ae - 3 to 18 cm, pale brown (10YR 6/3 dry), fine sandy loam; weakly fine platy; very friable; neutral.

AB - 18 to 20 cm, brown (10YR 5/3 dry), loam; fine blocky; moderately firm when moist; hard when dry; neutral.

Bt - 20 to 30 cm, yellowish brown (10YR 5/4 dry), loam; fine to medium blocky; very firm when moist, very hard when dry; neutral.

BC - 30 to 38 cm, brownish yellow (10YR 6/6 dry), loam; fine granular; very friable when moist, soft when dry; mildly alkaline.

Ck1 - 38 to 71 cm, very pale brown (10YR 7/4 dry), loam; fine pseudo-granular; soft; mildly alkaline; very strongly calcareous.

Ck2 - 71 cm +, light gray (10YR 7/2 dry), silty loam; fine pseudo-granular; soft; moderately alkaline; extremely calcareous.

Croll Series (CLL)

The Croll series consists of imperfectly drained Gleyed Carbonated Rego Black Chernozem soils of the Waskada Association developed on thin (25 to 100 cm), strongly calcareous, moderately fine textured (SCL, CL, SiCL), discontinuous aeolian and lacustrine mantle overlying strongly calcareous, medium to moderately fine textured, glacial till. The surface texture is dominantly loam to clay loam, the topography is gently undulating, permeability is slow and runoff is moderate. This soil is imperfectly drained and may be weakly saline. The estimated depth to water table during the growing season is 2 metres. The Croll series is associated with the imperfectly drained Gleyed Calcareous Black Chernozem Desford series and the well drained Bearford series (Soils of the Boissevain - Melita Area, 1978).

Cromer Series (CRM)

The Cromer series is the poorly drained Carbonated Rego Humic Gleysol member of the Pipestone Association, developed on deep, weakly to moderately calcareous, fine textured (SiC, C), and stratified lacustrine and alluvial sediments. The topography is nearly level; permeability and surface runoff are very slow. These soils generally have a clay surface texture, poor drainage and occur in depressions. Associated soils are the imperfectly drained Agnew and Pipestone series. These soils are characterized by surface water ponding throughout most of the year. The estimated depth to water table is less than 1 metre during the growing season. These soils rarely produce a crop due to flooding and delayed seeding in the spring and to re-flooding in the summer during periods of high precipitation. They can be recognized by native hydrophytic vegetation such as cattails and bulrushes.

The Cromer, sandy substrate variant, CRM1, has sandy textured sediments that commonly occur at 75 to 100 cm.

Salinity can be a problem in these soils. Many Cromer soils are situated in local groundwater discharge areas and as a result, soluble salts accumulate in the soil profile in sufficient concentration to severely limit the growth of many non-tolerant plants. The Cromer series resembles the Deloraine series of the Waskada Association. The only difference is the Deloraine series is underlain by glacial till which occurs at a depth of approximately 1 metre (Soils of the Boissevain - Melita Area, 1978).

Crookdale Series (CKD)

The Crookdale series consists of imperfectly drained Gleyed Rego Black Chernozem soil developed on a mantle (25 to 100 cm) of strongly calcareous, stratified, fine loamy (CL, SiCL) lacustrine sediments over strongly calcareous, deep uniform sandy (LFS, FS, S) fluvial lacustrine deposits. These soils occur in lower slope positions of level to nearly level slopes on level landscapes and have moderate permeability moderately slow surface runoff and a medium water table during the growing season. Crookdale soils are non-eroded, non-stony and slightly saline. They have high available water holding capacity, medium organic matter content, and

medium natural fertility. Native vegetation often includes tall prairie grasses. The majority of these soils are currently used for grain crop production.

In a representative profile of Crookdale soil the solum is approximately 25 cm thick. The profile is characterized by a black Ah to Ap horizon, 10 to 25 cm thick, a dark grayish brown transitional AC horizon, 10 to 20 cm thick with faint iron mottles, a white Cca horizon, 5 to 10 cm thick of lime accumulation and a light olive brown II Ck horizon with prominent iron mottles.

Crookdale soils occur in close association with Wellwood soils. They are similar to Prodan soils by having a Gleyed Rego Black profile developed in fine loamy lacustrine deposits but differ from Prodan soils which develop in deep fine loamy deposits by grading to sandy deposits at depth. Crookdale soils were previously mapped as an associate of the Glenboro association in the reconnaissance soil survey of South-Central Manitoba (1943).

Cross Bay Complex (CSB)

The Cross Bay complex embodies well drained to rapidly drained Orthic Eutric Brunisol and Eluviated Eutric Brunisol soils developed on 20 to 100 cm of stratified, strongly calcareous sand and gravel deposits or fragmental residual material overlying limestone bedrock. The dominant member is the Cross Bay series, an Eluviated Eutric Brunisol, shallow and very shallow lithic phases. The subdominant member of the complex is the Chartrand Island Series, an Orthic Eutric Brunisol, shallow and very shallow lithic phases. The fragmental nature of the parent material results in rapid internal drainage and limits the degree of profile development. Areas of Cross Bay complex soils have undulating to ridged topography. Permeability ranges from rapid to very rapid. Topography and depth to bedrock are two important features influencing the rates of runoff and permeability. Jack pine, spruce, and aspen constitute the dominant vegetative types on these soils.

Soils of the Cross Bay complex area are often found in areas with a thin veneer of water-worked glacial till overlying limestone bedrock. These soils are prevalent near P.T.H. No. 6 in the central part of the Waterhen map sheet, in association with bedrock and soils of the Limestone Point series.

Croyon Series (CYN)

The Croyon series consists of moderately well to well drained Orthic Black Chernozem soils developed on a mantle (25 to 100 cm) of moderately to strongly calcareous, uniform, loamy (L, SiL, CL) lacustrine sediments over moderately to strongly calcareous, stratified, deep sandy-skeletal (GrS, GrLS), glacio-fluvial deposits. These soils occur in middle and upper slope positions of very gentle slopes on undulating landscapes and have medium over rapid permeability, moderately rapid surface runoff and a low water table during the growing season. Croyon soils have medium available water holding capacity, medium organic matter content, and high natural fertility. Native vegetation often includes tall prairie grasses interspersed with aspen-oak groves. The majority of these soils are currently used for grain crop production.

In a representative profile of Croyon soil the solum is approximately 35 cm thick. The profile is characterized by a very dark gray Ah or Ap horizon, 10 to 15 cm thick, a dark brown Bm horizon, 10 to 25 cm thick, a yellowish brown II Cca horizon, 10 to 20 cm thick with secondary carbonate accumulation and a light yellowish brown IICk horizon. The parent material is typically stratified with thin (<5 cm) layers of SiL, CoS, GrS and SL textures.

The Croyon series shale gravel variant, (CYN1) occurs in close association with typical Croyon soils and differs in having dominantly shale derived coarse fragments in the sandy-skeletal substrate.

The Croyon series sandy substrate variant, (CYN2) occurs in close association with typical Croyon soils and differs in having dominantly sandy substrate rather than sandy-skeletal substrate deposits.

Croyon soils occur in close association with Capell soils. They are similar to Vandal soils by having a coarse-loamy mantle over sandy-skeletal deposits at depth but differ from the Orthic Dark Gray Chernozem, Vandal soils in having a less strongly developed Orthic Black Chernozem soil profile. Croyon soils were previously mapped as loamy surface associates of the Agassiz association in the reconnaissance soil survey of South-Central Manitoba (1943).

Dalny Series (DNY)

The Dalny series consists of well drained, Calcareous Black Chernozem soils of the Waskada Association developed on thin (25 to 100 cm), strongly calcareous, medium textured (VFSL, L, SiL), discontinuous eolian and lacustrine sediments overlying strongly calcareous, medium to moderately fine textured, glacial till; a very thin (< 5 cm) gravelly stratum may occur at the contact. These soils have a very fine sandy loam to clay loam surface texture, gently undulating topography, slow permeability, and moderate surface runoff. The soil is non-stony and is used for crop production. This series is associated with the well drained Maskawata and Waskada series and the imperfectly drained Two Creeks and Montgomery series of the Waskada Association. The Dalny series resembles the Underhill series of the Cameron Association; the only difference is that the Dalny series is underlain by glacial till (Soils of the Boissevain - Melita Area, 1978). A morphological description of a representative profile is presented below.

Ap - 0 to 15 cm, black (10YR 2/1 moist), very dark gray to dark gray (10YR 3.5/1 dry) very fine sandy loam; moderate fine granular; friable when moist, slightly hard when dry; abrupt, smooth boundary.

Ah - 15 to 20 cm, black (10YR 2/1 moist), very dark gray to dark gray (10YR 3.5/1 dry) very fine sandy loam; moderate fine granular; friable when moist, slightly hard when dry; clear, wavy boundary.

Bmk - 20 to 41 cm, very dark grayish brown (10YR3/2 moist), dark gray (10YR 4/1 dry) very fine sandy loam; strong fine granular; friable when moist, slightly hard when dry; abrupt, wavy boundary; weakly calcareous.

II Cca - 41 to 56 cm, pale brown (10YR 6/3 moist), white (10YR 8/2 dry) silt loam; weak fine granular; firm when moist, hard when dry; gradual, smooth boundary; very strongly calcareous.

II Ck - 56 cm +, light olive brown (2.5Y 5/4 moist), very pale brown (10YR 7/3 dry) silt loam; firm when moist, slightly hard when dry; strongly calcareous.

Daly Series (DLY)

The Daly series consists of imperfectly drained Gleyed Solonetzic Black Chernozem soils developed on moderately to strongly calcareous stratified clays overlying fine sand at about one meter. Daly soils have nearly level surfaces, very low permeability in the moist state, and very slow surface runoff. These soils have a thin black Ah or Ap horizon that is very hard and cloddy when dry. The AP horizon often overlies a very hard when dry, black to dark grayish brown Bnj horizon. In the uncultivated state the Bnj horizon is characterized by a thin, very hard, strong, coarse columnar structure. The underlying Cskg horizon is generally weakly to moderately saline, sticky and massive. Under cultivation, the Bnj horizon is truncated and the columnar structure breaks to a medium blocky structure. Cultivation of these soils in a dry condition is very difficult and results in a very rough cloddy surface. The contact between the cultivated layer and underlying horizon becomes almost impermeable to water causing surface ponding conditions in the spring and summer. The irregular growth of plants is a typical feature on these soils and native vegetation consists of grasses. Daly soils are closely associated with soils of the Halicz series because of the underlying sands.

Dand Series (DND)

The Dand series consists of imperfectly drained Gleyed Black Solonetz soils of the Souris Association, developed on deep, weakly to moderately calcareous, coarse textured (FS, LCoS, LS, LFS), lacustrine sediments. These soils have a fine sand surface texture, level to gently sloping topography, moderate permeability, low surface runoff and a water table at 1 metre during the growing season. These soils occur in deep sandy deposits between Lauder and Medora. The native vegetation consists of wild barley, gum weed, spider flower and pink cleome. These soils are frequently flooded and are generally used for pasture.

Dand soils are characterized by a dark gray Ah horizon 8 to 15 cm thick, a gray Ahe or Ae horizon 3 to 4 cm thick, a dark gray to black Bnt horizon 20 to 30 cm thick and a light yellowish brown, gleyed, saline Ckg horizon (Soils of the Boissevain - Melita Area, 1978). A representative profile description and analytical data are presented below.

Ah - 0 to 15 cm, very dark gray to dark gray (10YR 3.5/1 dry), fine sandy loam; loose when dry; clear, wavy boundary; non-calcareous; pH 7.5.

Aegj - 15 to 18 cm, gray (10YR 5/1 dry), fine sand; loose when dry; clear, wavy boundary; non-calcareous; pH 7.7.

Bntjgj - 18 to 46 cm, very dark brown to very dark grayish brown (10YR 2.5/2 moist), dark grayish brown (10YR 4/2 dry) loamy fine sand; strong, very coarse columnar; very firm when moist; irregular boundary; non-calcareous; pH 9. 1.

BC - 46 to 53 cm, dark grayish brown (10YR 4/2 moist), yellowish brown (10YR 5/4 dry) loamy fine sand; friable when moist; gradual, irregular boundary; weakly calcareous; weakly saline; pH 9.5.

Cskg1 - 53 to 79 cm, light grayish brown to light gray (10YR 6.5/2 moist), pale brown (10YR 6/3 dry) loamy fine sand; friable when moist; gradual, irregular boundary; moderately calcareous; weakly saline; pH 9.7.

Ckg2 - 79 to 102 cm, light yellowish brown to brownish yellow (10YR 6/5 moist), very pale brown (10YR 7/3 dry) fine sand; friable when moist; moderately calcareous; pH 9.0.

Danlin Series (DLN)

The Danlin series consists of imperfectly drained Gleyed Dark Gray Chernozem soils developed on moderately to strongly calcareous, fine loamy (CL, SiCL, SCL, L, SiL), lacustrine deposits. These soils occur in lower slope positions of very gentle to gentle slopes on rolling to undulating landscapes and have moderate permeability, moderate to moderately slow surface runoff, and a medium water table during the growing season. Danlin soils are non-eroded, non-stony, and non-saline. They have a medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation includes aspen, oak, shrubs and prairie grasses. The majority of these soils are currently cultivated for crop production.

In a representative profile the solum is approximately 80 cm thick. The profile is characterized by a dark gray Ap horizon, 10 to 15 cm thick, a transitional AB horizon, 8 to 12 cm thick a very dark grayish brown to grayish brown Btjg horizon, 15 to 25 cm thick with faint mottles and a grayish brown Ck horizon, with numerous faint mottles.

Danlin soils occur in association with Firdale and Tadpole soils. They are similar to Bone soils by having a Gleyed Dark Gray Chernozem profile in lacustrine deposits but differ from them in having fine loamy rather than coarse loamy sediments. Danlin soils were previously mapped as Degrading Black Meadow associates of the Firdale Association in the Carberry (1957) soil report.

Darlingford Series (DGF)

The Darlingford series consists of well drained Orthic Black Chernozem soils developed on moderately to strongly calcareous, deep, uniform, loamy (L, CL, SiCL), mixed till deposits. These soils occur in middle to upper positions of very gentle to gentle slopes on undulating to rolling landscapes and have medium to moderately slow permeability, moderate surface runoff and a medium water table during the growing season. Darlingford soils are slightly eroded and slightly stony. They have moderate available water holding capacity, medium organic matter content, and high natural fertility. Native vegetation often includes tall prairie grasses interspersed with aspen poplar stands. The majority of these soils are currently used for crop production.

In a representative profile of Darlingford soil the solum is approximately 60 cm thick. The profile is characterized by a very dark gray Ap or Ah horizon, 15 to 20 cm thick, a black Ah horizon, 5 to 10 cm thick, a brown to dark brown Bm or Btj horizon, 20 to 30 cm thick and a pale brown Cca horizon 10 to 15 cm thick. The parent material is typically yellowish brown mixed till with few coarse fragments.

Darlingford soils occur in close association with Dezwood, Nikkel and Cazlake soils. They are similar to Nikkel soils by having a dark surface layer and well developed B horizon but differ from Nikkel soils by being well drained while Nikkel soils are imperfectly drained. Darlingford soils were previously mapped as the dominant associate of the Darlingford association in the reconnaissance soil survey of South-Central Manitoba (1943).

Dauphin Series (DPH)

The Dauphin series consists of imperfectly drained Gleyed Rego Black Chernozem soils developed on moderately calcareous, fine textured (SiC, C) fluvio-lacustrine deposits. These soils occur in the Dauphin Lake Plain on level to very gently sloping terrain. Runoff is slow and permeability is very slow. In general, these lacustrine deposits are relatively shallow and are underlain with calcareous glacial till. Areas in which the till occurs within 100 cm of the surface have been mapped as McClernon Series. The native vegetation under which the Dauphin soils developed was mainly tall prairie and meadow-prairie grass associations with occasional bluffs of aspen and willow.

The soil is characterized by a very dark gray, fine to medium granular Ah horizon l2 to 35 cm thick; a gray AC horizon that has massive to medium granular structure and is moderately calcareous and a grayish brown amorphous calcareous C horizon. The clay content of the parent material is normally greater than 60 percent. The parent material of these soils contains solube salts but generally not saline enough to affect plant growth. The Dauphin clay soils usually occur in simple or homogeneous mapping units but may have minor inclusions of the poorly drained Fork River series. A description representative of the Dauphin series follows.

Ap - 0 to 15 cm, very dark gray (10YR 3/1dry, 2.5Y 2/0 moist), clay; amorphous breaking to moderate medium blocky; firm, hard, neutral; noncalcareous; abrupt, smooth boundary.

Ahgj - 15 to 35 cm, very dark gray (10YR 3/1 dry, 2.5Y 2/0 moist), clay; weak, medium granular breaking to moderate, fine granular; friable, slightly hard, neutral; usually noncalcareous; abrupt, irregular boundary.

ACkgj - 35 to 50 cm, gray (10YR 5/1dry, 5Y 3/2 moist) clay; weak medium granular breaking to weak fine granular; friable, slightly hard; mildly alkaline; moderately calcareous; abrupt, wavy boundary.

Cskg - 50 to 105 cm, grayish brown (2.5Y 5/2 dry, 5Y 3/1moist), clay; amorphous breaking to weak, fine pseudo granular; friable, hard; strongly alkaline; moderately calcareous; slightly saline; contains gypsum crystals.

Davidson Series (DVD)

The Davidson series consists of well to moderately well drained Orthic Dark Gray Chernozem soils developed on moderately calcareous, sandy, deltaic and beach deposits. Surface textures vary from sandy loam to medium sand. The topography is irregular very gently to gently sloping; runoff is low; permeability is rapid. The depth of sand is usually one to two metres to the underlying clay or till. The native vegetation is dominantly aspen with occasional white spruce or jack pine.

The Davidson soil is characterized by a dark gray Ahe horizon 16 to 24 cm thick and a very dark grayish brown Bm horizon. A lime carbonate layer may be present at 30 to 50 cm depth. Internal drainage is satisfactory as indicated by the absence of iron mottling within the meter depth or at the sand-clay or sand-till contact.

Davis Point Series (DVP)

The Davis Point series are imperfectly drained Gleyed Dark Gray Chernozem soils developed on moderately to strongly calcareous clayey till. Numerous isolated pockets of extremely calcareous, loamy till occur at random within the clayey matrix of the parent material. Clay surface textures and the nearly level to gently undulating topography of these soils contribute to slow permeability and slow to moderate runoff. Vegetative cover is dominantly aspen, spruce and balsam poplar with an undercover of willows, shrubs and grasses. The surface may be slightly stony. Areas of Davis Point soils are found mainly in the Interlake till plain, particularly on Birch Island and near Lake Winnipegosis. They commonly occur in association with the Inwood and the Sagemace series, peaty phase. The Davis Point series of the High Boreal-temperate climatic zone are similar in parent materials and drainage to the Warpath soils of the Low Boreal climatic zone. A description of a representative Davis Point soil follows:

L-H - 5 to 0 cm, black (5YR 2/1 dry), leaf mat, partially to well decomposed leaf and shrub remains; neutral; clear, smooth boundary.

Ahej - 0 to 5 cm, very dark gray (10YR 3/1 dry) with dark gray (10YR 4/1 dry) blotches, clay; few, medium, distinct mottles; moderate, medium granular; firm when moist, hard when dry; slightly acid; clear, smooth boundary.

Btjgj - 5 to 15 cm, dark gray (10YR 4/1 dry), clay; few, medium distinct dark brown mottles; strong, medium granular; firm when moist, hard when dry; neutral, abrupt, wavy boundary.

BC - 15 to 20 cm, gray (10YR 5/1 dry), clay; moderate, medium granular; firm when moist, hard when dry; mildly alkaline; strongly calcareous; clear, irregular boundary.

Ckgj1 - 20 to 60 cm, gray (5Y 6/1 dry), clay; moderate, medium pseudo-granular; firm when moist, hard when dry; mildly alkaline; strongly calcareous; separated by an abrupt, irregular boundary.

Ckgj2 - pockets of white (2.5Y 8/2 dry), silty clay loam; occur in the Ckgj1 horizon; moderately, fine pseudo-granular; friable when moist, very hard when dry; strongly cemented when dry; extremely calcareous.

Deadhorse Series (DHO)

The Deadhorse series consists of imperfectly drained Gleyed Rego Black Chernozem soils developed on moderately to strongly calcareous, deep, stratified, clayey (SiC, C), fluvial and lacustrine deposits. Thin strata of silt loam to clay loam often occur within 1 to 2 metres of the surface. These soils occur in middle position of level to very gentle slopes on undulating landscapes and have very slow permeability, slow surface runoff, and a high water table during the growing season. Deadhorse soils are non-eroded, non-stony, and frequently slightly saline. They have a high available water holding capacity, high organic matter content, and medium natural fertility. Native vegetation includes tall prairie grasses, aspen and oak. The majority of these soils are currently cultivated for grain crop production.

In a representative profile the solum is approximately 20 cm thick. The profile is characterized by a very dark gray Ah horizon, 12 to 25 cm thick, a carbonated, dark gray to gray AC horizon, 8 to 20 cm thick and a Ckgj horizon with faint mottles. The Deadhorse variant, DHO1, has a loam to clay loam surface texture, 15 to 30 cm thick. Deadhorse soils occur in close association with Winkler and Plum Coulee soils, they are similar to Plum Coulee soils by having an imperfectly drained, clayey profile but differ from them in having no Bm horizon. Deadhorse soils were previously mapped as clayey Black Meadow associates of the Horndean Complex in the Morris Map Sheet (1953).

Deleau Series (DLU)

The Deleau series consists of well drained, Calcareous Black Chernozem soils of the Souris Association, developed on deep, weakly to moderately calcareous, coarse textured (FS, LCoS, LS, LFS), lacustrine sediments. This soil has a fine sandy surface texture, very gently sloping to undulating topography, rapid permeability, and low surface runoff. The estimated depth to water table is 2 to 3 metres during the growing season. The surface is non-stony and non-saline. Most of these soils are cultivated. This soil is associated with the well drained Stanton and Scarth series, the imperfectly drained Lauder and Souris soils, and the poorly drained Oak Lake and Bell Creek soils.

This soil is characterized by a dark grayish brown Ap horizon 7 to 13 cm thick, grayish brown Bmk horizon 7 to 10 cm thick, a light gray Cca horizon 13 to 15 cm thick and a light olive brown Ck horizon. Surface soil colors have high chromas as a result of erosion and incorporation of underlying horizons during cultivation (Soils of the Boissevain - Melita Area, 1978). A representative profile description is given below.

Ap - 0 to 13 cm, very dark brown (10YR 2/2 moist), very dark grayish brown to dark grayish brown (10YR 3.5/2 dry), loamy fine sand; weak, fine granular; friable when moist, loose when dry; abrupt, smooth boundary; mildly alkaline.

Bmk - 13 to 23 cm, dark grayish brown to dark brown (10YR 4/2.5 moist), dark grayish brown to grayish brown (10YR 4.5/2 dry), loamy fine sand; weak, fine granular; friable when moist, loose when dry; clear, smooth boundary; weakly calcareous; mildly alkaline.

Cca - 23 to 41 cm, gray to grayish brown (2.5Y 5.5/2.5 moist), light gray (10YR 7/1 dry), fine sandy loam; weak fine granular; friable when moist, slightly hard when dry; gradual, smooth boundary; strongly calcareous; mildly alkaline.

Ck - 41 to 91 cm, light olive brown (2.5Y 5/4 moist), light brownish gray to light gray (10YR 6.5/2 dry) fine sandy loam; structureless, single grained; friable when moist; slightly hard when dry; strongly calcareous; mildly alkaline.

Delmar Series (DMR)

The Delmar series are poorly drained, carbonated Rego Humic Gleysol soils developed on moderately coarse (VFS, LCoS, LFS) to medium (VFSL, L, SiL) textured sediments overlying fine (SiC, C) textured lacustrine clay. The surface texture is variable ranging from very fine sandy loam, sandy clay loam to silt loam. The topography is depressional, level or gently sloping. The soil drainage is poor because of the lack of runoff, high water table or lateral seepage above the clay layer. Permeability is moderate to moderately slow in the moderately coarse textured deposits and slow to very slow in the lacustrine clay below. Native vegetation consists of sedges, rushes, and willow. In areas where there is upward flow of groundwater, salinity maybe a problem. Delmar, slightly saline phase soils are similar in profile characteristics to the Delmar series but have an accumulation of soluble salts other than gypsum within the effective rooting zone of plants in sufficient quantity to affect crop growth. These soils either have an inflow of near surface water that contains appreciable soluble salts or occurs in discharge areas with a near surface static water level and saline waters.

The soil is characterized by a very dark gray, carbonated Ah horizon 15 to 20 cm thick, and a gray carbonated AC horizon. Prominent yellowish brown iron mottles are present in the subsoil. In virgin sites up to 15 cm of fibric to humic peat may be present. A description of the Delmar series is given below.

Ahk1 - 0 to 8 cm, dark gray (10YR 4/1 dry, 10YR 2.5/1 moist); mucky loam; moderate, fine granular; friable when moist, soft when dry; mildly alkaline, moderate effervescence; clear, smooth boundary.

Ahk2 - 8 to 20 cm, gray (2.5Y 5/0 dry, 2.5Y 2.5/0 moist), loam; weak to moderate, fine platy to fine granular; friable when moist, soft when dry, slightly plastic, mildly alkaline; moderate effervescence; clear, smooth boundary.

AC1 - 20 to 28 cm, white (10YR 8/1 dry, 2.5Y 5/2 moist), silt loam, moderate, fine platy to weak fine granular; friable when moist, slightly hard when dry, slightly plastic, mildly alkaline; moderate effervescence; numerous, coarse, distinct light gray (2.5Y 7/2 moist), carbonate mottles; clear, smooth boundary.

AC2 - 38 to 40 cm, gray (10YR 5.5/1 dry, 10YR 3.5/1 moist), loam; very weak fine granular; very friable when moist, soft when dry, slightly plastic; mildly alkaline; moderate effervescence; clear, smooth boundary.

Ckg1 - 40 to 46 cm, light gray (2.5Y 7/2 dry, 2.5Y 6/2 moist), fine sand; single grained; loose when moist or dry, non-plastic; mildly alkaline, moderate effervescence; few, fine, distinct yellowish brown (10YR 5/8 moist), mottles; clear, smooth boundary.

Ckg2 - 46 to 66 cm, light gray (2.5Y 7/2 dry, 2.5Y 6/2 moist), fine sand; single grained; loose when moist or dry, non-plastic; mildly alkaline; moderate effervescence; numerous, coarse, prominent yellowish brown (10YR 5/8 moist), and few, medium, prominent black (10YR 2.5/1 moist), mottles; clear, smooth boundary.

Ckg3 - 66 to 99 cm, light gray (2.5Y 7/2 dry, 2.5Y 6/2 moist), fine sand; single grained; loose when moist or dry, non-plastic; non-sticky when wet; mildly alkaline; moderate effervescence; few, fine, distinct, yellowish brown (10YR 5/6 moist), mottles; abrupt, smooth boundary.

II Ckg - 90 to 100 cm, gray (5Y 5/1 dry, 2.5Y 4/2 moist), clay; weak, medium platy (varved); very sticky when wet; very plastic; mildly alkaline; moderate effervescence; few, medium, prominent white (2.5Y 8/2 moist), carbonate mottles.

Deloraine Series (DRI)

The Deloraine series consists of poorly drained, carbonated Rego Humic Gleysol soils of the Waskada Association, developed on thin (25 to 100 cm), strongly calcareous, medium to moderately fine textured (VFSL, SiL, SCL, CL, SiCL), discontinuous eolian and lacustrine sediments overlying strongly calcareous, medium to moderately fine textured, glacial till. These soils have a loam surface texture, nearly level topography, slow permeability, and very slow runoff. They occur in depressions and stream channels. The estimated depth to water table during the growing season is usually less than 1 metre. Flooding and surface ponding are a common occurrence. They are rarely cultivated and usually support hydrophytic vegetation such as cattails, bullrushes and horsetail.

Denbow Series (DBW)

The Denbow series is the imperfectly drained, Gleyed Black Chernozem member of the Lyleton Association, developed on deep, moderately calcareous, coarse loamy, lacustrine sediments. This soil occurs in areas of complex very gently sloping topography and is characterized by imperfect drainage, moderately rapid permeability and slow surface runoff. The estimated depth to water table during the growth season is 2 m. This soil is non-saline, non-stony and cultivated. It often occurs in close association with the Switzer series.

Denbow soils are characterized by a black Ap horizon 10 to 12 cm thick, a weakly stained gleyed very dark grayish brown Bmgj horizon 10 to 12 cm thick, an olive gray to grayish brown iron stained Cca horizon 25 to 30 cm thick and a gleyed, iron stained and mottled, light yellowish brown Ckg horizon.

Dencross Series (DCS)

The Dencross series consists of imperfectly drained Gleyed Rego Black Chernozem soil developed on (<1 m) of moderately to strongly calcareous, shallow clayey, lacustrine, deposits over very strongly to extremely calcareous, silty, lacustrine deposits. These soils occur in mid to upper positions of level to very gentle slopes on level to undulating landscapes and have slow to moderate permeability, slow surface runoff and a medium water table during the growing season. Dencross soils are non to slightly eroded, non stony and may be saline. They have medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes prairie grasses, aspen and willow. The majority of these soils are currently used for crop production.

In a representative profile of Dencross soil the solum is approximately 40 cm thick. The profile is characterized by a thin, very dark gray, clay Ah horizon, 15 to 25 cm thick; a moderately calcareous, dark gray, clay , AC horizon, 15 to 20 cm thick; a light gray, clay to silty clay, moderately calcareous, Ckgj horizon, 20 to 30 cm thick and a light olive brown, very strongly calcareous, SiL-SiCL, II Ckgj horizon. The parent material is typically clayey over silty. A typical profile also contains an underlay of clay below the silty strata at or below 1 m.

Dencross soils occur in close association with Hodinott and Red River soils. They are similar to Hoddinott soils by having a silty subsoil but differ from Red River soils which are more uniformly clayey throughout. Dencross soils were previously mapped as, part of the Emerson (heavy) Association in the Morris Map Sheet (Report No. 5, 1953).

Denham Series (DNH)

The Denham series consists of moderately well to well drained Orthic Black soil developed on mantle (60 to 90 cm) of moderately to strongly calcareous, shallow, loamy (VFSL, L, SiL, CL, SiCL), lacustrine sediments over moderately to strongly calcareous, deep, clayey (SiC, C, SC), lacustrine deposits. These soils occur in upper positions of very gentle slopes on undulating landscapes and have moderately permeable loams over slowly permeable clays, moderate to moderately rapid surface runoff, and a low water table during the growing season. Denham soils are non-eroded, non-stony, and non-saline. They have medium available water holding capacity, high organic matter content, and high natural fertility. Native vegetation includes aspen, oak, shrubs and prairie grasses. The majority of these soils are currently cultivated for crop production.

In a representative profile the solum is approximately 50 cm thick. The profile is characterized by a very dark gray to black Ap horizon, 20 to 30 cm thick, a very dark grayish brown to brown Bm horizon, 25 to 35 cm thick, a weakly calcareous BC horizon, 5 to 10 cm thick, and a yellowish brown to pale brown, moderately to strongly calcareous C horizon. The parent material is typically faintly mottled at depth.

Denham soils occur in close association with Rignold, Graysville and Edkins soils. They are similar to Hibsin soils by having an Orthic Black Chernozem profile and clayey substrate but differ from them in having a loamy mantle rather than a coarse loamy mantle. Denham soils were previously mapped as Blackearth associates of the Altona, clay substrate, Association in the Winnipeg-Morris (1953) soil report.

Dering Series (DRG)

The Dering series consists of poorly drained Rego Gleysol, carbonated, peaty phase soils developed on extremely calcareous, stony, loamy till. These soils occur in areas of depressional to level topography commonly bordering small lakes and bogs and frequently in swales where the dominant landform is ridge and swale. Generally, Dering series are moderately stony, the degree of stoniness being dependent upon the presence or absence of a thin (<15 cm) lacustrine overlay as well as upon the depth to bedrock. Internal drainage is very poor and runoff may vary from very slow to nil. A 15 to 40 cm mantle of mesic peat normally covers the surface of Dering soils. The dominant vegetation of these soils is black spruce and some willow with an understory composed of mainly sedges, reed grasses, and feathermosses. The Dering series occurs throughout the Low Boreal climatic region, usually in association with the better drained Chitek and Atikameg series. The Dering series, peaty phase (15 to 40 cm of mesic peat), correlates with the Meleb series, peaty phase of the High Boreal-temperate climatic zone. A description of a representative profile of the Dering series is as follows:

Om - 15 to 0 cm, black (10YR 2/1, dry), moderately decomposed woody and herbaceous materials; neutral.

II Ahg - 0 to 10 cm, grayish brown to dark brown (10YR 5/2 to 10YR 4/3 dry), very dark gray to very dark grayish brown (10YR 3/1 to 10YR 3/2 moist), loam; amorphous breaking to weak medium granular; neutral; weakly calcareous.

II Ckg - 10 to 60 cm, white to very pale brown (10YR 8/2 to 10YR 8/3 dry), pale brown (10YR 6/3 moist), silt loam; amorphous; mildly to moderately alkaline; extremely calcareous.

Desford Series (DFD)

The Desford series consists of imperfectly drained, Gleyed Black Chernozem soils of the Croll Association, developed on thin (25 to 100 cm), strongly calcareous, moderately fine textured, discontinuous lacustrine mantle overlying strongly calcareous medium to moderately fine textured glacial till. A very thin (less than 5 cm) gravelly stratum may occur at the contact. This soil has a clay loam surface texture, depressional to gently undulating topography, slow permeability and slow surface runoff. The estimated depth to water table is 2 metres during the growing season. It is occasionally saline, non-stony and generally cultivated.

Associated soils are the well drained Bearford series, the imperfectly drained Croll series, and the poorly drained Wassewa series. The Desford series resembles the Goodlands series of the Elva Association, and the Agnew series of the Pipestone Association. The only difference is the Desford series is underlain by glacial till (Soils of the Boissevain - Melita Area, 1978). Analytical data and a representative profile description is presented below.

Ap - 0 to 15 cm, very dark gray (10YR 3/1 moist), very dark gray to dark gray (10YR 3.5/1 dry) clay loam; strong, moderate platy; friable when moist, very hard when dry; abrupt, smooth boundary; pH 7.3.

Bmgj - 15 to 38 cm, black (10YR 2/1 moist), dark gray to gray (10YR 4.5/1 dry) silty clay; moderate medium granular; firm when moist, hard when dry; gradual, wavy boundary; pH 7.3.

II Cksgj - 38 cm +, dark gray (2.5Y 4/2 moist), grayish brown (10YR 5/2 dry) silty clay loam; amorphous.

Devils Lake Series (DVK)

The Devils Lake series consists of well to moderately well drained, Orthic Gray Luvisol soils, developed on 50 to 75 cm of extremely calcareous glacial till over limestone bedrock. The topography is gently undulating to undulating. Surface runoff is moderate, permeability is medium, and these soils are very to exceedingly stony. The native vegetation is mainly aspen and white spruce with jack pine. Devils Lake soils correlate with Garson, rock substrate phase soils reported in previous, published soil survey reports.

The Devils Lake soils have the typical Orthic Grey Luvisol profile characteristics, but the horizons are very thin. A neutral to slightly acid L-H horizon overlies a 2 to 8 cm thick light grayish brown Ae horizon that is neutral to slightly acid in reaction. The thin Bt is well developed and the transitional BC horizon separates the extremely calcareous Ck horizon. Limestone bedrock dominantly occurs within 50 to 75 cm of the mineral surface.

Minor amounts of bare limestone bedrock outcroppings occur in Devils Lake map units. These soils are significantly stonier than associated Garson soils.

Dexter Series (DXT)

The Dexter series consists of imperfectly drained Gleyed Black Chernozem soils developed on moderately to strongly calcareous, deep, stratified, sandy skeletal (FS, CoS, GrS), glaciofluvial deposits. These soils occur in middle positions of very gentle to gentle slopes on undulating landscapes and have rapid permeability, low surface runoff, and a medium water table during the growing season. Dexter soils are slightly eroded, non-stony, and non-saline. They have a low available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation includes bur oak, aspen, shrubs and prairie grasses. The majority of these soils are currently used for forage crops and grazing.

In a representative profile the solum is approximately 40 cm thick. The profile is characterized by very dark gray Ah horizon, 15 to 20 cm thick, a grayish brown to brown Bm horizon, 10 to 25 cm thick, a Cca (lime accumulation) horizon, 5 to 8 cm thick and a mottled and calcareous Ck horizon. A typical profile also varies in depth depending on the thickness of finer textured surface layers.

Dexter soils occur in close association with Dorset Marringhurst and Fortina soils. They are similar to Mansfield soils by having an imperfectly drained profile developed in sandy skeletal deposits in having a Bm horizon.

Dezwood Series (DZW)

The Dezwood series consists of moderately well to well drained Orthic Dark Gray Chernozem soils developed on moderately to strongly calcareous, deep, uniform, loamy (L, CL, SiCL) mixed shale, limestone and granite till deposits. These soils occur in middle and upper positions of gentle to moderate slopes on hummocky landscapes and have medium to moderately slow permeability moderate to rapid surface runoff and a medium water table during the growing season. Dezwood soils are slightly eroded and slightly stony. They have medium available water holding capacity, medium organic matter content and medium to high natural fertility. Native vegetation often includes tall prairie grasses interspersed with aspen-popular groves. The majority of these soils are currently used for crop production.

In a representative profile the solum is approximately 40 cm thick. The profile is characterized by a dark grayish brown Ah or Ap horizon, 15 to 20 cm thick, occasionally a thin light gray Ae horizon, 2 to 4 cm thick, a pale brown Bt horizon, 20 to 40 cm thick, and a light gray Cca horizon 15 to 30 cm thick. The parent material is typically light gray mixed till with few coarse fragments.

Dezwood soils occur in close association with Ferris and Nikkel soils. They are similar to Pembina soils by having been developed in a calcareous mixed regional till but differ from them by having a luvisolic Ae horizon greater than 5 cm thick in undisturbed profiles. Dezwood soils were previously mapped as gray black associates of the Pembina Association in the reconnaissance soil survey of South-Central Manitoba (1943).

Dickson Series (DKS)

The Dickson series consists of imperfectly drained Gleyed Dark Gray Chernozem soils developed on a mantle (25 to 100 cm) of moderately calcareous, coarse to moderately coarse textured (FS, LFS, VFS, LVFS) sandy lacustrine deposits, overlying moderately to strongly calcareous, fine loamy (L, CL, SICL) till deposits. These soils occur in middle and lower positions of nearly level to undulating landscapes and have moderate permeability, moderately slow surface runoff and a medium low water table during the growing season. Dickson soils are non-eroded, non-stony and non-saline. They have low available water holding capacity, and low organic matter content. Native vegetation often includes trembling aspen, birch balsam poplar, willow, and grasses. The majority of these soils are currently used for forages and annual crop production.

In a representative profile the solum is approximately 54 cm thick. The profile is characterized by a gray to dark gray, sandy loam textured Ap horizon, 12 to 20 cm thick, overlying a gray to light gray, loamy fine sand Ahe-Ahegj horizon, 15 to 40 cm thick, with few fine faint, reddish mottles; a brownish sandy loam Bmgj horizon, 12 to 36 cm thick with weak sub-angular blocky structure, and few medium faint mottles, a thin transitional BC horizon, 10 to 15 cm thick with some coarse fragments grades to a fine loamy II Ckgj horizon. The mottling in the profile is likely the result of restricted drainage caused by the close proximity of the underlying till.

Dickson soils occur in close association with Davidson, Ozerna, and Poppleton soils. They are similar to Poppleton soils in drainage and texture but differ from them because of the shallow depth to compact till. Dickson soils differ from Davidson soils because of poorer drainage and shallow depth to till and from Ozerna soils because of poorer drainage. Dickson soils were previously mapped in the Rackham soil association in the reconnaissance survey of soils in the Rossburn and Virden map sheet areas.

Dobbin Series (DOB)

The Dobbin series consists of well drained Orthic Dark Gray Chernozem soils developed on weakly to non-calcareous, deep, sandy (LFS, FS, S), lacustrine and eolian deposits. These soils occur in middle and upper positions of gentle slopes on undulating to hummocky landscapes and have rapid permeability, rapid surface runoff, and a low water table during the growing season. Dobbin soils are slightly wind eroded, non-stony, and non-saline. They have a low available water holding capacity, low organic matter content, and low natural fertility. Native vegetation includes aspen groves, bur oak, shrubs and tall prairie grasses. The majority of these soils are currently utilized for forage and crop production.

In a representative profile the solum is approximately 90 cm thick. The profile is characterized by a gray to dark gray Ap horizon, 20 to 35 cm thick, a grayish brown to brown Bm horizon, 40 to 55 cm thick, a dark grayish brown Btj or Bt (clay accumulation) horizon, 5 to 10 cm thick and a transitional BC horizon, 15 to 20 cm thick. A typical profile also contains thin strata of VFSL to SiL textures. Dobbin soils occur in close association with Stockton, Lavenham and Sewell soils. They are similar to Halstead soils by having a well drained Dark Gray Chernozem profile but differ from them in having sandy rather than coarse loamy deposits. Dobbin soils were previously mapped as degraded Black associates of the Stockton Association in the Carberry (1957) soil report.

Dogand Series (DGA)

The Dogand series consists of well to moderately well drained Calcareous Black Chernozem soils developed on a sequence of soil materials composed of a thin mantle, (25 to 60 cm) of moderately to strongly calcareous loamy sediments over thin (10 to 40 cm) medium sand to gravel strata, over a very strongly calcareous loamy textured glacial till. Strongly calcareous loam to clay loam glacial till of shale, limestone and granitic origin usually occurs within a two metre depth. The soils occur on gently sloping topography; runoff is moderate; permeability is moderate to rapid in the upper loamy and coarser strata and moderately slow in the underlying till.

A very dark gray Ahk horizon 10 to 15 cm thick, a brown to dark grayish brown Bmk horizon of 8 to 12 cm thick and a thin BC characterize the soil. A calcium carbonate layer (Cca) occurs at the contact of the loamy sediments and the coarser strata.

Dorset Series (DOT)

The Dorset series consists of moderately well to well drained Orthic Black Chernozem soils developed on moderately to strongly calcareous, deep , stratified, sandy to sandy skeletal (S, GrS, GrCoS), outwash and glaciofluvial deposits. These soils occur in upper positions of gentle slopes on hummocky landscapes and have very rapid permeability, low rapid surface runoff, and a low water table during the growing season. Dorset soils are non-eroded, non-stony, and non-saline. They have a low available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation includes aspen-oak stands and tall prairie grasses. The majority of these soils are currently used for grazing or are excavated for gravel deposits.

In a representative profile the solum is approximately 30 cm thick. The profile is characterized by a very dark gray Ah horizon, 12 to 18 cm thick, a dark brown Bm horizon, 15 to 22 cm thick, a Cca (lime accumulation) horizon, 6 to 12 cm thick and a light brown Ck horizon, with stratified sand and gravel. The Dorset, shaly gravel variant, DOT1, has a high proportion of shale fragments in the gravel.

Dorset soils occur in close association with Mansfield soils. They are similar to Marringhurst soils by having well drained profile in glaciofluvial deposits but differ from them in having a Bm horizon. Dorset soils were previously mapped as Blackearth associates of the Marringhurst Association in the Carberry (1957) soil report.

Drokan Series (DRO)

The Drokan series is characterized by a Rego Humic Gleysol (carbonated) solum, developed on moderately to strongly calcareous, loamy (L-CL) morainal till of limestone, granitic and shale rock origin. They are poorly to very poorly drained and occur in depressional positions of the undulating to hummocky morainal landscape. Surface runoff is negligible and the soils may remain in a ponded condition unless the surface drainage had been improved. Permeability is moderately slow to slow. In some landscapes, these areas are influenced by seepage from adjacent higher lands, and may have a considerable content of soluble salts. Native vegetation consists of sedges, cattails, rushes and willows. Saline areas have baltic rush, wild barley and saline goosefoot.

The Drokan soil profile has a moderately decomposed organic layer, 2 to 5 cm thick, a very dark gray Ah horizon, 10 to 18 cm thick, a mottled transitional AC horizon, 4 to 8 cm thick and a lime accumulation layer, 8 to 12 cm thick. The C horizon is olive gray to olive with yellowish brown mottles. Gypsum crystals are common in the lime accumulation layer and C horizon. In saline areas, white flecks of salt and gypsum are present in the Ah and AC horizons; soils with appreciable soluble salt are delineated as Drokan saline phase.

Generally, the average A horizon is 22 cm thick and varies from 15 to 35 cm; the average depth of its solum is 35 cm and varies from 15 to 70 cm. It differs from the closely related Penrith soil series in being less well developed and having shallower, less distinct horizons.

Dromore Series (DOM)

The Dromore series consists of well drained, Orthic Black Chernozem soils of the Dromore Association, developed on thin (25 to 100 cm), strongly calcareous, medium to moderately fine textured (VFSL, L, SiL to SCL, CL, SiCL), lacustrine sediments overlying coarse textured (FS, LCoS, LS, LFS), gravelly, deltaic beach and outwash deposits. This soil has a fine sandy loam to loam surface texture, gently undulating topography, moderately rapid permeability, and low surface runoff. This soil is very slightly stony, well drained, and non-saline. This soil occurs in areas adjacent to outwash deposits and is usually cultivated. The presence of the underlying gravel tends to make these thin soils somewhat droughty during periods of low precipitation.

Dromore, shaly variant (DOM1) are undelain by shaly, gravelly deposits. Dromore soils are characterized by black Ap horizons 10 to 15 cm thick, very dark brown Bm horizons 15 to 25 cm thick overlying a coarse textured II C horizon. The Dromore series resembles the Newstead series of the Newstead Association. The difference is the Newstead Association is underlain by glacial till.

Drunken Lake Series (DRL)

The Drunken Lake series consists of well to moderately well drained Orthic Gray Luvisol, lithic phase soils developed on a mantle (30 to 75 cm) of moderately to strongly calcareous, clayey lacustrine sediments overlying very strongly calcareous, fine silty and fine loamy lacustrine deposits overlying Precambrian bedrock. These soils occur in the crest to lower positions of gently to moderately sloping, undulating to hummocky landscapes. They have moderately slow permeability, slow surface runoff and a low water table during the growing season. Drunken Lake soils are non-eroded, non to moderately stony and non-saline. They have moderate available water holding capacity and low organic matter content. Native vegetation includes mixed stands of black spruce, jack pine, trembling aspen with alder in the understory. Ground cover is dominantly feathermosses with low ericaceous shrubs. The majority of these soils are currently under forest cover in the Snow Lake area. Drunken Lake soils occur in close association with granitic bedrock and Sipiwesk and Roe Lake soils. Drunken Lake soils in the Snow Lake area are often similar to the Wabowden soils by having strongly developed, columnar B horizons but differ in having a thin loamy subsoil and bedrock contact within 100 cm of the surface.

In a representative profile the solum is approximately 50 cm thick. The profile is characterized by a medium acidic, moderately decomposed LFH horizon, 6 to 10 cm thick; a very strongly acidic, clay loam Ae horizon, 5 to 8 cm thick; a very strongly acidic, clay Btnj horizon, 10 to 25 cm thick, with columnar structure; a strongly acidic, clay Bt horizon 10 to 15 cm thick; and a moderately calcareous, light gray, clay loam Ck horizon 10 to 20 cm thick over bedrock. The parent material is typically clay loam to fine sandy loam close to the bedrock contact. A typical profile also contains some gravel and cobbles.

Druxman Series (DXM)

The Druxman series consists of imperfectly drained Gleyed Black Chernozem soils developed on a mantle (25 to 100 cm) of moderately to strongly calcareous, stratified, deep, sandy-skeletal (GrS, GrLS), glacio-fluvial deposits. These soils occur in lower slope positions of very gentle slopes on undulating landscapes and have medium over rapid permeability, low surface runoff and a medium water table during the growing season. Druxman soils have medium available water holding capacity, medium organic matter content and medium natural fertility. Native vegetation often includes meadow and tall prairie grasses interspersed with willow clumps. The majority of these soils are currently used for grain crop production.

In a representative profile the solum is approximately 50 cm thick. The profile is characterized by a very dark gray Ah or Ap horizon, 15 to 25 cm thick, a dark yellowish brown to olive brown Bm horizon, 20 to 30 cm thick with many, fine, distinct, yellowish brown iron mottles, a transitional dark yellowish brown BC, 5 to 10 cm thick, occasionally a yellowish brown II Cca horizon, 5 to 10 cm thick and light yellowish brown II Ck horizon with many, large prominent iron mottles.

Druxman and Druxman, shaly variant (DXM1) soils occur in close association with Croyon and Carvey soils. They are similar to Capell soils by having an imperfectly drained Black profile developed in loamy over sandy-skeletal deposits but differ from Capell soils because Capell soils lack a Bm horizon. Druxman soils were previously mapped as imperfectly drained associates of the Agassiz Association in the reconnaissance soil survey of South-Central Manitoba (1943).

Duck Mountain Series (DKM)

The Duck Mountain series consists of moderately well drained, Orthic Gray Luvisol soils developed on 20 to 100 cm of clayey, stone-free glaciolacustrine sediments overlying moderately calcareous, loamy glacial till. Topography is generally gently sloping to undulating. The fine textured surficial material appears to have been deposited as a glaciolacustrine veneer in the Duck Mountain study area. Surface drainage is somewhat impeded by the fine textured surface material.

Duck Mountain soils have a thin leaf mat on the surface, a light gray, slightly acid Ae horizon, and a dark grayish brown Bt horizon with well developed blocky aggregates of very hard consistence when dry and high plasticity when wet. The solum extends to a depth of 40 to 50 cm, frequently coinciding with the contact with the underlying till. The II Ck horizon is light colored, loam textured, moderately calcareous, and moderately alkaline in reaction. Dominant vegetation is white spruce and aspen with a sparse understory of balsam fir and a ground cover of feathermoss and bunchberry.

Duck Mountain soils are of minor extent, occurring as constituents in several map units in the Singush Lake and Blue Lake map areas. Duck Mountain soils often occur in transitional areas between units of Waitville till soils and Blackstone soils developed on deep glaciolacustrine clayey materials.

Duck River Series (DKV)

The Duck River series consists of an imperfectly drained Gleyed Dark Gray Chernozem soils developed on extremely calcareous, sandy to loamy lacustrine and deltaic deposits. Surface textures range from very fine sandy loam to silt loam. The topography of these areas is irregular, gently sloping. Runoff is moderate, and internal drainage is moderately permeable. These soils are usually stone free, but boulders and cobbles occur where the till is close to the surface. Native vegetation is balsam poplar, alder, willow, grasses and herbaceous plants. The Duck River Series is found on the levees along the Overflowing and Santon Rivers. A representative profile is described below.

L-H - 2.5 to 0 cm, black (5YR 2/1 dry) dark reddish brown (5YR 3/2 moist), semi-decomposed organic matter, abrupt smooth boundary.

Ahe - 0 to 7 cm, very dark gray to dark gray (10YR 3/1-4/1 dry) very dark gray (10YR 3/1 moist) loam; pseudo-platy; moist friable; mildly alkaline; extremely calcareous; clear wavy boundary.

Bmgj - 7 to 20 cm, dark gray (10YR 4/1 dry) dark grayish brown (10YR 4/2 moist) loam; pseudo-platy breaking to weak fine granular; moist friable; neutral; moderately calcareous; clear wavy boundary.

Ckgj1 - 20 to 50 cm, pale brown (10YR 6/3 dry) light brownish gray to light gray (10YR 6.5/2 moist) silt loam; pseudo-platy; moist friable; mildly alkaline; extremely calcareous; clear wavy boundary.

Ckg2 - 50 to 75 cm, light brownish gray to light gray (10YR 6/2-7/2 dry); light yellowish brown to very pale brown (10YR 6.5/4 moist) silt loam; pseudo-platy; moist friable; mildly alkaline; extremely calcareous.

Ckg3 - 75 + cm, pale brown (10YR 6/3 dry) light gray (10YR 7/2 moist) silt loam; pseudo-platy; moist friable; moderately alkaline; extremely calcareous.

Dufresne Series (DFS)

The Dufresne series consists of poorly drained Rego Humic Gleysol soils developed on strongly calcareous, deep stratified, clayey, alluvial deposits. These soils occur in low to depressional positions along stream channels and have slow permeability, very slow surface runoff and a high water table during the growing season. Dufresne soils are Minimalroded, non-stony and non-saline. They have med.-high available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes sedge, rush and willow. The majority of these soils are currently used for natural grazing and woodland.

In a representative profile of Dufresne soil the solum is approximately 20 cm thick. The profile is characterized by a thin, dark gray, clay, Ah horizon, 15 to 25 cm thick, with a variable, stratified, strongly calcareous, clay to silty clay mottled Ckg horizon with thin former Ah (buried) horizons in the stratified layers. The parent material is typically stratified clay.

Dufresne soils occur in close association with Seine River soils. They are similar to Seine River soils by having similar textures but differ because of having poorer drainage. Dufresne soils were previously mapped as Riverdale soils in the Winnipeg Map Sheet (Report No. 5, 1953).

Dugas Series (DGS)

The Dugas series consists of imperfectly drained Gleyed Rego Black Chernozem soils developed on a mantle (40 to 70 cm) of moderately to strongly calcareous, shallow, uniform, clayey (SiC, C), lacustrine deposits over moderately to strongly calcareous, deep, stratified, sandy (FS,LFS,S), and loamy (L, SiL, CL), lacustrine, deposits. These soils occur in middle position of very gentle slopes on level landscapes and have very slow over moderately slow permeability, moderate surface runoff, and a high water table during the growing season. Dugas soils are non-eroded, non-stony, and occasionally slightly saline. They have a high available water holding capacity, high organic matter content, and medium natural fertility. Native vegetation includes aspen groves, shrubs, tall prairie and meadow grasses. The majority of these soils are currently cultivated for crop production.

In a representative profile the solum is approximately 15 cm thick. The profile is characterized by a black Ap or Ah horizon, 12 to 15 cm thick, a calcareous, very dark grayish brown AC horizon, 10 to 20 cm thick, a dark grayish brown Ckgj horizon, 15 to 25 cm thick, and a light olive brown II Ckg horizon, with many distinct reddish brown mottles. The Dugas variant, DGS1, has a loam to clay loam surface texture that is 15 to 30 cm thick.

They are similar to Deadhorse soils by having a Gleyed Rego Black Chernozem profile and clayey surface mantle but differ from them in having a loamy substrate rather than a fine loamy to clayey substrate. Dugas soils were previously mapped as Black Meadow associates of the Horndean Association in the Morris Map Sheet (1953).

Dunlop Series (DOP)

The Dunlop series consists of very poorly drained, Rego Gleysol soils developed on well sorted, strongly calcareous lacustrine sediments with textures that range from silt loam to silty clay loam. This soil has a peaty layer, 15 to 30 cm thick. A thin Ah horizon, high in organic matter, is present in some soils. Dunlop soils occur in some of the depressional areas and in narrow strips around some organic soils. The topography is level to very gently sloping. Internal drainage is poor for the greater part of the year because

of a high water table. Permeability of this soil is only fair due to stratification planes and close packing of the sediments. Native vegetation is mainly black spruce and tamarack with some clumps of willow and black alder. Ground cover is dominated by mosses of various kinds. A generalized profile description is given.

Om - 25 to 0 cm, very dark brown (10YR 2/2 moist and dry), organic layer; moderately decomposed in the lower portion; medium acid.

Ah - 0 to 5 cm, very dark gray (10YR 3/1 moist), silt loam to silty clay loam; fine granular; sticky and moderately plastic; neutral to mildly alkaline. Horizon is usually absent.

Ckg1 - 5 to 25 cm, grayish brown (2.5Y 4/2 moist) and light grayish brown (2.5Y 6/2 dry), silt loam to silty clay loam; fine pseudo-crumb structure; very sticky and plastic when wet; hard when dry; strongly gleyed; moderately alkaline; moderately calcareous; iron stained.

Ckg2 - 25 cm +, light brownish gray (2.5Y 6/2 moist) and light gray (2.5Y 7/2 dry), silt loam to silty clay loam; fine pseudo-crumb structure; very sticky and plastic when wet; hard when dry; weakly gleyed; moderately alkaline; strongly calcareous; iron stained.

Dunrea Series (DUR)

The Dunrea series is the well drained, Calcareous Black Chernozem member of the Terence Association, developed on thin (25 to 100 cm) weakly to moderately calcareous, coarse textured lacustrine sediments overlying strongly calcareous, medium to moderately fine textured glacial till. A very thin (less than 5 cm) gravelly lens may occur at the contact. This soil has a loamy fine sand surface texture, gently undulating topography, moderate permeability and slow surface runoff. This soil is moderately well drained, non-saline, and non-stony. The Dunrea series resembles the Deleau series of the Souris Association. The only difference is the Dunrea series is underlain by glacial till.

Durban Series (DRB)

The Durban series consists of well drained Orthic Black Chernozem soils developed on strongly to very strongly calcareous, deep, uniform coarse loamy (LVFS, FSL, VFSL) lacustrine sediments. These soils occur on upper slopes of very gently sloping landscapes and have moderate permeability, low surface runoff and a low water table during the growing season. Durban soils are slightly wind eroded. The native vegetation often comprises mixed woods of poplar and white spruce, with low shrubs and grass ground cover. The majority of these soils are currently used for crop production.

In a representative profile the solum is generally 50 cm thick. The profile is characterized by a thick (35 cm), very dark gray to dark gray A horizon overlying a light brown loam to fine sandy loam textured Bm or Btj horizon. The parent material is typically uniform, very light gray fine sandy loam and strongly calcareous.

Durban soils occur in close association with Banks soils. They are similar to Banks soils by having the same texture, drainage and profile type, but differ because of a less permeable till substrate within 1m of the surface. Durban soils have medium available water holding capacity, medium organic matter levels, and medium natural fertility.

Durnan Series (DRN)

The Durnan series consists of moderately well to well drained Rego Black Chernozem soils developed on strongly to very strongly calcareous, deep, stratified, coarse loamy (VFSL, L, SiL), lacustrine deposits. These soils occur in upper slope and crest positions of gentle slopes on hummocky to undulating landscapes and have moderate to moderately rapid permeability, moderate to rapid surface runoff, and a low water table during the growing season. Durnan soils are occasionally slightly eroded, non-stony, and non-saline. They have medium available water holding capacity, medium organic matter content, and high natural fertility. Native vegetation includes aspen, oak, prairie grasses and shrubs. The majority of these soils are currently cultivated for crop production.

In a representative profile the solum is approximately 10 cm thick. The profile is characterized by a very dark gray Ahk horizon, 10 to 15 cm thick, frequently a Cca horizon, 4 to 7 cm thick and a pale brown, calcareous C horizon.

Durnan soils occur in close association with Fairland, Torcan and Vordas soils. They are similar to Traverse soils by having a well drained profile in coarse loamy deposits but differ from them in having no Bmk horizon. Durnan soils were previously mapped as Blackearth associates of the Holland Association in the Carberry (1957) soil report.

Dutton Series (DTT)

The Dutton series consists of well drained Orthic Black Chernozem soils developed on moderately to strongly calcareous, deep, uniform, fine loamy (SCL, SiL, CL, SiCL), lacustrine sediments. These soils occur on level landscapes and have moderate permeability, slow surface runoff and a low water table during the growing season. The native vegetation often consists of aspen with an understory of low shrubs and grasses. The majority of these soils are currently used for crop and pasture.

In a representative profile the solum is generally about 50 cm thick. The profile is characterized by a thick (38 cm), dark gray, loam to clay loam Ah or Ap horizon overlying a dark brown, clay loam Bm or Btj horizon, and a carbonate-rich, light gray, silty clay loam Cca horizon. The parent material is typically uniform pale brown, clay loam to silty clay loam and moderately calcareous.

Dutton soils occur in close association with Valley soils. They are similar to Valley soils by having the same texture, but differ because of better drainage and the occurrence of a B horizon. The Dutton gravel substrate, (DTT2), soils occur in close association with Dutton soils. They are similar to Dutton soils by having similar surface texture, but differ because of the presence of the gravel substrate. The parent material of the gravel substrate is typically loose and strongly calcareous.

In a representative profile of Dutton gravel substrate soil, the solum is generally 45 cm thick. The profile is characterized by a 35 cm thick, loam to clay loam textured very dark gray A horizon overlying a clay loam brownish coloured B horizon, and clay loam to silty clay loam Ck horizon.

East Bay Series (ETY)

The East Bay series consists of moderately well to well drained Calcareous Black Chernozem soils developed on very coarse to coarse (VCoS, CoS, MS to FS, LCoS, LFS) textured outwash or beach deposits overlying extremely calcareous loamy glacial till or very strongly calcareous, clay till substrate. The surface texture varies from loamy fine sand to sandy loam. The topography is very gently to gently sloping; runoff is moderate, and permeability is rapid in the upper coarser sediments and moderate to slow in the loamy or clay till substrate. The depth of coarser material is variable from 0.5 to 1m. The native vegetation consists of grasses with some bur oak and aspen; many areas are presently cultivated or have had the coarser sediments removed.

The soil is characterized by a very dark gray A horizon 12 to 24 cm thick, and a grayish brown Bm horizon 7 to 15 cm thick. The depth of solum varies with the depth of the sandy layer over the gravelly sediments. A description of the East Bay series is given below.

Ap - 0 to 20 cm, very dark gray (10YR.3/1 dry, 10YR.2/1 moist), fine sandy loam; weak, fine granular, very friable when moist, soft when dry; non-plastic; mildly alkaline; weakly calcareous; clear, wavy boundary.

Bmk - 20 to 36 cm, grayish brown (10YR.5/2 dry, 10YR.4/3 moist); gravelly fine sand; single grained; loose; mildly alkaline; extremely calcareous; abrupt, smooth, boundary.

Ck1 - 36 to 43 cm, pale brown (10YR 6/3 dry & moist), fine sand; single grained; loose; moderately alkaline; very strongly calcareous; abrupt, smooth boundary.

Ck2 - 43 to 53 cm, pale brown (10YR 6/3 dry & moist), gravelly sand; single grained; loose; moderately alkaline; extremely calcareous; abrupt, smooth boundary.

II Ckg - 53 to 100 cm, light brownish gray (2.5Y 6/2 dry, 2.5Y 4/2 moist), clay; moderate, medium blocky; firm when moist, hard when dry; plastic; moderately alkaline; very strongly calcareous.

Easterville Series (Eap) or (ETV)

The Easterville series consists of poorly drained Rego Gleysol, carbonated, peaty phase soils developed on thin (25 to 100 cm) stratified, strongly calcareous sand and gravel deposits over extremely calcareous, loamy till. A thin (15 to 40 cm) layer of mesic peat blankets the surface of these soils. Runoff is very slow to nil. Internal percolation is impeded by a high groundwater table. These soils are moderately stony at the surface. The dominant vegetation on the Easterville soils is black spruce and willows with an understory of Labrador tea, Sphagnum, and feathermosses. Easterville, soils are generally developed on gently undulating to ridged beach and outwash deposits overlying ridged moraine till deposits. These soils occur predominantly along the southern edge of The Pas Moraine, in association with other series developed from similar materials, such as the Tremauden, Horseshoe Island, and Freshford complexes. A description of a representative Easterville, peaty phase soil is as follows:

Om1 - 38 to 33 cm, moderately decomposed coarse fibered woody and herbaceous materials; neutral; clear, wavy boundary.

Om2 - 33 to 18 cm, moderately decomposed herbaceous and woody materials; slightly acid; gradual, wavy boundary.

Om3 - 18 to 0 cm, medium to fine fibered mixed peat; compacted; neutral; abrupt, smooth boundary.

II Ckg - 0 to 46 cm, light brownish gray to pale brown (10YR 6/2 to 6/3 dry), dark gray to gray (10YR 4/1 to 5/1 moist), gravelly loamy sand; single grained; loose when moist, loose when dry; mildly alkaline; extremely calcareous; abrupt, smooth boundary.

III Ckg - 46 to 60 cm, (10YR 5/1 moist), clay loam; amorphous; extremely calcareous; mildly to moderately alkaline.

Ebor Series (EBO)

The Ebor series consists of imperfectly drained, Gleyed Carbonated Rego Black Chernozem soils of the Ebor Association, developed on thin (25 to 100 cm) weakly calcareous, shaley, coarse textured outwash overlying hard gray siliceous (Riding Mountain) shale. This soil commonly has very gently sloping topography, good to imperfect drainage, moderate permeability and

moderate surface runoff. The thin profile usually makes this soil droughty in periods of low precipitation. Ebor soils occur locally adjacent to the Souris Basin northwest of Elgin (Soils of the Boissevain - Melita Area, 1978).

Eddystone Series (EYT)

The Eddystone series is a Rego Humic Gleysol soil developed on poorly drained, sandy (LS, CoS) and gravelly (GrS), moderately to strongly calcareous outwash and beach deposits overlying extremely calcareous loamy till. These soils occur on level to depressional topography in association with Garrioch soils. Surface runoff is very slow. Permeability is rapid in the coarse upper deposits and slow in the till substrate but can be restricted under saturated soil conditions. Natural vegetative cover includes sedges, reeds, meadow grasses and willows. Eddystone soils have very severe limitations due to wetness that restrict their agricultural potential. This soil differs from the similar Sprague soils in having a gravelly surface mantle while Sprague soils have a sandy surface mantle.

The Eddystone soil profile usually has a moderately decomposed organic layer, 5 to 15 cm thick; a very dark gray Ahk horizon, 10 to 15 cm thick, and a carbonated AC horizon of variable thickness depending on the thickness of the gravelly mantle.

Edenburg Series (EBG)

The Edenburg series is an Orthic Black Chernozem soil developed on moderately well drained, moderately to strongly calcareous, shallow (less than 90 cm), fine loamy (CL, SiCL) sediments abruptly grading to sandy (LFS, FS) lacustrine sediments. These soils occur below the escarpment on level to very gently sloping topography in association with Newton Siding soils. Surface runoff is slow. Permeability is moderate in the loamy sediments, and rapid in the sandy subsoil. These soils can have a high water table at approximately one metre depth for short periods in the spring.

The Edenburg soil profile has a very dark gray to black Ap and Ah horizon, 25 to 35 cm thick; a very dark grayish brown Bm horizon, 25 to 35 cm thick, and a 5 to 10 cm thick transition BC horizon grading into a Ck horizon. A Cca horizon often occurs above the contact with the sandy sediments. This soil profile differs from the Eigenhof series in having slightly coarser textures in the subsoil. The Edenburg soils were previously mapped as the Altona (heavy) sandy substrate in the Morris Map Sheet Report No. 5, 1953.

Edkins Series (EDK)

The Edkins series consists of poorly drained Rego Humic Gleysol soils developed on a mantle (40 to 60 cm) of moderately to strongly calcareous, shallow loamy (L, SiL, SiCL), lacustrine deposits over moderately to strongly calcareous, clayey (C, SiC) lacustrine deposits. These soils occur in level to depressional positions of nearly level slopes on level landscapes and have restricted permeability, slow surface runoff, and a high water table during the growing season. Edkins soils are non-eroded, non-stony, and frequently slightly saline. They have a high available water holding capacity, high organic matter content, and low natural fertility. Native vegetation includes sedges, rushes, willows and reeds. The majority of these soils are currently under native vegetation.

In a representative profile the solum is approximately 25 cm thick. The profile is characterized by very dark gray, calcareous Ah horizon, 15 to 30 cm thick, a light gray AC horizon, 8 to 20 cm thick, usually a Cca (lime accumulation) horizon, 5 to 10 cm thick and a calcareous C horizon, with mottles and gypsum crystals.

Edkins soils occur in close association with Denham, Graysville and Rignold soils. They are similar to Blumenfeld soils by having a poorly drained profile and loamy surface mantle but differ from them in having a clayey substrate rather than a fine loamy substrate. Edkins soils were previously mapped as Meadow associates of the Altona, clay sub., Association in the Winnipeg-Morris soil report.

Edwards Series (EWS)

The Edwards series consists of imperfectly drained Gleyed Cumulic Regosol soils developed on weakly to moderately calcareous, moderately fine textured recent alluvial deposits. Surface textures are usually silty clay loam and the soils are stratified with layers ranging from sand to clay in texture. Dark colored organic layers are found throughout the profile. These regosolic soils occur in the Dauphin Lake Plain on nearly level meander flood plain and levee deposits associated with many of the rivers and streams flowing from the Saskatchewan Plain to the west. Runoff is moderate and internal soil permeability is moderately slow. Native vegetation is dominantly hardwood forest composed of elm, ash, Manitoba maple, willow and associated low shrubs and herbs. Most Edwards soils are cultivated except for narrow bands of native vegetation adjacent to the river channels. Minor inclusions of poorly drained Paulson soils and lighter textured Turtle River soils may occur in Edwards series mapping units.

Soil profile development on these alluvial sediments is restricted to a thin, weakly expressed Ah horizon that grades sharply into the stratified parent material. The A horizon has fine granular structure, dark grayish brown color, neutral reaction and may be weakly calcareous. The C horizon is moderately calcareous, mottled with weak iron staining and banded with dark colored layers representing former surfaces which have been covered by depositions of fresh alluvium. A representative profile of this series is described below.

> **Ap** - 0 to 15 cm, dark gray to gray (10YR 4.5/1dry, 10YR 3/2 moist) silty clay loam; moderate fine granular; friable when moist, hard when dry; mildly alkaline; weakly calcareous; abrupt, smooth boundary.

Ckgj1 - 15 to 30 cm, grayish brown (10YR 5/2 dry, 10YR 4/2 moist) silty clay; moderate fine granular; friable when moist, hard when dry; mildly alkaline; moderately calcareous; gradual, smooth boundary.

Ccagj - 30 to 60 cm, dark grayish brown (10YR 4/2 moist) silty clay loam; weak, fine granular; friable when moist, hard when dry; mildly alkaline; strongly calcareous; clear, smooth boundary.

Ckgj2 - 60 to 100 cm, very dark gray to black (10YR 2.5/1 moist) silty clay loam; moderate, medium granular; friable when moist, hard when dry; mildly alkaline; moderately calcareous.

Egg Island Series (EGG)

The Egg Island series consists of well drained Orthic Gray Luvisol, shallow lithic phase soils developed on thin, moderately to strongly calcareous, clayey lacustrine deposits underlain by extremely calcareous, loamy till. Limestone bedrock usually occurs within 50 to 100 cm of the surface. Topography of these areas varies from level to gently sloping. Generally these soils have a number of stones at the surface but not enough to be rated as very stony. Permeability is slow due largely to the clay surface texture of these soils. Runoff ranges from moderate to slow. Dominant vegetation includes aspen, spruce and jack pine.

The Egg Island soils have a dark grayish brown Ae horizon and a moderately developed Bt horizon. It is usually mapped in association with the Kinwow series, which is similar except for the lack of a lithic contact within the control section.

Egg Lake Series (EGK)

The Egg Lake series consists of well drained Orthic Gray Luvisol soils developed on moderately to very strongly calcareous sandy loam to loam textured till. The soil materials are usually skeletal due to large amounts of channery and flaggy limestone and dolostone fragments. Topography of these areas varies from very gently to gently undulating. Permeability of these soils is very good and runoff is limited. Dominant vegetation is black and white spruce, trembling aspen and jack pine with an understory of rose and alder. Grasses, herbs and mosses form the ground cover.

The Egg Lake soils have a thin Ae overlying a weakly developed Bt. These soils are generally shallow with unaltered parent material at approximately 40 cm depth. Organic surface horizons (L-F-H) are thin and generally moderately decomposed. The Egg Lake soils occupy small areas and are usually associated with Simonhouse, Leak Lake and Goose River soils.

Egilson Series (EGS)

The Egilson series consist of moderately well drained, Orthic Black Chernozem soils developed on moderately calcareous, fine textured lacustrine sediments underlain with calcareous till at depths generally exceeding 75 cm. No area with calcareous till less than 75 cm from the surface was sufficiently large to map out on the scale used. Surface textures are dominantly clay. An area in Township 36, Range 29W is mapped as Egilson clay. The terrain, which is smooth very gently sloping, has sufficient slope for adequate runoff in wet periods. A few depressional locations within the area are flooded for short periods of time. Permeability is medium to moderately slow. Native vegetation is mainly aspen with associated prairie grasses and herbs. Cobbles and boulders are scattered over the area in small numbers.

The soils have solum ranging from 25 to 38 cm thick, the Ah horizon being by far the most prominent. The Bm horizon, which seldom exceeds 10 cm in thickness, is identified by its brownish coloration. Leaching of carbonates from the Bm horizon is incomplete in many profiles. The presence of till has had no appreciable effect on the solum development, except where it occurs within 30 cm of the surface. Here the solum is thinner than in the modal type. A profile description of a representative virgin soil follows:

L-H - 3 to 0 cm, very dark brown (10YR 2/2, dry), leaf and sod mat; neutral.

Ah - 0 to 23 cm, very dark gray (10YR 3/1, dry), clay; fine granular; hard when dry, plastic and sticky when wet; neutral and tongued.

Bm - 23 to 30 cm, dark grayish brown (10YR 4/2, dry), clay; fine granular; hard when dry; mildly alkaline; tongued.

Ck1 - 30 to 51 cm, light brownish gray (10YR 6/2, dry), silty clay; fine pseudo-granular; weakly cemented when dry; moderately calcareous; moderately alkaline.

Ck2 - 51 cm +, very pale brown (10YR 6/2, dry), silty clay; fine pseudo-granular; weakly cemented when dry; moderately calcareous; iron stained; moderately alkaline.

Eigenhof Series (EGF)

The Eigenhof series consists of moderately well to well drained Orthic Black Chernozem soils developed on moderately to strongly calcareous, deep, stratified, fine loamy (CL, SiCL, CL), lacustrine deposits. These soils occur in upper positions of nearly level to very gently slopes on undulating landscapes and have moderate to moderately slow permeability, moderate surface runoff, and a low water table during the growing season. Eigenhof soils are non-eroded, non-stony and non-saline. They have a medium available

water holding capacity, medium organic matter content, and high natural fertility. Native vegetation includes aspen-oak groves, shrubs and prairie grasses. The majority of these soils are currently cultivated for crop production.

In a representative profile the solum is approximately 40 cm thick. The profile is characterized by a very dark gray to black Ah horizon, 15 to 25 cm thick, a grayish brown Bm horizon, 15 to 20 cm thick, a weakly calcareous, transitional BC horizon 5 to 15 cm thick, and a moderately calcareous C horizon, with stratified SiL and SiCL textures. A typical profile also contains thin layers of fine sand to silt below the solum.

Eigenhof soils occur in close association with Neuhorst soils. They are similar to Denham soils by having an Orthic Black profile but differ from them in having no clayey substrate diagnostic of Denham soils. Eigenhof soils were previously mapped as well drained, Blackearth associates of the Altona, heavy, Association in the Winnipeg-Morris soil report (1953).

Elias Series (EIS)

These are poorly or imperfectly drained Gleyed Cumulic Regosol soils formed on moderately calcareous (6 to 15 % $CaCO_3$), dominantly fine textured, and recently deposited shaly alluvium. They occur on level terrain adjacent to stream channels that issue from the Manitoba Escarpment. Flakes of dark gray shale are common in these stratified sediments that vary from sandy to clayey material. These changes in texture are abrupt. Runoff is slow and permeability is also slow. These soils are affected by high groundwater levels for a significant period in the spring.

The Elias soils have little or no horizon development but in cultivated fields may have a slightly darkened Ap horizons that overlie dark grayish brown (10YR 4/2) to light brownish gray (10YR 6/2) iron stained material. Organic matter content usually decreases irregularly with depth. Erratic changes in organic matter content are associated with buried former Ah horizons. These soils lack the Ah horizon development that characterizes the Blumengart soils found on the same parent material.

Elm Creek Series (EEK)

The Elm Creek series consists of imperfectly drained Gleyed Black Chernozem soil developed on a mantle (50 to 80 cm) of weakly to moderately calcareous, shallow sandy to coarse loamy (FS, LFS, VFS, LVFS, FSL), lacustrine deposits over moderately calcareous, deep uniform, clayey (SiC, C), lacustrine deposits. These soils occur in middle positions of very gentle slopes on level to undulating landscapes and have rapid permeability in the sandy deposit and restricted permeability in the clayey sediments, slow surface runoff, and a high water table during the growing season. Elm Creek soils are non-eroded, non-stony, and occasionally slightly saline. They have a medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation includes prairie grasses, aspen-oak groves, and meadow grasses. The majority of these soils are currently cultivated for crop production.

Elm Creek soils occur in close association with Hibsin, Rosebank and Layland soils. They are similar to Rosebank soils by having an imperfectly drained profile in coarse loamy over clayey deposits but differ from them in having a Bm horizon. Elm Creek soils were previously mapped as associates of the Almasippi clay substrate Association in the Carberry (1957) soil report.

In a representative profile soil the solum is approximately 45 cm thick. The profile is characterized by a very dark gray to dark gray Ah horizon, 18 to 25 cm thick, a grayish brown to dark grayish brown Bmgj horizon, 25 to 40 cm thick with many distinct mottles, frequently a Cca horizon, 10 to 15 cm thick, and a brownish gray to gray IICkg horizon, with distinct yellowish brown mottles.

Elm River Series (EMV)

The Elm River series consists of moderately well drained Cumulic Regosol soils developed on moderately calcareous, stratified, loamy (VFSL, L, SiL, SCL, CL, SiCL), recent fluvial deposits. Prior to settlement and drainage control annual flooding caused sediment deposition on the Elm River soils. These soils occur in middle positions of very gentle to gentle slopes on ridges or meander skrolls, and have moderate permeability, moderate surface runoff, and a high water table during the growing season. Elm River soils are non-eroded, non-stony, and frequently slightly saline. They have a medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation includes elm, ash, Manitoba maple and shrubs. The majority of these soils are currently cultivated for crop production.

In a representative profile there is no solum development. The profile is characterized by a brownish gray Ap horizon, 5 to 15 cm thick, and a slightly lighter colored Ck horizon. A typical profile also contains many buried Ah horizons and is mottled. Elm River soils occur in close association with Gervais, Poplar Point and Willowbend soils. They are similar to La Salle soils by having well drained profile in recent alluvium but differ from them in having a lighter coloured surface horizon. Elm River soils were previously mapped as associates of the Assiniboine Complex in the Carberry (1957) soil report.

The Elm River series, sandy variant, (EMV1), occurs in close association with normal Elm River soils and differs from the normal soils by having sandy (FS, LFS, S) textures predominate the soil profiles.

Elma Series (ELM)

The Elma Series consists of imperfectly drained Gleyed Dark Gray Luvisol soils developed on moderately calcareous, stratified, medium to moderately fine textured alluvial sediments, which frequently may have a lacustrine clay substrate within 75 cm of the

surface (clay variant). The surface textures range from loamy fine sand to loam and the underlying stratified material usually has layers of very fine sand to silty clay. These soils occur principally on imperfectly drained sites along the Sprague and Whitemouth Rivers and along Harrison's Creek in association with coarser textured Hadashville soils. The following is a description of a representative profile of the Elma loam, clay substrate phase:

Ah - 0 to 8 cm, black to very dark gray (10YR 2/1 to 3/1), fine sandy loam; moderate fine granular structure; friable when moist, soft when dry; neutral; possesses an abrupt, smooth, lower boundary.

Aegj - 8 to 18 cm, light gray to gray (10YR 6/1 to 5/1, dry), loamy fine sand; loose; very friable; neutral; a few small iron mottles stain the sand; clear, wavy, lower boundary.

Btgj - 18 to 33 cm, dark brown (10YR 3/3, dry), fine sandy clay loam; moderate, medium to coarse granular; firm when moist, hard when dry; slightly acid; a few small blotches of iron stains; clear, wavy, lower boundary.

BCgj - 33 to 71 cm, pale brown (10YR 6/3, dry), loamy fine sand; weak fine to medium granular; friable when moist; mildly alkaline; numerous, yellowish brown (10YR 5/6 to 5/8) iron mottles; clear wavy lower boundary.

Cgj - 71 to 81 cm, grayish brown (10YR 5/2, dry), clay loam and light gray (10YR 7/2) fine sand; stratified alluvial sediments; moderate, medium granular to loose; firm to very friable when moist, weakly cemented when dry; mildly alkaline; moderately calcareous; numerous flecks of iron stains; abrupt, smooth, lower boundary.

II Cgj - 81 cm +, dark grayish brown (2.5Y 4/2, dry); clay; massive to moderate coarse granular; very firm when moist; very hard when dry; light gray (10YR 7/2), calcium carbonate concretions; moderately alkaline.

Elva Series (ELV)

The Elva series consists of well drained, Orthic Black soils of the Elva Association, developed on deep, strongly calcareous, moderately fine textured (SCL, CL, SiCL), lacustrine sediments. This soil has a clay loam surface, nearly level to gently undulating topography, slow to moderate permeability, and moderate surface runoff. Elva soils are moderately well drained, non-saline, non-stony, generally cultivated and have an estimated depth to water table of 2 to 3 m during the growing season. These are highly productive soils. They occur generally in the Souris Basin in the vicinity of Elva and Hartney and have a limited occurrence in the Whitewater Basin area. This soil is associated with the imperfectly drained Goodlands, Cranmer, Minto and Ninga series; and the poorly drained Naples, Bunclody and Fairfax series (Soils of the Boissevain - Melita Area, 1978).

Emblem Series (EBL)

The Emblem series consists of poorly drained carbonated Rego Humic Gleysols of the Cameron Association developed on deep, strongly calcareous, loamy lacustrine sediments. These soils usually have depressional to level topography, loam surface textures; moderate permeability and very slow surface runoff. These soils are poorly drained due to a combination of depressional topography and high groundwater levels. The estimated depth to water table is less than 1.5 m during the growing season. These soils occur in drainage channels and depressions and are frequently flooded by ponded or flowing water. Emblem soils support hydrophytic vegetation, are non-stony and rarely cultivated.

Eramosh Series (EMH)

The Eramosh series consists of imperfectly drained, Gleyed Black Chernozem soils of the Carniege Association, developed on thin (25 to 97 cm), weakly to moderately calcareous, coarse textured (FS, LCoS, LS, LFS), lacustrine mantle overlying strongly calcareous, medium to moderately fine textured glacial till. A coarse textured gravelly layer (5 to 76 cm) occurs at the contact. Eramosh soils have a loamy fine sand surface texture, gently undulating topography, moderately rapid permeability, and low surface runoff. The thickness of the coarse gravelly layer and the proximity of the underlying till to the surface tend to restrict downward percolation resulting in lateral water flow through this soil. This results in imperfectly drained, iron stained profiles.

This soil is associated with the well drained Pendennis series and the poorly drained Carniege series. The Eramosh series resembles the Methvin series of the Chaucer Association. The only difference is that the Methvin is not underlain by glacial till (Soils of the Boissevain - Melita Area, 1978).

Erickson Series (ECK)

The Erickson series is characterized by an Orthic Dark Gray Chernozem solum on moderately to strongly calcareous, loamy (L, CL) morainal till of limestone, granitic and shale origin. These soils are moderately well to rapidly drained and occur in mid to crest positions of undulating to hummocky landscapes at somewhat higher elevations than those of the Newdale soils. Surface runoff is moderate to rapid; permeability is moderately low. Most of these soils are presently cultivated; native vegetation consists dominantly of aspen.

The solum has a loamy dark gray Ap horizon, 14 to 20 cm thick, a variable Ahe horizon, a dark yellowish brown clay loam to light clay Bt or Btj horizon, 20 to 30 cm thick, and a transitional BC horizon approximately 20 cm thick. A pale brown lime accumulation layer, 15 to 20 cm thick is usually present; some lime accumulation may occur along cracks in the Ck horizon.

In the Russell study area, the average A horizon thickness is 24 cm and varies from 15 to 35 cm. The average solum depth is 65 cm and varies from 35 to 100 cm. Minor amounts of imperfectly drained Petlura series (Gleyed Dark Gray Chernozem) are included in the Erickson mapping units.

Eroded Slope Complex (ERX) or ($ER)

This soil complex includes all the land occupied by the eroded slopes of river valleys and walls, incised stream channels and ravines that have down-cut through the surface deposits and shale bedrock. These are generally well drained, strongly to steeply sloping landforms that have variable soil development on materials that are variable in composition, depending on the nature of the surrounding deposits. Due to its complexity, this is a miscellaneous land type rather than a unit of normal soil. These areas are typically influenced by mass wasting processes such as slump, creep, solifluction and erosion.

The soils range from Orthic Black Chernozems to Regosols. The slopes are characterized by numerous major seepage zones where the water table intersects the slope walls or scarps, generally in the mid to lower slopes. The maintenance of vegetation on the Eroded Slopes is essential for their stability.

Ethelbert Series (ETT)

The Ethelbert series consists of well drained Orthic Black Chernozem soils developed on strongly calcareous, shallow, sandy to coarse loamy lacustrine sediments overlying very strongly calcareous loamy till within one meter of the surface. These soils occur on level landscapes of lacustrine veneer deposits and have rapid surface permeability and low subsoil permeability, slow surface runoff and a low water table during the growing season. Ethelbert soils may be slightly eroded, and moderately stony. The native vegetation often consists of aspen associated with tall shrubs and a mixed grass ground cover. The majority of these soils are currently used for crop production.

In a representative profile the solum is generally 44 cm thick. The profile is characterized by a thin, very dark gray, loamy fine sand A horizon overlying a fine sand to loamy fine sand brown coloured Bm horizon, and a pale brown fine sand Ck horizon. The parent material of the till substrate is typically compact loam textured and very strongly calcareous. Ethelbert soils occur in close association with Sevick soils. They are similar to Sevick soils by having the same texture and till substrate, but differ from them because of better drainage and lower water table. Ethelbert soils have low available water holding capacity, medium organic matter levels, and medium natural fertility. Ethelbert soils correlate with Gilbert till substrate phase soils previously published in the Swan River soil report (Soil Report No. 13).

Everton Series (EVO)

The Everton series consists of moderately well to well drained Orthic Black Chernozem soils developed on a thin mantle (25 to 75 cm) of silty clay to clay sediments over a thin strata (10 to 40 cm) of very strongly calcareous loamy glacial till of shale, limestone and granitic origin over a strongly calcareous till of shale, limestone and granitic origin. The soils occur on gently sloping topography. Runoff is moderate and permeability is moderately slow to slow.

The soil is characterized by a granular, very dark gray to black Ah horizon, 10 to 15 cm thick, a dark grayish brown to brown, fine subangular blocky Bm horizon 8 to 14 cm thick, and a pale brown BCk horizon. In areas where the clay overlay is not too deep, the solum extends to the contact of the clay and the very strongly calcareous glacial till which appears as a prominent Cca horizon.

Ewart Series (EWT)

The Ewart series consists of poorly drained, carbonated Rego Humic Gleysol soils of the Ryerson Association, developed on deep, strongly calcareous, medium to moderately fine textured glacial till, composed of material derived from shale, limestone, and granitic rock. This soil is usually developed in a considerable thickness of sediments which have been washed into the bottom of depressions. The surface texture, although variable is dominantly clay loam; the topography is depressional to nearly level; permeability is slow and surface runoff if any, is very slow. These soils are poorly drained with a very high water table which occurs at or near the surface most of the year. Surface vegetation usually consists of water hemlock (Cicuta spp.), Mint (Mentha arvensis), slough grass (Beckmannia syzigachne), cattails and reeds. This soil is occasionally moderately to strongly saline, depending on location, non-stony and is rarely cultivated.

Ewart soils are characterized by black, Ah horizons 10 to 20 cm thick, light gray Cca horizons 20 to 28 cm thick and gray brown iron mottled Ck horizons. These soils are commonly, weakly stratified.

Fairburn Series (FBU)

The Fairburn series consists of well drained, Rego Black Chernozem soils of the Menteith Association, developed on thin (25 to 100 cm) moderately calcareous, coarse to moderately coarse textured (VFS, LVFS, SL, FSL), lacustrine sediments overlying strongly calcareous, medium to moderately fine textured, glacial till.

A very thin (less than 5 cm) gravelly stratum may occur at the contact. Fairburn soils have loamy very fine sandy surface textures, nearly level topography, moderate permeability and moderate surface runoff. Drainage is good and the estimated depth to water table is 3 metres. These soils are non-stony, non-saline, usually cultivated, somewhat droughty and moderately susceptible to erosion. Fairburn soils are commonly found in close association with Nesbitt soils (Soils of the Boissevain - Melita Area, 1978).

Fairfax Series (FFX)

The Fairfax series consists of poorly drained, Carbonated Rego Humic Gleysols of the Elva Association; developed on deep, strongly calcareous, moderately fine textured (SCL, CL, SiCL), lacustrine sediments. These soils have a clay loam surface texture, nearly level to depressional topography, slow permeability, and very slow surface runoff. These soils are poorly drained with the water table at or near the surface most of the year. Surface ponding and flooding are very common. These soils are not cultivated and generally support a lush growth of hydrophytic vegetation such as cattails, reeds, and slough grass; some willows may also occur (Soils of the Boissevain - Melita Area, 1978).

Fairford Series (FFD)

The Fairford series consists of well drained Eluviated Eutric Brunisol soils, developed on extremely calcareous glacial till. Surface texture varies from loam to clay loam. These soils occupy much of the well drained land in the Interlake Till Plain. They occur commonly with Garson soils. The topography is very gently sloping to gently sloping. The native vegetation is aspen, jack pine, and white spruce. The Fairford soils are very stony.

A representative profile is described below: The solum of Fairford soil is generally less than 20 cm, characterized by less than 25 cm broken light-colored Ae horizon or a several cm thick Aej horizon overlying a thin, weakly developed textural B horizon. The Aej horizon is slightly acid or neutral, and the B horizon is neutral.

Fairhall Series (FHL)

The Fairhall series consists of imperfectly drained, Gleyed Regosols of the Cameron Association developed on deep, strongly calcareous, medium textured (VFSL, L, SiL), lacustrine sediments. This soil has a loam surface texture, moderate permeability and moderate surface runoff. The topography is nearly level to gently undulating with Fairhall soils occurring in lower and mid slope positions. These soils are imperfectly drained, non-saline, cultivated and moderately to strongly susceptible to erosion. These eroded soils lack sufficient fertility to produce good crops. Fairhall soils are found in close association with the well drained Argue and Schaffner soils, and the imperfectly Underhill series. The estimated depth to water table during the growing season is 2 metres (Soils of the Boissevain - Melita Area, 1978).

Fairland Series (FND)

The Fairland series consists of moderately well to well drained Orthic Black Chernozem soils developed on strongly to very strongly calcareous, deep, stratified, loamy (VFSL, L, SiL), lacustrine deposits. These soils occur in upper positions of gentle slopes on rolling landscapes and have moderate permeability, moderate surface runoff, and a low water table during the growing season. Fairland soils are often slightly eroded, non-stony, and non-saline. They have a medium available water holding capacity, medium organic matter content, and high natural fertility. Native vegetation includes aspen, oak, shrubs and prairie grasses. The majority of these soils are currently cultivated for crop production.

In a representative profile the solum is approximately 25 cm thick. The profile is characterized by a very dark gray to very dark grayish brown Ap horizon, 10 to 15 cm thick, a brown to dark brown Bm horizon, 10 to 15 cm thick a pale brown BC horizon, 5 to 10 cm thick with carbonates and a light gray Cca horizon, 5 to 10 cm thick with lime accumulation. The parent material is typically very pale brown and calcareous.

The Fairalnd, fine loamy (CL, SiCL) variant, FND1, has a clay loam to silty clay loam layer within a depth of 1 m. Fairland soils occur in close association with Traverse, Taggart and Vordas soils. They are similar to Durnan soils by having well developed profile in loamy deposits but differ from them in having a strongly developed Bm horizon. Fairland soils were previously mapped as Blackearth associates of the Holland Association in the Carberry (1957) soil report.

Faulkner Series (FKR)

The Faulkner series consists of imperfectly drained Gleyed Dark Gray Chernozem soils developed on thin (20 to 100 cm), extremely calcareous, loamy till deposits over limestone bedrock. Due to the thin veneer of till they are developed on, these soils are considered Gleyed Dark Gray Chernozems, shallow and very shallow lithic phases. The surface of these soils is generally very stony to exceedingly stony. Faulkner soils are associated with areas of nearly level to gently sloping topography. Runoff is slow and permeability moderately slow to slow. Native vegetation on these soils is dominantly aspen with some white spruce and balsam poplar.

Faulkner soils are characterized by a thin, dark gray Ahe horizon overlying a thin, weakly developed Bt horizon that grades sharply into extremely calcareous till. The solum is generally less than 20 cm thick, and surface horizons are neutral to alkaline in reaction.

The Faulkner soils correlate with the Inwood series, rock substrate phase, as mapped in the Soils of the Grahamdale Area (Soil Report R13 or Soil Report 16). The Faulkner series of the High Boreal-temperate climatic zone also correlates with the Birch Bay series of the Low Boreal zone.

Favel Series (FVL)

The Favel series consists of Gleyed Black Solonetz soils developed on thin, moderately to strongly calcareous, moderately fine to fine textured sediments overlying weakly to moderately calcareous, shaly clay till. A water-worked gravelly and cobbly lens of variable thickness (25 to 90 cm) may occur between the two materials. Although surface textures of the Favel soils vary from clay to clay loam, clay is dominant. These soils occur in the southwest portion of the Dauphin Lake Plain as part of a narrow belt immediately below the Manitoba Escarpment. The surface lacustrine and till deposits are very thin in this area and the underlyinng shale bedrock or shaly clay till is exposed or occurs within one meter of the surface. The Favel soils are found in level to very gently sloping, imperfectly drained areas. Runoff is moderate and internal soil permeability is slow. Lateral seepage is moderate in those soils where continuous, water-worked, gravelly layers lie above the less permeable, shaly till or shale bedrock. Native vegetation consists of open stands of aspen with an understory of shrubs (snowberry) and grasses (red top and bluegrass). Wild barley, gumweed and alkali grass are present in lesser amounts. Cobbles and boulders are widespread and would be a serious hindrance to cultivation in portions of the area.

The Favel series show moderate development of features characteristic of Solonetz soils. The solum ranges from 25 to 55 cm in thickness, the most striking feature being the well developed columnar structure of the Bnt horizon. The B horizon varies from 30 to 45 cm in thickness and is capped by a thin, light coloured, weakly platy Ae horizon. A very thin, black Ah horizon occurs at the soil surface. The columnar aggregates of the B horizon grade into massive silty clay, high in gypsum. The soils are acid in the surface horizons but percent base saturation is above 50 percent. The subsoil is alkaline and moderately calcareous. A representative description of a Favel soil is given below:

Ah - 0 to 4 cm, black (10YR 2/1 moist) loam; moderate, coarse granular, very friable when moist, slightly hard when dry; medium acid in reaction; abrupt, smooth boundary.

Ae - 4 to 8 cm, light brownish gray to grayish brown (10YR 6/2 to 5/2 dry) loam; strong medium platy, very friable when moist, slightly acid in reaction; abrupt, smooth boundary.

Bntj - 8 to 18 cm, dark gray (10YR 4/1 dry) loam; strong coarse columnar breaking to moderate, medium subangular blocky; very firm when moist, slightly acid in reaction; gradual, wavy boundary.

Bntgj - 18 to 40 cm, black (10YR 2/1 dry) clay; strong, coarse columnar, very firm when moist, extremely hard when dry; mildly alkaline in reaction; gradual, wavy boundary.

Bnjtgj - 40 to 55 cm, very dark brown (10YR 2/2 moist) clay, massive breaking to weak coarse columnar; firm when moist, extremely hard when dry; moderately alkaline; gradual, wavy boundary.

Cskg - 55 to 75 cm, very dark brown (10YR 2/2 moist) silty clay with concentrations of light gray (l0YR 6/1 moist) calcite and gypsum; massive; firm when moist, very hard when dry; moderately alkaline in reaction; moderately calcareous; gradual, wavy boundary.

Ckg - 75 to 100 cm, brown to yellowish brown (10YR 4/3 to 5/4 moist); silty clay; massive; firm when moist, very hard when dry; moderately alkaline in reaction, moderately calcareous.

Fay Lake Series (FYK)

The Fay Lake series consists of well drained Eluviated Dystric Brunisol soils developed on a mantle of very strongly to strongly acid; coarse loamy, morainal till deposits. These soils occur in mid slope positions of strong to steep slopes on hummocky landscapes and have moderately high permeability and moderately slow surface runoff and a low water table during the growing season. Fay Lake soils are susceptible to erosion, moderately stony and non saline. They have low available water holding capacity, medium organic matter content, and low natural fertility. Native vegetation often includes white spruce, aspen, and alder with minor occurrences of birch and black spruce. The majority of these soils remain under natural conditions.

In a representative profile the solum is approximately 60 cm thick. The profile is characterized by a very dark brown LH horizon, 2 to 3 cm thick, a gray structureless Ae horizon, 10 to 38 cm thick with many roots and coarse mineral fragments, a yellowish brown moderately porous Bm horizon, 30 to 45 cm thick and a light brownish gray C horizon. The parent material is typically loamy sand to gravelly sandy loam. A typical profile also contains coarse fragments throughout the profile.

Fay Lake soils occur in close association with Wolverton soils. They are similar to Wolverton soils by having similar texture, drainage and parent material but differ from them in that depth of parent material to bedrock exceeds 1 metre. Fay Lake soils were previously mapped in the Cormorant Lake soil report.

Fenton Series (FET)

The Fenton series consists of poorly drained, carbonated Rego Humic Gleysol soils developed on a thin mantle (25 to 75 cm) of silty clay to clay sediments over a thin strata (10 to 40 cm) of very strongly calcareous loamy glacial till of limestone and granitic origin over a strongly calcareous loam to clay loam glacial till of shale, limestone and granitic origin. These soils occur in level to

depressional topography and are subject to ponding and prolonged wetness. Runoff is very slow; permeability is slow to very slow. Some salts may occur in the soil in areas of seepage or upward movement of groundwater containing appreciable soluble salts toward the surface.

The soil is characterized by a thin, moderately decomposed organic layer 2 to 5 cm thick, a very dark gray Ah horizon, 8 to 12 cm thick, a thin olive gray AC horizon, and olive C horizon that may have some yellowish brown mottles. Silt sized, pseudomycelium of magnesium sulfate or gypsum may be present in the surface horizon of saline areas.

Ferris Series (FRS)

The Ferris series consists of imperfectly drained Gleyed Rego Black Chernozem soils developed on moderately to strongly calcareous deep, uniform, fine loamy and fine silty, slightly stony mixed till deposits. These soils occur in lower positions of very gentle slopes on undulating landscape and have moderately slow permeability slow surface runoff and a medium water table during the growing season. Ferris soils are non-eroded, non-stony and slightly saline. They have high available water holding capacity, high organic matter content, and high natural fertility.

In a representative profile the solum is approximately 30 cm thick. The profile has a black, carbonated Ap horizon, 25 to 35 cm thick, a dark gray, transitional AC horizon, 15 to 30 cm thick with iron mottles, and a light gray to pale yellow Cca horizon 10 to 15 cm thick with lime accumulation. The parent material is light yellowish brown mixed till with iron mottles.

Ferris soils occur in close association with Nikkel soils. They are similar to Joyale soils by having a Gleyed Rego Black Chernozem profile and mixed till at depth but differ because of a fine loamy lacustrine veneer (30 to 90 cm thick) overlying the mixed till. Ferris soils were previously mapped as imperfectly drained blackearth associates of the Pembina association in the reconnaissance soil survey of South-Central Manitoba (1943).

Fifere Series (FFR)

The Fifere series consists of well drained Orthic Dark Gray Chernozem soils developed on weakly calcareous to neutral, shallow uniform, fine loamy and fine silty (SiL, L, CL) till derived from shale bedrock. These soils occur in upper positions of gentle to moderate slopes on hummocky and ridged landscapes and have moderate permeability moderate to rapid surface runoff and a low water table during the growing season. Fifere soils are moderately eroded. They have low available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes oak aspen-popular and shrubs. The majority of these soils are currently used for crop production.

In a representative profile the solum is approximately 70 cm thick. The profile is characterized by a gray brown Ap or Ah horizon, 15 to 18 cm thick, a light brownish gray Bt horizon, 25 to 35 cm thick and a light grayish brown transitional BC horizon, 10 to 30 cm thick. The parent material is typically light grayish brown non-calcareous shale till. A typical profile also contains numerous shale fragments of various sizes throughout.

Fifere soils occur in close association with Manitou, Nayler and Fresno soils. They are similar to Nayler soils by having a profile developed in well drained, non-calcareous shale till but differ from Nayler soils because of the absence of an Ae horizon greater than 5 cm in thickness. Fifere soils were previously mapped as associates of the Manitou association in the reconnaissance soil survey of South-Central Manitoba (1943).

File Lake Complex (FLL)

The File Lake complex consists of poorly to very poorly drained Terric Mesisol and Terric Fibrisol soils developed on shallow (40 to 160 cm), stratified, woody, mesic and fibric forest peat or thin (0 to 60 cm) fibric sphagnum peat overlying mesic forest peat. The organic materials are underlain by non calcareous loamy to sandy till, which often contains significant amounts of coarse fragments especially at the contact with the organic materials. These soils occur on gently sloping to level and depressional terrain. The water table is high during the growing season and runoff is very slow. Native vegetation varies with depth of peat, depth to groundwater and distance to the mineral upland. Black spruce and tamarack growth is generally stunted. Alder growth may be thick in the peatland margins. Groundcover vegetation is variable and consists mostly of sphagnum mosses and ericaceous shrubs on raised peatlands; feather and patchy sphagnum mosses, herbs and sedges occur in the nutritionally more enriched peatlands.

The File Lake complex includes Terric Fibric Mesisol, Terric Mesic Fibrisol, Terric Mesisol and Terric Mesisol, sphagnic phase soils of which the Terric Fibric Mesisol is the most common. The Terric Fibric Mesisol is characterized by a very strongly acidic, yellowish red fibric sphagnum peat, with an Of horizon 15 to 30 cm thick; a strongly acidic, dark reddish brown, mesic peat comprised of mixed moss, leaves and needles Om horizon, 40 to 60 cm thick, with slightly hard, woody fragments; a slightly acidic, black, humic Oh horizon, 10 to 15 cm thick; and a slightly acidic, sandy loam, II Ckg horizon with cobbles.

Of - 0 to 40 cm, yellowish red (5YR 4/6 moist) and pink (7.5YR 7/4 dry), non to slightly decomposed sphagnum moss (35 %) and soft, woody fragments (15%); extremely acid; abrupt, wavy boundary.

Oh - 40 to 50 cm, black (5YR 2/1 moist) and dark reddish brown (5YR 2/2 dry) highly decomposed, amorphous peat; slightly sticky and very friable; moderately acid; clear, wavy boundary.

II Ahg - 50 to 75 cm, black (10YR 2/1moist and dark gray (10YR 4/1 dry) skeletal silt loam; massive structure; sticky, friable, slightly plastic consistence; 40 % angular cobbly coarse fragments; moderately acid; clear, wavy boundary.

II Cg - 75 to 100 cm, dark gray (5Y 4/1 moist) and light gray (5Y 7/2 dry), silt loam; mottles; massive structure; slightly sticky; friable; slightly plastic; strongly acid.

Findlay Series (FDY)

The Findlay series are well drained Orthic Regosols of the Lyleton Association, developed on deep, moderately calcareous, coarse to moderately coarse textured (FS, LCoS, LFS to VFS, LVFS, FSL), lacustrine sediments. These eroded soils have loamy very fine sand surface textures, moderate permeability and low surface runoff. The topography ranges from gently sloping to gently rolling with Findlay soils occupying the higher elevations. The profile drainage is good and the estimated depth to water table is < 3 metres. These soils are non-saline, non-stony, and extremely susceptible to erosion in the cultivated state. Productivity is low because of loss of organic matter and low water holding capacity. In some instances plowing has turned the C horizon onto the surface leaving a darker Ap band below the surface. The Findlay soil is associated with the well drained Lyleton, Moan and Kemnay soils and the imperfectly drained Denbow, Switzer and Plum Creek soils (Soils of the Boissevain - Melita Area, 1978). Analytical data and a site description are presented below.

Apk - 0 to 15 cm, dark brown (10YR 3.5/3 moist), grayish brown to light brownish gray (10YR 5/2 dry) loamy very fine sand, single grained; very friable when moist; abrupt, smooth boundary; moderately calcareous; pH 7.8.

Ck1 - 15 to 50 cm, pale brown to light yellowish brown (10YR 6/3.5 moist), light gray (10YR 7/2 dry) very fine sand; single grained; very friable when moist; moderately calcareous; pH 7.7.

Ck2 - 50 cm + , pale brown to light yellowish brown (10YR 6/3.5 moist), light gray (10YR 7/2 dry) very fine sand; single grained; very friable when moist; moderately calcareous; pH 7.9.

Firdale Series (FIR)

The Firdale series consists of moderately well to well drained Orthic Dark Gray Chernozem soils developed on moderately to strongly calcareous, deep, fine loamy (SCL, SiCL, L, SiL), lacustrine deposits. These soils occur in upper positions of gentle to moderate slopes on undulating to dissected landscapes and have rapid permeability, moderate to rapid surface runoff, and a low water table during the growing season. Firdale soils are often moderately eroded, non-stony, and non-saline. They have medium available water holding capacity, medium organic matter content, and high natural fertility. Native vegetation includes aspen, oak and prairie grasses. The majority of these soils are currently cultivated for crop production.

In a representative profile the solum is approximately 60 cm thick. The profile consists of a dark gray Ap horizon, 20 to 30 cm thick, a yellowish Bt horizon, 30 to 45 cm thick with clay accumulation, a Cca horizon, 5 to 10 cm thick, and a calcareous C horizon. Firdale soils are associated with Danlin and Tadpole soils. They are similar to Halstead soils by having a well drained Orthic Dark Gray Chernozem profile but differ from them in having fine loamy rather than coarse loamy deposits. Firdale soils were previously mapped as Degraded Black associates of the Firdale Association in the Carberry (1957) soil report.

Fisher Series (FIH)

The Fisher series consists of imperfectly drained Gleyed Cumulic Regosols developed on strongly to very strongly calcareous, stratified dominantly medium to moderately fine textured alluvial sediments. These immature soils occur on the flood plain and levees of the Icelandic and Fisher Rivers. The surface texture is dominantly silty clay loam to clay loam, but silt loam or silty clay may be encountered. The topography is very gently to gently sloping. Native vegetation consists of aspen, black poplar and willow. The soil profile is characterized by a thin, weakly expressed Ah horizon of 6 to 10 cm that grades sharply into the stratified alluvial sediments. The A horizon has fine granular structure, is mildly alkaline and weakly calcareous. Under cultivation, the surface colors range from light gray to dark gray. The C horizon is strongly to very strongly calcareous, stratified, and may contain darker materials representing former surfaces which have been covered by more recent deposition of sediments.

Fisherton Series (FHT)

The Fisherton series consists of imperfectly drained Gleyed Dark Gray Chernozem soils developed on strongly calcareous, dominantly moderately fine textured (SCL, CL, SiCL) lacustrine sediments overlying extremely calcareous loamy glacial till within 1 metre. The topography is level to very gently sloping; runoff is moderately slow and permeability is moderately slow. Native vegetation consists dominantly of aspen, white spruce with occasional willow.

The Fisherton soil is weakly degraded and is characterized by a thin dark gray Ahej horizon, 4 to 10 cm thick and a weakly developed Bt horizon. A thin gravel or cobble strata may occur at the contact of the extremely calcareous loamy till. Fine to medium yellowish brown iron mottles may be observed at or below this contact. The chemical and physical properties are similar to the Warren series. Fisherton, clay till variant, (FHT1)is similar to the Fisherton soil, except for the clay till nature of the parent material.

Flood Lake Series (FOD)

The Flood Lake series consists of Rego Gleysol soils developed under poorly drained conditions from moderately calcareous, sand to very fine sandy loam textured glaciofluvial outwash. These soils occur in gently sloping to level areas as well as depressional channels. A high groundwater level is typical due to lateral seepage or topographic position. These soils are usually very permeable, although stratification of the parent material may limit permeability in some layers. Soils of the Flood Lake series generally exhibit minimal profile development, often possessing only a very thin, dark Ahg horizon overlying a mottled, gleyed Ckg horizon.

Flood Lake, peaty phase soils are similar, except for a thin 15 to 40 cm layer of mesic to fibric peat on the surface. Vegetation in Flood Lake soil areas is dominantly black spruce with an understory of Labrador tea and feathermoss. These soils occur as map units in the Singush Lake area. Two areas mapped as Flood Lake series occur in similar materials having a recent lacustrine origin and vegetation consists of grasses and willows. These areas occur southwest of East Blue Lake.

Floors Series (FLS)

The Floors series consists of moderately well to well drained Rego Black Chernozem soils developed on moderately to strongly calcareous, deep, stratified, sandy to sandy skeletal (S, GrS, GrCoS) outwash and glaciofluvial deposits. These soils occur in upper positions of gentle slopes on hummocky landscapes and have very rapid permeability, rapid surface runoff, and a low water table during the growing season. They have low available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation includes aspen-oak stands and tall prairie grasses. The majority of these soils are currently used for grazing or are excavated for gravel deposits.

Floors soils occur in close association with Dorset and Mansfield soils. They are similar to Marringhurst soils by having well drained profile in glaciofluvial deposits but differ from them lacking a Bm horizon.

Flux Lake Complex (FXL)

The Flux Lake complex consists of poorly to very poorly drained Mesisol, lithic phase and Fibrisol, lithic phase soils developed on shallow (40 to 160 cm), stratified, woody, mesic and fibric forest peat or thin (0 to 60 cm) fibric sphagnum peat overlying mesic forest peat. The organic materials are underlain by Precambrian bedrock or very thin till veneers over the bedrock. These soils occur in depressions and on lower positions of gently sloping bedrock terrain. The water table is high during the growing season and runoff is very slow. The vegetation consists of patchy black spruce and tamarack, alder and a groundcover of sphagnum and feathermosses, herbs, ericaceous shrubs and some sedge.

The Flux Lake complex includes Fibric Mesisol, lithic phase, Mesic Fibrisol, lithic phase and Typic Mesisol, lithic phase soils. These soils resemble the File Lake soils in most aspects and are often associated with these soils.

Foley Series (FOY)

The Foley series consists of poorly drained Rego Humic Gleysol carbonated phase soils developed on very strongly and extremely calcareous, loamy lacustrine sediments. Surface textures are very fine sandy loam, loam and silt loam and subsurface textures generally become coarser with depth. These soils are level to depressional with very slow surface runoff. While the soils are very permeable, internal drainage is impeded by a high water table. Native vegetation consists of sedges and reed grasses with clumps of willow and alder. Foley peaty phase soils have a thin (15 to 40 cm) organic surface layer comprised mainly of moderately well decomposed fen peat.

Fork River Series (FKV)

The Fork River series consists of poorly drained Rego Humic Gleysol soils developed on moderately to strongly calcareous, fine textured (SiC, C), lacustrine deposits. They occur mainly within the Dauphin Lake Plain on the west side of Dauphin Lake. The Fork River soils also occupy minor depressional sites associated with the Dauphin soils. Drainage is poor due to the level to depressional topography and permeability is slow due to its fine texture. Salts are prevalent in some of these soils. Native vegetation consists of meadow grasses, sedges, reeds and cattails.

All of the Fork River soils are mapped as the peaty phase and are characterized by a thin (15 to 40 cm) organic surface horizon of mesic fen peat, a very dark gray to dark gray Ah horizon and a calcareous C horizon that is gleyed and mottled with iron. On cultivation, the Ap horizon may be mucky and high in organic matter due to incorporation of the organic surface layer into subsurface mineral horizons.

Forrest Series (FRT)

The Forrest series consists of imperfectly drained Gleyed Rego Black Chernozem soils developed on a thin mantle (25 to 75 cm) of silty clay to clay sediments over a thin strata (10 to 40 cm) of very strongly calcareous loamy glacial till of shale, limestone and granitic origin. The topography is level to very gently sloping; runoff is moderately slow to slow and permeability is moderately slow to slow. These soils are influenced by a subsoil seepage condition in the very strongly calcareous till and an upward pressure of groundwater. Soluble salts are usually found in the subsoil.

The soil is characterized by an irregular, very dark gray Ah or Ahk horizon, 10 to 15 cm thick, with tongues to 25 cm, and a dark gray to olive gray AC, 4 to 8 cm thick. A weakly mottled, calcareous light olive brown Ckgj horizon is also present.

Fort Garry Series (FTY)

The Fort Garry series consists of moderately well drained Orthic Black Chernozem soils developed on thin moderately calcareous, clayey lacustrine sediments over a variable depth of very strongly calcareous silty sediments which overlie moderately calcareous lacustrine clay either within or below 1 metre depth. The general thickness of the silty sediments is 40 to 75 cm but may vary to depths greater than 1.5 metres. The surface texture is clay. The silty sediments below range in texture from silt loam to silty clay. The topography is very gently to gently sloping; runoff is moderate and permeability is variable in the upper clay and silty layers being dependent on the texture and thickness of the stratified silty sediments. Most of the Fort Garry soils are cultivated; native vegetation consisted dominantly of tall prairie grasses with occasional clumps of aspen and bur oak. The Fort Garry soils are associated with the imperfectly drained, Dencross series and the poorly drained Glenmoor series.

Fortier Series (FTE)

The Fortier series is a Gleyed Cumulic Regosol soil developed on imperfectly drained, moderately to strongly calcareous, clayey (SiC, C) fluvial sediments. These soils occur in smooth, level topography beyond the levees of the Whitemud River, and Pine and Squirrel Creeks in association with Dufresne, Willowbend, Gervais and La Salle soils. Periodic overflow or ponding occurs with spring runoff or during periods of high rainfall. Surface runoff is slow. Permeability is slow due to the clay textures and downward movement can be restricted by a high water table, especially in spring. Although Fortier soils are cultivated, small remnant stands of native vegetation support tall prairie and prairie-meadow grasses with some deciduous trees.

The Fortier soil profile has a weak, dark gray to gray Ah horizon, 10 to 20 cm thick which is slightly darker in color than the underlying mottled C horizon. Thin layers of very fine sandy loam, silt loam and silty clay loam are often present in the dominantly clayey profile. Buried Ah horizons occur in profiles in some areas. Fortier soils are finer textured and less permeable than the coarser textured Gervais soils. These soils have moderately severe agricultural limitations due to wetness and the possibility of seasonal inundation. Fortier soils take longer to warm up in spring and take longer to become trafficable after rain than coarser textured soils.

Fortina Series (FTN)

The Fortina series consists of poorly drained Rego Humic Gleysol soils developed on moderately to very strongly calcareous, deep, stratified, sandy skeletal (S, GrS, GrLS), glacial fluvial deposits. These soils occur in depressional positions of nearly level slopes on level landscapes and have moderately rapid to rapid permeability, low surface runoff, and a high water table during the growing season. Fortina soils are non-eroded, non-stony, and frequently slightly saline. They have a low available water holding capacity, high organic matter content, and low natural fertility. Native vegetation includes sedges, rushes, reeds and willows. The majority of these soils are currently in native vegetation.

In a representative profile the solum is approximately 30 cm thick. The profile is characterized by a carbonated, black Ah horizon, 20 to 30 cm thick, a Cca horizon, 15 to 25 cm thick with many distinct mottles, and a Ckg horizon, with numerous prominent mottles. The parent material is typically stratified with sand and gravel.

Fortina soils occur in close association with Dexter and Dorset soils. They are similar to Sewell soils by having a poorly drained profile with sandy strata but differ from them in having gravelly strata which are absent in Sewell soils. Fortina soils were previously mapped as Meadow associates of the Marringhurst Association in the Carberry (1957) soil report.

Framnes Series (FMS)

The Framnes series consists of imperfectly to moderately well drained Gleyed Dark Gray Chernozem soils developed on 15 to 90 cm of moderately to strongly calcareous lacustrine clay underlain by very strongly to extremely calcareous medium textured (L, SiL) sediments. The topography is smooth, nearly level; permeability is moderately slow in the lacustrine clay strata and variable from moderate to slow in the silty strata. The medium textured strata vary in thickness from 40 to 90 cm or deeper and are usually underlain by lacustrine clay. The native vegetation consists of aspen, balsam poplar, ash, dogwood and grass species.

The soil is characterized by a thin, slightly acid, leaf mat underlain by a variable dark gray to gray A horizon, 5 to 15 cm thick, and a very dark grayish brown Btj horizon 25 to 40 cm thick and usually extends (or tongues) into the calcareous C horizon. The FMS1 variant differs from the normal Framnes series by having a clay till substrate.

Freshford Complex (FHF)

The Freshford complex is comprised of the rapidly to well drained Orthic Gray Luvisol (Woodridge Series), Orthic Eutric Brunisol (Kawinaw Series) and Eluviated Eutric Brunisol (Freshford Series) soils developed on stratified, strongly to extremely calcareous sand and gravel deposits. The Freshford series is the dominant member of the complex. A thin loamy fine sand to sand surface mantle generally covers coarser substrate materials. The Freshford complex is associated with narrow, elongated, undulating beach

ridges. Surface runoff from these soils is nil to very slow as these soils are very permeable and water percolates through them quite rapidly. The surface may have some stones. Native vegetation consists dominantly of jack pine with some spruce and aspen. A description of a representative Freshford series (Eluviated Eutric Brunisol) follows:

L-H - 4 to 0 cm, very dark brown to dark brown (10YR 4/2 to 3/3 dry), very dark gray to dark reddish brown (5YR 3/1 to 2/2 moist), partially decomposed organic matter, medium acid, abrupt smooth boundary.

Aej - 0 to 3 cm, light brownish gray (10YR 6/2 dry), grayish brown (10YR 5/2 moist) gravelly sandy loam; single grained; loose moist and dry; neutral; moderately calcareous; abrupt smooth boundary.

Btj - 3 to 7 cm, brown (10YR 5/3 dry) dark yellowish brown (10YR 4/4 moist) gravelly loam, weak fine granular; loose moist and dry; neutral; moderately calcareous; abrupt wavy boundary.

BC - 7 to 17 cm, gray to light gray (10YR 6/1 dry) very dark gray (10YR 3/2 moist) very gravelly sandy loam; single grained; loose moist and dry; mildly alkaline; extremely calcareous; clear wavy boundary.

Ck1 - 17 to 30 cm, white to very pale brown (10YR 8/2 to 8/3 dry) brown to pale brown (10YR 5/3 to 6/3 moist) very gravelly loamy sand; single grained; loose moist and dry; moderately alkaline; extremely calcareous; clear smooth boundary.

Ck2 - 30 to 40 cm, gray to grayish brown (10YR 5/1 to 5/2 dry) very dark brown (10YR 3/3 moist) very gravelly sandy loam; single grained; loose moist and dry; mildly alkaline; extremely calcareous; clear smooth boundary.

Ck3 - 40 to 100 cm, white (10YR 8/2 dry) pale brown (10YR 6/3 moist) very gravelly sand; single grained; loose moist and dry; mildly alkaline; extremely calcareous.

Freshford soils have a thin brownish gray Ae horizon and a weakly developed Bm or Btj horizon. The degree of leaching or soil profile development depends upon slight differences in parent material and position on beach ridges. Woodridge soils are usually found on the intermediate slopes of the ridges. The Freshford series, an Eluviated Eutric Brunisol, occurs higher up on the ridges, while the Kawinaw series, an Orthic Eutric Brunisol, occurs on the crest of the ridges.

Soils of the Freshford complex occur on The Pas Moraine. Here the parent material is somewhat coarser, which inhibits Luvisolic soil development. Therefore the Freshford series, an Eluviated Eutric Brunisol, rather than the Woodridge series, an Orthic Gray Luvisol, is the dominant series. Freshford soils are often associated in map units with soils of the Tremauden and Horseshoe Island complexes, and the Norris and Easterville series, peaty phase.

Fresno Series (FSO)

The Fresno series consists of imperfectly drained Gleyed Dark Gray Chernozem soils developed on weakly calcareous to neutral, shallow uniform, fine loamy and fine silty (SiL, L, CL, SiCL), till derived from shale bedrock. These soils occur in lower slope positions of gentle to moderate slopes on hummocky and ridged landscapes and have moderate permeability moderately slow surface runoff and a high water table during the growing season. They have medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes tall prairie and meadow grasses. The majority of these soils are currently used for crop production.

In a representative profile the solum is approximately 70 cm thick. The profile is characterized by a grayish brown Ap or Ah horizon, 15 to 20 cm thick, an Ahe or transitional AB horizon, 15 to 25 cm thick with rinsed ped surfaces, a light grayish brown Bm or Bt horizon, 25 to 35 cm thick with a few, fine, faint iron mottles and a light grayish brown transitional BC horizon 10 to 20 cm thick with a few, fine faint iron mottles. The parent material is typically light grayish brown, non-calcareous shale till with medium distinct mottles.

Fresno soils occur in close association with Nayler and Fifere soils. They are similar to Zaplin soils by having an imperfectly drained Gleyed Dark Gray Chernozem profile but differ from them in having a much hig her content of shale bedrock derived material in their parent material. Fresno soils were previously mapped as imperfectly drained associates of the Snowflake association in the reconnaissance soil survey of South-Central.

Froswick Series (FWK)

The Froswick series is characterized by an Orthic Black Chernozem profile developed under well to moderately well drained moisture regime on a variable veneer (25 to 90 cm) of moderately to strongly calcareous loamy (L, CL, SiCL) glacial till of shale, limestone and granitic origin overlying non-to weakly calcareous shale bedrock. These soils occur in association with Black soils on the upper slopes and in various locales where the surface deposits are shallow to shale bedrock. They occur on undulating, hummocky and inclined landscapes with a variable slope class from gentle to steeply sloping. Runoff is moderate to rapid; permeability above the shale bedrock is moderate. Native vegetation consists of mixed tall grass, deciduous trees and shrubs. Most of these soils have been cultivated.

The Froswick profile has a very dark gray to black clay loam Ap horizon 15 to 20 cm thick, a brown to dark brown clay loam Bm 15 to 20 cm thick, a calcareous transitional BC horizon 10 to 20 cm thick above the parent material. The underlying shale bedrock may have an altered or softened layer of 15 to 25 cm before the more compact layers are encountered.

Fyala Series (FYL)

The Fyala series consists of poorly drained Peaty Rego Humic Gleysol soils developed on weakly to moderately calcareous lacustrine clay deposits. Surface texture of cultivated soils is clay, but usually contains a high percentage of peaty material that has been incorporated with the mineral material. Fyala series are clay textured throughout the profile. Internal drainage in these soils is impeded by fine textures and a high ground water table. The soils are stone free.

The Fyala soils have a surface layer of fibrous, medium acid to neutral peat and muck that is 0 to 15 cm thick, underlain by a thin, very dark gray Ah horizon high in organic matter and neutral to mildly alkaline in reaction. The Ah horizon is from 5 to 15 cm thick, but frequently tongues into the Ckg horizon to depths of 20 to 30 cm. The Ckg horizon is grayish brown to olive gray, contains numerous, large concretions of lime carbonate and is iron stained.

Gainsborough Series (GGH) or (GEK)

The Gainsborough series consists of poorly drained, Carbonated Rego Humic Gleysols of the Mentieth Association, developed on thin (25 to 100 cm), moderately calcareous, coarse to moderately coarse textured lacustrine sediments, overlying strongly calcareous, medium to moderately fine textured glacial till. A very thin (less than 5 cm), gravelly stratum may occur at the contact. This soil has nearly level to depressional topography, a sandy loam surface texture, moderately slow permeability and no surface runoff. This soil is poorly drained as a result of its depressional landscape position and high groundwater level. The estimated depth of water table is less than 1 metre during most of the growing season. The surface of these soils occasionally dries out during later summer but is usually saturated by fall rains before freeze up. The vegetation consists of hydrophytic reeds, grasses and willows. Gainsborough soils generally occur in depressions and stream channels and are frequently flooded and ponded.

This soil is associated with the well drained Langvale, Nesbitt and Fairburn series and the imperfectly drained Ashbury and Mentieth series. The Gainsborough series resembles the Plum Lake series of the Lyleton Association. The only difference is the Plum Lake series is not underlain by glacial till (Soils of the Boissevain - Melita Area, 1978).

Garrioch Series (GRH)

The Garrioch series consists of imperfectly drained Gleyed Rego Black Chernozem soils developed on sandy skeletal outwash or beach deposits overlying extremely calcareous loamy till. The surface texture varies from loamy fine sand to sandy clay loam and is underlain by a gravelly layer that varies from 50 to 100 cm thick. The topography is level to very gently sloping. Imperfectly drained soil conditions are due to perched water conditions above the slowly permeable till and also because of lateral flow and seepage from adjacent upland areas. Native vegetation consists dominantly of tall prairie grasses with some aspen and willow.

The soil is characterized by very dark gray Ah horizon 15 to 20 cm thick and a carbonated, gravelly loamy coarse sand AC horizon 10 cm thick. The solum has variable thickness depending on the depth of the sandy surface sediments to the coarser gravelly strata. These soils are similar in physical characteristics to the associated well drained, East Bay and Gunton series, the imperfectly drained Beaverdam series, and the poorly drained Eddystone and Berry Island series. Garrioch soils were previously mapped in the Agassiz, till substrate phase, soil association in the reconnaissance survey of soils in the Winnipeg map sheet area.

Garson Series (GSO)

The Garson series consists of moderately well to well drained Orthic Gray Luvisol soils developed on very strongly to extremely calcareous, stony, glacial till. The surface texture varies from loamy fine sand to loam. The topography is irregular, very gently to gently sloping. Surface runoff is moderate and permeability is medium to moderately slow. The vegetation consists mainly of aspen with occasional bur oak.

The Garson soil is characterized by a thin neutral to slightly acid leaf mat (L-F-H), a distinct gray Ae horizon 4 to 11 cm thick, and a dark yellowish brown Bt horizon 6 to 10 cm thick. The extremely calcareous C horizon is very pale brown and may be somewhat compact and platy.

The Garson, clay till variant, GSO1, differs from the modal Garson by having a clay texture in the underlying parent material. This till is less stony and generally less compact than the normal extremely calcareous till.

These soils are similar in physical characteristics to the associated well drained, Aneda series, the imperfectly drained Inwood and Lundar series, and the poorly drained Clarkleigh and Meleb series. Garson soils were previously mapped in the Garson soil association in the reconnaissance survey of soils in the Winnipeg map sheet area.

Gateside Series (GTD)

The Gateside series consists of imperfectly drained Gleyed Black Chernozem soils developed on moderately to strongly calcareous, deep, coarse loamy (VFS, LVFS, FSL, SL), lacustrine deposits. These soils occur in middle positions of very gentle to nearly level slopes on undulating landscapes and have moderately rapid permeability, moderately slow surface runoff, and a high water table during the growing season. Gateside soils are non-stony, and occasionally slightly saline. They have a medium available water holding capacity, medium organic matter content, and high natural fertility. Native vegetation includes tall prairie grasses, aspen-oak groves, shrubs and meadow grasses. The majority of these soils are currently cultivated for crop production.

In a representative profile the solum is approximately 35 cm thick. The profile is characterized by a very dark gray to black Ah horizon, 12 to 18 cm thick, a brown to olive brown Bmgj horizon, 15 to 30 cm thick with faint iron mottles, a light olive brown BC horizon, 5 to 15 cm thick with carbonates and a light olive brown to yellowish brown Ckgj horizon with distinct yellowish brown mottles.

Gateside soils occur in close association with Prosser, Pleasant and Poolex soils. They are similar to Pleasant soils by having imperfect drainage in coarse loamy deposits but differ from them in having a Bmgj horizon. Gateside soils were previously mapped as Black Meadow associates of the Holland Association in the Carberry (1957) soil report.

Gendzel Series (GDZ)

The Gendzel series consists of imperfectly drained, carbonated, Gleyed Rego Black Chernozem soils developed on a thin mantle (25 to 60 cm) of moderately to strongly calcareous sandy textured sediments overlying moderately to strongly calcareous medium sand to gravelly textured sediments. The soil occurs in a level to gently sloping topography. Runoff is moderately slow; permeability is moderately rapid to rapid, but may be restricted in the subsoil during periods when the water table is high.

The soil is characterized by a very dark gray to black Ahk horizon, 10 to 16 cm thick, a dark gray to light gray AC horizon 5 to 9 cm thick; and a lime accumulation (Cca) horizon 6 to 12 cm thick. In the soils with a shallow solum, the lime accumulation (Cca) horizon occurs at the transition of the sandy to gravelly sediments.

George Lake Series (GGK)

George Lake series consists of Orthic Black Chernozem soils of the George Lake Association, developed on thin (25 to 100 cm), weakly to moderately calcareous, moderately coarse textured (VFS, LVFS, FSL), lacustrine sediments overlying coarse textured, deltaic, beach and out-wash deposits. This soil has a loamy very fine sand surface texture, very gently sloping, complex topography, good drainage, rapid permeability and low surface runoff. This soil is non-saline, non-stony and usually cultivated. This soil is closely associated with Bede soils but is not as coarse and generally has a deeper profile. The Ap horizon is dark gray to dark grayish brown and ranges from 15 to 20 cm thick. Occasionally an Ah horizon is present and is usually black to very dark gray and 3 to 5 cm thick. A deep, dark brown Bm horizon 20 to 30 cm thick is common overlying a coarse, stratified yellowish brown II Ck horizon. The George Lake series is associated with the imperfectly drained Ninette and Linklater series, and the poorly drained Pierson series. The George Lake series resembles the Griswold series except that it is underlain by glacial till (Soils of the Boissevain - Melita Area, 1978). A description of a representative profile is presented below.

Ap - 0 to 20 cm, very dark gray (10YR 3/1 moist), dark brown to brown (10YR 3.5/1 dry) fine sandy loam; weak, medium granular; slightly plastic; loose when dry; friable when moist; abrupt, smooth boundary; non-calcareous.

Ah - 20 to 23 cm, black (10YR 2/1 moist), very dark gray (10YR 3/1 dry) sandy loam; weak, medium granular; slightly plastic, loose when dry, friable when moist; clear, smooth boundary; non-calcareous.

Bm - 23 to 51 cm, dark brown to brown (10YR 3.5/3 moist), dark grayish brown to grayish brown (10YR 4.5/2 dry) sandy loam; weak, medium prismatic to weak, fine granular; slightly plastic; friable when moist; clear, wavy boundary; non-calcareous.

II Ck1 - 51 to 101 cm, yellowish brown (10YR 5/4 moist), light brownish gray (10YR 6/2 dry) course sandy, gravel; structureless; non-plastic; moderately calcareous; abrupt, smooth boundary.

II Ck2 - 101 cm +, pale brown (10YR 6/2 moist), very pale brown (10YR 7/3 dry), gravel; moderately calcareous; some staining and iron concretions present.

Gervais Series (GVS)

The Gervais series consists of imperfectly drained Gleyed Cumulic Regosol soils developed on moderately to strongly calcareous, deep, stratified, loamy (SiL, L, SiCL, CL), recent fluvial deposits. Flooding is a hazard where drainage has not been improved. These soils occur in middle positions of very gentle slopes on floodplain landscapes and have moderately slow to slow permeability, slow surface runoff, and a high water table during the growing season. Gervais soils are non-stony, and frequently slightly saline. They have medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation includes elm, maple, poplar and meadow grasses. The majority of these soils are currently cultivated for crop production.

In a representative profile there is no solum development. The profile is characterized by a weakly developed dark gray to gray Ah horizon, 12 to 20 cm thick, and a lighter colored Ck horizon, with stratified FSL and FS textured layers. A typical profile also contains dark coloured buried Ah horizons.

Gervais soils occur in close association with La Salle and Willowbend soils. They are similar to Poplar Point soils by having an imperfectly drained profile in loamy deposits but differ from them in having a distinct Ah horizon. Gervais soils were previously mapped as associates of the Assiniboine Complex in the Carberry (1957) soil report.

Gilbert Series (GBT)

The Gilbert series consists of well drained Orthic Black Chernozem soils, developed on moderately to strongly calcareous, deep, uniform, and sandy to coarse loamy lacustrine sediments. These soils occur on level landscapes and have rapid permeability, low surface runoff and a low water table during the growing season. Gilbert soils have low available water holding capacity, medium organic matter levels, and medium natural fertility. These soils are slightly to severely eroded. The native vegetation often comprises of aspen with scattered white spruce and mixed grasses and shrubs in the understory. The majority of these soils are currently used for crop production.

In a representative profile the solum is generally about 70 cm thick. The profile is characterized by a thick (37 cm), very dark gray non-calcareous loamy fine sand Ah(p) horizon overlying a thick dark brown non-calcareous loamy fine sand Bm horizon, and very pale brown moderately calcareous fine sand textured Ck horizon. The parent material is typically uniform, very pale brown, strongly calcareous fine and very fine sand.

Gilbert soils occur in close association with the imperfectly drained, Lenswood soils. They are similar to Lenswood soils by having the same textural range, but differ because of better natural drainage and a lower water table.

The Gilbert loamy substrate variant, (GBT1), consists of well drained Orthic Black Chernozem soils developed on moderate to strongly calcareous, shallow, uniform, sandy to coarse loamy lacustrine sediments less than 1 m in depth overlying loamy lacustrine sediments. These soils occur on level lacustrine veneer deposits and have rapid surface permeability and low subsoil permeability in the loamy substrate, slow surface runoff and a low water table during growing season. Gilbert loamy substrate variant soils have medium available water holding capacity, medium organic matter levels, and medium natural fertility. The native vegetation often comprises aspen with occasional white spruce and an understory of mixed grasses and low shrubs. The majority of these soils are currently used for crop production.

In a representative profile of a Gilbert loamy substrate variant soil, the solum is generally 60 cm thick and ranges from 30 to 100 cm thick. The profile is characterized by a thick (36 cm), very dark gray, non-calcareous loamy fine sand Ah(p) horizon overlying about 24 cm of yellowish brown to brown, non-calcareous loamy fine sand Bm horizon, and a light gray to pale brown, strongly calcareous very fine sand Ck horizon. The parent material of the substrate is typically stratified clay loam to silty clay loam texture.

The Gilbert gravel substrate variant, (GBT2), consists of well drained Orthic Black Chernozem soils developed on moderately to strongly calcareous, shallow, somewhat stratified sandy to coarse loamy lacustrine sediments underlain by stratified coarse sand and fine gravel fluvial deposits within 1 metre. These soils occur on nearly level lacustrine landscapes and have rapid permeability, slow surface runoff and a medium low water table during the growing season. Gilbert gravel substrate variant soils have low available water holding capacity, medium organic matter levels and medium natural fertility. The native vegetation often consists of mixed grasses, low shrubs and occasional groves of aspen. The majority of these soils are currently used for crop production.

In a representative profile of a Gilbert gravel substrate variant soil, the solum is generally about 50 cm thick. The profile is characterized by a 30 cm thick, very dark gray, non-calcareous very fine sand A horizon overlying a yellowish brown to brown non-calcareous fine sand textured Bm horizon about 30 cm thick, and a light gray, very fine sand, moderately calcareous Ck horizon. The parent material of the gravel substrate is typically moderately calcareous, stratified coarse sand and fine gravel.

The Gilbert gravel substrate variant soils occur in association with Lenswood gravel substrate variant soils. They are similar to the Lenswood gravel substrate soils because of texture, but differ from them because of having better drainage.

Giroux Series (GRX)

The Giroux series consists of imperfectly drained Gleyed Dark Grey Chernozem soils developed on moderately calcareous (6 to 15 % $CaCO_3$), coarse textured (FS, LCoS, LS, LFS) deltaic lacustrine deposits overlying moderately to strongly calcareous, clayey, lacustrine deposits. The surface texture is fine sand to loamy fine sand. Topography is level to very gently sloping; runoff is moderately slow and permeability is moderately rapid in the coarse textured sediments and slow in the underlying clay. Native vegetation consists dominantly of aspen, balsam poplar, willow, dogwood and grasses.

Giroux soils are characterized by a thin, partially decomposed leaf mat and a dark gray Ah or Ahe horizon 8 to 15 cm thick. A pale brown Bmgj horizon may have a slight accumulation of clay coatings on the sand grains. Iron mottles are common in the lower B horizon, generally increasing in size and abundance with depth. These soils are associated with the poorly drained Prawda series.

Glenboro Series (GBO)

The Glenboro series consists of moderately well to well drained Orthic Black Chernozem soil developed on a mantle (25 to 90 cm) of moderately to strongly calcareous, shallow, loamy (VFSL, L, SiL), lacustrine deposits over moderately calcareous, stratified, deep, sandy (FS, LFS, LS) deposits. These soils occur in upper positions of gentle slopes on sloping to undulating landscapes and have moderate over moderately rapid permeability, moderately slow surface runoff, and a low water table during the growing season. Glenboro soils are often slightly eroded, non-stony, and non-saline. They have a medium available water holding capacity, high organic matter content, and high natural fertility. Native vegetation includes tall prairie grasses and aspen-oak groves. The majority of these soils are currently cultivated for crop production.

In a representative profile the solum is approximately 30 cm thick. The profile is characterized by a very dark gray to black Ah horizon, 12 to 18 cm thick, with granular structure, a dark brown to brown Bm or Btj horizon 10 to 16 cm thick with subangular blocky structure, a brown to pale brown BC horizon, 6 to 14 cm thick and a light gray to very pale brown Cca horizon, 5 to 8 cm thick. The parent material is typically pale brown to light yellowish brown sandy. Some stratified sands to loams may occur in the loam/sand

transition. The Glenboro, clay loam to silty clay loam, variant, (GBO1) contains a clay loam to silty clay loam layer in the subsoil above the sandy deposits.

Glenboro soils occur in close association with Grover and Grayson soils. They are similar to Fairland soils by having an Orthic Black Chernozem profile and loamy surface mantle but differ from them in having a sandy substrate. Glenboro soils were previously mapped as Blackearth associates of the Glenboro Association in the Carberry (1957) soil report.

Glencross Series (GCS)

The Glencross series are imperfectly drained Gleyed Rego Black Chernozem (carbonated) soils developed in thin, medium (VFSL, L, SiL) grading to moderately fine textured (SCL, CL, SiCL), moderately to strongly calcareous lacustrine, sediments that overlie strongly calcareous, stony, water-worked glacial till. Shale bedrock may occur below the till at about 1 to 1.5 m. The change from loamy sediments to stony, loam to clay loam textured till is abrupt and usually occurs at 0.3 to 1 m below the surface. A gravelly or cobbly lens (<10 cm in thickness) usually occurs at the contact of the unconforming layers. Glencross soils occur in a few scattered small areas on level terrain where runoff is slow and in association with the well drained Roseisle soils.

These slightly to moderately stony soils have thin black to very dark gray Ah horizons that are granular, friable, mildly alkaline in reaction and calcareous; thin transitional, grayish brown, strongly calcareous, moderately alkaline, granular AC horizons; and light gray to light brownish gray, strongly calcareous Ck horizons having a granular-like structure, friable to slightly hard consistence and numerous, faint to distinct, medium to fine sized, brown mottles. Flakes of dark gray shale with white calcium carbonate coatings occur near the contact of the underlying till. The grayish brown to light brownish gray, loamy textured till is granular, moderately alkaline, moderately to strongly calcareous, gypsiferous and stained with brown mottles.

The Glencross variant, GCS1, has similar characteristics to the Glencross series, but has a limestone layer at or near the 1 metre depth. There is a small area mapped in Section 23, Township 4, Range 6W. The limestone layer is hard and not weathered but the thickness of this layer and the underlying layer is not known. The Glencross soil occurs in association with the Roseisle soils. They were previously mapped as part of the Blumenstein Complex in the South-Central (1943) report.

Glenella Series (GNL)

The Glenella series consists of imperfectly drained, carbonated, Gleyed Rego Black Chernozem soils developed on dominantly coarse loamy sediments overlying clayey lacustrine sediments. Surface texture is dominantly very fine sandy loam, but may vary from loamy very fine sand to sandy clay loam. The topography is level to very gently sloping; runoff is moderately slow to slow; permeability is moderate in upper coarse loamy sediments and slow in the underlying clay. In some areas, lateral flow of water may occur through the very fine sand strata above the clay. Salinity may be present in some soils. The native vegetation consists of tall prairie grasses, some aspen or willow.

The soil is characterized by a very dark gray, strongly to very strongly carbonated Ah horizon 10 to 20 cm thick, a thin 7 to 10 cm, transitional AC horizon. The underlying stratified sediments often contain less carbonates than the near surface horizons and are mottled; they may have coarser strata of loamy very fine to fine sand. Associated soils are the imperfectly drained Greenwald series and the poorly drained Delmar series. The soil description is similar to Plum Ridge series except that moderately calcareous clay occurs within a depth of 1 metre. Glenella soils were previously mapped in the Lakeland soil association in the reconnaissance survey of soils in the Winnipeg map sheet area.

Glenfields Series (GFS)

The Glenfields series consists of poorly drained, carbonated Rego Humic Gleysol soils developed on strongly to very strongly calcareous, dominantly fine loamy (CL, SiCL) lacustrine and alluvial sediments. These deposits are stratified and may be underlain by clay or glacial till at depth below 1 metre. Surface textures range from loam to clay loam. Movement of water through the profile is impeded by a high water table and by alternating sandy to fine loamy strata. In some areas, the saline phase of these soils may contain sufficient soluble salts within the profile to affect crop growth.

The cultivated Glenfields series is characterized by a black organic layer or mixed organic and mineral material, 10 to 12 cm thick, that is friable when moist and moderately calcareous; and a black (moist) Ah horizon of 8 to 15 cm thick with variable carbonate content. A dark gray transitional AC horizon, 9 to 15 cm thick and a Ckg horizon with distinct, yellowish brown mottles are present. Within the Glenfields areas, dry surface color varies from black to grays; the gray colors are due to high carbonate content in the Ah horizon.

The Glenfields, peaty phase consists of soils with a similar profile except that a thick organic layer (15 to 40 cm) occurs at the surface. Glenfields soils were previously mapped in the Lakeland soil association in the reconnaissance survey of soils in the Winnipeg map sheet area.

Glenhope Series (GHP)

The Glenhope series consists of imperfectly drained, carbonated Gleyed Rego Black Chernozem soils developed on strongly calcareous coarse loamy (LVFS, FSL, VFSL) lacustrine sediments, overlying extremely calcareous loamy glacial till. The surface texture ranges from loamy very fine sand to sandy clay loam. The topography is level to very gently sloping. Runoff is slow, and

permeability in the upper strata is moderate when moist. Permeability may be restricted due to a perched water table above the slowly permeable till during the spring runoff or following heavy rains. In some areas where lateral flow of saline water occurs, the soils may be sufficiently saline to affect crop growth. The native vegetation is meadow-prairie grasses and herbs with scattered groves of aspen, black poplar and willow.

The Glenhope soil is characterized by very dark gray to black carbonated granular Ah horizon 10 to 20 cm thick and a thin transitional AC horizon 5 to 10 cm thick. A white layer of calcium carbonate accumulation (Cca) may be present. The underlying sediments are stratified, pale brown to white in color, and generally become slightly coarser with depth. The extremely calcareous loamy till usually occurs at 60 to 80 cm depth, but ranges from 40 to 100 cm.

The soil profile, texture and drainage are similar to the Plum Ridge, however the Plum Ridge series consists of coarse loamy stratified sediments to a depth of 1 metre or more; the Glenella soils are similar to the Glenhope, but are underlain by clayey sediments within the 1 metre depth. Glenhope soils were previously mapped in the Woodlands soil association in the reconnaissance survey of soils in the Winnipeg map sheet area.

Glenlorne Series (GNO)

The Glenlorne series consists of imperfectly drained Gleyed Eluviated Black Chernozem soils of the Waskada Association, developed on thin (25 to 100 cm), strongly calcareous, moderately coarse to medium textured, discontinuous eolian and lacustrine sediments overlying stronger calcareous medium to moderately fine textured glacial till. A very thin (less than 5 cm), gravelly stratum or pebble line may occur at the contact. This soil has smooth to level topography, fine sandy loam to silt loam surface texture, slow permeability, and slow surface runoff. The estimated depth to water table during the growing season is less than 2 metres. This soil is non-saline non-stony and usually cultivated. It is frequently flooded and ponded in the spring and after heavy rains. Although these soils are cultivated, they are generally not productive as the crops are adversely affected by periodic, excessive wetness.

Glenlorne soil is characterized by a black Ap horizon, 13 to 15 cm thick, a gray to light gray Ae horizon, 3 to 5 cm thick, a very dark grayish brown, gleyed, Bt horizon, 20 to 30 cm thick, a grayish brown, gleyed, iron stained and mottled Cca horizon, 13 to 18 cm thick. A grayish brown, gleyed, weakly mottled II Ckgj is also present. Associated soils include the well drained Waskada and Maskawata series, the imperfectly drained Montgomery and Two Creeks series, and the poorly drained Deloraine series. The Glenlorne series resembles the Hayfield series of the Cameron Association. The only difference is the Glenlorne series is underlain by glacial till (Soils of the Boissevain - Melita Area, 1978). A description of a representative profile is presented below:

Ap - 0 to 15 cm, black (10YR 2/1 moist), very dark gray to dark gray (10YR 3/1 dry) silt loam; medium granular; friable when moist, soft when dry; abrupt, smooth boundary; weakly calcareous; pH 7.4.

Ae - 15 to 20 cm, dark gray (10YR 4/1 moist), gray to light gray (10YR 6/1 dry) silt loam; weak, fine platy; very friable when moist, soft when dry; clear, wavy boundary; pH 7.3.

Btgj1 - 20 to 25 cm, very dark grayish brown (2.5Y 3/2 moist); grayish brown (2.5Y 5/2 dry); clay loam; weak, fine granular; firm when moist; slightly hard when dry; smooth boundary; pH 7.2.

Btgj2 - 25 to 36 cm, very dark brown (10YR 2/2 moist), very dark grayish brown (10YR 3/2 dry) clay loam; medium blocky breaking to weak, fine subangular blocky; very firm when moist, hard when dry; clear, wavy boundary; pH 7.3.

Btgj3 - 36 to 43 cm, gray grayish brown (2.5Y 4/2 moist); olive gray (5Y 5/2 dry) clay loam; weak, fine granular; firm when moist; slightly hard when dry; clear, smooth boundary; pH 7.3.

Ckgj - 43 to 61 cm, dark grayish brown to grayish brown (2.5Y 4.5/2 moist), grayish brown (2.5Y 5/2 dry) loam; few, fine, faint iron and manganese mottles; weak, fine granular; friable when moist, soft when dry; abrupt, smooth boundary; moderately calcareous; pH 7.5.

Ccagj - 61 to 76 cm, grayish brown (2.5Y 5/2 moist), light gray (2.5Y 7/2 dry) silt loam; few, fine, faint iron mottles; moderate fine granular; firm when moist, soft when dry; abrupt, smooth boundary; few, gypsum crystals present; strongly calcareous; pH 7.6.

II Ckgj - 76 cm +, grayish brown (2.5Y 5/2 moist), light brownish gray (2.5 6/2 dry) loam, few, fine faint light yellowish brown (2.5Y 6/6 dry), iron mottles; weak, fine granular; firm when moist, slightly hard when dry; moderately calcareous; pH 7.5.

Glenmoor Series (GOO)

The Glenmoor series consists of poorly drained Rego Humic Gleysol soils developed on a thin mantle (< 1 m) of moderately to strongly calcareous, clayey lacustrine deposits over very strongly to extremely calcareous, silty, lacustrine deposits. An underlay of lacustrine clay generally occurs below the silty deposits. These soils occur in low to depressional positions of level to nearly level landscapes and have slow to moderate permeability, very slow surface runoff and a high water table during the growing season. Glenmoor soils are non-eroded, non-stony and may be saline. They have medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes sedges, grasses and willow. With adequate drainage, the majority of these soils are currently used for crop production.

In a representative profile the solum is approximately 10 to 25 cm thick. The profile is characterized by a thin, very dark gray (10YR3/1 dry), weakly calcareous, clay to silty clay A horizon 0 to 22 cm thick. A moderately to very strongly calcareous, olive gray

(5Y6/2 dry), silty clay, Ckg horizon 22 to 45 cm and a pale olive to olive, very strongly to extremely calcareous, SiL to SiCL, mottled, Il Ckg horizon are also present. The parent material is a silty sediment underlain by a clayey substrate.

A Glenmoor, peaty phase consists of soils with similar profile characteristics to the Glenmoor series, but have a thick organic layer at the surface which ranges from 15 to 40 cm. Glenmoor soils occur in close association with Dencross soils which are imperfectly drained. Glenmoor soils were previously mapped as part of the Fort Garry association in the Winnipeg Map Sheet (Report No. 5, 1953).

Glenn Series (GNN)

The Glenn series consists of poorly drained, carbonated, Rego Humic Gleysol soils developed on thin (< 100 cm), strongly calcareous (16 to 25 % $CaCO_3$), moderately fine textured (SCL, CL, SiCL) lacustrine and alluvial sediments underlain by moderately calcareous (6 to 15 % $CaCO_3$) lacustrine sand. Surface textures range from loam to clay loam. This soil is similar to a Balmoral profile that is underlain by sand.

The soil is characterized by a black Ah horizon 8 to 15 cm thick, dry surface colors vary from black to gray. The gray colors are due to high carbonate content of the soil.

Glenora Series (GLO)

The Glenora series consists of imperfectly drained, carbonated, Gleyed Rego Black Chernozem soils of the Bernice Association developed on thin (25 to 100 cm), moderately to strongly calcareous, coarse textured, gravelly deltaic and outwash deposits overlying strongly calcareous medium to moderately fine textured glacial till. This soil has a coarse sandy surface texture, nearly level to gently sloping topography, rapid permeability and slow surface runoff. The imperfect drainage is due to high water table and the proximity of the underlying less permeable glacial till. Lateral groundwater flow through these soils is common. Gleyed Calcareous Black Chernozem soils may be found in close association with Glenora soils which commonly occur in the vicinity of outwash deposits and in glacial stream channels that have eroded through till deposit in the western part of the Boissevain-Melita map area. The Glenora series resembles the Napinka series of the Bede Association. The only difference is the Glenora is underlain by glacial till.

Glenview Series (GLN)

The Glenview series consists of imperfectly drained Gleyed Black Chernozem soils of the Dromore Association, developed on thin (25 to 100 cm), strongly calcareous, medium textured (VFSL, L, SiL), lacustrine sediments overlying coarse textured (FS, LCoS, LFS), gravelly deltaic outwash deposits. The dominant surface texture is loam; the topography is nearly level; permeability is moderate; and runoff is moderate. These soils are non-saline and cultivated.

The Glenview is associated with the well drained Dromore series and resembles the Bower series except that the Bower series is underlain by glacial till (Soils of the Boissevain - Melita Area, 1978).

Gnadenthal Series (GDH)

The Gnadenthal series consists of imperfectly drained Gleyed Rego Black Chernozem soils developed on moderately to strongly calcareous, deep stratified, loamy (VFSL, L, SiL), fluvial and lacustrine deposits. These soils occur in middle positions of nearly level to very gentle slopes on undulating landscapes and have moderate permeability, moderately slow surface runoff, and a medium water table during the growing season. Gnadenthal soils are non-eroded, non-stony, and frequently slightly saline. They have a medium available water holding capacity, medium organic matter content, and high natural fertility. Native vegetation includes tall prairie grasses and aspen-oak groves. The majority of these soils are currently cultivated for crop production.

In a representative profile the solum is approximately 30 cm thick. The profile is characterized by a very dark gray to black weakly calcareous Ap horizon, 15 to 40 cm thick, a gray to dark gray AC horizon, 7 to 25 cm thick, moderately calcareous, occasionally a Cca horizon, 5 to 10 cm thick, and a Ck horizon with iron mottles. The parent material is typically stratified with FSL, SiCL and CL textures.

Gnadenthal, fine loamy variant, GDH1, is found in close association with the modal Gnadenthal soils and differs from them by having 25 to 40 cm of CL to SiCL textured surface deposits over the loamy deposits. Gnadenthal, clayey variant, GDH2, is found in close association with the modal Gnadenthal soils and differs from them by having 25 to 40 cm of SiC to C textured surface deposits over the loamy deposits. Gnadenthal soils occur in close association with Reinfeld and Blumenfeld soils. They are similar to Neuenberg soils by having a Gleyed Rego Black Chernozem profile and loamy surface but differ from them in having a finer textured subsurface. Gnadenthal soils were previously mapped as Black Meadow associates of the Altona Association in the Winnipeg-Morris (1953) soil report.

Goodlands Series (GOL)

The Goodlands series consists of imperfectly drained, Gleyed Black Chernozem soils of the Elva Association, developed on deep, strongly calcareous, moderately fine textured (SCL, CL, SiCL), lacustrine sediments. The surface texture is clay loam, the topography is nearly level to gently sloping, permeability is slow and runoff is slow. Depth to water table is estimated at 2 metres during the growing season. This soil is usually non-stony, and may be weakly to moderately saline in subsurface horizons.

This soil is characterized by black to very dark gray Ap horizons 10 to 25 cm thick, black to very dark brown gleyed Bm horizons 13 to 20 cm thick, very dark gray to dark gray gleyed BC horizons 18 to 25 cm thick and gleyed, light olive brown to pale olive C horizons (Soils of the Boissevain - Melita Area, 1978). Analytical data and a representative profile description are presented:

Ap - 0 to 25 cm, very dark gray (10YR 3/1 moist), very dark gray to dark gray (10YR 3.5/1 dry) clay loam; moderate medium subangular blocky breaking to moderate fine subangular blocky; friable when moist; abrupt, smooth boundary; non-calcareous; pH 6.7.

Btjgj - 25 to 41 cm, black to very dark brown (10YR 2/1.5 moist), very dark gray to dark gray (10YR 3.5/1 dry) silty clay loam; weak medium prismatic breaking to weak fine subangular blocky; friable when moist; irregular boundary; pH 7.6.

BC - 41 to 64 cm, very dark gray to dark gray (10YR 3.5/1 moist), gray (10YR 5/1 dry) silty clay loam; weak fine subangular blocky; friable when moist; diffuse irregular boundary; moderately calcareous; pH 8.3.

Cksgj - 64 cm +, light olive brown (2.5Y 5/4 moist), pale olive (5Y 6/3 dry) silty clay loam; weak fine granular; friable, when moist; very strongly calcareous; weakly saline; pH 8.5.

Goose Island Complex (GOI)

The Goose Island complex consists of imperfectly drained Goose Island series (Gleyed Rego Dark Gray Chernozem), Louis Island series (Gleyed Dark Gray Chernozem) and Matheson Island series (Gleyed Dark Gray Luvisol) soils, developed on 15 to 30 cm of stratified sand and gravel outwash and beach deposits over extremely calcareous till. The topography is very gently sloping and the vegetation is dominantly aspen, black and white spruce, some jack pine and sedges. Goose Island soils correlate with Spearhill till substrate phase soils reported in published soil survey reports.

The Goose Island soils are leached but the degree of degradation varies. The Gleyed Dark Gray Chernozem member has a dark colored surface horizon blotched with lighter colored areas and underlain by a weakly developed Bt horizon. The Gleyed Dark Gray Luvisol member also has a dark surface horizon and a thin, grayish brown Ae horizon underlain by a moderately developed Bt horizon. Iron stains and mottles are common to all soils in this complex.

Goose River Series (GOV)

The Goose River series consists of poorly drained Rego Gleysol, peaty phase soils developed on moderately to very strongly calcareous, sandy loam to loam till. The till usually is skeletal due to large amounts of channery and flaggy limestone and dolostone fragments. Topography is level to depressional and the permeability is good but drainage is poor due to high ground water levels. Runoff is limited. The dominant vegetation is black spruce, ericaceous shrubs, feather and Sphagnum mosses.

The Goose River soils are characterized by a 20 cm thick LFH layer or a 10 to 25 cm thick Of and Om surface layer. The Ah horizon ranges from 5 to 15 cm in thickness and overlies a 10 to 15 cm thick Bg or Btjg, which in turn overlies a calcareous parent material. Some Goose River soils are very shallow and have developed on carbonate rock rubble. The better developed Goose River soils support good mixed forest stands with a wide range of tree, shrub and herb species. Associated soils are Egg Lake, Simonhouse and Leak Lake soils.

Gopher Creek Series (GPE)

The Gopher Creek series is the imperfectly drained, carbonated, Gleyed Rego Black Chernozem soils of the Dromore Association, developed on thin (25 to 100 cm), strongly calcareous, medium textured (VFSL, L, SiL), lacustrine sediments overlying coarse textured (FS, LCoS, LFS), gravelly deltaic and outwash deposits. This soil is characterized by nearly level topography, moderately slow permeability, and low surface runoff. The dominant surface texture is very fine sandy loam. Some of these soils are cultivated and some are used as pasture. The estimated depth to water table during the growing season is 2 metres.

Associated soils are the well drained Dromore and Breadon series, the imperfectly drained Glenview series, and the poorly drained William series. The Gopher Creek series resembles the Alexander series except that the Alexander series is underlain by glacial till (Soils of the Boissevain - Melita Area, 1978).

Gormley Lake Complex (GMX) or (GRY)

The Gormley Lake complex consists of very poorly drained Terric Mesisols, Terric Mesisols sphagnic phase, Terric Fibric Mesisols, and Terric Mesic Fibisols developed on 40 to 160 cm of mesic forest peat. These soils frequently have a then (0 to 65 cm) fibric Sphagnum moss peat overlying the mesic forest peat. Moderately to strongly calcareous sandy lacustrine sediments occur within

160 cm of the surface. Gormley Lake areas are depressional to level. Permeability and runoff are very slow to nil on these soils. The native vegetation is dominantly black spruce in the overstory and ericaceous shrubs, Sphagnun and feathermosses in the understory. The Gormley Lake complex is found in the Mid Boreal climatic zone, and its equivalent in the Low Boreal climatic zone is the Rat River complex.

Graham Series (GHM)

The Graham series consists of poorly drained, carbonated, Rego Humic Gleysols of the Melita Association, developed on deep, moderately calcareous, medium textured (VFSL, L, SiL), recent alluvial sediments. These deposits are stratified and contain numerous dark colored bands of former surface horizons in the profile. Graham soils generally occur in the Souris River channel south of Melita and in the vicinity of Gainsborough, Antler and Graham Creeks that empty into the Souris River from the west. Graham soils have complex gently undulating topography, a silt loam surface texture, slow permeability and very slow surface runoff. Surface ponding and flooding are a common occurrence on Graham soils. The vegetation consists mainly of hydrophytic species and many of these soils are used only for pasture.

Associated soils are the well drained Melita series and the imperfectly drained Liege series. The Graham series of the Melita Association resembles the Leighton series of the Coulter Association. They are both alluvial deposits. The major difference between the two is that the Melita Association consists of stratified medium textured sediments while the Coulter Association consists of more uniform, moderately fine textured (Soils of the Boissevain - Melita Area, 1978).

Grande - Clairiere Series (GDC)

The Grande-Clairiere series consists of rapidly drained, Orthic Regosols of the Grande-Clairiere Association, developed on deep, weakly calcareous to non calcareous, coarse textured aeolian deposits. This soil has a fine sand surface texture, complex duned topography ranging from undulating to strongly rolling, rapid permeability and no surface runoff. In these rapidly drained soils, depth to water level occurs at depths greater than 4 metres. Native vegetation consists of groves of white poplar (Populus tremuloides) dominantly, hazel nut (Corylus spp.), poison oak, some low creeping juniper (Junperus horizontalis) and various grasses and shrubs. They are very droughty and generally low in fertility, and very few are cultivated. Most Grande-Clairiere soils are managed as rangeland. The Grande-Clairiere Association is similar to the Souris Association, in respect to the parent material being coarse textured. The main difference is the Grande-Clairiere Association is composed of Regosolic soils on duned sand, while the Souris Association is composed mainly of Chernozemic soils developed on lacustrine sands (Soils of the Boissevain - Melita Area, 1978). A typical profile description is described:

L-H - 5 to 0 cm, organic layer composed of decaying leaves, grasses, roots, etc., grades abruptly with a clear, smooth boundary.

Ahej - 0 to 2 cm, a gray (10YR 5/1 dry, 10YR 4/3 moist) fine sand; structureless, loose when moist, pH 5.2; with a clear, smooth boundary.

C - 2 to 150 cm, a brown (10YR 5/3 dry, 10YR 4/3 moist) fine sand; structureless; loose moist and dry; pH 6.0.

Grayson Series (GYS)

The Grayson series consists of poorly drained Rego Humic Gleysol soils developed on a thin mantle (25-95 cm) of moderately to strongly calcareous loamy (VFSL, L, SiL) sediments grading to moderately calcareous sandy (FS, LFS, LS) deposits. The soils occur in level to depressional topography and have a saturation zone at or very near the surface for a considerable time. Runoff is very slow to negligible; permeability of the soil material is moderate, but restricted during periods when the soil is saturated. The soil is characterized by a thin, moderately decomposed organic layer 2 to 5 cm thick, a very dark Ah or Ahk horizon 8 to 12 cm thick and a dark gray AC. In some soils, thin cumulic layers of organic and mineral matter may be present at the surface. A lime carbonate horizon is often present below the AC. The subsoil is light olive brown to olive and may have yellowish brown mottles.

Graysville Series (GYV)

The Graysville series consists of imperfectly drained Gleyed Rego Black Chernozem soils developed on a mantle (60 to 90 cm) of moderately to strongly calcareous, loamy (VFSL, L, SiL, SiCL, CL), fluvial and lacustrine deposits over moderately calcareous, clayey (C, SiC), lacustrine deposits. These soils occur in middle positions of nearly level slopes on undulating landscapes; surface runoff is slow. Permeability is moderate in the loamy overlay and very slow in the clayey substrate. They have a perched water table during the spring and early growing season. Graysville soils are non-eroded, non-stony, and occasionally slightly saline. They have a high available water holding capacity, high organic matter content, and high natural fertility. Native vegetation includes prairie grasses and willows. The majority of these soils are currently cultivated for crop production. Graysville soils occur in close association with Denham, Rignold and Edkins soils. Graysville soils were previously mapped as Black Meadow associates of the Altona, heavy substrate in the Winnipeg-Morris (1953) soil report.

The solum is approximately 30 cm thick with a very dark gray Ah horizon, 15 to 40 cm thick; and an AC horizon, 8 to 20 cm thick, moderately calcareous. The II Ck clay horizon has many distinct mottles and contains gypsum; a Cca horizon, 5 to 8 cm thick may be present.

Greenwald Series (GEW)

The Greenwald series consists of imperfectly drained Gleyed Dark Gray Chernozem soils developed on moderately to strongly calcareous coarse loamy (VFS, LVFS, SL, FSL, VFSL) sediments over moderately to strongly calcareous lacustrine clay. These soils are similar to Ladywood series except they have a clay strata occurring within 1 metre of the surface. The surface textures are variable ranging from very fine sand to clay loam. Topography is level to irregular, very gently sloping; runoff is moderately slow and permeability is moderately rapid in the upper strata and slow in the underlying clay strata. A temporary saturated condition occurs above the clay strata during the spring and following intense rains. Native vegetation consists of aspen, hazel, rose, forbs and grasses; some willow or occasional bur oak.

A thin leaf and forb layer overlying a dark gray A horizon 10 to 15 cm thick that contains light gray blotches characterizes the soil. The dark grayish brown B horizon is loamy very fine sand to fine sandy loam, fine to medium granular and may contain some translocated clay. The B horizon may also contain some carbonates, mainly as small carbonate sand grains. Weak iron mottles may be present in the solum, but are more distinct in the lower portions of the profile. The underlying light brownish gray (10 YR 6/2 dry) II Ckgj horizon is variable silty clay loam to clay.

L-H - 5 to 0 cm, dark reddish brown (5YR 3/1 moist), partially to well-decomposed leaf litter; neutral; abrupt, smooth boundary.

Ahe - 0 to 12 cm, dark gray (10YR 4/1 dry, 10YR 2/1 moist); sandy loam; very weak fine granular; very friable when moist, soft when dry, non-plastic; mildly alkaline, clear, smooth boundary.

Bm - 12 to 24 cm, dark grayish brown (10YR 4/2 dry, 10YR 4/3 moist), fine sandy loam; weak fine granular; very friable when moist, soft when dry non-plastic: mildly alkaline; weakly calcareous, mainly on sand grains: clear, smooth boundary.

BC - 24 to 36 cm, light yellowish brown (10YR 6/4 dry, 10YR 6/4 moist), loamy very fine sand, very weak fine platy; loose when moist or dry; moderately alkaline; very strongly calcareous, very fine faint mottles; abrupt smooth boundary.

II BC - 36 to 39 cm, brown to dark brown (10YR 4/3 moist), clay loam; weak fine platy, friable when moist, slightly hard when dry, plastic; moderately alkaline; very strongly calcareous; common, medium, distinct brownish yellow (10YR6/8 moist), mottles: clear smooth boundary.

II Cca - 39 to 54 cm, light gray to white (10YR 7/1 dry, 10YR 6/3 moist), variable silty clay loam and clay; moderate, medium granular; firm when moist, hard when dry, plastic; moderately alkaline, extremely calcareous; few, fine, faint yellowish brown (10YR 5/6 moist) mottles; clear smooth boundary.

II Ckgj1 - 54 to 80 cm, light brownish gray (10YR 6/2 dry, 10YR 5/4 moist), variable silty clay loam and clay; moderate, medium granular; firm when moist, hard when dry, plastic; moderately alkaline; strongly calcareous; common, medium distinct white (I0YR 8/1 moist) mottles; clear, smooth boundary.

II Ckgi2 - 80 to 100 cm, light brownish gray (10YR 6/2 dry, 10YR 5/3 moist), variable silty clay loam and clay; moderate, medium granular; firm when moist, hard when dry, plastic; moderately alkaline; strongly calcareous; common, medium, distinct white (10YR 8/1 moist) mottles.

Gregg Series (GRG)

The Gregg series consists of imperfectly drained Gleyed Eluviated Black Chernozem soils developed on fine loamy (CL, SiCL) to clayey (SiC, C) lacustrine sediments underlain by stratified loamy fine sand (LFS) to stratified fine sand (FS) deposits at depths of 1.2 to 1.8 metres. These soils occur in depressional positions in level to nearly level landscapes and have low permeability. A Btgj horizon (clay accumulation) with a thickness of up to 1 m results in slow downward movement of water. They have moderately high available water holding capacity, average organic matter and medium natural fertility. Due to landscape position, these soils will pond water during heavy summer precipitation events resulting in crop drown-outs. Native vegetation includes aspen, willow, shrubs and prairie grass. The majority of these soils are currently cultivated for grains, oilseed, and special crops.

In a representative profile the solum is approximately 100 cm thick. The profile is characterized by a very dark gray to dark gray Ap horizon 15 cm in thickness, a dark gray to gray Aegj horizon 10 to 15 cm thick, a transitional dark grayish brown AB horizon or a very dark grayish brown BA horizon 10 cm thick, a dark brown Btgj horizon 50 to 75 cm in thickness, a transitional BC horizon about 10 cm thick, and a Cgj horizon. Gregg soils occur in close association with well drained Ramada and Wellwood soils. They differ by having an imperfectly drained profile and an illuviated Btgj horizon.

Gretna Series (GRA)

The Gretna series is a Gleyed Solonetzic Black Chernozem intergrading to a Gleyed Black Solonetz, with imperfect soil drainage, and developed on weakly to moderately calcareous, fine to very fine clayey, fluvial and lacustrine sediments. They occur below the escarpment in areas that were affected by the back-beach deposits of Lake Agassiz and subsequent flooding and deposition of fine textured sediments derived from the Cretaceous shales and the associated till. The clayey strata vary in thickness from 1 to 4 m and may be underlain by stratified silty sediments. These soils occur on level to depressional areas with soluble salts that contain a

considerable proportion of sodium ion. Surface runoff is moderately slow and permeability is very slow, particularly in the B horizon with considerable sodium.

The solum has a very dark gray to black Ah horizon 10 to 15 cm thick with clay that is very sticky when wet, forms hard clods when dry and neutral to mildly alkaline in reaction; a massive very dark gray to black Bnjgj horizon, 12 to 20 cm thick with heavy clay texture; and a transitional BC horizon 5 to 15 cm thick. The massive B horizon breaks as weak subangular blocky fragments that have curved or concoidal edges when moist; it forms hard irregular blocks or clods when dry which are difficult to break. Under pasture conditions, a shallow columnar Bnjgj1, 10 to 12 cm thick is common and grades into the massive Bnjgj2. Under cultivation, this columnar structure is broken up and incorporated with the Ap. Gypsum crystals are commonly noted within and below the BC horizon. The gray to olive gray Ckgj horizon is calcareous, usually gypsiferous and has other salts.

The Gretna series occurs below the Escarpment in association with the Blumengart and Deadhorse series. It was previously the imperfectly drained, slightly alkalized Blackearth member of the Gretna Association in the South-Central (1943) report.

Grifton Series (GFT)

The Grifton series consists of well-drained Orthic Gray Luvisols developed on sandy loam textured, calcareous till. The underlying soil materials contain 30 to 40 % calcium carbonate. This compares with 40 to 60 percent calcium carbonate in the substratum of the Garson soils. Other soils in the association are imperfectly drained Gleyed Gray Luvisols and poorly drained peaty, Gleysols. The imperfectly drained soils have a thicker solum, because of a more favorable water regime, and usually have a thin Ah horizon of 1 to 5 cm in thickness.

The largest areas of Grifton soils occur on the high-land immediately north of Thunder Hill, along the south and east slopes of Porcupine and Duck Mountains and on the ridges located in Township 38, Range 24W. The topography is irregular, gently to steeply sloping and is marked by prominent wet depressions. Most of the soils are well drained, having rapid runoff and medium permeability. Native vegetation on the better-drained soils consists mainly of aspen, white spruce, birch and balsam poplar, while on the poorly drained soils tamarack, black spruce, willow and swamp birch are most common. Stoniness ranges from moderate to severe.

The dominant, well drained Orthic Gray Luvisol soil has well developed Ae and Bt horizons, but both horizons are thin. In comparison with the well drained member of the Garson soil, the well drained Grifton soil is developed on material with a lower calcium carbonate content (10 to 20 percent less), is coarser in texture and has a slightly thicker solum. The Ae horizons range from 5 to 13 cm in thickness and the Bt from 8 to 15 cm. A description of a virgin profile of the Orthic Gray Luvisol soil in the Grifton Association follows:

L-H - 5 to 0 cm, very dark brown (10YR 2/2, dry), leaf mat; neutral.

Ae - 0 to 10 cm, pale brown (10YR 6/3, dry), sandy loam; medium platy; slightly hard when dry; neutral.

Bt - 10 to 20 cm, reddish brown (5YR 4/4, dry), sandy clay loam; fine blocky; hard when dry; neutral.

BC - 20 to 36 cm, brown (7.5YR 5/4, dry), sandy loam; fine blocky; hard when dry; neutral.

Ck - 36 cm +, very pale brown (10YR 7/4, dry), sandy loam; fine pseudo-fragmental; strongly cemented when dry; moderately alkaline.

Grindstone Series (GDT)

The Grindstone series consists of poorly drained Terric Mesisol organic soils developed on shallow deposits (40 -160 cm) of moderately well to well decomposed forest peat. These soils are underlain by very stony, extremely calcareous, medium textured till within 160 cm of the surface. These soils are composed dominantly of mesic forest peat which is usually slightly acidic and layered with woody logs and debris. Feathermosses, the dominant peat former in these soils decomposes rapidly and more completely, than other materials and imparts a very dark brown to black color to the matrix. The organic portion of this soil is similar to the Okno series, but differs from the Okno due to the stony till mineral substrate rather than a fine textured lacustrine substrate.

The native vegetation consists mainly of black spruce forest with some larch; the under story is characterized by ericaceous shrubs (Labrador tea and leather leaf) and feathermosses. Sphagnum species however do occur in some very poorly drained less productive sites. A description of the Grindstone series is given below.

Of1 - 0 to 5 cm, light gray fibrous sphagnum peat (10YR 7/2 natural, 10YR 7.5/2 pressed, 10YR7/2 rubbed), fine fibered, fibrous, non-sticky when wet, abrupt wavy boundary.

Of2 - 5 to 20 cm, grayish brown (10YR 5/2 natural, 10YR 6/3 pressed, 10YR 2.5/2 rubbed), sphagnum and mixed moss; fine fibered, moderate wood content; non-sticky when wet; neutral; abrupt smooth boundary.

Om1 - 20 to 82 cm, very dark brown (10YR 2/2 natural, 10YR 4/3 and 3/2 pressed), mesic forest peat, very fine fibered, low wood content, slightly sticky when wet; medium acid; abrupt, smooth boundary.

II Ckg - 82 cm +, greenish gray (5GY 6/1 moist), sandy loam till, moderately alkaline; very strongly calcareous.

Griswold Series (GWD)

The Griswold series consists of well drained, Orthic Black Chernozem soils of the Griswold Association, developed on thin (25 to 97 cm) moderately calcareous, coarse (FS, LS, LFS) to moderately coarse (VFS, LVFS, FSL) textured lacustrine sediments overlying strongly calcareous, medium to moderately fine textured glacial till. A coarse textured, 5 to 76 cm thick, gravelly layer occurs at between the lacustrine and till materials. This soil has a sandy loam surface texture, complex, gently sloping topography, moderately good drainage, moderate permeability and little surface runoff.

This soil is generally cultivated but tends to be droughty during dry spells, due to its coarse surface texture and to the presence of the gravel layer below. Griswold soils are characterized by a black Ah horizon, 15 to 20 cm thick of which the upper 10 to 15 cm are often disturbed due to cultivation, a very dark grayish brown Bm horizon 8 to 13 cm thick. A dark gray BC horizon 5 to 8 cm thick may occur above the pale brown II Ck horizon. The II Ck horizon may range from 5 to 71 cm thick and usually overlies a pale brown to light gray glacial till (III Ck horizon) (Soils of the Boissevain - Melita Area, 1978). The Griswold series resembles the George Lake series. The only difference is the Griswold series is underlain by glacial till whereas George Lake soils are underlain by coarse gravels. A representative profile of the Griswold series is described below.

Ap - 0 to 15 cm, black (10YR 2/1 moist), very dark gray (10YR 3/1 dry) sandy loam; weak, fine granular; friable when moist, slightly hard when dry; abrupt, smooth boundary; pH 7.2.

Ah - 15 to 20 cm, black (10YR 2/1 moist), very dark gray (10YR 3/dry) sandy loam; weak, fine granular; friable when moist, slightly hard when dry; abrupt, wavy boundary; pH 7.4.

Bm - 20 to 30 cm, very dark grayish brown (10YR 3/2 moist), dark grayish brown (10YR 4/2 dry) sandy loam; weak, coarse granular breaking to weak, fine granular; friable when moist, slightly hard when dry; clear; pH 7.4.

BC - 30 to 38 cm, black (10YR 2/1 moist), dark gray (10YR 4/1 dry) coarse sandy loam; weak, fine granular; friable when moist, slightly hard when dry; abrupt, smooth boundary; weakly calcareous; pH 7.5.

II Ck - 38 to 58 cm, dark brown to brown (10YR 4/3 moist), pale brown (10YR 6/3 dry) loamy medium sand; single grained; loose when moist and dry; abrupt, smooth boundary; moderately calcareous; pH 7.9.

III Cca - 58 to 69 cm, grayish brown (2.5Y 5/2 moist), light gray (2.5Y 7/2 dry) silty clay loam till; moderate, fine granular; firm when moist; very hard when dry; abrupt, smooth boundary; extremely calcareous; pH 8.1.

III Cks - 69 cm +, pale brown (10YR 6/3 moist), light gray (10YR 7/2 dry) silty clay loam till; moderate, fine granular; firm when moist, very hard when dry; very strongly calcareous; pH 8.1.

Grossil Series (GSI)

The Grossil series consists of moderately to well drained Calcareous Black Chernozemic soils developed on a thin layer of clay textured lacustrine sediment overlying extremely calcareous loamy glacial till. The clay layer varies from 15 to 75 cm in thickness. The topography is very gently to gently sloping and runoff is moderate. Permeability is slow in the clay layer and moderately slow in the loamy glacial till. In some areas, a clayey textured till (a mixture of clay and extremely calcareous loamy till) occurs below the surface clay layer. Whenever this till is encountered the soil is referred to as a variant (GSI1) of the Grossil series. Native vegetation consists of tall prairie grasses, aspen, and bur oak.

The soil is characterized by a granular very dark gray Ahk horizon 10 to 20 cm thick and a pale brown Bm horizon 10 to 15 cm thick. The B horizon grades sharply into a moderately calcareous Ck horizon. In some cases, a thin accumulation of carbonates (Cca horizon) is present. Where the clay sediment is thin, part of the B horizon extends into the loamy till, water modified till or to a gravelly lens. In areas where the clay till (GSO1) occurs below the lacustrine clay, it is often difficult to differentiate the contact of the lacustrine clay and the clay till, except for the pockets of extremely calcareous cobbly till.

The upper clay layer is similar in properties in both the Grossil series and its variant (GSO1). However, the subsoil of the normal Grossil series has chemical and physical properties similar to that described for the parent material for the Aneda and Isafold series.

Grover Series (GRO)

The Grover series consists of imperfectly drained Gleyed Rego Black Chernozem soils developed on a mantle (25 to 75 cm) of moderately to strongly calcareous, shallow, loamy (VFSL, L, SiL), lacustrine deposits over moderately calcareous, deep, sandy (FS,LFS,LS), lacustrine deposits. These soils occur in middle positions of very gentle slopes on undulating landscapes and have moderate over moderately rapid permeability, moderately slow surface runoff, and a high water table during the growing season. Grover soils are non-eroded, non-stony, and non-saline. They have medium available water holding capacity, high organic matter content, and medium natural fertility. Native vegetation includes aspen oak, ash and tall prairie grasses. The majority of these soils are currently cultivated for crop production.

In a representative profile the solum is approximately 20 cm thick. The profile is characterized by a very dark gray to black Ah or Ahk horizon, 15 to 25 cm thick, a dark grayish brown AC horizon, 15 to 20 cm thick with faint mottles, a Cca horizon, 5 to 8 cm thick, and a light yellowish brown, sandy Ck horizon, with yellowish brown mottles. Grover soils occur in close association with Glenboro and Grayson soils. They are similar to Crookdale soils by being imperfectly drained with a sandy substrate but differ from them by having loamy rather than fine loamy surface. Grover soils were previously mapped as Black Meadow associates of the Glenboro Association in the Carberry (1957) soil report.

Guerra Series (GRR)

The Guerra series consists of poorly drained Rego Humic Gleysol soils developed on a mantle (35 to 100 cm) of moderately to strongly calcareous, uniform, fine loamy (CL, L, SiCL), lacustrine deposits over moderately to strongly calcareous, deep, uniform, fine loamy (CL, L, SiC L), mixed till deposits. These soils occur in level to depressional positions of very gentle slopes on hummocky landscapes and have slow permeability very slow surface runoff and a high water table during the growing season. Guerra soils are occasionally slightly saline. They have a medium available water holding capacity, high organic matter content, and low natural fertility. Native vegetation often includes sedges, rushes and willows. The majority of these soils are currently used for natural grazing.

In a representative profile the soil solum is approximately 25 cm thick. The profile is characterized by a black Ah or Ahk horizon, 15 to 30 cm thick, a very dark gray transitional AC horizon, 5 to 15 cm thick with many prominent iron mottles, and a dark olive gray Ck horizon with many prominent iron mottles. The parent material is relatively free of coarse fragments.

Guerra soils occur in close association with Knudson, Joyale and Ullrich soils. They are similar to Narish soils by having a Rego Humic Gleysol profile developed in mixed calcareous till but differ from Narish soils because Narish profiles are associated with Dark Gray soils while Guerra profiles are associated with Black soils. Guerra soils were previously mapped as the poorly drained blackearth associate of the Altamont association, in the reconnaissance soil survey of South-Central Manitoba (1943).

Gull Lake Series (GLK)

The Gull Lake series consists of well drained Dark Gray Luvisol soils developed on, thin (approximately 25 to 100 cm) sandy and gravelly outwash or water worked, moderately to strongly calcareous deposits overlying extremely calcareous, stony, compact loamy glacial till. The surface textures vary from loamy sand to gravel. The topography is irregular, very gently to gently sloping; surface runoff is moderate and permeability is rapid in the upper deposits and moderate to moderately slow in the underlying till material. Vegetation consists of bur oak, grasses, herbs, hazelnut, and some aspen.

The Gull Lake series is characterized by a 7 to 12 cm dark gray Ap horizon, with a 5 to 15 cm pale brown Ae horizon, and a 8 to 15 cm light brown Bt horizon which usually extends to a layer which contains coarser fragments. A transitional BC horizon may be present above the pale brown glacial till II Ck horizon. The structure of the till varies from weak fine granular-like to somewhat platy-like or angular blocky-like and the till is compact because of the high carbonate content.

Gunton Series (GUO)

The Gunton series consists of well to moderately well drained Orthic Dark Gray Chernozem soils developed on thin sandy and gravelly outwash or water-worked, moderately to strongly calcareous deposits overlying extremely calcareous stony glacial till. The profile is similar to the Leary series with a surface texture ranging from loamy fine sand to fine sandy loam; the thickness of the sandy to coarse loamy upper layer is 15 to 40 cm and changes abruptly to stratified gravelly and sandy deposits which vary in thickness from 10 to 60 cm. The topography is irregular, very gently to gently sloping; surface runoff is moderate to moderately slow in underlying sediments. Vegetation consists of bur oak, grasses, herbs, hazel, and some aspen.

The Gunton, clay till variant, GUO1, differs from the modal Gunton by having a clay texture in the underlying parent material. This till is less stony and generally less compact than the normal extremely calcareous till.

The Gunton series is characterized by a thin partially decomposed leaf mat derived from deciduous and grass vegetation, a dark gray Ah or Ahe horizon of variable thickness depending on the uniformity of the sandy to coarse loamy layer, and a brown to dark yellowish brown Bm or Bt horizon which usually terminates at a layer which contains coarser fragments. The underlying loamy glacial till is pale brown and varies in structure from weak fine granular to somewhat platy or fissile.

L-H - 4 to 0 cm, dark grayish brown (10YR4/2 dry) leaf mat and twigs in the surface and moderately decomposed above the mineral soil; neutral; abrupt, smooth boundary.

Ahe - 0 to 3 cm, dark grayish brown (10YR 4/2 dry) sandy loam; very weak, fine to very fine granular; loose; non-plastic; neutral; non-calcareous; abrupt, smooth boundary.

Ae - 3 to 6 cm, brown (10YR 5/3 dry) loamy sand; single grained; loose; non-plastic; neutral; non-calcareous; clear smooth boundary.

Bt - 6 to 16 cm, dark brown (7.5YR 3/2 dry) gravelly sandy loam; moderate, medium sub-angular blocky; slightly hard when dry; slightly plastic; neutral; contains sand and pebbles grains of carbonate mineral; abrupt, smooth boundary.

Ck1 - 16 to 46 cm, light yellowish brown (10YR 6/4 dry) gravelly sand; single grained; loose; non-plastic; mildly alkaline; very strongly calcareous; abrupt, smooth boundary.

II Ck1 - 46 to 100 cm, pale brown (10YR 6/3 dry) loam; moderate, fine platy; hard when dry; plastic; mildly alkaline; extremely calcareous.

Guy Hill Series (GYL)

The Guy Hill complex is composed of poorly to very poorly drained organic soils developed on 0 to 65 cm of fibric Sphagnum moss peat overlying dominantly mesic forest peat. Strongly calcareous sandy sediments, within 160 cm of the surface underlie these soils. These underlying sandy sediments are mildly to moderately alkaline, and stone free. Areas of Guy Hill soils have level to depressional topography. Native vegetation consists of dominantly stunted black spruce and tamarack with an understory of dominantly Sphagnum mosses, sedges and ericaceous shrubs.

The Guy Hill series, a Terric Mesisol, sphagnic phase with a significant layer of 15 to 65 cm of fibric Sphagnum moss peat at the surface, is the dominant member of this complex. Other minor but significant members of the Guy Hill complex are the Catfish Point series, a Terric Mesic Fibrisol; and the Pigeon Point series, a Terric Mesisol with a thinner (0 to 15 cm) overlay of fibric Sphagnum moss, is also commonly associated with the Guy Hill complex. This is due to the hummocky nature of the discontinuous fibric Sphagnum moss overlying the mesic forest peat. These organic soils correspond very closely to the Orok and Lamb Lake complexes, differing from them only in the nature of the mineral substrate. Soils of the Guy Hill complex occur predominantly of the Pas Moraine, in association with soils of the Lamb Lake complex and the Easterville series, peaty phase.

Hadashville Series (HHV)

The Hadashville series consists of imperfectly drained Gleyed Dark Gray Luvisol soils developed on moderately to strongly calcareous, stratified, medium to moderately coarse textured (VFSL, L, SiL to VFS, LVFS, FSL), alluvial and lacustrine deposits. These deposits may be underlain by clay or strongly calcareous glacial till substrates. This soil type occurs in narrow strips along the Whitemouth, and Birch Rivers. Topography is level to irregular, very gently sloping. Surface runoff is slow and internal drainage is medium to moderately rapid but may be impeded by a high water-table. Native vegetation consists of aspen, balsam poplar, white spruce, elm and ash. In open stands dense shrub, herb and grass layers are found. The soils are free of stones except for scattered surface stones in areas where the underlying glacial till is close to the surface.

The Hadashville soils are characterized by a thin, very dark brown slightly acid leaf mat overlying light grayish brown Aeg horizon neutral in reaction. The dark grayish brown Btg horizon has a slight clay accumulation and is slightly acid to neutral in reaction. Occasional flooding by lime-charged water causes these soils in some areas to be mildly alkaline and calcareous to the surface. The Hadashville clay variant, HHVc, is areas of the Hadashville soils in which a deposit of weakly to moderately calcareous lacustrine clay occurs within 75 cm of the surface.

Halcrow Series (HCW)

The Halcrow series are very poorly drained Terric Mesisol, sphagnic phase soils developed on 15 to 65 cm of fibric Sphagnum moss peat overlying dominantly mesic fen peat. These soils are underlain by extremely calcareous, loamy, moderately stony till. A till contact occurs within 160 cm of the surface. The topography of these organic soil areas varies from depressional to level. Dominant vegetation consists of scattered thin stands of tamarack and some stunted black spruce with an understory of Sphagnum mosses, sedges and ericaceous shrubs. The Halcrow soil profile closely resembles that the Howell differing from it only in the nature of the mineral substrate. The Halcrow series occurs throughout the map area, often in association with soils of the Crane and Katimik series.

Halicz Series (HCZ)

The Halicz series consists of imperfectly drained Gleyed Rego Black Chernozem soils developed on thin, moderately to strongly calcareous, fine textured (SiC, C), lacustrine sediments, underlain by sand within 100 cm of the surface. They occur on level to very gently sloping terrain characterized by slow runoff. Permeability is very slow in the upper materials but increases in the underlying sandy substrate. Internal drainage of the Halicz soils is thus slightly better than is found in the deeper clay deposits of the associated Dauphin soils. Native vegetation was mainly tall prairie and meadow prairie grass associations with occasional bluffs of aspen and willow. Most of these soils are presently cultivated.

The Halicz soils are similar in profile characteristics to the Dauphin soils, but differ from them in having a coarse textured substrate rather than deep uniform clay deposits. The upper profile is characterized by a very dark gray to black, medium granular A horizon, a thin gray AC transitional horizon that has massive to medium granular structure and a moderately calcareous and a grayish brown, iron stained calcareous C horizon. Tongues of dark colored clay often extend irregularly into the lighter colored AC and C horizons.

Hallboro Series (HAL)

The Hallboro series is an Orthic Black Chernozem soil developed on moderately well to well drained, weakly to moderately calcareous, coarse (FS, LFS, LS), lacustrine sediments underlain by moderately calcareous, moderately fine (CL, SiCL) textured lacustrine deposits. These soils occur in the Upper Assiniboine Delta on level to gently sloping topography in association with Stockton and Shilox soils. Surface runoff is low, and permeability is rapid in the fine sand to loamy fine sand sediments and moderately slow in the clay loam to silty clay loam subsoil. Wind erosion is common if the soil is not protected with adequate surface residue.

The Hallboro soil profile has a very dark gray to very dark grayish brown Ah, 18 to 25 cm thick; a brown to grayish brown Bm horizon, 12 to 22 cm thick; a pale brown to light yellowish brown BC horizon, 10 to 20 cm thick. The BC horizon is underlain by loam to clay loam II Ahb and II Bm and a yellowish brown to pale brown, clay loam to silty clay loam, II Ckgj horizon.

The SCK1 variant (mapped in previous areas) has a clay loam to silty clay loam substrate and is currently described as the Hallboro series.

Halstead Series (HAT)

The Halstead series consists of well to moderately well drained Orthic Dark Gray Chernozem soils developed on weakly calcareous, deep, stratified, coarse loamy and coarse silty (FSL, VFS, LVFS, VFSL, L, SiL), lacustrine deposits. These soils occur in upper positions of very gentle to gentle slopes on hummocky landscapes and have moderate to moderately rapid permeability, moderate to rapid surface runoff, and a low water table during the growing season. Halstead soils are frequently moderately eroded, non-stony, and non-saline. They have a medium available water holding capacity, medium organic matter content, and high natural fertility. Native vegetation includes aspen, scrub oak, shrubs and prairie grasses. The majority of these soils are currently cultivated for crop production.

In a representative profile the solum is approximately 50 cm thick. The profile is characterized by a very dark gray Ah or Ap horizon, 20 to 30 cm thick, a weakly developed brown Bm horizon, 15 to 25 cm thick, a prominent brown Bt horizon, 5 to 10 cm thick and a brown Ck or Ckgj horizon. A typical profile also contains thin layers of SiCL and SiL textures.

Halstead soils occur in close association with Bone and Poolex soils. They are similar to Firdale soils by having an Orthic Dark Gray Chernozem profile but differ from them in having coarse loamy rather than fine loamy deposits. Halstead soils were previously mapped as coarser associates of the Firdale Association in the Carberry (1957) soil report.

Hamiota Series (HMI)

The Hamiota series is characterized by an Orthic Humic Gleysol solum, developed on moderately to strongly calcareous, loamy (L-CL) morainal till of limestone, granitic and shale rock origin. They are poorly to very poorly drained and occur in depressional positions of the undulating to hummocky morainal landscape. Surface runoff is negligible and the soils may remain in a ponded condition unless the surface drainage had been improved. Permeability is moderately slow to slow. In some landscapes, these areas are influenced by seepage from adjacent higher lands, and may have a considerable content of soluble salts. Native vegetation consists of sedges, cattails, rushes and willows.

The Hamiota series differs from the closely related Drokan soil series in being more developed (presence of B horizon) and is less leached than the Penrith series.

Hansen Creek Series (HEK)

The Hansen Creek series consists of imperfectly drained Gleyed Cumulic Regosol soils developed on thin deposits of weakly to moderately calcareous, medium textured (VFSL, L, SiL), alluvium underlain by extremely calcareous medium textured, stony till within l00 cm of the surface. Surface textures are usually loam to silt loam and the soils are stratified with layers ranging from sand to clay in texture. Dark colored organic layers occur throughout the upper alluvial deposits and the contact with the underlying till substrate is often marked by a gravelly lens or cobbly layer. These immature soils are of minor extent occurring mainly near outcroppings of till moraine within the Dauphin Lake Plain. Native vegetation on the Hansen Creek soils is dominantly hardwood forest comprised of aspen, elm, ash, maple and associated low shrubs and herbs. Most of the Hansen Creek soils have been cleared for cultivation.

Soil profile development on these alluvial sediments is restricted to a thin, weakly expressed Ah horizon that grades sharply into the stratified parent material. The Hansen Creek soils are very similar to the Turtle River soils differing mainly in the presence of the stony till substrate. The Hansen Creek soils may include minor amounts of the Turtle River soils where the underlying till substrate occurs at depths beyond 1 metre.

Harding Series (HRG)

The Harding series consists of imperfectly drained Gleyed Black Chernozem soils developed on moderately to strongly calcareous, silty clay to clay lacustrine deposits. These soils occur on level to very gently sloping topography. Runoff is slow; permeability is moderately slow to slow. Most of these soils occur within a discharge region characterized by an upward pressure of groundwater or a lateral flow of water through the underlying very strongly calcareous till which may occur at a depth of one to two metres. Appreciable soluble salts may be present within the rooting zone and gypsum crystals are common.

The soil is characterized by a very dark gray Ah horizon 12 to 22 cm thick, a dark grayish brown, prismatic to subangular blocky Bmgj horizon, 15 to 20 cm thick with fine yellowish brown mottles; a lime accumulation horizon (Cca) is common. Salt pseudomycelium and gypsum concretions are common in the olive brown to olive Ckgj horizon.

Hargrave Complex (HGX) or (HGR)

The Hargrave Complex consists of very poorly drained Typic Mesisol soils developed on extremely acidic, sphagnum peat overlying extremely acidic moderately decomposed forest peat. These soils occur in former glacial drainage channels and depressions in the bedrock, primarily in the eastern half of the study area. They have moderate permeability and a very high (0.2 m) water table. The native vegetation often comprises black spruce, tamarack, Chamaedaphne Chalcyculata (leatherleaf), willow, Labrador Tea, ericaceous shrubs, short white spruce, swamp birch, and grasses with minor occurrences of Equisetum (horsetail), and alder.

In a representative profile the peat is generally 165 to 410 cm thick. The profile is characterized by an Of (20 to 70 cm thick) horizon overlying an Om (130 to 280 cm thick) middle tier on an Oh (20 to 70 cm thick) bottom tier. The organic parent material is typically fibric over mesic and then humic with clay textures dominating the mineral substrate. Hargrave soils occur primarily in channels and depressions in the bedrock predominantly. They are similar to Atik soils in materials and composition, but differ from Atik soils because of the deeper layer of peat overlying clay (>160 cm). Hargrave soils correlate with the Hargrave Complexes previously published in the Cormorant Lake interim soil report.

Harlington Series (HGT)

The Harlington series consists of moderately well drained, Orthic Dark Gray Chernozem soils developed on moderately calcareous, fine textured, lacustrine sediments underlain by strongly calcareous till at variable depth. This till substrate is within 75 cm of the surface in most of the areas of Harlington soils in the Swan River map area.

The Harlington soils occur mainly in the Kenville plain. The terrain is very gently sloping, although some prominent ravines dissect a few of the areas. Runoff is medium and permeability is moderate. No native vegetation remains; it is assumed that aspen and white spruce predominated prior to settlement. A few stones occur on the surface of the till substrate phase.

Soils with more than 75 cm of fine textured material have a solum thickness of 36 to 46 cm. Soils with a till substrate between 15 to 75 cm from the surface are thinner particularly those with a clay covering less than 46 cm thick. In soils with more than 30 cm of clay, the B horizon usually extends into the till substrate. The A horizon in these soils is representative for the Dark Gray Chernozem types found elsewhere. The A horizon shows evidence of leaching but is sufficiently dark in color and high in organic matter to be classed with Chemozemic soils. The Ahe horizon is very dark gray to dark gray in color, 15 to 25 cm in thickness and slightly acid in reaction. The Bt horizon is dark grayish brown, blocky and neutral in reaction. The BC is a transitional horizon and extends into the till in soils with a thin clay mantle. The underlying till is moderately calcareous and clay loam in texture.

Areas mapped as the Harlington series include small areas of Peguis and Kenville soils. Harlington till substrate phase, map units contain areas of Peguis till substrate, Kenville till substrate and Plainview soils. A description of a Harlington clay, till substrate phase, is provided.

L-H - 5 to 0 cm, very dark brown (10YR 2/2, dry), leaf mat; slightly acid.

Ahe - 0 to 18 cm, very dark gray (10YR 3/1, dry) to dark gray (10YR 4/1 dry), clay; medium granular; hard when dry; slightly acid.

Bt - 18 to 25 cm, very dark grayish brown (10YR 3/2,dry), clay; fine blocky; very hard when dry; neutral.

II BC - 25 to 33 cm, grayish brown (10Y 5/2, dry); clay loam till; fine pseudo-fragmental; hard when dry; mildly alkaline; moderately calcareous.

IICk - 33 cm +, very pale brown (10YR 7/3, dry), clay loam till; fine pseudo-fragmental; moderately calcareous; iron stained; moderately alkaline.

Hartley Series (HLY)

The Hartley series consists of well drained, Orthic Black Chernozem soils of the Hartley Association, developed on thin (25 to 97 cm), strongly calcareous, moderately fine textured (SCL, CL, SiCL), lacustrine sediments overlying strongly calcareous, medium to moderately fine textured till. A coarse textured gravel layer (5 to 76 cm thick) occurs at the contact. The soil has a silty clay loam to clay loam surface texture, gently undulating topography, moderately low permeability, and rapid surface runoff. The soil is moderately well drained, non-saline and cultivated (Soils of the Boissevain - Melita Area, 1978).

Hartney Series (HRY)

The Hartney series consists of the imperfectly drained, Gleyed Rego Black Chernozem carbonated member of the Cameron Association developed on deep, strongly calcareous, loamy lacustrine sediments. This soil has level to very gently sloping complex topography, moderate permeability, slow surface runoff and a loam surface texture. The estimated depth to water table is less than 2 m during the growing season. This soil is used for crop production.

Hartney soils are characterized by black Apk horizons 10 to 12 cm thick, dark gray AC horizons 5 to 7 cm thick, light olive gray Cca horizons 7 to 10 cm thick overlying a pale olive to pale yellow Ckgj, horizon.

Harwill Series (HWI)

The Harwill series consists of moderately well drained Orthic Dark Gray Chernozem soils developed on strongly to very strongly calcareous dominantly moderately fine textured (SCL, CL, SiCL) sediments. These sediments are variable in thickness and often have a stratum of fine textured lacustrine clay overlying extremely calcareous loamy glacial till. The surface texture ranges from sandy loam to clay loam. The topography is smooth to gently sloping. Runoff is moderate and permeability is moderate to moderately slow in the dominantly moderately fine textured strata and moderately slow to slow in the underlying clay strata and glacial till. Native vegetation is dominantly aspen, white spruce and balsam poplar. These soils are non stony.

The soil is characterized by a dark gray to gray granular to fine platy Ahe horizon 10 to 18 cm thick, and a dark grayish brown Bm or Bt horizon 8 to 12 cm thick. Some carbonates are present as undissolved sand grains. The reaction is neutral. A description of the Harwill soil is given below.

Ap - 0 to 12 cm, very dark grayish brown (10YR 3/2 dry, 10YR 3.5/1 moist) sandy clay loam, weak, fine granular; very friable when moist, soft when dry; slightly plastic; neutral; non-calcareous; abrupt, smooth boundary.

Ahe - 12 to l8 cm, gray (10YR 5/1 dry, 10YR 4.5/2 moist) sandy clay loam; weak to moderate fine platy; very friable when moist; soft when dry; slightly plastic; mildly alkaline; non-calcareous except for a few sand grains; clear, smooth boundary.

Bt - 18 to 30 cm, dark grayish brown (10YR 4/2 dry, 10YR 3/2 moist) sandy clay; weak, moderate prismatic to moderate, medium blocky; firm when moist; slightly hard when dry; plastic; neutral; non-calcareous except for few sand grains in interior of peds; clear, smooth boundary.

BC - 30 to 38 cm, grayish brown (10YR 5/2 dry, 10YR4/2 moist) variable sandy clay loam to clay loam; moderate, medium granular; friable when moist; slightly hard when dry; slightly plastic; mildly alkaline; strongly calcareous; clear, smooth boundary.

II Ck1 - 38 to 60 cm, light brownish gray (2.5Y 6/2 dry, 10YR 4/3 moist) clay; moderate, medium granular; firm when moist; hard when dry; plastic; moderately alkaline; moderately calcareous; common, medium prominent white (10YR 8/2 moist) mottles; clear, smooth boundary.

Hat Lake Series (HTK)

The Hat Lake series consists of Gleyed Eluviated Dystric Brunisol soils developed on deep (> 100 cm), moderately acidic to neutral, coarse loamy to sandy, morainal (till) deposits. These soils occur on the lower slope positions of gently to moderately sloping blanket landscapes and filled-in hollows on bedrock terrain. These soils have rapid to moderate permeability, very slow surface runoff and a low water table during the growing season. The soils are non-eroded, slightly to very stony. They have low water holding capacity and low organic matter content. Native vegetation includes black spruce, trembling aspen and jack pine stands with alder in the understory and a ground cover of feathermosses, ericaceous shrubs like blueberry, rock cranberry and twinflower and herbs like bunchberry. The majority of these soils are currently under forest cover. Hat Lake soils occur in close association with Wolverton and Fay Lake soils.

A representative profile is approximately 35 cm thick. The profile is characterized by a very strongly acidic, LFH horizon of slightly to moderately decomposed leaves, moss and needles, 6 to 8 cm thick; a very strongly acidic, loamy sand Ae horizon, 5 to 7 cm, with coarse fragments; a very strongly acidic, sandy loam or loamy sand Bm horizon, 15 to 25 cm thick, with coarse fragments; a strongly acidic, loamy sand BC horizon, 10 to 20 cm thick, with coarse fragments and a strongly acidic, loamy sand Cgj horizon with faint mottles.

Hathaway Series (HHY)

The Hathaway series consists of well drained Rego Black Chernozem soils of the Ryerson Association, developed on deep, strongly calcareous, medium to moderately fine textured glacial till. The till is composed mainly of mixed materials derived from shale, limestone and granitic rocks. The surface horizons are usually very thin as a result of erosion by wind, water and cultivation. These soils have a loam to clay loam surface texture, gently undulating topography, moderate permeability and rapid surface runoff. Hathaway soils usually occur in the upper slope and knoll positions, and usually have a lighter gray surface color than adjacent, deeper soils. The light color is due to carbonates. Depth to water table ranges from 2 to 3 metres. These soils are usually strongly calcareous and low in organic matter. This soil is characterized by a gray non-leached Apk horizon 10 to 20 cm thick, a dark gray to gray AC horizon 20 to 50 cm thick overlying a light yellowish brown Ck horizon. Morphological data for a representative profile are presented below.

Apk - 0 to 20 cm, black (10YR 2/1, moist), gray (10YR 5/1, dry), loam; weak, fine, subangular blocky, very friable; clear smooth boundary; strongly calcareous; pH 7.8.

AC - 20 to 50 cm, dark gray (10YR 4/1, moist), gray (10YR 5/1, dry), loam; weak, fine subangular blocky, very friable; clear irregular boundary; strongly calcareous; pH 8.2.

Ck - 50 to 76 cm, yellowish brown to light yellowish brown (10YR 5.5/4, moist), light yellowish brown (10YR 6/4, dry), loam; weak fine subangular blocky, very friable; clear smooth boundary; strongly calcareous; pH 8.1.

Ckgj1 - 76 to 100 cm, dark yellowish brown to yellowish brown (10YR 7/4, dry), loam; weak fine subangular blocky, very friable; clear smooth boundary; strongly calcareous; pH 7.9.

Ckgj2 - 100 to 160 cm, dark yellowish brown to yellowish brown (10YR 4.5/4, moist), pale brown (10YR 6/3, dry), loam; weak medium subangular blocky, friable; strongly calcareous; common, medium prominent, dark red (10YR 3/6), iron concretions; pH 7.8.

Haute Series (HAU)

The Haute series consists of very poorly drained Terric Humisol soils developed on shallow, woody organic humic to mesic forest peat grading to humic fen peat underlain by loamy to clayey sediments. These soils occur on depressional areas of level organic deposits and have moderate permeability, very slow surface runoff and a very high water table during the growing season. Haute soils have high available water holding capacity, high organic matter levels, and medium natural fertility. The native vegetation often comprises tamarack with high shrubs such as willow and alder and ground cover of aquatic mosses feathermoss and sedge. The majority of these soils currently exist in the native state and are used for wild life habitat.

In a representative profile the solum is generally about 140 cm thick. The profile is characterized by 25 cm of mesic to humic woody forest peat overlying a humic sedge peat horizon, and strongly mottled, dark olive gray to gray, loam to clay textured calcareous Ckg horizon.

Haute soils occur in close association with Novra soils. They are similar to Novra soils by having very poor drainage, but differ from Novra soils because of deeper (in excess of 40 cm) peat layers. Haute soils correlate with the more highly decomposed members of the shallow peat soils previously published in the Swan River soil report.

Hayfield Series (HYF)

The Hayfield series consists of imperfectly drained, Gleyed Eluviated Black Chernozem soils of the Cameron Association, developed on deep, strongly calcareous, medium textured lacustrine sediments. This soil commonly has a fine sandy loam surface texture, gently undulating topography, moderate permeability and slow surface runoff. These soils are very susceptible to surface flooding and ponding. The estimated depth to water level during the growing season is less than 2.1 metres. These soils are saturated in the spring and after heavy rains in the summer; as a result crop yields may be low. The fact that they dry readily facilitates management in that machinery is able to cross them in dry periods.

The Hayfield series resemble the Glenlorne series of the Waskada Association. The only difference is the Glenlorne series is underlain by glacial till.

Hazeldean Series (HZD)

The Hazeldean series is the imperfectly drained, Gleyed Eluviated Black Chernozem member of the Ryerson Association, developed on deep, strongly calcareous, medium to moderately fine textured glacial till composed of mixed materials derived from shale, limestone and granitic rocks. These soils are generally located in elevated, depressional positions with very gently sloping topography, moderate permeability and very little surface runoff. The dominant surface texture is clay loam. Surface water frequently ponds on these soils for short periods of time. The depth of water table ranges from ground surface in the spring to 3 m in January with an average of 1.5 m during the growing season. These soils contribute the major portion of the ponded surface waters to the groundwater zone. Transmittance of this water through the profile leaches the soluble salts, carbonates and some clay minerals, resulting in the development of the Ae and Bt horizons.

The profiles of these soils consists of thick black Ah or Ap horizons 10 to 36 cm thick overlying a strongly developed, weakly stained, platy structured Aegj horizon 15 to 18 cm thick. The underlying dark gray Btgj horizon is 41 to 61 cm thick, weakly stained with prominent iron mottles and has a strong coarse subangular blocky structure. The parent material is dark yellowish brown, weakly stained and weakly calcareous. Hazeldean soils are commonly developed in sediments laid down in shallow depressions in glacial deposits. However, these sediments are not as deep as those in wetter depressions characterized by Tilston soils. Many Hazeldean soils are cultivated but in the undisturbed sites the native vegetation consists primarily of mesophytic perennials such as the common horsetail, Equissetum arvense L. Because the surface of these soils is generally dry during periods of low rainfall much of the native vegetation is destroyed by cultivation. Cultivated crops can occasionally be grown but generally do not yield well. Hazeldean soils occur in close association with Regent and Coatstone soils. A description of a representative profile is presented below.

Ap - 0 to 28 cm, black (10YR 2/1, moist), dark gray (10YR 4/1, dry), silt loam; loose, moist; abrupt smooth boundary; non calcareous; pH 7.5.

Aegj - 28 to 38 cm, grayish brown (10YR 5/2, moist), light brownish gray (10YR 6/2, dry), silt loam; moderate medium platy, very friable; abrupt smooth boundary; non-calcareous; pH 7.1.

Btgj 1 - 38 to 46 cm, dark grayish brown (10YR 4/2, moist), gray (10YR 5/1, dry), silty clay loam; weak medium platy, friable; clear wavy boundary; non calcareous; pH 6.8.

Btgj 2 - 46 to 53 cm, black (10YR 2/1, moist), dark gray to gray (10YR 4.5/1, dry), silty clay loam; moderate medium prismatic, firm; clear wavy boundary; non calcareous; pH 6.7.

Btgj 3 - 53 to 86 cm, dark grayish brown (10YR 4/2, moist), light brownish gray (10YR 6/2, dry), clay loam; moderate medium prismatic, firm; clear wavy boundary; weakly calcareous; pH 7.2.

BC - 86 to 107 cm, pale brown (10YR 6/3, moist), very pale brown (10YR 7/3, dry), loam; moderate medium prismatic to medium blocky, friable; distinct wavy boundary; strongly calcareous; pH 7.7.

Ckg - 107 to 160 cm, light brownish gray (2.5Y 6/2, moist), very pale brown (10YR 7/3, dry), loam; coarse subangular, blocky, friable; strongly calcareous; few, fine, distinct mottles; pH 7.7.

Heatley Series (HAY)

The Heatley series consists of imperfectly drained Gleyed Cumulic Regosol soils developed on moderately to strongly calcareous, shallow (< 1 m), stratified fine loamy to coarse loamy fluvial (alluvial) deposits overlying gravelly fluvial deposits. These soils occur on mid to lower positions undulating landscapes, and have moderate permeability, moderate surface runoff and a medium water table during the growing season. Heatley soils have medium available water holding capacity, low organic matter levels, and medium natural fertility. The native vegetation often consists of mixed hardwood forest of balsam poplar with some elm, ash and maple. The majority of these soils are currently used for cropland.

In a representative profile the solum is generally about 20 cm thick corresponding to the depth of cultivation. The profile is characterized by a thin, grayish brown, weakly calcareous, loam textured A horizon overlying a stratified very fine sand to loam Ckgj horizon banded with dark colored layers representing former surface horizons buried by deposits of more recent alluvium. The parent material is typically weakly mottled and moderately calcareous.

Heatley soils occur in close association with Homestead soils and have a similar texture in the upper 20 to 80 cm, but differ from Homestead soils because of the underlying coarse textured gravelly substrate.

Hebbot Series (HEB)

The Hebbot series consists of well drained Rego Black Chernozem soils developed on strongly to very strongly calcareous, deep, uniform, loamy (L, CL, SiCL), glacial till deposits derived from limestone, granite and shale. These soils occur in upper and crest positions of moderate to strong slopes on hummocky landscapes and have moderate to moderately rapid permeability, moderate surface runoff, and a low water table during the growing season. Hebbot soils are severely water eroded, slightly stony, and non-saline. They have a medium available water holding capacity, low organic matter content, and medium natural fertility. Native vegetation includes scrub oak, aspen, shrubs and prairie grasses. The majority of these soils are currently cultivated for crop and forage production.

In a representative profile of Hebbot soil the solum is eroded. The profile is characterized by a dark gray to very dark gray Ah horizon, 10 to 15 cm thick, a brown to pale brown Cca horizon, 10 to 15 cm thick, and a yellowish brown Ck horizon.

Hebbot soils occur in close association with Darlingford, Nikkel and Cazlake soils. They are similar to Darlingford soils by having a well drained profile but differ from them by having no Bm horizon. Hebbot soils were previously mapped as Calcareous Black Chernozem associates of the Darlingford Association in the South Central (1943) soil report.

Hecla Soils (HCL)

The Hecla Association includes soils that are developed on the eroded terrace of glacial Lake Agassiz on the north side of the Tiger Hills. The eroded lake terrace is composed of shale and shale-clay from which much of the rock flour and the till has been removed, leaving stones and till residue on the wave-cut terrace. Shallow lacustrine sediments may occur intermixed with the residues of the boulder till. The dominant texture is clay loam to clay, and stones may be frequent and sometimes large. The typical profile is a well drained, Orthic Black Chernozem developed in loam to clay deposits.

Heron Creek Series (HEC)

The Heron Creek series consists of poorly drained Rego Humic Gleysol soils developed on deep (>100 cm) moderately to strongly calcareous, coarse textured (FS, LCoS, LFS), gravelly deltaic beach or outwash deposits. These soils occur in depressions of level to nearly level landscapes and have high permeability, moderately slow surface runoff and a high water table during the growing season. Heron Creek soils associated with creek or stream channels are susceptible to water erosion by stream flow if the soil surface is disturbed. Many of these soils are moderately stony and all are non-saline. Heron Creek soils have low available water holding capacity, and medium organic matter content. Native vegetation often includes reeds, sedges, cattails and willow. The majority of these soils are currently used for natural grazing and woodland.

In a representative profile the solum is approximately 25 cm thick. The profile is characterized by a black, strongly calcareous, sandy loam Ahk horizon, 20 to 40 cm thick, overlying a strongly mottled, strongly calcareous, coarse gravelly Ckg horizon, a thin transitional AC horizon is common between the A and C horizons. The parent material is typically stratified, and of fluvial origin. A typical profile generally contains stones and cobbles.

Heron Creek soils occur in close association with Sinnot and Seech soils. They are similar in texture to Seech soils but differ significantly due to their poorer drainage. They differ from Sinnot soils because of their coarse textured parent material. Heron Creek soils were not previously differentiated. They were considered as inclusions of Seech and Zaparosa soil associations, and some

were included in the Peat and Half Bog map units in the reconnaissance survey of soils in the Rossburn and Virden map sheet areas.

Hibsin Series (HIN)

The Hibsin series consists of moderately well drained Orthic Black Chernozem soils developed on a mantle (40 to 90 cm) of weakly to moderately calcareous, shallow, coarse loamy to sandy (LVFS VFS, FSL, FS, LFS), lacustrine deposits over moderately calcareous, uniform, deep, clayey (SiC, C), lacustrine deposits. These soils occur in upper positions of very gentle slopes on undulating landscapes and have moderately rapid over slow permeability, moderate surface runoff, and a low water table during the growing season. Hibsin soils are non-eroded, non-stony, and non-saline. They have a medium available water holding capacity, high organic matter content, and medium natural fertility. Native vegetation includes aspen, oak, shrubs and prairie grasses. The majority of these soils are currently cultivated for crop production.

In a representative profile the solum is approximately 40 cm thick. The profile is characterized by a very dark gray to dark gray Ah horizon, 15 to 25 cm thick, a brown Bm horizon, 20 to 30 cm thick, a Cca horizon, 8 to 13 cm thick and a Ck horizon. The profile is usually developed entirely in the coarser material. Hibsin soils occur in close association with Rosebank and Layland soils. They are similar to Hochfeld soils by having an Orthic Black profile in coarse loamy deposits but differ by having a clayey substrate. Hibsin soils were previously mapped as associates of the Altona (light) Association in the Winnipeg-Morris (1953) soil report.

Hickson Series (HKS)

The Hickson series consists of poorly drained carbonated Rego Humic Gleysol soils developed on a thin mantle (50 to 75 cm) of very strongly to extremely calcareous loamy (L, SiL, SiCL, CL) glacial till of limestone and granitic origin overlying strongly calcareous loam to clay loam glacial till of shale, limestone, and granitic origin. They occur in level to depressional (pothole) topography and are subject to ponding and prolonged saturation. Runoff is negligible, and permeability is very slow. Soluble salts may occur in the soil in areas of seepage or upward movement of groundwater containing appreciable soluble salts toward the surface.

The soil is characterized by a moderately decomposed organic layer 2 to 5 cm thick, a very dark gray, carbonated Ah horizon, and a thin gray to olive gray AC horizon with mottles. The Ckg horizon is pale olive and may contain yellowish brown mottles.

High Bluff Series (HFF)

The High Bluff series is a Gleyed Cumulic Regosol developed on imperfectly drained, weakly to moderately calcareous, clayey (SiC, C), recent alluvial deposits. These soils occur in smooth, level terrain adjacent to the Assiniboine, Elm, La Salle and Boyne Rivers associated with Fortier soils. Surface runoff is slow. Permeability is slow and groundwater level is near the surface in spring. Native vegetation consists of dominantly tall prairie to prairie-meadow grasses with some deciduous trees.

The High Bluff soil profile has little or no Ah horizon development, and a C horizon with fine, faint to distinct mottles. These soils are similar in texture and taxonomy to the Fortier series but differ in the degree of development of the surface horizon. Fortier soils have a weak dark gray to gray Ah horizon that is darker than the underlying horizon.

Hilbre Series (HIB)

The Hilbre series consists of well drained Degraded Eutric Brunisol soils developed on 50 to l00 cm of extremely calcareous, medium textured stony till over limestone bedrock. Surface textures vary from loam to clay loam; the surface of these soils is often severely water-worked and very bouldery. Topography of the Hilbre soils is gently undulating to undulating. Runoff is moderate and permeability is medium in the upper till deposits but impeded by the underlying bedrock. Vegetation is aspen, jack pine and white spruce.

The solum of the Hilbre soils is generally less than 20 cm, characterized by a thin light colored Ae horizon (3 to l0 cm) overlying a thin weakly developed B horizon. The Hilbre soils correlate with Fairford rock substrate phase soils in previously published soil survey reports. They are similar to the Fairford soils, differing from them in that the limestone bedrock occurs between 50 and l00 cm of the surface. The Hilbre soils occur in portions of the Interlake Plain near the Lake Winnipegosis shoreline. They are mapped in complex areas with the Faulkner soils and outcroppings of limestone bedrock. Minor amounts of normal Fairford and Inwood soils may occur in Hilbre mapping units. Hilbre soils are significantly stonier than the associated Fairford soils.

Hilton Series (HIT)

The Hilton series consists of well drained Orthic Black Chernozem soils developed on strongly to extremely calcareous, thin, uniform, fine loamy (L, CL, SiCL) glacial till of limestone, shale and granite origin. These soils occur in upper slope positions of moderate slopes on hummocky landscapes and have moderate permeability rapid surface runoff and a low water table during the growing season. Hilton soils are moderately eroded, moderately stony and non-saline. They have medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes tall prairie grasses interspersed with aspen-oak groves. The majority of these soils are currently used for forage crop production and improved pasture.

In a representative profile the solum is approximately 30 cm thick. The profile is characterized by a very dark gray Ah or Ap horizon, 10 to 20 cm thick, a dark brown Bm horizon, 5 to 15 cm thick, a very pale brown Cca horizon, 10 to 40 cm thick and a yellowish brown Ck horizon. The parent material is typically very stony.

Hilton soils occur in close association with the imperfectly drained Barwood series and the poorly drained Hickson soils. They are similar to Tiger Hills soils by having a well drained, very thin soil profile developed in strongly to extremely calcareous glacial till but differ from them in having a less strongly leached soil profile. Tiger Hills soils have Ae or Ahe horizons and Bt horizons while Hilton soils do not. Hilton soils were previously mapped as dominant associates of the Hilton association in the reconnaissance soil survey of South-Central Manitoba (1943).

Hochfeld Series (HHF)

The Hochfeld series consists of moderately well drained Orthic Black Chernozem soils developed on moderately calcareous, coarse loamy (VFS, LVFS, SL, FSL), lacustrine deposits. These deposits range in thickness from 1.5 to 5 metres over finer textured lacustrine sediments. These soils occur in upper positions of very gentle slopes on undulating landscapes and have moderately rapid permeability, moderate surface runoff, and a low water table during the growing season. Hochfeld soils are often slightly eroded, non-stony, and non-saline. They have a medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation includes aspen, oak, shrubs and prairie grasses. The majority of these soils are currently cultivated for crop production.

In a representative profile the solum is approximately 50 cm thick. The profile is characterized by a dark gray to very dark gray Ah horizon, 15 to 25 cm thick, a brown Bm horizon, 15 to 40 cm thick, usually a light brown Cca horizon, 5 to 8 cm thick, and a brown Ck horizon, with many faint mottles. Hochfeld soils occur in close association with Reinland soils. These soils were previously mapped as Blackearth associates of the Altona (light) Association in the Winnipeg-Morris (1953) soil report.

Hoddinott Series (HDN)

The Hoddinott series consists of imperfectly drained Gleyed Black Chernozem soils developed on a thin clayey strata over a very strongly to extremely calcareous silty lacustrine strata, which vary in thickness from 20 to 75 cm and in turn overlies calcareous clay. The surface texture may vary from clay loam to clay. The topography is level to very gently sloping; runoff is slow; and permeability is moderately slow in the upper clay strata, and variable from moderately rapid to slow in the silty strata due to the variability of the silt content, stratification and thickness. Permeability of the underlying clay is slow. Native vegetation consisted of tall prairie grasses and dispersed clumps of aspen and willow.

The soil is characterized by a dark granular Ah horizon 12 to 20 cm thick and a dark grayish brown Bmgj horizon 10 to 18 cm thick. The structure is medium prismatic to fine granular. The solum is developed in the upper clay strata with an abrupt change at the extremely calcareous silty strata, although some tonguing of the clay into the silty strata may be noted. Hoddinott soils occur in close association with Dencross and Glenmoor soils. They were previously mapped as the Blackearth-Meadow associate of the Emerson (heavy) association in the Winnipeg-Morris Report No. 5, 1953.

Hodgson Series (HDG)

The Hodgson series consists of moderately well drained Cumulic Regosol soils developed on strongly to very strongly calcareous stratified dominantly medium to moderately fine textured (VFSL, L, SiL to SCL, CL SiCL), alluvial deposits. These soils occur on the upper parts of the floodplain and levees. The topography is ridged, with gentle to steep short slopes. Runoff is moderate, and permeability varies from moderate to slow depending on the texture of the layers. Native vegetation consists principally of elm, ash, basswood, hazel, rose, forbs and grasses.

The soil is characterized by a thin, weakly developed dark gray to gray Ah horizon 5 to 15 cm thick which is fine granular, friable, neutral to mildly alkaline and may contain lime carbonate. The underlying material is stratified, strongly calcareous and may contain dark colored bands representing former surface layers. These soils occur in close association with Fisher soils and are difficult to separate in levee-dominated units. The chemical and physical analysis of the Hodgson soil is similar to the Fisher soil.

Holditch Series (HCH)

The Holditch series consists of very poorly drained organic soils developed on shallow mesic fen peat overlying limestone bedrock within 160 cm of the surface. These soils may have a surface layer of fibric Sphagnum moss peat less than 15 cm. thick. They occur in high nutrient, (eutrophic) poorly drained depressional to level areas adjacent to rock outcrops or to shallow mineral soils overlying limestone bedrock. The native vegetation is dominantly sedges, reed grasses and meadow grasses with scattered clumps of willow and swamp birch.

The Holditch series is a Typic Mesisol, lithic phase. Minor areas of the Primes series, a Humic Mesisol, lithic phase; the Meskenau series, a Fibric Mesisol, lithic phase; and the Flathouse series, a Limno Mesisol, lithic phase, may occur within map units of the Holditch series. The Holditch series is comparable to the Cayer series, differing only in the presence of the lithic substrate instead of lacustrine sediments.

Homebrook Series (HOK)

The Homebrook series consists of Orthic Dark Gray Chernozem soils developed on moderately to strongly calcareous clay till. Numerous, randomly distributed pockets of loamy textured, stony, extremely calcareous, light gray till occur in the dark colored clayey matrix of this till. Surface textures are clay and the topography is gently undulating to undulating. These soils also are well drained and moderately stony. Native vegetation consists of mixed aspen, white spruce, and balsam poplar.

Homebrook is somewhat stonier than the very similar, clay textured Arnes soil series; is finer textured, less friable and less permeable than the similar loamy textured Harwill soils or the gravelly textured Leary, Gunton and Lynx Bay soils. A representative soil profile of the Homebrook Series is described below:

L-H - 5 to 0 cm, very dark brown (10YR 2/2, moist), gray (10YR 4.5/1, dry), leaf mat; neutral; abrupt, smooth boundary.

Ahe - 0 to 10 cm, very dark brown (10YR 2/2, moist), dark gray (10YR 4.5/1, dry), clay; moderate, fine granular; firm when moist, hard when dry; neutral; clear, smooth boundary.

AB - 10 to 25 cm, very dark gray (10YR 3/1, moist), gray (10YR 5/1, dry), clay; moderate, medium granular; very firm when moist, very hard when dry; slightly acid; clear, wavy boundary.

Bt - 25 to 46 cm, very dark grayish brown (10YR 3/2,moist), dark grayish brown (10YR 4/1.5, dry), clay; moderate, coarse columnar structures breaking into strong, medium to coarse subangular blocky aggregates; very firm when moist, very hard when dry; slightly acid; abrupt, wavy boundary.

BC - 46 to 56 cm, olive brown (2.5Y 4/4, moist), grayish brown (2.5Y 5/2, dry), clay; weak, coarse columnar structures breaking into moderate, fine to medium subangular blocky aggregates; firm when moist, hard when dry; neutral; calcium carbonate concretions; abrupt, wavy boundary.

IICk - 56 cm +, light olive brown (2.5Y 5/4, moist), light gray (2.5Y 7/2, dry), mixed loam and clay textured stony till; moderate, coarse granular; firm when moist, hard when dry; mildly alkaline.

Homestead Series (HMD)

The Homestead series consists of imperfectly drained Gleyed Cumulic Regosol soils developed on weakly to moderately calcareous, deep, stratified, fine loamy to coarse loamy fluvial (alluvial) deposits. These soils occur on upper and middle slopes of very gently undulating landscapes and have moderate permeability, moderate surface runoff and a medium high water table during the growing season. The native vegetation often comprises mixed hardwood forest of balsam poplar with some elm, ash and maple. The majority of these soils are currently used for cropland.

In a representative profile the solum is generally about 16 cm thick, corresponding to the depth of cultivation. The profile is characterized by a thin grayish brown, weakly calcareous, loam textured Ap horizon overlying a stratified very fine sand to loam Ckgj horizon banded with dark coloured layers, representing former surface horizons buried by depositions of fresh alluvium. The parent material is typically weakly mottled and moderately calcareous.

Homestead soils occur in close association with Novra soils. They are similar to Novra soils by having the same stratification and texture, but differ from Novra soils because of better drainage. Homestead soils have medium available water holding capacity, low organic matter levels, and medium natural fertility. Homestead soils correlate with the imperfectly drainage member of the Alluvial complex soils previously published in the Swan River soil report.

Horndean Series (HND)

The Horndean series is a Gleyed Black Chernozem soil developed on imperfectly drained, moderately to strongly calcareous, clayey (SiC, C) sediments overlying sandy to loamy stratified fluvial and lacustrine sediments, that range in texture from fine sand to silty clay loam. These soils occur in the western section of the Red River Plain on level to very gently sloping terrain in association with Dugas and Jordan soils. Surface runoff is slow. Permeability is moderately slow to slow in the clayey sediments and moderate in the underlying sandy to loamy sediments; downward movement of water can be restricted during the spring by a high water table.

The Horndean soil profile has a granular structured, black to very dark gray Ah horizon, 20 to 30 cm thick, that is plastic and sticky when wet, very firm when moist and very hard when dry; a very dark brown to very dark grayish brown Bm horizon, 15 to 25 cm thick, having blocky structure, plastic and sticky consistence when wet, and a thin transitional BC horizon. This transitional horizon grades to a grayish brown Ckgj horizon that is granular structured, firm when moist, distinctly mottled and gypsiferous, particularly near the contact of the clayey and sandy materials. The underlying sediments are stratified, usually saline and mottled.

The Horndean, clay loam variant, HND1, is characterized by the Horndean soils in which the surface texture is clay loam instead of silty clay or clay. This soil differs only slightly from the Dugas series in having a Bmgj horizon. The clayey Plum Coulee soils, like Horndean soils are imperfectly drained Gleyed Blacks, but are more uniformly fine textured in the subsoil.

Horod Series (HRD)

The Horod series consists of moderately well drained Orthic Black Chernozem soils developed on deep (>100 cm) moderately to strongly calcareous, sandy to coarse loamy (LS, FS, LFS, VFS, SL), fluvial deposits. These soils occur in upper and mid-slope positions of nearly level to gently sloping landscapes and have rapid permeability, low surface runoff and a medium low water table

during the growing season. Horod soils are slightly eroded due to wind, and are non-stony and non-saline. They have low available water holding capacity and medium to low organic matter content. Native vegetation often includes aspen, shrubs, and grasses. The majority of these soils are currently used for annual crop production.

In a representative profile the solum is approximately 30 cm thick. The profile is characterized by a black, sandy loam Ap horizon, 15 to 20 cm thick, a dark grayish brown, sandy loam Bm, 10 to 15 cm thick; overlying a thin, gray, strongly calcareous Cca horizon, 5 to 10 cm thick, and a strongly calcareous, grayish brown, single grained, loamy sand Ckgj horizon, with many fine, faint mottles. A typical profile may contain some coarse fragments and in-filled gopher burrows.

Horod soils occur in close association with the imperfectly drained Lenswood soils. They are similar in texture and parent materials but differ because of drainage and level of carbonates throughout the profile. Horod soils were previously mapped as the Horod soil association in the reconnaissance survey of soils in the Rossburn and Virden map sheet areas.

Horose Series (HOS)

The Horose series consists of poorly drained Rego Humic Gleysol soils developed on moderately to strongly calcareous, deep, uniform, fine loamy and coarse loamy (L, CL, SiCL) mixed till of limestone, granite and shale origin. These soils occur in level to depressional positions of moderate slopes on hummocky landscapes and have very slow permeability very slow surface runoff and a high water table during the growing season. Horose soils are non-eroded, slightly stony and slightly saline. They have medium available water holding capacity, high organic matter content, and low natural fertility. Native vegetation includes sedges, reeds and willows. The majority of these soils are under natural conditions.

In a representative profile the solum is approximately 25 cm thick. The profile is characterized by a black Ah or Ahk horizon, 20 to 35 cm thick, a light olive brown AC horizon, 5 to 10 cm thick, and a light yellowish brown Ckg horizon with many, large, prominent iron mottles. A typical profile also contains a Cca horizon, 5 to 10 cm thick below the AC horizon.

Horose soils occur in close association with Dezwood, Pembina and Zaplin soils. They are similar to Cazlake soils by having the same Rego Humic Gleysol profile development and poor drainage but differ from Cazlake soils because the Horose series is associated with Dark Gray soils while the Cazlake series is associated with Black soils. Horose soils were previously mapped as poorly drained associates of the Pembina association, in the reconnaissance soil survey of South-Central Manitoba (1943).

Horseshoe Island Complex (HRX) or (HHD)

The Horseshoe Island complex includes imperfectly drained Gleyed Eluviated Eutric Brunisol and Gleyed Gray Luvisol soils developed on thin (25 to 100 cm), stratified, strongly calcareous sand and gravel deposits over extremely calcareous, loamy till. The dominant member is the Horseshoe Island series, a Gleyed Eluviated Eutric Brunisol. The associated minor member, a Gleyed Gray Luvisol, is the Arbakka series. Areas of Horseshoe Island complex soils are ridged to gently undulating and are usually very stony at the surface. Surface runoff is moderate and permeability may vary from moderate to slow depending upon the depth to the underlying glacial till deposits. In addition, internal drainage is impeded to some degree by a generally high groundwater table. Spruce, jack pine and balsam poplar constitute the tree cover while sedges and meadow grasses comprise the understory.

Horseshoe Island soils usually have a light gray Ae horizon overlying a Bm or Btj horizon. The fragmental to sandy- skeletal texture of the surface deposits usually limits the development of an illuvial Bt horizon. The parent material of these soils develops from till ridges which have undergone a degree of water sorting insufficient to produce deeper beach and outwash deposits. Horseshoe Island soils commonly occur in association with soils of the Freshford, Long Point and Soul Lake complexes and the Easterville series, peaty phase. These soils occur predominantly along The Pas Moraine, in the northern portion of the map area.

Horton Series (HOT)

The Horton Series is the well drained, Orthic Dark Gray Chernozem member of the Horton Association, developed on deep, strongly calcareous, medium to moderately fine textured glacial till deposits composed of shale, limestone and granitic rock. These well drained soils have moderate permeability and rapid surface runoff. The depth to water table is in the range of 4.3 to 6.1 metres. The topography is undulating to moderately rolling and consists dominantly of complex slopes. The native vegetation consists of balsam poplar (Populus balsamifera), hazel nut, grasses and shrubs. Many of these soils are cultivated; however in the undisturbed sites they are characterized by a thin black Ahe horizon 0 to 5 cm thick, a grayish brown Ahe horizon 8 to 10 cm thick, a dark brown to brown Bt horizon 15 to 20 cm thick, and a brown to pale brown BC horizon 13 to 15 cm thick. In some cases a brown Ck horizon is present immediately above a dark yellowish brown to pale brown Cca horizon 15 to 18 cm thick. A pale brown Ck horizon constitutes the soil parent material.

The Horton Association is related to the Ryerson Association. They are both found on the same parent material but the Ryerson Association (Chernozemic) is found at lower elevations while the Horton Association (degraded Chernozemic) is found at higher elevations in the Turtle Mountains. A representative profile description is presented below.

LFH - 3 to 0 cm

Ah - 0 to 5 cm, black (10YR 2/1, moist), dark grayish brown (10YR 4/2, dry), loam; moderate medium to fine subangular blocky; very friable when moist; clear wavy boundary; pH 6.3.

Ahe - 5 to 15 cm, very dark grayish brown (10YR 3/2, moist), grayish brown (10YR 5/2, dry), clay loam; moderate medium granular; friable when moist; clear wavy boundary; pH 6.5.

Bt1 - 15 to 28 cm, dark brown (10YR 3/3, moist), brown (10YR 5/3, dry), clay loam; moderate fine subangular blocky; friable when moist, clear wavy boundary; pH 6.7.

Bt2 - 28 to 36 cm, dark brown (10YR 3/3, moist), brown (10YR 4.5/3, dry), clay loam; moderate coarse blocky to moderate medium blocky; firm when moist; clear wavy boundary; pH 6.9.

BC - 36 to 51 cm, dark brown (10YR 3/3, moist), brown to pale brown (10YR 5.5/3, dry), clay loam; moderate coarse blocky to moderate, medium to fine blocky; firm when moist; gradual irregular boundary; moderately calcareous; pH 7.6.

Ck1 - 51 to 74 cm, brown (10YR 4.5/3, moist), brown to pale brown (10YR 5.5/3, dry), clay loam; strong medium subangular blocky; friable when moist; gradual irregular boundary; moderately calcareous; pH 7.7.

Cca1 - 74 to 86 cm, dark yellowish brown to yellowish brown (10YR 4.5/4, moist), pale brown (10YR 6/3, dry), silt loam; moderate coarse subangular blocky to moderate medium subangular blocky; friable when moist; strongly calcareous; pH 7.8.

Cca2 - 86 to 97 cm, dark yellowish brown to yellowish brown (10YR 4.5/4, moist), very pale brown (10YR 7/3, dry), carbonates (10YR 8/1, dry), clay loam; moderate coarse subangular blocky to moderate medium subangular blocky; friable when moist; strongly calcareous; gradual irregular; pH 7.9.

Ck2 - 97 to 130 cm, brown (10YR 4.5/3, moist), pale brown (10YR 6/3, dry), loam; strong coarse subangular blocky; friable when moist; moderately calcareous; pH 7.9 (carbonates follow old root channels and cracks).

Howell Series (HWL)

The Howell series are very poorly to poorly drained Terric Mesisol, sphagnic phase soils developed on 40 to 160 cm of dominantly mesic fen peat underlain by moderately to strongly calcareous, loamy to clayey lacustrine sediments. A mantle of 15 to 65 cm of fibric Sphagnum moss peat covers the surface. Howell soils occupy areas of depressional to level topography, often occupying the swales in areas of ridge and swale topography. These soils support sedge-meadow plant communities in close association with Sphagnum mosses and some ericaceous shrubs. The overstory is dominantly tamarack occurring in thin, scattered stands along with some stunted black spruce. A description of the profile of a representative Howell soil follows:

Of - 0 to 30 cm, yellowish brown (10YR 5/6 moist) to very pale brown (10YR 7/4, moist), non-woody fibrous; spongy compacted or layered Sphagnum moss with woody intrusions (tamarack roots and stems); unrubbed fiber content approximately 76 percent; medium acid.

Om1 - 30 to 60 cm, very dark brown to dark reddish brown (10YR 2/2 to 5YR 3/3 moist), moderately decomposed, mixed woody and non-woody fibrous material composed of mosses, shrubby remains and herbaceous remains; becoming more herbaceous near bottom of layer; unrubbed fiber content approximately 61 percent; medium acid.

Om2 - 60 to 90 cm, dark brown (10YR 3/3, moist) moderately decomposed, medium fiber herbaceous material; matted and felt-like; unrubbed fiber content approximately 54 percent; medium acid.

Om3 - 90 to 120 cm, very dark brown (10YR 2/2, moist) moderately decomposed, medium fiber herbaceous material; matted or felt-like; unrubbed fiber content approximately 45 percent; medium acid.

II Ahg - 120 to 128 cm, black (5Y 3/0, wet), light clay; strong fine granular; sticky and very plastic when wet; neutral; abrupt, wavy lower boundary.

II Cg - 128+ cm, light gray (5Y 5/1, wet), clay; massive; neutral to mildly alkaline.

Hughes Series (HGH)

The Hughes series consists of imperfectly drained, Gleyed Black Chernozem soils developed on a thin mantle (25 to 60 cm) of sandy textured sediments overlying weakly to non calcareous medium to coarse sand and occasional gravel sediments. The soil occurs in lower position of level to gently sloping topography. Permeability is moderately rapid to rapid, but may be restricted in the subsoil during periods when the water table is high (within 1m of the surface).

The soil is characterized by a very dark gray to black Ah or Ap horizon, 10 to 30 cm thick, a brown to dark brown, weakly mottled Bmgj horizon, 15 to 22 cm thick, a light yellowish brown BC with strong brown mottles and a Cgj horizon 30 to 50 cm thick. They occur in close association with the imperfectly drained Gendzel soils, the well drained Wheatland soils and the poorly drained Lowry series.

Hummerston Series (HMO)

The Hummerston series consists of imperfectly drained Gleyed Rego Black Chernozem soil developed on weakly to moderately calcareous, deep, uniform, sandy (FS, LFS, LS), lacustrine and fluvial deposits. These soils occur in middle to lower positions of very gentle slopes on undulating landscapes and have moderately rapid permeability, low surface runoff, and a high water table

during the growing season. Hummerston soils are often slightly wind eroded, non-stony, and slightly saline. They have a low available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation includes aspen-oak groves, shrubs, tall prairie and meadow grasses. The majority of these soils are currently cultivated for forage and grain crops.

In a representative profile the solum is approximately 20 cm thick. The profile is characterized by a very dark gray Ah horizon, 15 to 20 cm thick, a dark gray AC horizon, 10 to 18 cm thick with moderate calcareousness, and a yellowish brown Ck horizon, with prominent yellow mottles.

Hummerston soils occur in close association with Stockton, Lavenham and Sewell soils. They are similar to Lavenham soils by having an imperfectly drained profile in sandy deposits but differ from them in having no diagnostic Bm Horizon. Hummerston soils were previously mapped as Black Meadow associates of the Stockton Association in the Carberry (1957) soil report.

Hunt Series (HUT)

The Hunt series consists of well to rapidly drained Eluviated Dystric Brunisol soils developed on moderately acidic to neutral, deep, stratified, sandy to skeletal, glaciofluvial and lacustrine deposits. These soils occur on crest, upper and middle slope positions of very gently to moderately sloping to nearly level landscapes. They have rapid permeability, very slow surface runoff and a very low water table during the growing season. Hunt soils are none to moderately stony and have low available water holding capacity and low organic matter content. Native vegetation consists of jack pine, white birch, and aspen with juniper, blueberry, bearberry, rose, feathermosses and lichens. These soils are currently in their native state and under forest cover. Hunt soils are associated with Sandilands soils but are coarser textured and often contains larger quantities of coarse fragments.

In a representative profile of Hunt soil the solum is approximately 70 cm thick. The profile is characterized by: a strongly acidic, very dark gray LH horizon, 2 to 4 cm thick; a very strongly acidic, light brownish gray Ae, 2 to 6 cm thick, a strongly acidic, yellowish brown Bm, 25 to 45 cm thick; a strongly acidic, yellowish brown to brownish yellow, transitional BC horizon, 20 to 35 cm thick and a moderately acidic, brownish yellow C horizon with layers of coarse sand, gravel and cobbles.

Indian Springs Complex (IPG)

The soils mapped as Indian Springs association are a variable complex of moderately deep soils developed on sandy textured deposits but intermixed with gravely, gritty textured reworked boulder till that may contain considerable shale. The soils, which are dominantly of the black to dark gray types, are variable in texture, ranging from sandy loam to clay loam or silty clay, but the sandier textures predominate. Surface drainage is fairly good, but poorly drained depressions are common and most locations show the effect of moist substrata. Gravelly areas may be found scattered throughout. But they are more extensive along the northern margin of the area and adjacent to the Pembina channel.

In resurveys at a detail level, Indian Springs complex is described by soil series such as Vandal, Druxman, Croyon, Capell and Vartel.

Inland Series (ILD)

The Inland series consists of imperfectly drained Gleyed Gray Luvisol soils developed on 50 to 100 cm of moderately to strongly calcareous clayey till overlying limestone bedrock. Due to the presence of bedrock within the control section, the Inland series is classified as a Gleyed Gray Luvisol, shallow lithic phase. Proximity of the bedrock to the surface affects the permeability and accounts for the moderately stony to very stony nature of the surface of Inland soils. The underlying limestone bedrock may hinder the permeability at specific sites, but on a larger scale the presence of cracks and fractures may increase soil permeability. These soils have gently undulating to undulating topography and moderate runoff. Native vegetation includes spruce, jack pine and aspen with some balsam poplar.

The Inland series is mapped in a few isolated areas, notably along the east shore of Lake Winnipegosis, and near Reedy Lake. Inland soils commonly occur in mapping units with soils of the Wicked Point series and with limestone bedrock.

Inwood Series (IWO)

The Inwood series consists of Gleyed Dark Gray Chernozem soils developed on extremely calcareous, medium textured (VFSL, L, SiL) till. The dominant surface texture is loam but may have loamy fine sand to fine sandy loam in water-worked areas. They occur on the intermediate and lower landscape position on very gently to irregular very gently undulating topography. Runoff is slow; permeability is moderately slow. Near surface water table may be high during the spring of the year. The areas are generally stony; the frequency of stones increases in areas of more severe water working. The native vegetation is dominantly aspen, with some rose, willow, meadow-prairie grasses and herbs.

The Inwood soils are characterized by a shallow solum with a thin LH horizon, a thin Ahe horizon 3 to 8 cm thick, a weakly developed Bt horizon 4 to 15 cm thick which grades sharply into the extremely calcareous till. The Inwood soils have loamy glacial till that is quite variable in thickness, ranging from a meter thick to greater than 15 metres.

The Inwood, clay till variant, IWO1, has similar solum properties as the normal Inwood series but differs in composition and texture of the undelying parent material. This material consists of a heterogenous mixture of moderately to strongly calcareous clayey and extremely calcareous, loamy stony materials. Surface stones are less prominent that in the normal Inwood.

Isafold Series (ISF)

The Isafold series is a moderately well drained Rego Black Chernozem soils developed on extremely calcareous, medium textured (VFSL, L, SiL), stony till. While the dominant surface texture is loam, textures range from very fine sandy loam to clay. These soils occupy the well drained ridges and knolls; topography is level to irregular, gently sloping. Runoff is moderate and permeability is moderate. The Isafold soils are usually very stony; exceedingly stony areas occur on the higher more severely water-worked portions of the ridges. These soils have developed under mixed prairie grasses, but most virgin sites now support near continuous stands of stunted aspen with some bur oak.

The solum of the Isafold soils is thin (8 to 20 cm). Most Isafold soils have a thin leaf and sod mat underlain by a thin, very dark gray to black Ah horizon usually free of carbonates and alkaline in reaction. A gray carbonated transitional AC horizon separates the Ah horizon from the extremely calcareous C horizon. Water-working of the parent material of these soils is evident in a concentration of cobbles, stones and gravel, usually between the AC horizon and the C horizon. Cultivation of the shallow solum incorporates the surface horizons with the calcareous C horizon. The resulting plow layer is dark gray to gray in color and calcareous to the surface. The Isafold soils occur in association with the Lundar and Clarkleigh soils. A description of the Isafold series is given below:

L-H - 3 to 0 cm, very dark brown (10YR 2/2 dry) leaf and sod mat; neutral in reaction; abrupt, smooth boundary.

Ah - 0 to 14 cm, black (10YR 2/1 moist) clay loam, moderate, fine to medium granular; friable when moist, slightly hard when dry; neutral in reaction; noncalcareous; clear, wavy boundary.

AC - 14 to 20 cm, gray (10YR 6/1 dry, 10YR 5/2 moist) loam; weak, fine granular; very friable when moist, soft when dry; mildly alkaline; very strongly calcareous; gradual, wavy boundary.

Cca - 20 to 43 cm, light gray (10YR 7/2 dry, 10YR 6/2 moist) silty clay loam; weak, fine granular; very friable when moist, slightly hard when dry; moderately alkaline; extremely calcareous; diffuse, smooth boundary.

Ck - 43 to 100 cm, very pale brown (10YR 7/3 dry, 10YR 5/5 moist) silt loam; weak fine granular; very friable when moist; slightly hard when dry; moderately alkaline; extremely calcareous.

Iskwasum Series and Complex (ISK)

The Iskwasum complex consists of a poorly to very poorly drained 40 to 160 cm depth of stratified, woody, mesic and/or fibric peat. A thin (0 to 60 cm) fibric Sphagnum peat may overly the mesic peat. The organic materials overlie a calcareous loam to sand loam till, usually with channery or flaggy components. These soils occur on flat and blanket bogs. Topography may be level or depressional to slightly sloping. Vegetation is dominantly black spruce, ericaceous shrubs and feather and/or Sphagnum mosses. The Iskwasum soils include Terric Mesic Fibrisol and Terric Fibrisol soils of which the Terric Fibric Mesisol best represent the series. The Iskwasum soils in the study area have been mapped to include forest peat soils developed under swamp conditions. Generally these soils are more decomposed, contain less Sphagnum moss remains, contain more woody fragments and have higher pH levels. Vegetation is more diversified and tree growth is better. However soil properties are sufficiently similar to group these soils with the Iskwasum complex in this study area.

The Iskwasum soils in the study area are shallow and have developed on approximately 60 cm of mesic peat. The upper 20 cm is slightly decomposed Sphagnum and feather moss peat. The underlying peat material is well decomposed and grades into a well decomposed muck or humic peat. Limestone and/or dolostone fragments are present in the lower peat and well decomposed peat occupies the voids between coarse fragments at the 60 cm level. This area may previously have been washed when the level of Reed Lake was higher. Associated soils include the Atik complex, Rock Island complex and Reed Lake complex soils.

Jackson Creek Series (JKE)

The Jackson Creek series is the well drained Rego Black Chernozem member of the Bede Association, developed on strongly calcareous, deep, coarse textured gravelly deltaic, beach and outwash deposits. This soil has gently sloping to gently undulating topography, good drainage, rapid permeability and very slow surface runoff. The depth to water table is estimated at 2 to 3 metres during the growing season. The native vegetation consists of drought resistant herbs, grasses and shrubs. These soils are not usually cultivated; most are used as unimproved pasture. Jackson Creek soils are found in close association with Broomhill soils.

The soil is characterized by a thin, very dark gray Ah horizon 0 to 8 cm thick, a dark gray AC horizon, 5 to 8 cm thick, a white Cca horizon, 15 to 20 cm thick, overlying a pale brown, stratified parent material. A representative profile description follows:

Ahk - 0 to 8 cm, very dark gray (10YR 3/1, moist), very dark gray to dark gray (10YR 3.5/1, dry), medium sandy loam; structureless; loose when moist and dry; clear smooth boundary; moderately calcareous; pH 7.9.

AC - 8 to 13 cm, very dark grayish brown (10YR 3/2, moist), dark gray (10YR 4/1, dry), fine sandy loam; structureless; loose when moist and dry; clear smooth boundary; strongly calcareous; pH 8.0.

Cca - 13 to 38 cm, light brownish gray (2.5Y 6/2, moist), white (2.5Y 8/2, dry), coarse sandy loam; structureless; loose when moist and dry; clear smooth boundary; strongly calcareous; pH 8.1.

Ck1 - 38 to 66 cm, pale brown (10YR 6/3, moist), very pale brown (10YR 7/3, dry), coarse sand; structureless; loose when moist and dry; clear smooth boundary; strongly calcareous; pH 8.1.

Ck2 - 66 to 97 cm, strong brown to reddish brown (7.5YR 5.5/6, moist), light brownish gray (10YR 6/2, dry), coarse sand; few fine faint iron mottles; structureless; loose when moist and dry; clear smooth boundary; strongly calcareous; pH 8.0.

Ck3 - 97 cm +, yellowish brown (10YR 5/6, moist), very pale brown (10YR 7/4, dry), coarse sand; structureless; loose when moist and dry; moderately calcareous; pH 8.1.

Janick Series (JIK)

The Janick series consists of well to moderately well drained Orthic Black Chernozem soils developed on moderately to strongly calcareous, deep, uniform, clayey (C, SiC), lacustrine deposits. These soils occur in upper positions of nearly level slopes on undulating landscapes and have slow permeability, moderately slow surface runoff, and a medium water table during the growing season. Janick soils are non-eroded, non-stony, and non-saline. They have a high available water holding capacity, high organic matter content, and high natural fertility. Native vegetation includes prairie grasses. The majority of these soils are currently cultivated for crop production.

In a representative profile the solum is approximately 30 cm thick. The profile is characterized by a very dark gray to black Ah horizon, 10 to 18 cm thick, a dark grayish brown to brown Bm horizon, 8 to 15 cm thick with fine subangular blocky structure, a pale brown BC horizon, 5 to 10 cm thick, weakly calcareous, and a light grayish brown to pale brown Ck horizon, with a few faint mottles. Janick soils occur in close association with Harding soils. They are similar to Winkler soils by having a well drained profile in clayey deposits but differ from them in having no stratified fine loamy deposits in the substrata. Janick soils were previously mapped as Blackearth associates of the Harding Association in the Carberry (1957) soil report.

Janora Complex (JOR)

The Janora Complex consists of a group of organic soils developed on 40 to 130 cm of mesic forest peat, or thin (0 to 60 cm) of fibric Sphagnum moss underlain by mesic forest peat; limestone bedrock occurs within 130 cm of the surface. A small area of these soils occurs adjacent to outcroppings of bedrock southeast of Lake St. Martin. These soils are under the influence of drainage water from the adjacent bedrock. The topography is very gently sloping to depressional. The dominant vegetation on these soils is productive stands of black spruce with an understory of mixed mosses and ericaceous shrubs.

The Janora Series, a Lithic Mesisol, is the dominant soil in the complex. This soil consists of 40 to 90 cm of mesic peat derived from forest litter and underlain by limestone bedrock. Janora - deep phase has 90 to 130 cm of mesic forest peat overlying limestone bedrock.

Other soils in the complex are: Highrock Series, a Lithic Fibrisol, characterized by dominantly fibric forest or sphagnum peat in the organic section; Whiteway Series, a Lithic Fibric Mesisol developed on dominantly mesic material with a subdominant layer of fibric sphagnum peat at the surface. The Atim Series, a Lithic Mesic Fibrisol, consisting of dominantly fibric sphagnum peat underlain by a subdominant layer or layers of mesic forest peat. Minor inclusion with the soils of Meleb rock substrate peaty phase and Bullhead Complex soils occur within the complex.

Jasset Series (JST)

The Jasset series consists of imperfectly drained Gleyed Black Chernozem soils developed on a mantle (70 to 90 cm) of moderately to strongly calcareous, shallow loamy (VFSL, L, SiL), lacustrine deposits over moderately calcareous, stratified, deep, sandy (FS,LFS,VFS) lacustrine deposits. These soils occur in middle positions of very gentle slopes on undulating landscapes and have moderate over moderately rapid permeability, slow surface runoff, and a high water table during the growing season. Jasset soils are non-eroded, non-stony, and occasionally slightly saline. They have medium available water holding capacity, high organic matter content, and medium natural fertility. Native vegetation includes aspen, oak, maple and prairie grasses. The majority of these soils are currently cultivated for crop production.

In a representative profile the solum is approximately 60 cm thick. The profile is characterized by a very dark gray to black Ap horizon, 25 to 35 cm thick, a brown to yellowish brown Bm horizon, 25 to 40 cm thick with fine, faint mottles, a carbonated BC horizon, 10 to 15 cm thick and a Cca horizon, 5 to 10 cm thick. A typical profile also contains a calcareous C horizon with prominent mottles.

Jasset soils occur in association with Neuenberg and Rosengart soils. They are similar to Neuenberg soils by having an imperfectly drained profile in loamy over sandy deposits, but differ from them in having a prominent Bm horizon. Jasset soils were previously mapped as Black Meadow associates of the Altona (light) Association in the Winnipeg-Morris (1953) soil report.

Jaymar Series (JAY)

The Jaymar series consists of well drained, Orthic Black Chernozem soils developed on stratified materials composed of a thin mantle (40 to 70 cm) of moderately to strongly calcareous, loamy (L, CL), lacustrine sediments over a thin 30 to 60 cm, contact zone of sandy skeletal (S, GrS) materials, overlying moderately to strongly calcareous, loamy (L, CL, SiCL), glacial till of shale, limestone and granitic rock origin. The soils occur on very gently to gently sloping topography, runoff is moderate, and permeability is moderate to rapid in the upper loamy and sandy skeletal strata and moderately slow in the underlying till. These soils are often stony due to the modification of the till.

The soil is characterized by a very dark gray Ah horizon 10 to 15 cm thick, a dark brown to brown Bm horizon 8 to 15 cm thick and a lime accumulation layer (Cca) that occurs at the contact of the loamy sediments and underlying coarser wash zone. Jaymar soils occur as well drained inclusions of the Heaslip Complex in the South-Central (1943) soil report.

Jirose Series (JIS)

The Jirose Series is characterized by a Gleyed Rego Black Chernozem carbonated profile developed under an imperfect moisture regime on a variable veneer (25 to 90 cm) of moderately to very strongly calcareous, loamy (loam to clay loam) glacial till of shale, limestone and granitic origin overlying non to weakly calcareous shale bedrock. These soils occur in association with Black soils and in various locales where the surface deposits are shallow to shale bedrock. They occur on the lower slopes; some seepage from upslope and salinity may be present. Surface runoff is moderate, but internal drainage and permeability may be restricted for a considerable period during spring and summer.

The Jirose soil has a carbonated, very dark gray to black, loam Ap horizon 15 to 20 cm thick and an Ah horizon 10 to 20 cm, a gray to grayish brown transitional AC horizon 5 to 15 cm may be present. Gypsum crystals are common in the C horizon. The underlying shale bedrock may have an altered or softened layer of 15 to 25 cm before the more compact layers are encountered.

Jordan Series (JOD)

The Jordan series is an Orthic Black Chernozem soil developed on moderately well drained, thin (0.6 to 1m), moderately to strongly calcareous, clayey sediments abruptly grading to calcareous stratified sandy (FS, LFS, LS) to loamy (VFSL, L, SiL, VFS, LVFS) lacustrine sediments. The soils occur in the western section of the Red River Plain on level to very gently sloping terrain in association with Horndean and Dugas soil series. Surface runoff is moderately slow to slow. Permeability of the clayey sediments is moderately slow to very slow, whereas subsoil permeability is moderate to moderately rapid.

The Jordan profile has a very dark gray to black Ah horizon, 15 to 35 cm thick, and a dark grayish brown Bm horizon, 20 to 30 cm thick with subangular blocky structure. The B horizon usually extends to the contact of the coarser sediments. The contrasting II Ck horizon is not only variable in texture, but also has numerous, faint iron mottles. The Jordan variant, JOD1, is a clay loam deposit grading to coarser sediments. This soil differs from the similar Winkler series in having somewhat coarser textures in its stratified subsoil. The Jordan soil was mapped as part of the Horndean Complex in the Winnipeg-Morris (1953) soil report.

Joyale Series (JYL)

The Joyale series consists of imperfectly drained Gleyed Rego Black Chernozem soils developed on a mantle (25 to 100 cm) of moderately to strongly calcareous, uniform, fine loamy (L, CL, SiCL), lacustrine deposits over moderately to very strongly calcareous, deep uniform, fine loamy (CL, SiCL), mixed till deposits. These soils occur in lower slope positions of very gentle slopes on undulating landscapes and have moderate permeability slow surface runoff and a medium water table during the growing season. Joyale soils are usually slightly saline. They have a medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes tall prairie and meadow grasses. The majority of these soils are currently used for crop production.

In a representative profile the solum is approximately 25 cm thick. The profile is characterized by a very dark gray to black Apk or Ahk horizon, 15 to 25 cm thick, a light gray Cca or AC horizon, 5 to 15 cm thick with distinct iron mottles, and a very pale brown II Ck horizon with many prominent iron mottles. A typical profile also contains a thin pebble line at the lacustrine/till contact.

Joyale soils occur in close association with Knudson, Ullrich and Guerra soils. They are similar to Prodan soils by having a Gleyed Rego Black Chernozem profile developed dominantly in imperfectly drained fine loamy deposits but differ from Prodan soils because of the presence of a compact till substrate within a meter of the mineral surface. Joyale soils were mapped as minor, imperfectly drained blackearth associates of the Altamont association in the reconnaissance soil survey of South-Central Manitoba (1943).

Julius Series (JUS)

The Julius series consists of deep (>160 cm), poorly drained organic soils developed on thick, fibric sphagnum peat overlying forest or fen peat or both. They are underlain by lacustrine sediments of various textures. The Julius soils are Typic Fibrisols composed dominantly of extremely acid, uniform deposits of fibric sphagnum peat greater than 130 cm deep occurring on treed, domed or raised bog landforms. This soil develops on a drainage divide in central parts of peatlands away from the influence of minerotrophic groundwaters. Under such conditions, the rapid growth of sphagnum mosses as well as their fairly high resistance to decomposition, results in significant accumulation of peat and the formation of a raised organic landform. Water samples from these areas are very

ombotrophic (nutrient deficient) as the site is above the regional water table and moisture is provided mainly by precipitation. Native vegetation on Julius soils is stunted black spruce, Labrador tea, leather leaf, and Sphagnum moss.

Jumping River Series, peaty phase (JPV)

The Jumping River series are poorly drained Rego Gleysol, peaty phase soils developed on strongly to extremely calcareous, weakly stratified, and loamy to clayey recent alluvial deposits. These materials are generally underlain by clayey glacial till, which may occur within the control section (within 1 metre of the mineral soil surface) in some areas. A thin surface mantle (15 to 40 cm) of mesic peat commonly caps the surface of these soils. Topography of the Jumping River soils is generally depressional to nearly level. These soils are confined to the flood prone areas common to the channels of the larger streams flowing through the map area. Natural drainage of these soils is severely impeded by a high groundwater table. The native vegetation of the Jumping River areas consists of dominantly black spruce, willow, alder and balsam poplar with an undercover of meadow grasses and sedges. Soils of the Jumping River series commonly occur in association with the McKay series.

Justice Series (JUC)

The Justice series consists of imperfectly drained Gleyed Black Chernozem soils developed on a thin mantle (25 to 75 cm) of silty clay to clay sediments over a thin strata(10 to 40 cm) of very strongly calcareous loamy glacial till of shale, limestone and granitic origin over a strongly calcareous till of shale, limestone and granitic origin. The topography is level to gently sloping; runoff is slow and permeability is moderately slow to slow. These soils are influenced by a subsoil seepage condition in the very strongly calcareous till and an upward pressure of groundwater. Although these soils are not saline, some of the adjacent soil types have appreciable soluble salts within their solum.

The soil is characterized by a very dark gray Ah horizon, 12 to 22 cm thick, a dark grayish brown, prismatic to subangular blocky Bm horizon 15 to 20 cm thick, with fine yellowish brown mottles; a calcium carbonate accumulation horizon is common. Where the clay overlay is shallow, the depth of solum extends to the contact of the very strongly calcareous till.

Katherine Series (KHI)

The Katherine series consists of imperfectly drained Gleyed Dark Gray Chernozem soils developed on deep (>100 cm), moderately to strongly calcareous, coarse textured (FS, LCoS, LFS), sandy to gravelly, deltaic, beach, or outwash deposits. These soils occur in mid to lower positions of very gentle to moderate slopes on undulating to hummocky landscapes and have rapid permeability, low surface runoff and generally, a low water table during the growing season. Katherine soils are susceptible to wind erosion when cultivated, and are none to slightly stony and non-saline. They have low available water holding capacity, and medium organic matter content. Native vegetation often includes aspen, willow, shrubs, and grasses. The majority of these soils are currently used for improved pasture and annual crop production.

In a representative profile the solum is approximately 50 cm thick. The profile is characterized by a dark gray, sandy loam Ah or Ap horizon, 15 to 20 cm thick, grading to a gray, sandy loam, Ahe horizon, 4 to 10 cm thick, overlying a grayish brown to brown sandy loam to sandy clay loam Btgj horizon, 20 to 35 cm thick with many medium faint reddish and yellowish mottles and iron stains. The underlying Ckg horizon is moderately calcareous and has a coarse sandy texture, with many medium prominent reddish brown mottles. A typical profile may contain coarse fragments of shale, granite rock, limestone and dolomite throughout. The parent material is typically stratified with sandy to gravelly layers which reflect its fluvial origin.

Katherine soils occur in close association with Seech, Bethany and Poppleton soils. They have similar parent materials to the well drained Seech soil and the imperfectly drained Bethany soil. Coarser textures differentiate Katherine soils from Poppleton soils. Katherine soils were previously included in areas mapped as Seech and Zaparosa soil associations in the reconnaissance survey of soils in the Rossburn and Virden map sheet areas.

Katimik Series (KMK)

The Katimik series consists of very poorly drained Typic Mesisol, sphagnic phase soils developed on dominantly mesic fen peat. These very deep organic soils are underlain by undifferentiated materials, usually loamy to clayey lacustrine sediments, at depths below 160 cm. A thin layer of fibric Sphagnum moss peat 15 to 65 cm thick blankets the surface. Katimik soils occur in areas of depressional to level topography and have a very hummocky micro relief. Vegetation supported on these soils is stunted black spruce and tamarack, with dominantly Sphagnum moss and ericaceous shrub understory. A representative Katimik series profile is described below.

Of1 - 0 to 20 cm, reddish yellow (7.5YR 6.5/6 moist) dominantly fibric Sphagnum moss, medium to fine fibered, low wood content, extremely acid, unrubbed fiber content approximately 89% rubbing to 81%.

Of2 - 20 to 55 cm, brown to dark brown (7.5YR 4/4 moist) fibric Sphagnum moss, medium to fine fibered; non woody; very strongly acid; unrubbed fiber content approximately 88%, rubbing to 76%, clear wavy boundary.

Om1 - 55 to 160 cm, black (7.5YR 2/2 moist) dominantly moderately decomposed fen peat, coarse to very fine fibered, low wood; medium acid; unrubbed fiber content approximately 48%; rubbing to 33%; clear wavy boundary.

Oh1 - 160 to 180 cm, black (5YR 2/1 moist) dominantly fen peat; dominantly fine to very fine fibered with some coarse wood fragments; low wood; slightly acid; unrubbed fiber content approximately 32% rubbing to 9%; clear wavy boundary.

II Ckg - 180 + cm, gray (5Y 5/1 moist) silty clay; massive; very sticky wet; moderately alkaline very strongly calcareous.

Most of the Katimik soil is found around the Big Bog, in association with such soils as Stead or Waskwei series.

Keld Series (KLD)

The Keld series consists of imperfectly drained Gleyed Sombric Brunisol soils developed on thin, moderately fine to fine textured (SCL, CL, SiCL to SiC, C), sediments overlying strongly acid shaly clay till. This till is of local occurrence and originates from soft, very strongly acid shale bedrock found usually at depths ranging from 0.5 to 2.0 metres. The Keld soils occur as small areas at lower elevations around the Riding Mountain escarpment. They are of local extent in areas where the acid shales of the Keld Formation are covered by very thin glacial till and lacustrine sediments. Surface textures are dominantly clay loam but range from loam to heavy clay. The surface of the Keld soils is often characterized by numerous large boulders of granitic origin, but they do not present a serious problem to cultivation. The topography is smooth and level and the soils are dominantly imperfectly drained as surface runoff and internal percolation are slow. Native vegetation on the Keld soils is mainly aspen, black poplar, willow and moist prairie grasses and sedge. Oak may occur with aspen on slightly better drained sites.

The solum of the Keld soils is about 50 to 70 cm and weakly developed. Keld soils in the virgin state are characterized by a thin sod and leaf mat underlain by a dark colored acidic A horizon which dries to a grayish brown color. The weak B horizon appears as a dark brown mottled layer which gradually fades into dark grayish brown and dark gray massive shaly clay banded with yellowish brown layers of jarosite and other iron and sulphur bearing minerals. Base saturation is 30 to 65 percent. Acidity in the underlying shaly till and shale bedrock is fairly constant at a pH of 3.8. The Keld soils are classified as Gleyed Sombric Brunisols based on the strongly acid character of the solum and parent material. The KLD1 variant is a Rego Humic Gleysol. A description of the Keld Series is given below:

Ah - 0 to 20 cm, very dark brown (10YR 2/2moist, 10YR 5/2 dry) clay loam to silty clay loam, weak fine subangular blocky breaking readily to weak, fine granular; friable when moist, slightly hard when dry; very strongly acid (pH 4.5); abrupt, smooth boundary.

Bmgj - 20 to 50 cm, very dark brown to very dark grayish brown (10YR 2/2 to 3/2 moist, 10YR 3/3 dry) clay loam to clay; weak, medium subangular blocky breaking to weak, fine granular; friable when moist and slightly hard when dry; extremely acid (pH 3.6); abrupt, irregular boundary. Mottles with colors of 10YR 3/4 and 5Y 8/6.

Bg - 50 to 70 cm, dark red (2.5YR 3/6 dry) clay; weak, fine granular; very friable when moist, soft when dry; extremely acid (pH 3.4); abrupt, irregular boundary. Many streaks and blobs of olive yellow (2.5Y 6/6 m) jarositic clay materials and mottles with colors of 2.5YR 4/8 to 2.5 YR 4/0.

Cg - 70 to 100 cm, dark brown to gray (10YR3/3 moist, 10YR 5/1 dry) heavy clay; moderate, fine granular; firm when moist, hard when dry; extremely acid (ph 3.2); gradual, smooth boundary. Mottles with a color of 5Y 8/6.

II Ckg - 100 + cm, very dark gray to dark gray (10YR 3/1 moist, 10YR 4/1 dry); shaly, silty clay to clay; neurtal reaction (pH 6.8).

Kelwood Series (KWD)

The Kelwood series consists of Gleyed Rego Black soils developed on thin (25 to 100 cm) moderately to strongly calcareous, moderately coarse to medium textured (VFS, LVFS, FSL to VFSL, L, SiL), sediments overlying weakly to moderately calcareous, shaly clay till. The two materials may be separated by 25 to 90 cm of water-worked gravelly and cobbly materials. The surface texture of the Kelwood soils varies from loamy fine sand to loam; loam is dominant. These soils occur in the southwest portion of the Dauphin Lake Plain as part of a narrow belt of shallow lacustrine deposits parallel to the Manitoba Excarpment. The lacustrine and till surficial deposits are very thin in much of this area and shale bedrock or shaly clay till is found within the control section. The Kelwood soils are found in near level to very gently sloping areas. Most of the Kelwood soils are cultivated but native vegetation generally consists of meadow grasses associated with a cover of balsam poplar and willow groves. The Kelwood soils are moderately to very stony and bouldery, the severity of this condition varying with the depth of lacustrine overlay. Areas where the stones and boulders have been removed in the course of cultivation or where the overlays are deeper are virtually stone-free.

The Kelwood soils have a very dark gray to black surface. The permeability of the materials in the lacustrine mantle is moderate; the underlying shaly clay materials are almost impermeable and variably saline. Where the water-worked lens occurs, it acts as an aquifer for laterally moving groundwaters. These coarse textured layers are often characterized by large amounts of iron compounds as well as carbonates and gypsiferous salts. The Kelwood soils usually occur in single or homogeneous mapping units that may contain minor inclusions of Crawford and Kerosene Creek soils.

Kemnay Series (KMY)

The Kemnay series is the well drained, Calcareous Black Chernozem member of the Lyleton Association, developed on deep, moderately calcareous, coarse to moderately coarse textured lacustrine deposits. This soil has a sandy loan surface texture, a

complex, very gently sloping topography, moderately good drainage, moderately rapid permeability and moderate surface runoff. The depth of the water table is estimated at 2 to 3 metres during the growing season. Kemnay soils can be found in close association with Lyleton soils. The Nesbitt series of the Mentieth Association resembles the Kemnay series. The only difference is the Nesbitt series is underlain at shallow depth by glacial till.

Kemnay soils are characterized by a thick black Ah horizon 10 to 28 cm thick of which the upper 15 cm constitute the Ap horizon. The dark brown Bmk horizon is 25 to 30 cm thick and the Cca horizon when present is grayish brown and 8 to 13 cm thick. The parent material or Ck horizon is pale brown, stratified and has a few faint iron mottles. Morphological data for a representative profile is presented below.

Apk - 0 to 15 cm, black to very dark gray (10YR 2.5/1, moist), very dark gray to dark gray (10YR 3.5/1, dry), very fine sandy loam; weak fine granular; very friable when moist; soft when dry; abrupt smooth boundary; weakly calcareous; pH 7.6.

Bmk - 15 to 23 cm, very dark grayish brown (10YR 3/2, moist), grayish brown (10YR 5/2, dry), loam; weak fine granular; friable when moist, slightly hard when dry; abrupt wavy boundary; strongly calcareous; pH 7.7.

Cca - 23 to 33 cm, light gray (10YR 7/2, moist), white (10YR 8/2, dry), silt loam; moderate fine granular; firm when moist, hard when dry; clear smooth boundary; extremely calcareous; pH 8.0.

Ck - 33 cm +, very pale brown (10YR 7/3, moist), very pale brown (10YR 8/3, dry), silt loam; weak fine granular; friable when moist, soft when dry; very strongly calcareous; pH 8.2.

Kenville Series (KVL)

The Kenville series consists of well drained Orthic Black Chernozem soils developed on moderately calcareous (6 to 15 % $CaCO_3$), moderately fine (SCL, CL, SiCL) textured lacustrine sediments. Surface textures range from clay loam, silty clay loam to silty clay. The topography is dominantly very gently sloping with stronger relief near rivers, creeks and deep ravines, some of which exceed 30 m in depth. The majority of Kenville soils have minimal erosion, good structure and moderate permeability. However, on the steeper slopes, sheet erosion is evident. Native vegetation is aspen with associated shrubs, herbs and tall prairie grasses. Some stones occur in areas where the underlying till is near the surface.

The Kenville soils have a solum from 40 to 70 cm thick. The A horizon is 25 to 40 cm thick, and the B horizon is 20 to 30 cm thick. Some leaching is evident by a grayish coloration in the A horizon and a slight accumulation of clay in the B horizon. A representative profile is described.

L-H - 2 to 0 cm, very dark brown (10YR 2/2, dry), sod mat; slightly acid.

Ah(e) - 0 to 33 cm, very dark gray (10YR 3/1), to dark gray (10YR 4/1, dry), silty clay loam; medium granular; hard when dry; plastic and sticky when wet; slightly acid.

Btj - 33 to 53 cm, very dark grayish brown (10YR 3/2, dry), to dark grayish brown (10YR 4/4, dry), silty clay loam to silty clay; fine blocky; hard when dry; slightly acid.

BC - 53 to 60 cm, dark brown (10YR 4/3, dry), silty clay loam; fine blocky; hard when dry; mildly alkaline; moderately to strongly calcareous.

Ck - 60 to 100 cm, grayish brown (2.5Y 5/2, dry), silty clay loam; fine pseudo-fragmental; hard when dry; moderately alkaline; moderately calcareous.

Kergwenan Series (KRW)

The Kergwenan series consists of imperfectly drained Gleyed Dark Gray Chernozem soils developed on strongly calcareous, sandy and gravelly out wash or beach deposits. The surface texture is usually finer ranging from a fine sandy loam to loam. The topography is very gently sloping to level. Surface runoff is slow; permeability is rapid. Drainage is imperfect because of a fluctuating water table that rises within 50 cm of the surface during the spring or due to lateral seepage. Vegetation consists dominantly of aspen and grasses with some dogwood, balsam poplar and willows.

The Kergwenan soil is characterized by a thin layer of decomposing leaf litter and grasses, a dark gray Ah to Ahe horizon, 10 to 24 cm thick, and a dark grayish brown to very dark grayish brown Bmgj or Btgj horizon which contains dark yellowish brown mottles. Below the B horizon mottles are common, and a lime carbonate enrichment (Cca) may occur.

Kerosene Creek Series (KCE)

The Kerosene Creek series consists of carbonated Rego Humic Gleysol soils developed on thin, moderately to strongly calcareous, moderately coarse to medium textured (VFS, LVFS, FSL to VFSL, L, SiL), sediments overlying weakly to moderately calcareous shaly clay till. A layer, 25 to 90 cm of water-worked gravelly and cobbly materials commonly occurs between the two materials. Surface textures vary from loamy fine sand to loam but loam is dominant. The Kerosene Creek soils occur in the southwest portion of the Dauphin Lake Plain. They are of minor extent occurring as part of a narrow belt of shallow lacustrine deposits parallel to and below the Manitoba Escarpment. Throughout this area the lacustrine and till surface deposits are very thin, so that the shale

bedrock may be exposed at the surface or is found within 1 metre of the surface. The Kerosene Creek soils occur in level to depressional areas much of which remains uncultivated. Native vegetation generally consists of meadow grasses and sedges and a few clumps of willow and balsam poplar. These soils are moderately bouldery to very bouldery. The severity of this bouldery condition varies with the depth of lacustrine overlay.

The Kerosene Creek soils have a thin dark colored surface horizon (< l5 cm) which is usually carbonated. A thin transitional AC horizon occurs at the top of the water-worked lens. This lens of coarse, water-worked materials is extremely variable in depth and composition. It commonly contains numerous large, rounded granitic boulders and/or flat-lying limestone cobbles near the bottom of the overlay. The lens may vary from nearly pure gravel and sand to cobbly and gravelly loam textured materials. Many of these lenses are high in iron and sulphur compounds (strongly colored orange, yellow, brown and red), may contain soluble salts and gypsum, but may or may not be calcareous. A strongly calcareous Cca horizon often appears near the lower limit of the lens. The underlying shaly clay materials (shaly clay till or shale bedrock) occur at depths ranging from at or near the surface to 1 and 2 metres. Although the Kerosene Creek soils are delineated on the soil map as single or homogeneous map units, minor inclusions of Kelwood and Crawford soils may occur.

Kerran Series (KRN)

The Kerran series consists of poorly to very poorly drained Rego Humic Gleysol soils developed on moderately to strongly calcareous, deep, stratified, clayey (SiC, C), recent alluvial deposits with strata of silty clay loam and clay loam textures. These soils occur in depressional positions of level slopes on flood prone terraced landscapes and have very slow permeability, very slow surface runoff, and a high water table during the growing season. Kerran soils are non-eroded, non-stony, and frequently moderately saline. They have a high available water holding capacity, high organic matter content, and low natural fertility. Native vegetation includes reeds, rushes, sedges and willows. The majority of these soils are currently in native vegetation.

In a representative profile the solum is not developed. The profile is characterized by a thin organic horizon, 2 to 4 cm thick, a weakly developed dark gray Ahk horizon, 10 to 15 cm thick, and a pale brown to light gray Ck horizon, with prominent iron mottles. The parent material is typically stratified, mottled, and may contain buried former Ah horizons. Kerran soils occur in close association with Assiniboine soils. They are similar to Barker soils by having a poorly drained profile in recent alluvium but differ from them in having finer textures throughout the profile. Kerran soils were previously mapped as associates of the Assiniboine Complex in the Carberry (1957) soil report.

Kerry Series (KRY)

The Kerry series consists of poorly drained, Peaty Rego Gleysol soils developed on sandy outwash deposits. They occur adjacent to the numerous sandy moraines. They occupy small, level to depressional areas where surface drainage is very slow and internal drainage is impeded because of a high water table.

Kerry soils are characterized by a thin, acid fibrous to mucky peat surface layer 15 to 30 cm thick, underlain by a strongly iron stained Cg horizon. Some profiles have a thin (less than 5 cm) Ah horizon; others have a thin leached or bleached surface horizon that is strongly gleyed and lacks mottling. A representative soil profile of Kerry series is described below.

L-H - 15 to 0 cm, dark brown to black (10YR 3/2 to 2/1 dry) partially to well decomposed sedges, reed-grasses and forbs; neutral; abrupt, smooth, lower boundary.

Ahg - 0 to 5 cm, very dark gray (10YR 3/1 dry) fine sandy loam; weak, fine granular; very friable when moist; soft when dry; neutral; horizon is often discontinuous.

Cg1 - 5 to 35 cm, light gray (2.5Y 7/2 dry) fine sand; loose; mildly alkaline; numerous iron mottles; gradual, smooth, lower boundary.

Cg2 - 35 to 75 cm, pale yellow gray (2.5Y 7/4 to 7/2 dry) fine sand; loose; mildly alkaline; strongly iron stained.

Kettle Hills Series (KTS)

The Kettle Hills series consists of rapidly drained, Orthic Regosol soils developed on non-calcareous, coarse textured outwash (glacio-fluvial) and/or residual sandstone deposits. The topography is gently undulating to gently rolling (duned) and the vegetation is a regeneration of jack pine, mosses, juniper and bearberry. Internal drainage is rapid and surface runoff is minimal. A generalized profile description is given.

LF - 1 to 0 cm, very dark brown (10YR 2/2 moist and dry); weakly decomposed; clear, smooth boundary.

C1 - 0 to 15 cm, light yellowish brown (10YR 6/4 moist, 10YR 7/3 dry); fine sand; structureless; loose when moist and dry; very strongly acid; arbitrary boundary.

C2 - 15 to 30 cm, light yellowish brown (10YR 6/4 moist, 10YR 7/3 dry); fine sand; structureless; loose when moist and dry; strongly acid; arbitrary boundary.

C3 - 30 to 61 cm, light yellowish brown (10YR 6/4 moist, 10YR 7/3 dry); fine sand; structureless; loose when moist and dry; strongly acid; arbitrary boundary.

C4 - 61 to 96 cm, light yellowish brown (10YR 6/4 moist, 10YR 7/3 dry); fine sand; structureless; loose when moist and dry; strongly acid; arbitrary boundary.

C5 - 96 to 122 cm, dark brown (10YR 4/3 moist) and pale brown (10YR 6/3 dry); fine sand; structureless; loose when moist and dry; very strongly acid; irregular boundary.

C6 - 122 cm +, light yellowish brown (10YR 6/4 moist) and very pale brown (10YR 7/3 dry); fine sand; structureless; loose when moist and dry; medium acid.

Kilkenny Complex (KEY)

The Kilkenny complex comprises a group of organic soils developed on deep, 65 to 160 cm of fibric Sphagnum moss peat generally underlain by significant layers of mesic forest and/or mesic fen peat. Extremely calcareous loamy, moderately stony till occurs within 160 cm of the surface. Areas of Kilkenny complex soils are characterized by depressional to level topography with associated poor to very poor drainage. Native vegetation on these soils is black spruce and some tamarack with an understory of Sphagnum mosses and ericaceous shrubs.

The dominant soil within the Kilkenny complex is the Kilkenny series, a Terric Mesic Fibrisol. Others are the Ferland series, a Terric Fibric Mesisol and the Elmore series, a Terric Fibrisol. Both of these soils are generally only of minor significance. These soils are very low in nutrients and medium to strongly acid. The Kilkenny soils occur in association with the Crane series and the Dering peaty phase series and Lamb Lake complex. The soils of the Kilkenny complex are similar to those of the Molson complex and the Sand River complex, differing from them only in the nature of the underlying mineral substrates, which are lacustrine clay and sandy sediments respectively. A representative Kilkenny series may be described as follows:

Of1 - 0 to 50 cm, reddish brown (5YR 4/4 moist) fibric Sphagnum moss; medium to fine fibered; nonwoody; extremely acid; unrubbed fiber approximately 99% rubbing to 91%.

Of2 - 50 to 85 cm, strong brown (7.5 YR 5/6 moist) fibric Sphagnum moss; medium to fine fibered; nonwoody; extremely acid; unrubbed fiber approximately 84% rubbing to 70%; clear wavy boundary.

Om - 85 to 110 cm, black (5YR 2/1 moist) moderately decomposed herbaceous forest peat; dominantly fine to very fine fibered with some coarse fibered wood fragments; low wood content; slightly acid; unrubbed fiber approximately 22%; clear smooth boundary.

II Ckg - 110 cm +, light gray (10YR 7/1 moist) silt loam; massive; sticky wet; mildly alkaline; extremely calcareous.

Killeen Series (KLL)

The Killeen series consists of imperfectly drained, carbonated, Gleyed Rego Black Chernozem soils developed on a thin mantle (25 to 60 cm) of sandy sediments (FS, LFS, LS) over a thin strata (10 to 40 cm) of very strongly calcareous, loamy glacial till of limestone and granitic origin over a strongly calcareous loam to clay loam till of shale, limestone and granitic origin. The topography is level to very gently sloping; runoff is moderately slow to slow, and permeability is moderately rapid in the upper sandy strata and decreases to moderately slow to slow in the lower, more compact, weakly to moderately fissile till.

The soil is characterized by a very dark gray Ah horizon, 15 to 20 cm thick, a dark gray to grayish brown, weakly mottled AC horizon, and a light gray lime accumulation (Cca) layer. Where the overlay is relatively shallow, the lime accumulation horizon occurs at the contact of very strongly calcareous till.

Kilmury Series (KUY)

The Kilmury series consists of imperfectly drained Gleyed Rego Black carbonated soils developed on a thin mantle (<1 m) of moderately to strongly calcareous sediments of VFS, LVFS, SL and FSL texture overlying moderately to strongly calcareous stratified medium sands to gravelly textured deposits. They occur in close association with Wytonville series, the well drained Miniota series and the poorly drained Bornett series. The topography is level to very gently sloping; runoff is moderately slow; permeability is moderately rapid in the very fine sandy sediments and rapid in the subsoil, but restricted by a high water table during spring and early summer.

The soil is characterized by a very dark gray Ah horizon, 20 to 35 cm thick, a dark gray to grayish brown AC horizon 10 to 16 cm thick and a Cca horizon 10 to 18 cm thick. Yellowish brown mottles are common in the sandy and coarser subsoil. Kilmury profiles differ from Wytonville profiles in not having a Bmgj horizon and in having free lime carbonate in their Ah horizons.

Kingsley Series (KIS)

The Kingsley series consists of moderately well to well drained Orthic Dark Gray Luvisol soils developed on a mantle (25 to 100 cm) of weakly to moderately calcareous, uniform, fine loamy (CL, SiCL), lacustrine deposits over moderately to strongly calcareous, deep, uniform, fine loamy (CL, L), mixed till deposits. These soils occur in upper slope positions of very gentle slopes on hummocky landscapes and have moderate permeability, moderate surface runoff and a low water table during the growing season. Kingsley soils are slightly water eroded. They have a medium available water holding capacity, medium organic matter content, and high

natural fertility. Native vegetation often includes forests of bur oak and aspen. The majority of these soils are currently used for crop production.

In a representative profile the solum is approximately 60 cm thick. The profile is characterized by a grayish brown Ahe or Ap horizon, 10 to 20 cm thick, a light gray Ae horizon, 10 to 15 cm thick with fine platy structure, a light yellowish brown, transitional AB horizon, 10 to 25 cm thick, a pale brown Bt horizon, 5 to 15 cm thick with clay skins, a light yellowish brown transitional II BC horizon, 10 to 20 cm thick, and a very pale brown II Ck horizon. The till substrate is commonly mixed till but can also be a shaly till. Kingsley soils occur in close association with Altamont soils. Kingsley soils were previously mapped as gray-wooded associates of the Altamont association in the reconnaissance soil survey of South-Central Manitoba (1943).

Kinwow Series (KNW)

The Kinwow series are Orthic Gray Luvisol soils developed on 15 to 100 cm of moderately to strongly calcareous, clayey lacustrine deposits underlain by extremely calcareous loamy till. These well drained soils have clay surface textures. Their gently undulating to level topography and slow permeability contribute to a moderate runoff. Depending upon the thickness of the lacustrine clay mantle over the till, Kinwow soils may range from being slightly stony to moderately stony. The native vegetation is dominantly spruce and aspen with some balsam poplar and jack pine.

The Kinwow soils have a thin grayish brown Ae horizon overlying a weakly to moderately developed textural B horizon. The C horizon contains an increasing proportion of extremely calcareous loamy till as the depth increases. The contact between the clayey mantle and the underlying till is sometimes abrupt, indicating a lacustrine overlay. At other times the contact is gradual, as the till occurs in pockets within the clay, and the material appears similar to clay till. Kinwow soils occur in association with soils of the Mantagao series. The Kinwow series of the Low Boreal climatic zone correlate with the Arnes series of the High Boreal-temperate zone, as mapped in the soils of the Red Rose-Washow Bay Area (Soils Report No. 19). A description of a representative Kinwow series is presented:

L-H - 2 to 0 cm, moderately decomposed leaves, needles and feathermoss; slightly acid; clear smooth boundary.

Ae - 0 to 6 cm, grayish brown (10YR 5/2 moist); loam; moderate fine platy; moist very friable; medium acid; gradual wavy boundary.

Bt - 6 to 30 cm, dark brown (10YR 3/3 exped moist) brown to dark brown (10YR 4/3 to 3/3 inped moist), clay; moderate to strong fine to medium subangular blocky; moist very friable; slightly acid; clear smooth boundary.

II Ckg - 30 + cm, very pale brown (10YR 7/3 moist) silt loam; moderate to strong medium subangular blocky; moist very friable; moderately alkaline; extremely calcareous.

Kiplin Series (KPN)

The Kipling series are imperfectly drained Gleyed Dark Gray Chernozem soils developed on very strongly calcareous, stratified, alluvial and lacustrine sediments. These sediments may be underlain by a clay substrate within 75 cm of the surface. Textures are variable throughout the profile ranging from fine sand to silty clay. These soils occur in small areas adjacent to the Whitemouth, Winnipeg and Seine rivers. Topography is level to irregular very gently sloping. Surface runoff is slow and the soil is moderately pervious.

Kiplin soils are characterized by a thin very dark brown to black leaf and forb mat overlying a 5 to 10 cm dark gray A horizon with blotches of light gray material. The Btjgj horizon contains some translocated clay and is usually neutral in reaction. Analytical and morphological data for a representative profile is presented below.

L-H - 5 to 0 cm, very dark brown to black (10YR 2/2 to 2/1 dry), partially to well decomposed leaf, herb and grtass litter; neutral in reaction; abrypt, smooth, lower boundary; pH 6.8.

Ahegj - 0 to 8 cm, dark gray (10YR 4/1 dry), loam with areas of light gray (10YR 6/1 dry) material; moderate, medium platy breaking readily to weak, fine granular; friable when moist; soft when dry; mottled; neutral; abrupt, smooth lower boundary; pH 7.4.

Btgj - 8 to 25 cm, dark gray to very dark gray (10YR 4/1 to 3/1 dry), clay loam; strong, medium granular; firm when moist; hard when dry; mottled; mildly alkaline; clear, wavy lower boundary; pH 7.4.

BCkgj - 25 to 30 cm, light gray (10YR 7/2 dry), clay loam; moderate, medium granular; firm when moist; hard when dry; mottled; mildly alkaline and strongly calcareous; clear, wavy lower boundary; pH 7.7.

Ckgj - 30 to 60 cm, light gray to white (2.5Y 7/2 to 8/2 dry), clay loam; massive breaking to medium granular-like structures; weakly cemented when dry; moderately alkaline and very strongly calcareous; pH 8.3.

Kircro Series (KIC)

The Kircro series consists of very poorly to poorly drained Terric Mesisol soils developed on shallow (40 to 160 cm) deposits of moderately decomposed fen peat. Little or no (< 15 cm) fibric Sphagnum moss occurs on the surface. The Kircro soils are underlain by strongly calcareous sandy or gravelly sediments within 160 cm of the surface. The Kircro soils occur in high nutrient (eutrophic),

very poorly to poorly drained depressional to level areas. Native vegetation is dominantly sedges, brown mosses, and reeds, with willow and swamp birch on local sites having better drainage.

Minor areas of Waldersee series, a Terric Humic Mesisol, and Sturgeon Gill series a Terric Mesisol, sphagnic phase may be included in some map units mapped as the Kircro series. The Kircro series is often associated with soils of the Sand River and the Whithorn complexes. The Cayer and Crane series are similar, but are underlain by clay and loamy till respectively.

Kirkness Series (KKS)

The Kirkness series consists of moderately well to well drained Orthic Black Chernozem soils developed on a thin mantle (25 to 60 cm) of sandy sediments (FS, LFS, LS) over a thin strata (10 to 40 cm) of very strongly calcareous loamy glacial till of limestone and granitic origin over a strongly calcareous loam to clay loam glacial till of shale, limestone and granitic origin. They occur on gently sloping to gently undulating topography. Runoff is low; permeability is rapid in the upper strata and moderately slow in the underlying till deposits.

The soil is characterized by a very dark gray Ah horizon 15 to 22 cm thick and a brown Bm horizon 12 to 18 cm thick. The depth of the solum varies with the thickness of the overlay; generally the BC extends to the contact of the sandy strata and the very strongly calcareous loamy till, which appears as a prominent Cca horizon.

Kiskitto Complex (KHX)

The Kiskitto complex consists of deep (>160 cm) organic soils composed of strongly acidic, fibric Sphagnum moss peat (>65 cm thick) overlying mesic forest on fen peat. The underlying mineral sediments are undifferentiated, but are usually strongly gleyed, moderately to strongly calcareous, loamy to clayey lacustrine sediments. These soils develop on a raised landform due to the rapid growth of Sphagnum moss. The topography of these soils is level to gently sloping, and drainage is poor to very poor. Water samples from these sites are very ombrotrophic (nutrient deficient) as the site is above the regional water table and moisture is provided mainly by precipitation. Native vegetation on Kiskitto soils is stunted black spruce and tamarack with an understory of dominantly Sphagnum moss and ericaceous shrubs.

The Kiskitto series is the dominant member of the complex, a Mesic Fibrisol with a surface layer of 80 to 135 cm of fibric Sphagnum moss peat. The other member a Typic Fibrisol has greater than 125 cm of fibric Sphagnum moss. The Kiskitto complex is mapped within the Mid Boreal climatic zone. The Kiskittos equivalent complex mapped in the Low Boreal climatic zone is the Whithorn complex, which is also found in this report. Kiskitto soils are found only in the Playgreen Lake area and are associated with other deep organic soils such as Nekik Lake complex and Rock Island complex. Permeability is moderate, but can be restricted due to saturation of the subsoil. In areas of seepage or discharge, soluble salts in the subsoil and groundwater can be translocated nearer the surface in quantities sufficient to affect vegetation.

Kleysen Series (KYS)

The Kleysen series consists of moderately well to well drained Calcareous Black Chernozem soils developed on a thin mantle (25 to 60 cm) of loamy lacustrine sediments over a thin strata (10 to 40 cm) of very strongly calcareous loamy glacial till of limestone and granitic origin over a strongly calcareous loam to clay loam till of shale limestone and granitic origin. These soils in the upper slope positions are of gently sloping, undulating or rolling topography. Runoff is moderate to moderately rapid; permeability is moderate in the lacustrine sediments and in the loose, very strongly calcareous till, and moderately slow to slow in the more compact, somewhat fissile loam to clay loam till.

The soil is characterized by a very dark gray to black Ah horizon 10 to 14 cm thick and a brown to dark brown calcareous Bm horizon 8 to 12 cm thick. The solum usually extends to the contact of the very strongly calcareous till. A description of a representative Kleysen soil is described below.

Ah - 0 to 17 cm, very dark gray (10YR 3/1 dry, 10 YR2.5/1 moist) silty clay loam, weak, fine subangular blocky; very friable when moist; slightly hard when dry; plastic; mildly alkaline; non-calcareous; clear, smooth boundary.

Bmk - 17 to 30 cm, brown (10YR 4.5/3 dry, 10YR 3.5/3 moist) silty clay loam; weak to moderate, fine subangular blocky; friable when moist; slightly hard when dry; plastic; moderately alkaline; strongly calcareous; clear, wavy boundary.

II Cca - 30 to 45 cm, light gray to very pale brown (10YR 7/2.5 dry, 10YR 5.5/3.5 moist) silty clay loam (till); very weak, fine, pseudo granular; very friable when moist; hard when dry; plastic; strongly alkaline; extremely calcareous; clear, irregular boundary.

II Ck - 45 to 80 cm, very pale brown (10YR 7.5/3 dry, 10YR 5.5/4 moist) silt loam (till); weak, fine to medium, pseudo, subangular blocky; friable when moist; hard when dry; plastic; strongly alkaline; extremely calcareous; abrupt, smooth boundary.

III Ck - 80 to 100 cm, pale brown (10YR 6/3 dry, 10YR4.5/4 moist) loam (till); weak to moderate, fine to medium subangular blocky; friable when moist; slightly hard when dry; plastic; moderately alkaline; very strongly calcareous; contains significant amounts of shale fragments.

Klidal Series (KDA)

The Klidal series is characterized by a Gleyed Solonetzic Black Chernozem solum, imperfect soil drainage, consisting of a veneer (25 0 90 cm) of non to weakly calcareous clayey deposits or weathered (altered) shale overlying non to weakly calcareous shale bedrock. These soils occur in the lower to mid slope positions in association with the Benton soils in the escarpment area and various locales above the escarpment. Slopes are generally very gently sloping; runoff is moderate to slow; and some seepage from upslope position may occur. Permeability is very slow to negligible because of the massive soil structure in the lower B and the C horizon.

The solum has a very dark gray to black Ap or Ah horizon 20 to 25 cm thick, a weak columnar grading to massive Bnj 15 to 25 cm thick. A massive Cg or weakly calcareous Ckg changes from softened or altered shale to the firm shale bedrock. Gypsum crystals and jarosite may be present in the weakly oxidized upper layers of softened or altered shales.

Kline Series (KLI)

The Kline series consists of poorly drained Rego Humic Gleysol soils developed on thin, fine textured (SiC, C), moderately to strongly calcareous lacustrine deposits overlying stony, extremely calcareous loamy glacial and water-modified till deposits. They occupy the level to depressional sites in the transition belt between the lacustrine and high lime glacial till soils. Runoff is very slow, and permeability is very slow. The natural vegetation is dominantly meadow grasses, sedge with some willow and balsam poplar. The Kline soils are characterized by a thin partially decomposed organic layer 5 to 15 cm thick, a very dark gray to dark gray Ah horizon 10 to 15 cm thick and a dark gray to olive gray calcareous C horizon; a thin pebble line may be present at the contact of the high lime glacial till in some areas.

The solum is similar in properties to the Osborne clay, and the subsoil is similar to the Ckg horizon of the Meleb and Inwood series. The Kline, clay till variant, KLI1, consists of soil similar in profile characteristics to the normal Kline clay except that the substrate is a clay till (a mixture of clay material with a color of 5Y 5/3 and loamy, exremely calcareous deposits with a color of 5Y 7/2).

Knolls Series (KLS)

The Knolls series is an Orthic Regosol soil developed on well to excessively drained, strongly to very strongly calcareous, loamy (VFSL, L, SiL), lacustrine sediments. These soils occur on the Brandon Lakes Plain and Upper Assiniboine Delta in the upper slope and knoll positions on gently undulating to moderately rolling topography in association with Fairland, Durnan, Torcan, Taggart and Vordas soil series. Surface runoff is moderate to rapid, and permeability is moderate. These soils are severely eroded remnants of Fairland and Durnan soils whose surface horizons have been removed by wind and water erosion. They continue to be very susceptible to both wind and water erosion.

The Knolls soil profile has a gray to light gray, calcareous Ap horizon, 10 to 15 cm thick, that is slightly darker in color than the light yellowish brown to pale brown C horizon.

Knudson Series (KUD)

The Knudson series consists of moderately well to well drained Orthic Black Chernozem soils developed on a shallow deposits (30 to 100 cm) of weakly to moderately calcareous, uniform, fine loamy to clayey, glaciolacustrine deposits, over moderately to strongly calcareous, deep, uniform, fine loamy to fine silty mixed till deposits. These soils occur in middle positions of very gentle slopes on undulating landscape and have medium permeability, moderate surface runoff and a medium water table during the growing season. Knudson soils have moderate available water holding capacity, moderate organic matter content, and high natural fertility.

In a representative profile the solum is approximately 60 cm thick. The profile is characterized by a black Ap horizon, 15 to 25 cm thick, with a brown to grayish brown Bm horizon 8 to 12 cm thick with medium subangular blocky structure, a very pale brown Cca horizon 6 to 10 cm thick, and a yellowish brown II Ck horizon. A typical profile also contains a thin pebble line at the lacustrine-till interface. Knudson soils occur in close association with Joyale and Guerra soils. They are similar to Darlingford soils by having similar profile characteristics but differ from them in having a thin mantle of fine loamy to clayey glaciolacustrine deposits overlying glacial till. Knudson soils were previously mapped as blackearth associates of the Altamont association in the reconnaissance soil survey of South-Central Manitoba (1943).

Koostatak Series (KOS)

The Koostatak series consists of poorly drained Rego Humic Gleysol soils developed on moderately to strongly calcareous, clayey, lacustrine sediments. These soils are level to depressional with very slow surface runoff. The soils are very impermeable, but any internal drainage would be impeded by a high water table. These soils can also have a layer (15 cm) of mesic peat on the surface. Native vegetation consists of clumps of willows and alders with sedges, reed grasses and feathermoss forming the ground cover. On slightly better drained sites where surface water is able to move off slowly, the dominant species are mixed stands of balsam poplar and some black spruce. Areas consist of normal Koostatak series with minor inclusions of Koostatak peaty phase and areas of Koostatak soils having 15 to 40 cm of mesic herbaceous peat layer.

Kornell Series (KOL)

The Kornell series consists of poorly to very poorly drained Rego Humic Gleysols soils developed on deep (>100 cm), moderately to strongly calcareous (6 to 25 % $CaCO_3$), stratified, dominantly clayey, recent alluvial deposits with some shale. They occur on the level to depressional sites in the flood plain of stream channels and are subject to flooding. These soils have slow permeability and little or no surface runoff.

The Kornell series is characterized by a thin LH horizon, 1 to 3 cm thick over a black Ahg horizon, 10 to 15 cm thick, and a light gray to pale brown, recently deposited Ckg layer.

Kronstal Series (KOT)

The Kronstal series consists of an imperfectly drained Gleyed Black Chernozem soil developed on moderately calcareous, deep, stratified, coarse loamy (VFS, LVFS, FSL, SL), lacustrine deposits. These soils occur in middle positions of nearly level slopes on undulating landscapes and have moderate to moderately rapid permeability, low surface runoff, and a high water table during the growing season. Kronstal soils are non-eroded, non-stony, and occasionally slightly saline. They have a medium available water holding capacity, high organic matter content, and medium natural fertility. Native vegetation includes aspen-oak groves, shrubs, meadow and tall prairie grasses. The majority of these soils are currently cultivated for crop production.

In a representative profile the solum is approximately 55 cm thick. The profile is characterized by a very dark gray Ah horizon, 20 to 30 cm thick, a grayish brown to brown Bm horizon, 20 to 40 cm thick with fine to medium yellowish mottles, a Cca horizon, 8 to 13 cm thick and a Ck horizon, with distinct mottles. The parent material is typically stratified with layers of FS to LFS texture. Kronstal soils occur in close association with Hochfeld, Reinland and Osterwick soils. They are similar to Jasset soils by having a Gleyed Black profile and coarse loamy substrate but differ from them in having no loamy surface mantle. Kronstal soils were previously mapped as Black Meadow associates of the Altona Association in the Winnipeg-Morris (1953) soil report.

Kulish Series (KUH)

The Kulish series consists of imperfectly drained Gleyed Cumulic Regosol soils developed on thin deposits of weakly to moderately calcareous, moderately fine textured (SCL, CL, SiCL), alluvial deposits underlain by coarse to fine textured shale gravel. The surface textures are usually silty clay loam and the upper alluvial materials are stratified with layers ranging in texture from sand to clay. Dark colored organic rich layers are found throughout the profile. These Regosolic soils occur in the Escarpment area of the Riding Mountain Upland, immediately below a major topographic break at about 390 m.a.s.l.. In this area, erosion by glaciation and subsequent wave action has exposed shale bedrock which provided the source for subsequent deposition of fine to coarse shale gravel. Numerous creeks and rivers flowing from this portion of the Escarpment have resulted in the deposition of a thin alluvial mantle over the shaly gravel. The Kulish soils occupy gently to moderately sloping areas; runoff is moderately rapid and permeability is moderately slow in the upper materials but rapid in the shaly gravel. Native vegetation on the Kulish soils is hardwood forest composed of elm, ash, Manitoba maple, willow and associated low shrubs.

Soil development on these alluvial sediments is restricted to a thin, deciduous leaf litter underlain by the stratified parent material. The C horizon is moderately calcareous, mottled with weak iron staining and banded with dark colored layers representing former soil surfaces which have been covered by deposition of fresh alluvium. The Kulish soils are very similar to the Edwards soils, differing by the alluvium that grades into the shaly gravel deposits.

La Broquerie Series (LAB)

The La Broquerie series consists of imperfectly drained Gleyed Cumulic Regosol soils developed on moderately to strongly calcareous, stratified coarse to moderately coarse textured (VFS, LVFS, SL, FSL), alluvial sediments. These youthful soils occur on the plain and levees of the Seine and Rat Rivers. The surface textures vary from loamy sands to sandy loams. The topography is very gently to gently sloping. Native vegetation consists of aspen, black poplar, willow with some ash, elm and maple.

The soil profile is characterized by a thin, weakly expressed Ah horizon of 8 to 12 cm that grades sharply into the stratified alluvial sediments. Under cultivation, the surface colors range from light gray to dark gray. The C horizon is moderately to strongly calcareous, stratified, and may contain darker materials representing former surface which have been covered by more recent deposition of sediments.

La Perouse Series (LPR)

The La Perouse series consists of Orthic Luvic Gleysol soils developed on deep, moderately to strongly calcareous, fine textured lacustrine sediments. Surface textures are usually heavy clay grading into dominantly clay materials containing thin. Silty textured varves. These poorly drained soils occur in near level to very gently sloping areas usually in the lower to mid-slope position. Runoff is moderate and soil permeability is moderate in the solum and slow in the subsoil. Native vegetation is mainly open, evenly spaced black spruce stands with an understory of swamp birch and willow and a ground cover of mixed mosses and low ericaceous shrubs.

The La Perouse soils may have up to 40 cm of peat at the surface. They have weakly leached profiles with a very thin (2 to 4 cm) dark gray A horizon and a light brownish gray Ae horizon. The Ae has a moderately well developed fine shot-like structure. The underlying B horizon is grayish brown to brown and has strongly developed medium to coarse shot-like aggregates. The C horizon consists of massive clay with fine silt varves and is calcareous and strongly gleyed.

La Salle Series (LSL)

The La Salle series is characterized by a moderately well drained Cumulic Humic Regosol solum, and moderately to strongly calcareous loamy (L, SiL, SiCL, CL) stratified recent fluvial sediments. These soils occur in the western part of the Red River Plain on gently sloping to irregular topography in upper terraces, levees and meander scrolls along the Assiniboine, Elm, La Salle and Boyne Rivers. These soils are subject to occasional flooding during periods of high stream flows. Runoff is moderate; permeability is moderate. Native vegetation consists dominantly of deciduous trees, elm, ash, basswood and Manitoba maple and some tall prairie grasses.

The La Salle series, sandy variant, LSL1, occurs in close association with normal La Salle soils. It differs from the normal La Salle series by having dominantly sandy (FS, LFS, S) textures throughout the profile. The profile has a weakly developed dark gray Ah horizon that is somewhat darker than the C horizon. The underlying material is stratified with dominantly silt loam to silty clay loam textures and thin strata of very fine sand, fine sand or silty clay. In some areas, the solum in the moist state appears to have development of a Bmk with weak blocky structure.

Ladywood Series (LYW)

The Ladywood series consists of imperfectly drained Gleyed Dark Gray Chernozem soils developed on moderately to strongly calcareous, stratified dominantly loam textured alluvial and lacustrine deposits. These soils are similar to the Greenwald or Woodmore series, but do not have the clay or till within a meter of the surface. Surface textures are variable ranging from very fine sand to clay loam. Topography is level to irregular very gently sloping. Surface runoff is moderate slow; and permeability is moderate, but often restricted due to a high water table.

The Ladywood soils are characterized by a thin leaf and forb layer overlying a thin dark gray Ah horizon which contains patches of light gray material. The very dark gray to dark gray B horizon usually contains some translocated clay. For an example of the properties of the solum, refer to the Greenwald or Woodmore series; the parent materials to a depth of 1.2 m are similar to the Ladywood series.

Lakeland Series (LKD)

The Lakeland series consists of imperfectly drained Gleyed Rego Black carbonated soils developed on moderately to extremely calcareous, dominantly fine loamy sediments. Surface textures range from loam to clay loam and occasionally silty clay. The topography is level to very gently sloping; runoff is slow; and permeability is moderate to moderately slow. The native vegetation consists of meadow grasses with clumps of willow. In some areas, there is an upward flow of groundwater containing soluble salts. Where the salt content in the rooting zone is sufficient to affect crop growth, the Lakeland slightly saline phase is mapped. Lakeland soils like most soils developed on extremely calcareous parent material have shallow soil profiles. The thin 15 to 25 cm very dark gray Ah horizon is granular, and usually moderately to strongly calcareous. This horizon is usually separated from the pale yellow, extremely calcareous Ckgj horizon by a thin (15 to 20 cm) transitional, AC or Cca layer that is usually very strongly calcareous.

Lakeland, slightly saline phase consists of soils with similar profile characteristics as the Lakeland series, except they have a appreciable quantity of soluble salts within the rooting zone of plants in sufficient quantity to affect crop growth. The salts are dominantly magnesium sulfate and gypsum. These soils were formerly mapped as the imperfectly drained Blackearth-Meadow associates of the Emerson (silty clay loam) Association in the Winnipeg-Morris (1953) report.

Lamb Lake Complex (LBK)

The Lamb Lake complex consists of poorly to very poorly drained organic soils developed on 0 to 65 cm of fibric Sphagnum moss peat overlying dominantly mesic forest peat. Areas of Lamb Lake complex are similar to those of the Grindstone complex, but have a thicker and more continuous layer of Sphagnum moss overlying the mesic forest peat. Extremely calcareous, loamy, moderately stony till occurs within 160 cm of the surface. Lamb Lake soils have depressional to level topography. Natural drainage of these soils is generally slightly more impeded than for the Grindstone soils. The dominant vegetation consists of unproductive stunted black spruce and tamarack with Sphagnum mosses, sedges and some ericaceous shrubs in the understory.

The dominant soil within the Lamb Lake complex is the Lamb Lake series, a Terric Mesisol, sphagnic phase. Other soils in the complex are the Kanusk series, a Terric Mesic Fibrisol; and the Mistatim series, a Terric Fibric Mesisol. The Grindstone series, a Terric Mesisol with a thinner (0 to 15 cm) surface layer of fibric Sphagnum peat, is also associated with the Lamb Lake complex. This is due to the nature of the discontinuous hummocky, nature of the fibric Sphagnum moss overlying the mesic forest peat. These organic soils correspond very closely to those described under the Orok and Guy Hill complexes, differing from them only in the nature of the mineral substrate. Soils of the Lamb Lake complex occur mainly along The Pas moraine, often in association with the Dering peaty phase and Crane series Lamb Lake soils.

Lambert Series (LAM)

The Lambert series consists of poorly drained Rego Humic Gleysol carbonated phase soils developed on strongly to very strongly calcareous, medium textured (VFSL, L, SiL), lacustrine sediments, underlain by moderately to strongly calcareous coarse textured

(FS, LCoS, LFS), lacustrine deposits. The surface texture ranges from sandy loam to loam. Topography is depressional, level or very gently sloping. The soil drainage is poor because of a lack of runoff, or high water table. Vegetation consists of sedges, reed grasses, with areas of balsam poplar, willow, and dogwood.

The soil is characterized by a very dark gray carbonated Ah horizon 12 to 18 cm thick and a gray carbonated AC horizon. Prominent yellowish brown iron mottles are found in the profile. Lambert, peaty phase also occur and are similar to the Lambert soils except they have a thicker (15 to 40 cm) peaty surface.

Landseer Series (LSR)

The Landseer series consists of poorly drained Rego Humic Gleysol soils developed on a mantle (25 to 100 cm) of moderately to strongly calcareous, uniform, clayey (SiC, C), lacustrine sediments over moderately to strongly calcareous, stratified, deep, loamy (L, SiL, VFSL) lacustrine deposits. These soils occur in lower positions of nearly level landscapes and have very slow permeability, very slow surface runoff, and a high water table during the growing season. Landseer soils are non-eroded, non-stony, and usually strongly saline. They have a high available water holding capacity, high organic matter content, and low natural fertility. Native vegetation includes salt tolerant grasses and hydrophytic vegetation. The majority of these soils are currently in native grasses.

In a representative profile the solum is approximately 25 cm thick. The profile is characterized by thick black A horizon, 20 to 25 cm thick, with evidence of salinity, a Cca horizon, 25 to 50 cm thick, and a dark gray Ckg horizon, with many prominent mottles and salt crystals. Landseer soils occur in close association with Oliver soils. They are similar to Tadpole soils by having Rego Humic Gleysol profile but differ from them in having clayey as compared to fine loamy sediments. Landseer soils were previously mapped as marshland inclusions of the Heaslip complex in the reconnaissance survey of South-Central Manitoba (1943).

Langvale Series (LGV)

The Langvale series is the well drained, Orthic Black Chernozem member of the Mentieth Association, developed on thin (25 to 100 cm), moderately calcareous, coarse to moderately coarse textured, lacustrine sediments overlying strongly calcareous, medium to moderately fine textured glacial till. The profile may contain a very thin (<5 cm), gravelly stratum or pebble line at the till contact. Langvale soils usually have a loamy very fine sand surface texture, gently undulating topography, moderate permeability and moderately slow surface runoff. The estimated depth to water level is 2 to 3 metres during the growing season. They usually occur in the well drained middle and upper slope positions in the landscape. These soils are cultivated, non-stony and non-saline. The Langvale series resembles the Lyleton series, except that the Langvale soils are underlain by glacial till.

Larrett Series (LRT)

The Larrett series consists of well to moderately well drained Eluviated Black Chernozem soils developed on a mantle (25 to 100 cm) of weakly to moderately calcareous, uniform, fine loamy (L, CL, SiCL), lacustrine sediments over moderately to strongly calcareous, deep fine loamy (L, SiL, CL) mixed till deposits. These soils occur in middle to upper slope positions of very gentle to undulating landscapes. Surface runoff is moderate, permeability is also moderate and the water table is below 2 m during the growing season. Larrett soils are non-eroded, non-stony and non-saline. They have a high water holding capacity, medium organic matter, and high natural fertility. Native vegetation often includes tall prairie grasses interspersed with aspen-oak groves. The majority of these soils are used for crop production.

The solum is approximately 60 cm thick with a dark gray Ap or Ah horizon, 15 to 20 cm thick; an eluvial Ae horizon, 2 to 5 cm thick with rinsed ped surfaces. A brown to pale brown Bt horizon, 10 to 25 cm thick is underlain by a transition pale brown II BC horizon, 10 to 20 cm thick. Occasionally a white, II Cca horizon 4 to 6 cm thick is present. The parent material is typically pale brown to very pale brown, strongly calcareous mixed till. Larrett soils occur in close association with Kingsley, Knudson and Tellier soils. Larrett soils were mapped as an associate of the Altamont Association in the reconnaissance soil survey of South-Central Manitoba (1943).

Lauder Series (LUD)

The Lauder series is the imperfectly drained Gleyed Black Chernozem member of the Souris Association, developed on deep, weakly to moderately calcareous, coarse textured lacustrine sediments. Lauder soils generally have a loamy fine sand to fine sand surface texture, level topography, moderately rapid permeability and very little surface runoff. These soils are non-stony, rarely saline and have an estimated depth to water table of less than 2 metres during the growing season. Most are cultivated and produce cereal crops.

The profile is characterized by black Ah horizons 10 to 25 cm thick, gleyed, faintly mottled very dark brown Bmgj horizons 20 to 51 cm thick light gray, gleyed Ccagj horizons 15 to 25 cm thick and light brownish gray Ckg horizons with iron staining and mottling. Data for a representative profile of the Lauder series is presented.

Ah - 0 to 23 cm, very dark gray (10YR 3/1, moist), very dark gray to dark gray (10YR 3.5/1, dry), loamy medium sand; weak fine granular; very friable when moist and dry; clear smooth boundary; pH 7.9.

Bmgj - 23 to 46 cm, dark yellowish brown (10YR 4/4), dark grayish brown (10YR 4/2, dry), medium sand; single grained; loose when moist and dry; clear smooth boundary; pH 7.9.

Cca - 46 to 61 cm, brown (10YR 5/3, moist), light gray (10YR 7/2, dry), medium sand; single grained; loose when moist and dry; diffuse wavy boundary; moderately calcareous; pH 8.2.

Ckg - 61 cm +, very pale brown (10YR 7/4, moist), light gray (10YR 7/2, dry), fine sand; single grained; loose when moist and dry; moderately calcareous; pH 8.4.

Laurier Series (LUI)

The Laurier series consists of Gleyed Black Chernozem soils developed on moderately to strongly calcareous, coarse to moderately coarse textured lacustrine and deltaic deposits. Surface textures range from sandy clay loam to sand; fine sandy loam is dominant. The Laurier soils occur in the southern portion of the Dauphin Lake Plain just below the Manitoba Escarpment. The topography is level to irregular, very gently sloping. Runoff is moderate and permeability is impeded by a high water table. These soils are non-stony. Native vegetation is meadow prairie grasses and herbs with scattered tree cover of aspen, black poplar and willow.

The Laurier soils have a noncalcareous dark colored surface horizon which grades into a weakly developed B horizon. A thin, light brownish gray to gray Cca may be present below the B horizon. This gradually fades into a very pale brown C horizon which usually becomes coarser textured with depth. A representative profile is described below.

Ah - 0 to 25 cm, black (10YR 2/1 moist), fine sandy loam; weak, coarse prismatic breaking readily to moderate, fine granular; very friable when moist, neutral; gradual, wavy boundary.

Bmgj - 25 to 33 cm, dark yellowish brown (10YR 4/4 moist), loamy sand; weak, medium subangular blocky breaking readily to moderate, fine granular; firm when moist; neutral, weakly calcareous due to inclusions of residual calcareous sand particles; clear, smooth boundary.

Ccag - 33 to 46 cm, light gray (10YR 7/2 dry), loamy sand, single grain; loose when moist and dry; moderately alkaline; very strongly calcareous; gradual, smooth boundary.

Ckg - 46 to 100 cm +, light yellowish brown and yellow (l0YR 6/4 moist, 10YR 7/6 dry), fine sand; single grain; loose when moist and dry; moderately alkaline; strongly calcareous.

Lavenham Series (LVH)

The Lavenham series is a Gleyed Black Chernozem soils developed on imperfectly drained, weakly to moderately calcareous, sandy (FS, LFS, LS), lacustrine sediments. These soils occur in the Upper Assiniboine Delta on level to very gently sloping topography, in association with Stockton, Cactus, Hummerston and Sewell soils. Surface runoff is slow, and permeability is moderately rapid. Downward movement of water is restricted in the subsoil during periods of high water table. The water table ranges from 1 metre shortly after spring runoff, to 3 metres below the surface in late fall and winter. These soils are also susceptible to erosion.

The Lavenham soil profile has a very dark gray to very dark brown Ah horizon, 18 to 25 cm thick; a dark brown to yellowish brown Bmgj horizon, 20 to 40 cm thick, with distinct brown mottles in the lower part of the horizon; a lime carbonate accumulation (Ccagj) horizon, 12 to 20 cm thick, and a pale brown Ckgj horizon with distinct to prominent brown mottles. This soil profile differs from the very similar Hummerston soil series in having a prominent Bmgj horizon. Lavenham and Hummerston soils are coarser and more permeable than the finer textured Gateside and Pleasant soils. Lavenham soils were mapped as Black Meadow associates of the Stockton Association in the Carberry (1957) soil report.

Lavinia Series (LAV)

The Lavinia series is characterized by a Gleyed Calcareous Black Chernozem solum on moderately to strongly calcareous, loamy (L, CL) morainal till of limestone, granite and shale origin. These soils are imperfectly drained and occur in the lower slope positions of undulating to hummocky landscapes in close association with Varcoe and Moore Park soils. They receive runoff from the upper slopes, and in some landscapes, may be influenced by seepage. Permeability is slow and may be restricted during periods of subsoil saturation.

Lavinia soils differ from the Varcoe series in having a B horizon. They differ from Moore Park soils in having free lime carbonate present in the solum.

Layland Series (LAY)

The Layland series consists of poor drained Rego Humic Gleysol soils developed on a mantle (30 to 90 cm) of strongly calcareous, stratified, shallow, sandy (FS, LFS) to coarse loamy (VFS, LVFS, FSL), deposits over moderately calcareous, uniform, deep, clayey (SiC, C), lacustrine deposits. These soils occur in depressional positions of nearly level slopes on undulating landscapes and have moderately rapid over very slow permeability, very slow surface runoff and a high to ponded water table during the growing season. Layland soils are non-eroded, non-stony, and often slightly saline. They have medium available water holding capacity, high organic matter content, and low natural fertility. Native vegetation includes sedges, rushes, seeds and willows. The majority of these soils are currently in native vegetation.

In a representative profile the solum is approximately 25 cm thick. The profile is characterized by very dark gray Ah horizon, 15 to 35 cm thick, moderately calcareous, an AC horizon, 7 to 20 cm thick with moderate calcareousness, a Cca horizon, 5 to 8 cm thick with a Ckg horizon. A typical profile also contains a peaty surface layer 5 to 15 cm thick.

Layland soils occur in close association with Hibsin, Rosebank and Elm Creek soils. They are similar to Osterwick soils by having a poorly drained profile in coarse loamy deposits but differ from them in having no clayey substrate. Layland soils were previously mapped as associates of Almasippi clay substrate Association in the Carberry (1957) soil report.

Leak Lake Series (LAK)

The Leak Lake series consists of imperfectly drained Gleyed Eluviated Eutric Brunisol soils developed on moderately to very strongly calcareous sandy loam to loam textured till. The soil materials usually are skeletal due to large amounts of channery and flaggy limestone and/or dolostone fragments. The Leak Lake soils occupy the lower slope position in very gently undulating and very gently sloping topography. Permeability of these soils is good to very good but landscape position creates periodical excess moisture conditions. Dominant vegetation is black and white spruce, trembling aspen, willow and mosses.

Gleyed Eutric Brunisols have been included with the Leak Lake soils. These soils show considerable variation in profile development due to variations in parent material properties and drainage. The Leak Lake soils in the survey area have thin (4 to 10 cm), moderately to well decomposed LFH surface horizons. The underlying Ae (if present) is weakly developed and between 2 and 5 cm deep. The Bm is about 15 cm thick and grades through a BCk into a weakly gleyed calcareous C. Most Leak Lake soils in this area are fairly shallow and have a loam to clay loam texture.

Leary Series (LRY)

The Leary series consists of well to rapidly drained Orthic Dark Gray Chernozem soils developed on moderately to strongly calcareous, deep, stratified, sandy to sandy-skeletal (LCoS, GrLS), glaciofluvial deposits. These soils occur in middle to upper slope positions of moderate slopes on hummocky landscapes and have very rapid permeability and a low water table during the growing season. Leary soils have low available water holding capacity, low organic matter content, and low natural fertility. Native vegetation often includes forests of dominantly bur oak. The majority of these soils are currently excavated for road construction material and the aggregate industry.

In a representative profile the solum is approximately 50 cm thick. The profile is characterized by a dark gray Ah or Ap horizon, 10 to 20 cm thick, a dark brown Bt or Btj horizon, 5 to 20 cm thick, a brown transitional BC horizon, 15 to 30 cm thick and a light yellowish brown Ck horizon with thin layers of coarse sand, fine sand and gravel.

Leary soils are similar to Vandal soils by having an Orthic Dark Gray Chernozem soil profile and sandy-skeletal substrate material but differ from Vandal soils in not having 25 to 100 cm of loamy surface over the sandy-skeletal substrate. Leary soils were previously mapped as the dominant associate of the Leary association in the reconnaissance soil survey of South-Central Manitoba (1943). The Leary series, coarse-loamy substrate variant, LRY1, occurs in close association with typical Vandal soils and differs from them in having a light yellowish brown, relatively stone-free coarse-loamy (SiL, VFSL) substrate.

Ledwyn Series (LWY)

The Ledwyn series consists of Gleyed Dark Gray Chernozem soils developed on very strongly to extremely calcareous, dominantly moderately fine textured (SCL, CL, SiCL) sediments. Surface textures range from very fine sandy loam to silty clay loam; the soils commonly become slightly coarser with depth and are often stratified with very fine sand. The topography is level to very gently sloping; runoff is slow and internal drainage is moderate to moderately rapid, but may be impeded by a high water table. Native vegetation is dominantly aspen and white spruce.

The soil is characterized by a thin, dark gray Ahej horizon with areas of gray patches in the lower portion. The B horizon is grayish brown, granular, iron stained and has a slight clay accumulation. The solum is shallow, generally less than 25 cm thick. Occasional flooding by lime-charged water causes these soils to be carbonated in the A and B horizons. A representative profile is described below.

L-H - 3 to 0 cm, very dark brown (10YR 2/2 dry) leaf mat of partially decomposed aspen leaves, mildly alkaline; abrupt, smooth boundary.

Ahej - 0 to 7.5 cm, very gray (10YR 3/1 dry) with locales of gray (10YR 5/1 dry) clay loam; moderate fine granular; friable when moist; slightly hard when dry; mildly alkaline; gradual smooth boundary.

Btg - 7.5 to 15 cm, grayish brown (10YR 5/2 dry) silty clay loam; moderate fine granular; friable when moist; slightly hard when dry; mildly alkaline; iron stained; gradual, smooth boundary.

BC - 15 to 23 cm, light brownish gray (2.5Y 6/2 dry); silty clay loam; weak fine granular; friable when moist; slightly hard when dry; moderately alkaline; calcareous; iron stained; gradual, smooth boundary.

Ckg - 23 to 90 cm, light gray (2.5Y 7/2 dry) stratified very fine sandy loam to silty clay loam; friable when moist; weakly cemented when dry; moderately alkaline and strongly calcareous; iron stained.

Lee Lake Series (LEK)

The Lee Lake series consists of poorly drained Carbonated Rego Humic Gleysol soils developed on thin (50 to l00 cm) deposits of extremely calcareous, medium textured (VFSL, L, SiL), stony till underlain by limestone bedrock. The Lee Lake soils occur in level to depressional areas and the vegetation is dominantly sedges and meadow grasses with variable amounts of willow and swamp birch. Clumps of balsam poplar, aspen and some black spruce may occur. The Lee Lake soils correlate with Meleb rock substrate phase soils as mapped in previously published soil reports.

The Lee Lake soils consist dominantly of a thin layer of mesic fen peat, overlying a thin, dark gray Ah horizon that grades into the gleyed extremely calcareous C horizon. The Lee Lake soils occur near the south shore of Lake Manitoba and northwest of Crane River. Limestone bedrock is at or close to the surface in these areas and the associated soils are mainly Hilbre and Faulkner.

Lee River Series (LEV)

The Lee River series is a poorly drained, peaty Humic Luvic Gleysol developed on weakly to moderately calcareous lacustrine clay. These soils occur along and adjacent to the east side of the Winnipeg River and in small scattered areas throughout the mapped area, particularly along margins of shallow organic soils. They occupy level to depressional positions in the landscape. Surface drainage is slow and internal drainage is impeded because of fine textures and a high water table. Native vegetation is normally sedges, meadow grasses and marsh plants with clumps of black spruce, willow, alder and tamarack.

The Lee River soils have a surface layer of fibrous peat that varies in thickness from 15 to 46 cm. The underlying A horizon, usually very difficult to observe in the moist condition, is dark gray in color. The massive B horizon has a slight accumulation of translocated clay and grades gradually into the calcareous C horizon. A representative profile of Lee River series is described below:

L-H - 15 to 0 cm, very dark brown (10YR 2/2, dry), moderately decomposed sedges and grasses; medium acid in reaction; abrupt, smooth, lower boundary.

Aheg - 0 to 8 cm, dark gray to gray (5Y 5/1 to 6/1, dry), clay; massive; breaking readily to strong coarse blocky; firm when moist, plastic and sticky when wet; slightly acid; iron stained; clear, broken, lower boundary.

Btg - 8 to 25 cm, very dark gray to dark olive gray (5Y 3/1 to 3/2, dry), clay; massive; firm when moist, plastic and sticky when wet; slightly acid in reaction; iron stained; diffuse, broken, lower boundary.

BC - 25 to 46 cm, light olive gray (5Y 6/2, dry), clay; massive; firm when moist, plastic and sticky when wet; mildly alkaline and strongly calcareous; iron stained; diffuse, broken, lower boundary.

Ckg - 46 to 91 cm, olive gray to light olive gray (5Y 5/2 to 6/2, dry), clay; massive; firm when moist, plastic and sticky when wet; alkaline and moderately calcareous; iron stained.

Leighton Series (LGT)

The Leighton series is the poorly drained carbonated Rego Humic Gleysol member of the Coulter Association, developed on deep moderately calcareous, moderately fine to fine textured (SCL, Cl, SiCL to SiC, C), recent alluvial sediments. These soils generally have a clay loam to clay surface texture, nearly level to depressional topography, slow to very slow permeability and very little surface runoff. These soils occur in channels usually in the low lying alluvial flood plains. They are poorly drained and have a water table within 1 metre for most of the growing season. Leighton soils are very susceptible to spring flooding from high river levels and after heavy rains. A few areas of Leighton soils are cultivated, but many are left as natural sites with native hydrophytic vegetation.

Lelant Series (LLT)

The Lelant series consists of poorly drained Rego Humic Gleysol soils developed on moderately to strongly calcareous, deep, uniform, sandy (FS, LFS, LS), lacustrine deposits. These soils occur in level to depressional positions of very gentle slopes on beach-back beach landscapes and have rapid but restricted premeability, very slow surface runoff, and a high water table during the growing season. Lelant soils are non-eroded, non-stony, and frequently slightly saline. They have a low available water holding capacity, high organic matter content, and low natural fertility. Native vegetation includes reeds, sedges, rushes and willows. The majority of these soils are currently in native vegetation.

In a representative profile the solum is approximately 15 cm thick. The profile is characterized by moderately decomposed organic horizon, 5 to 10 cm thick, a very dark gray to black Ah horizon, 8 to 15 cm thick, a transitional AC horizon, 5 to 10 cm thick, and a Cca horizon, 5 to 8 cm thick is frequently present. Lelant soils occur in close association with Skelding, Longplain and Almasippi soils. They are similar to Osterwick soils by having a poorly drained Rego Humic Gleysol profile but differ from them in having sandy rather than coarse loamy deposits. Lelant soils were previously mapped as Meadow associates of the Almasippi in the Carberry (1957) soil report.

Lena Series (LNA)

The Lena series is the poorly drained carbonated Rego Humic Gleysol member of the Chesterfield Association, developed on thin (< 1m), weakly calcareous, moderately fine to fine textured (SCL, CL, SiCL to SiC, C), alluvial sediments underlain by shaley clay or

soft shale bedrock. These soils have very gently sloping topography, imperfect to poor drainage, dominantly a clay loam surface texture, slow permeability, and slow surface runoff. This soil has a very dark gray LH horizon 0 to 3 cm thick overlying a black Ah horizon 10 to 30 cm thick, a dark gray horizon 15 t o 20 cm thick and a dark gray Ckg horizon.

Lenore Series (LNO)

The Lenore series is characterized by an Orthic Black Chernozem soil developed in weakly to moderately calcareous loamy (L to CL) morainal till of dominantly shale rock origin with minor amounts of limestone and granitic material. These soils are moderately well to rapidly drained and occur in the mid to upper slope positions of undulating, hummocky or ridged landscpaes. Surface runoff is moderately rapid; permeability is moderate. Native vegetation is mixed tall prairie grasses and aspen groves.

The Lenore solum has a very dark gray Ah horizon, 20 to 30 cm thick and a dark brown to dark yellowish brown Bm horizon, 15 to 30 cm thick, and a variable transitional BC horizon. The thickness of the transitional horizon varies with the amount of carbonate present in the shaly till; solum thickness can exceed 75 cm in material with lower carbonate levels.

These soils differ from the similar Newdale series in having a thicker or deeper solum, greater shale content, and lower carbonate content. In the northern part of the Russell study area, the shaly, weakly to moderately calcareous till underlies the mixed till at depths below 1.5 m; in the northeastern part the shaly till frequently occurs within 1 m of the surface.

Lenswood Series (LSW)

The Lenswood series consists of imperfectly drained Gleyed Rego Black Chernozem, carbonated phase, soils developed on moderately calcareous, dominantly coarse textured (FS, LS, LFS), deltaic sediments. The surface textures range from loamy fine sand to fine sandy loam. The topography is level to very gently sloping; runoff is moderate to moderately slow; and permeability is moderately rapid, but may be impeded due to a high water table during part of the year. Clay or till deposits occurring below the one meter depth is partially responsible for the impediment of downward water movement, but some lateral movement from better drained soils also occurs. Native vegetation is mainly aspen, balsam poplar, grasses and willow. The majority of these soils are currently used for crop production. The soil is characterized by a very dark gray carbonated Ah horizon 15 to 40 cm thick, and a transitional AC horizon 6 to 10 cm thick. A lime accumulation zone (Cca) often occurs below the solum.

Lenswood soils occur in close association with Gilbert soils. They are similar to the Gilbert soils by having the same texture, but differ because of absence of a B horizon and the presence of carbonates to the soil surface. The Lenswood, loamy substrate variant, (LSW1), consists of imperfectly drained carbonated Gleyed Rego Black Chernozem soils developed on moderately to strongly calcareous, shallow, sandy to coarse loamy lacustrine sediments less than 1 m in thickness overlying loamy lacustrine sediments. These soils occur on level lacustrine veneer deposits and have rapid surface permeability and slow subsoil permeability, slow surface runoff and a medium water table during the growing season. Lenswood loamy substrate soils may be slightly eroded. Lenswood loamy substrate soils have low available water holding capacity, medium organic matter levels, and medium natural fertility. The native vegetation often comprises black poplar, low willow shrubs and a ground cover of meadow grasses.

In a representative profile the solum is generally about 50 cm thick. The profile is characterized by a 35 cm thick very dark gray fine sandy loam Ap and Ah horizon overlying loamy fine sand textured calcareous transitional AC horizon, and a pale yellow strongly calcareous fine sand mottled Ckgj horizon. The parent material of the loamy substrate (II Ckg) is typically compact, stratified, yellow silt loam to clay loam, mottled and strongly calcareous.

The Lenswood, gravel substrate variant, (LSW2), consists of imperfectly drained carbonated Gleyed Rego Black Chernozem soils developed on moderately to strongly calcareous, shallow, somewhat stratified sandy to coarse loamy lacustrine sediments less than 1 m thick overlying gravel glaciofluvial deposits. These soils occur on level lacustrine veneer deposits and have rapid permeability, slow surface runoff and a medium water table during the growing season. They may be slightly to severely eroded and have low available water holding capacity, medium organic matter levels, and medium natural fertility. The native vegetation often comprises black poplar associated with willow and a ground cover of meadow grasses. The majority of these soils are currently used for improved pasture.

In a representative profile the solum is generally between 50 and 60 cm thick. The profile is characterized by a 30 cm thick very dark gray calcareous fine sandy loam Ap and Ah horizon overlying a thin gray calcareous fine sand mottled, AC transition horizon, and pale yellow strongly calcareous mottled fine sand, Ckgj horizon. The parent material (IICkg) of the gravel substrate is typically stratified coarse sand and fine gravel. Lenswood gravel substrate soils occur in close association with Gilbert gravel substrate variant soils. They are similar to these soils by having the same texture and similar gravel substrate, but differ from the Gilbert gravel substrate soils because of lack of a B horizon and presence of carbonates to the soil surface.

Leon Series (LEO)

The Leon series is the imperfectly drained, carbonated, Gleyed Rego Black Chernozem member of the Leon Association, developed on thin (25 to 100 cm) moderately to strongly calcareous, moderately fine textured lacustrine sediments overlying coarse textured, gravelly deltaic beach and outwash deposits. These soils have a clay loam to light clay textured surface, nearly level topography, moderately slow to slow permeability and moderate surface runoff. The depth to water table is estimated to be less than 2 m during the growing season. Imperfectly drained Leon soils are usually cultivated. Leon soils occur in areas adjacent to the outwash deposits in the western part of the Boissevain-Melita map area.

Le Pas Series (LPS)

The Le Pas series consists of soils developed on moderately calcareous, clayey stratified, recent alluvium. These soils are Rego Gleysols, carbonated phase, having no significant horizon development. The topography is level and the vegetation is reeds and sedges. These soils have a thin peat surface layer but the peat accumulation seldom exceeds 15 cm in thickness. In some soils the lack of organic accumulation on the surface is the result of frequent flooding. The flooding has retarded continuous organic matter production by covering the peat or muck with mineral sediments during the periods of inundation. As a result of these floods, the profiles are stratified with bands of peat or muck and the clay matrix is banded with thin layers of silty and sandy sediments. Reaction is variable throughout the profile, ranging from slightly acid to moderately alkaline. In general lower reactions are encountered in the layers containing an abundance of organic substances. Some salts are also found in this soil. The Le Pas series is found only in the Saskatchewan River Delta. A typical Le Pas series is described below:

Ahg1 - 0 to 3 cm, dark grayish brown (10YR 4/2 moist) gray (10YR 5/1 dry) silty clay; weakly granular; moist firm; dry hard; neutral; abrupt wavy boundary.

Ahg2 - 3 to 34 cm, very dark grayish brown (10YR 3/2 moist) dark gray to very dark brown (10YR 4/1 to 3/2 dry) clay; weakly granular; moist friable, dry soft; neutral; clear smooth boundary.

Ckg1 - 34 to 56 cm, olive brown (2.5Y 4/4 moist) dark gray to grayish brown (10YR 4/1 to 5/2 dry) silty clay; few fine faint yellowish brown (10YR 5/5) mottles; moderate medium granular; moist friable; slightly hard; mildly alkaline; weakly calcareous; clear smooth boundary.

Ckg2 - 56 to 70 cm, very dark grayish brown (2.5Y 3/2 moist) light brownish gray (10YR 6/2 dry) silty clay loam weak fine pseudo-platy breaking to moderate fine granular; moist friable; dry slightly hard; mildly alkaline; moderately calcareous; abrupt smooth boundary.

Ckg3 - 70 to 100 cm, grayish brown (2.5Y 5/2 moist); brown to pale brown (10YR 5/3 to 10YR 6/3 dry); loam; weak fine pseudo-platy breaking to weak fine granular; moist friable; dry soft; mildly alkaline; moderately calcareous.

Lettonia Series (LTI)

The Lettonia series consists of well drained Solonetzic Gray Luvisol soils developed on moderately to strongly calcareous lacustrine clay. Topography is level to undulating. Surface drainage is moderate, while internal drainage is impeded because of texture and poor structure. A thin light gray Ae horizon overlies the B horizon. A characteristic feature of the Lettonia soil profile is the columnar structure of the B horizon. Very thin light gray coatings occur on the upper portion of the columns of the B horizon. The columnar aggregates grade into massive clay in the lower part of the B horizon. The native vegetation is dominantly white spruce, aspen and jack pine. A representative profile is described below.

L-H - 5 to 0 cm, herbaceous leafmat; very strongly acid; abrupt smooth boundary.

Ae - 0 to 3 cm, light brownish gray (10YR 6/2 moist) light gray (10YR 7/1 dry) clay; moderate medium platy; moist friable; dry slightly hard; strongly acid; abrupt smooth boundary.

AB - 3 to 8 cm, dark gray (10YR 4/1 moist) light gray (10YR 7/2 dry) clay; strong coarse platy; moist firm; dry hard; strongly acid; clear smooth boundary.

Bt - 8 to 40 cm, dark brown (10YR 3/3 moist) grayish brown (10YR 5/2 dry) clay; strong medium to coarse columnar breaking to strong coarse blocky; moist very firm, dry very hard; slightly acid; clear smooth boundary.

BC - 40 to 65 cm, brown to dark brown (10YR 4/3 moist); grayish brown (10YR 5/2 dry); clay; massive; moist firm, dry hard; medium acid; clear smooth boundary.

Ck1 - 65 + cm, grayish brown (10YR 5/2 moist) very pale brown (10YR 7/3 dry) clay; massive; moist firm; dry hard; mildly alkaline; moderately calcareous.

Levine Series (LEI)

The Levine series consists of imperfectly drained Gleyed Cumulic Regosol soils developed on moderately to strongly calcareous, deep, stratified, coarse loamy to fine loamy (VFSL, L, CL) recent alluvial deposits. These soils occur in flood plains on level slopes in level landscapes. They have rapid permeability, moderately slow surface runoff and a medium water table during the growing season. Levine soils are occasionally slightly saline and are subject to periodic inundation during spring runoff or after heavy rains. They have a moderate to low available water holding capacity, low organic matter content and medium natural fertility. The majority of these soils are currently used for crop production.

In a representative profile the solum is approximately 15 cm thick and the profile is characterized by a dark gray Apk or Ahk horizon 10 to 20 cm thick and a light yellowish brown Ck horizon. The underlying strata may vary in colour from light to dark. The thin dark coloured mineral and organic layers are former surface horizons that have been exposed to soil forming processes for a significant period before burial by alluvial deposits. Medium, distinct yellowish brown iron mottles occur through the soil. Levine soils were previously mapped as inclusions of Eroded Slope Complexes in the reconnaissance soil survey of South-Central Manitoba.

Libau Series (LBU)

The Libau series consists of well to moderately well drained Orthic Dark Gray soils developed on a thin mantle of lacustrine clay over extremely calcareous medium textured (VFSL, L, SiL), till within 75 cm of the surface. The underlying till is usually very stony and ranges in texture from loam to clay loam. The terrain on which they occur is irregular, gently sloping. Surface runoff is moderate and internal drainage is moderately slow to slow. Native vegetation is dominantly trembling aspen with bur oak, hazel and native grasses.

The Libau soil is characterized by a dark gray to gray Ahe horizon 6 to 9 cm thick and a very dark grayish brown Bt 20 to 30 cm thick with subangular blocky to coarse granular structure. The Bt horizon usually occurs within the clay deposits but where the till is within 40 cm of the surface, the Bt may extend into the underlying light gray extremely calcareous medium till. In some cases the till may consist of a mixture of strongly calcareous, fine (SiC, C) and extremely calcareous medium (silt loam to silty clay loam) material, this soil is described as the Libau, mixed till variant, LBU1. The properties of this till are variable depending on the proportion of the fine and medium material.

Liege Series (LIG)

The Liege series is the imperfectly drained Gleyed Cumulic Regosol member of the Melita Association, developed on deep, moderately calcareous, loamy alluvial sediments. These deposits are stratified and contain numerous dark colored bands of former surface horizons. These soils generally have a silt loam to very fine sandy loam surface texture, nearly level to gently undulating topography, moderate permeability and moderate surface runoff. The drainage is imperfect and the estimated depth to water table is less than 2 m. These soils are very susceptible to spring flooding due to high water levels in the creeks and Souris River. Some of these soils are cultivated and produce excellent crops.

This soil is characterized by dark gray Ap horizons 7 to 12 cm thick, gleyed carbonated dark gray Ahkgj horizons 5 to 7 cm thick, gleyed gray brown Ckgj horizons overlying dark gray brown Ahk horizons and light brownish gray to gray brown Ckgj horizons.

Limestone Point Series (LMP)

The Limestone Point series are composed of well drained Eluviated Eutric Brunisol soils developed on thin (20 to 100 cm) extremely calcareous, loamy glacial till deposits over limestone bedrock. Loam to clay loam is the dominant surface texture of these soils. Topography is gently undulating to undulating. Runoff is usually moderate and permeability may be moderate to slow. The underlying limestone bedrock may hinder the permeability at specific sites, but on a larger scale the presence of cracks and fractures may increase soil permeability. The Limestone Point soils are usually very stony with exceedingly stony areas occurring on the more severely water worked portions of ridges or where the bedrock approaches the surface. The solum of Limestone Point soils is generally less than 20 cm, characterized by a thin light colored Ae or Aej horizon overlying a thin, weakly developed B horizon. Native vegetation is dominantly spruce and jack pine with some aspen.

Limestone Point soils of the Low Boreal climatic zone correlate with the Hilbre soils of the High Boreal-temperate zone. Limestone Point, shallow phase, (LMPs) occurs where the till veneer overlying the limestone varies in thickness from 20 to 100 cm in thickness. Areas of Limestone Point soils having 10 to 20 cm of extremely calcareous loamy till over limestone bedrock are described as aa Eluviated Eutric Brunisol, microlitlic phase. The Limestone Point and Limestone Point shallow phase series occurs mainly in the north east corner of the map sheet, often in association with bedrock outcrops and soils of the Atikameg series.

Lindstrom Series (LDM)

The Lindstrom series consists of imperfectly drained, carbonated, Gleyed Rego Black Chernozem soils developed on a thin mantle (25 to 60 cm) of very fine sandy sediments (VFS, LVFS, FSL) over a thin strata (10 to 50 cm) of very strongly calcareous loamy glacial till of limestone and granitic origin over strongly calcareous glacial till of shale, limestone and granitic origin. Topography is level to very gently sloping; runoff is moderately slow; permeability is moderate in the sandy strata and moderately slow in the underlying till.

The soil is characterized by a very dark gray Ah(k) horizon, 18 to 25 cm thick, a dark gray to grayish brown AC horizon, 10 to 18 cm thick and a lime accumulation horizon (Cca), 6 to 10 cm thick. Where the sandy stratum is shallow, the lime accumulation layer grades to the very strongly calcareous glacial till. A few yellowish brown mottles may be present in the AC and Cca horizons.

Linklater Series (LIK)

The Linklater series is the imperfectly drained, carbonated, Gleyed Rego Black Chernozem member of the George Lake Association, developed on thin (25 to 100 cm) weakly to moderately calcareous, moderately coarse textured lacustrine sediments overlying coarse textured gravelly deltaic beach and outwash deposits. This soil has nearly level topography with small complex slopes, imperfect drainage, moderate permeability and slow surface runoff. The estimated depth to water level is less than 2 metres. The surface is slightly to moderately stony and may cause some hindrance to cultivation. These soils occur near the stream and creek channels in the Ryerson tills on the wet side of the Boissevain-Melita map area.

These soils consist of black, calcareous, Ahk horizons 5 to 10 cm thick, dark gray AC horizons 5 to 8 cm thick, light gray Cca horizons 13 to 18 cm thick and sandy light brown Ck horizons overlying a very coarse gravelly II Ck horizon. The Linklater series

resembles the Cauldwell series of the Griswold Association. The only difference is the Cauldwell series is underlain by glacial till. A profile description is presented below.

Ahk - 0 to 10 cm, black to very dark gray (10YR 2.5/1, moist), very dark gray to dark gray (10YR 3.5/1, dry), sandy loam; massive; friable when moist; abrupt boundary; weakly calcareous.

AC - 10 to 15 cm, sandy loam; friable when moist; abrupt boundary; weakly calcareous.

Cca - 15 to 33 cm, light gray to white (10YR 7.5/1, dry), sandy loam; friable when moist; abrupt boundary; strongly calcareous.

Ck - 33 to 64 cm, sandy loam; friable when moist; abrupt boundary; moderately calcareous.

II Ck - 64 cm +, gravel and coarse sand.

Lockhart Series (LKH)

The Lockhart series consists of moderately well to well drained Orthic Black Chernozem soils developed on a thin mantle (25 to 60 cm) of very fine sandy sediments (VFS, LVFS, FSL) over a thin strata (10 to 50 cm) of very strongly calcareous loamy glacial till of limestone and granitic origin, over a strongly calcareous loam to clay loam glacial till of shale, limestone, and granitic origin. These soils occur on gently sloping to undulating topography. Runoff is moderate to moderately rapid; permeability is moderately rapid in the upper sandy strata and moderately slow in the underlying till. These soils have been slightly eroded.

The soil is characterized by a very dark gray Ah horizon 18 to 25 cm thick and a grayish brown to brown Bm horizon 12 to 20 cm thick. The depth of solum varies with the depth of the sandy overlay with the BC terminating at the contact of the sandy surface and very strongly calcareous till.

Loewen Series (LEW)

The Loewen series consists of poorly drained Rego Humic Gleysol soils developed on non to weakly calcareous, stratified, loamy (CL, L, SiCL, SCL) fluvial deposits. These soils occur in depressional positions of gentle slopes often along stream channels on flood prone landscapes and have restricted permeability, very slow surface runoff, and a high or ponded water table during the growing season. Loewen soils are non-eroded, non-stony, and frequently slightly saline. They have a medium available water holding capacity, medium organic matter content, and low natural fertility. Native vegetation includes sedges, reeds, rushes and willows. The majority of these soils are currently in native vegetation.

In a representative profile there is little or no solum development and the profile is characterized by a mixed peaty-mineral surface horizon, 10 to 15 cm thick, a thin, carbonated Ah horizon, 5 to 15 cm thick, and a olive gray Ckg horizon, with variable textures. A typical profile also contains buried surface layers at various depths. Loewen soils occur in close association with Chortitz soils. They are similar to Blumenort soils by having a poorly drained profile in alluvium but differ from them in having dominantly loamy textures. Loewen soils were previously mapped as associates of the Riverdale Complex in the Winnipeg-Morris (1953) soil report.

Lonery Series (LOE)

The Lonery series consists of poorly drained, carbonated Rego Humic Gleysol soils developed on a thin mantle (25 to 60 cm) of very fine sandy sediments (VFS, LVFS, FSL) over a thin strata (10 to 50 cm) of very strongly calcareous loamy glacial till of limestone and granitic origin over a strongly calcareous loam to clay loam glacial till of shale, limestone and granitic origin. These soils occur on level to depressional topography. Runoff is very slow to negligible; permeability is very slow.

The soil is characterized by a thin, moderately decomposed organic layer, 2 to 5 cm thick, a very dark gray Ah horizon, 10 to 18 cm thick, and a dark gray to olive gray AC horizon, 6 to 10 cm thick. A lime accumulation horizon (Cca) is usually present in the sandy strata and may extend to the very strongly calcareous till. Yellowish brown mottles are usually present below the Ah horizon.

Lonesand Series (LSD)

The Lonesand series consists of imperfectly drained Gleyed Degraded Dystric Brunisol soils developed on siliceous sandy outwash. The surface texture is loamy fine sand to fine sand. The topography is generally level to irregular, very gently sloping. Surface drainage is slow and internal drainage is impeded by a high water table. The Lonesand soil profile has a light gray, iron stained, strongly acid, Aeg horizon and a loose to very friable, brown, strongly acidic, iron stained B horizon with a weak concentration of iron and organic matter. The C horizon is acid to a depth of about 80 to 110 cm where traces of lime carbonate are encountered.

Longdens Series (LGD)

The Longdens series is a Gleyed Eluviated Black Chernozem soil developed under imperfectly drained conditions on a thin veneer (usually less than 1 m) of moderately to strongly calcareous coarse loamy (SL to L) fluvial and lacustrine sediments overlying strongly calcareous loamy (L to CL) glacial till of shale, limestone and granitic origin. A sand or gravel lens ranging from 5 to 60 cm

thick commonly occurs between the loamy surface sediments and the till. These soils are found on the lower to mid-slope positions and have nearly level to gentle slopes. Runoff is moderately slow; permeability is moderately rapid in the overlay and moderate to moderately slow in the underlying till.

The solum has a very dark gray to dark gray Ap horizon 15 to 18 cm thick, a thin Ahe or Ae commonly less than 7.5 cm and a weakly mottled brown to dark grayish brown Bm or Btj horizon 20 to 40 cm thick. The solum varies with the depth of the sandy loam to loam overlay and the amount of coarser fragments in the sandy or gravelly layer. Some of these soils have sand or loamy sand textured surfaces that may extend to the underlying till at 75 to 95 cm. The fluvial or lacustrine sediments are generally thicker on the Longdens soils in comparison to the better-drained Jaymar series.

Long Plain Series (LOP)

The Long Plain series consists of imperfectly drained Gleyed Regosol soils developed on weakly to moderately calcareous, deep, uniform, sandy (LFS, FS), wind-modified, deltaic deposits. These soils occur in middle positions of gentle slopes on undulating landscapes and have rapid permeability, low surface runoff, and a high water table during the growing season. Long Plain soils are severely wind eroded, non-stony, and non-saline. They have a low available water holding capacity, low organic matter content, and low natural fertility. Native vegetation includes scrub oak, aspen, shrubs and prairie grasses. The majority of these soils are currently used for pasture.

In a representative profile of Long Plain soil the solum is not developed. The profile is characterized by a dark gray to gray Ap horizon, 10 to 25 cm thick, a leached C horizon, 60 to 90 cm thick, and a calcareous C horizon, with prominent mottles. A typical profile also contains a dark gray layer, 5 to 15 cm thick within a meter of the surface.

The Long Plain, medium sand variant, LOP1, is found in close association with normal Long Plain soils and differs from them in having dominantly medium sand textures (LS, S) throughout the soil profile. Long Plain soils occur in close association with Skelding, Almasippi and Lelant soils. They are similar to Willowcrest soils by having an imperfectly drained profile in sandy deposits but differ from them in having no profile development. Long Plain soils were previously mapped as associates of the Almasippi Association in the Carberry (1957) soil report.

Long Point Series (LGP)

The Long Point series consists of well drained Orthic Gray Luvisol soils developed on moderately to strongly calcareous, coarse sandy to gravelly outwash, beach and stratified drift deposits overlying extremely calcareous, stony, loamy glacial till. There is commonly a thin sandy surface mantle over the gravelly material. The topography is irregular, very gently to gently sloping, surface runoff is moderate and permeability is rapid in the upper deposits and moderate to moderately slow in the underlying sediments. Vegetation consists of bur oak, grasses, herbs, hazelnut and some aspen.

The Long Point series is characterized by a thin 4 to 6 cm LH horizon, with a 5 to 10 cm gray to light gray Ae horizon and a 10 to 15 cm dark yellowish brown Bt horizon which usually terminates at a layer that contains coarser fragments. A transitional BC horizon may be present above the pale brown glacial till II CK.

Lorteau Series (LTU)

The Lorteau series are moderately well drained Dark Gray Luvisol soils developed on a thin mantle of lacustrine clay over stratified, very strong calcareous loam to silty clay sediments. While the clay mantle varies in thickness from 15 to 76 cm, its average thickness is about 50 cm. These soils occur mainly along the Winnipeg River and Pinawa Channel. The topography is level to irregular, very gently sloping. Surface drainage and internal drainage is moderately slow.

The Lorteau series is characterized by a very thin dark gray Ahe, a gray Ae horizon and a moderately well developed textural B horizon. These soils are intergrades between Chernozemic Dark Gray and Orthic Gray Luvisol soils, however, they do not have prominent Ah horizons characteristic of Orthic Dark Gray Luvisol soils. The dry rubbed color of the plow layer ranges from gray to dark grayish brown (10YR 6/1 to 4/2) in most cultivated fields. A description of a representative Lorteau soil profile follows:

L-H - 8 to 0 cm, very dark grayish brown to black (10YR 3/2 to 2/2, dry), moderately to well decomposed litter; neutral, abrupt, smooth, lower boundary.

Ahe - 0 to 5 cm, dark gray (10YR 4/1, dry), clay loam; moderate fine to medium platy; friable when moist, soft when dry; slightly acid; abrupt, broken boundary.

Ae - 5 to 10 cm, light brownish gray to light gray (10YR 6/2 to 7/1, dry), clay loam; moderate fine to medium platy; friable when moist, soft when dry, slightly acid; clear, smooth, lower boundary.

AB - 10 to 15 cm, grayish brown to gray (10YR 5/2 to 6/1, dry), clay; strong coarse granular to fine blocky; firm when moist; hard when dry; medium acid; clear, smooth, lower boundary.

Bt1 - 15 to 36 cm, dark grayish brown (10YR 4/2, dry), clay; weak, medium prismatic breaking readily to strong fine blocky; firm when moist, hard when dry; strongly acid; abrupt, smooth boundary.

II Bt2 - 36 to 46 cm, dark gray (10YR 4/1, dry), clay; weak, medium prismatic breaking to strong fine blocky; firm when moist, hard when dry; mildly alkaline and moderately calcareous; clear, wavy, lower boundary.

II BC - 46 to 61 cm, grayish brown (10YR 5/2, dry), silty clay; moderate medium blocky; firm when moist; hard when dry; mildly alkaline and strongly calcareous; clear, wavy, lower boundary.

II Ck - 61 cm +, pale brown to light gray (10YR 6/3 to 7/2, dry), silty clay; moderate medium blocky-like structure; firm when moist, hard when dry; moderately alkaline and very strongly calcareous.

Lowroy Series (LOW)

The Lowroy series consists of poorly drained Rego Humic Gleysol (carbonated) soils developed on a thin mantle (<1 m) of moderately to strongly calcareous sandy (FS, LFS, LS) sediments overlying moderately to strongly calcareous, medium sand to gravelly textured deposits. They occur in level to depressional sites which have a water table at or near the surface for part of the year. Runoff is negligible; permeability of the sandy sediments is moderate to moderately rapid above the saturation zone. In areas where the seepage water contains soluble salts, a sufficient concentration of salts may occur in the soil to inhibit the growth of the normal sedge and meadow grasses.

The soil is characterized by a moderately decomposed organic layer 2 to 5 cm thick, a very dark gray Ahk horizon 7 to 15 cm thick, a thin dark gray AC horizon and a Cca horizon. Yellowish brown mottles are common in the AC and Ccag horizon and subsoil.

Lowton Series (LWN)

The Lowton series consists of poorly drained Rego Humic Gleysol soils developed on moderately to strongly calcareous, clayey, (SiC, C), lacustrine deposits. These soils occur in lower to depressional positions of nearly level landscapes and have very slow permeability, very slow surface runoff, and a high water table during the growing season. Lowton soils are non-eroded, non-stony, and moderately saline. They have a high available water holding capacity, high organic matter content, and low natural fertility. Native vegetation includes native grasses, willows and sedges. The majority of these soils are currently under native vegetation.

In a representative profile the solum is approximately 20 cm thick. The profile is characterized by moderately decomposed LFH horizon, 1 to 5 cm thick, a very dark gray Ah horizon, 5 to 20 cm thick with carbonates, and a dark gray to olive gray Ckg horizon, with many mottles and carbonate concentrations. A typical profile also contains till at 1 to 2.5 m below the surface. Lowton, soils occur in close association with Sigmond and Janick soils. They are similar to Landseer soils by having a Rego Humic Gleysol profile developed in clayey sediments but differ from them in having uniform textures throughout while Landseer soils are stratified at depth. Lowton soils were previously mapped as minor inclusions of the Oliver Association in the South-Central Manitoba (1943) reconnaissance soil survey.

Lundar Series (LUR)

The Lundar series consists of imperfectly drained Gleyed Rego Black Chernozem, carbonated soils developed on extremely calcareous loamy and water modified till. In some areas these soils may have a very thin mantle of lacustrine sediments over the till. The surface texture ranges from silty clay loam to loam. The soil occupies the intermediate position between the ridge and swale sequence in the Isafold Association. Topography is level to very gently sloping; runoff is moderately slow, and permeability is moderately slow. The native vegetation consists of native grasses, aspen, black poplar and some willow. These soils usually are very stony. The Lundar soil is characterized by a thin very dark gray Ah horizon grading directly into the gleyed, extremely calcareous parent material. The A horizon is moderately alkaline and contains considerable lime carbonate.

Ahk - 0 to 13 cm, very dark gray (10YR3/1 dry), loam to clay loam; moderate fine granular; firm when dry, slightly hard when moist; mildly alkaline and calcareous; diffuse, irregular boundary.

AC - 13 to 28 cm, grayish brown (10YR 5/2 dry), sandy clay loam to clay loam; weak fine granular; firm when moist, slightly hard when dry, plastic and sticky when wet; moderately alkaline and strongly calcareous; iron stained, gradual, irregular boundary.

Ckgj - 28 + cm, blotched light gray (2.5 Y 7/2 dry), loam to silt loam, iron stained with mottles, moderately alkaline and extremely calcareous.

Lydiatt Series (LYI)

The Lydiatt series consists of poorly drained, carbonated Rego Humic Gleysol developed on thin moderately to strongly calcareous dominantly moderately coarse to medium textured sediments overlying a significant lacustrine clay strata over extremely calcareous, loamy glacial till. The solum is similar to the Delmar series, but the clay strata of the Delmar series is thicker and extends below the one meter depth. Topography is level to depressional; runoff is slow; and permeability is slow due to the underlying clay strata. The native vegetation consists of sedge, reed grasses and willow.

The soil is characterized by a thin moderately decomposed peat layer (Om) of 6 to 15 cm thick, and a carbonated, friable very dark gray Ah horizon 10 to 20 cm thick; a thin transition horizon between the Ah and C may tongue into the underlying C horizon. The clay strata usually occur between the 50 and 75 cm depth and have a thickness of 15 to 30 cm; the extremely calcareous loamy till occurs below 75 cm depth. The chemical and physical properties of the underlying clay and loamy till strata are similar to those of Nourse series.

Lyleton Series (LYT)

The Lyleton series is the well drained Orthic Black Chernozem member of the Lyleton Association, developed on deep, moderately calcareous, coarse loamy (VFS, LVFS, FSL) lacustrine sediments. This soil usually has sandy loam to loamy very fine sand surface texture, complex gently sloping to gently undulating topography, moderately rapid permeability and moderate surface runoff. The depth to groundwater is estimated at 2 m during the growing season. The surface is non-stony and non-saline. Under cultivation these soils are moderately susceptible to erosion, somewhat droughty and generally low in natural fertility. The majority of these soils occur in the southwestern portion of the Souris River Basin.

The profiles are often deep and consist of black to very dark brown Ap horizons 12 to 15 cm thick, very dark gray to black Ah horizons 18 to 25 cm thick, very dark grayish brown Bm horizons 12 to 18 cm thick, light brownish gray Cca horizons 15 to 20 cm thick and calcareous, light brownish gray Ck horizons.

Lynx Bay Series (LXB)

The Lynx Bay series consists of moderately well drained Orthic Dark Gray Chernozem soils developed on moderately to strongly calcareous outwash and beach deposits over limestone bedrock. The solum is similar to the Gunton or Leary series; properties of the outwash and beach deposits are similar to those of the Leary series. The topography is very gently sloping to irregularly gently sloping. Permeability is rapid in the coarse textured outwash and moderate in the fractured permeable limestone within a metre of the surface. The surface textures range from medium sand to fine sandy loam. Native vegetation consists of aspen, bur oak and native grasses.

Macawber Series (MWB)

The Macawber series consists of very poorly drained organic soils developed on greater than 130 of mesic fen peat. A very thin (< 15 cm) layer of sphagnum moss may occur on the surface. Macawber series is a Typic Mesisol developed on uniform mesic fen peat (moderately well decomposed peat derived from sedges, reed grasses and aquatic mosses). The organic section of this soil is characterized by a thin (usually less than 30 cm) dark yellowish brown, fibric fen peat layer that is usually medium acid to neutral in reaction. This surface layer grades into a thick (in excess of 160 cm), very dark brown to black, medium acid to neutral, moderately well decomposed mesic fen peat layer that is usually weakly granular and slightly sticky. This layer in turn grades into a thin (approximately 30 cm) black, slightly acid to mildly alkaline well decomposed humic fen peat layer. The total depth of the organic section usually ranges from 1.5 to 2.5 m in thickness.

These soils are underlain by extremely calcareous, medium textured, stony till. The Macawber soils occur mainly in a few elongate, level to depressional swales north of Lake Manitoba. These areas are poorly drained and support a treeless fen type of vegetation dominated by sedges, reed meadow grasses and aquatic mosses; shrubs such as willow and swamp birch are common. The Macawber soils are similar to those described under the Stead series, differing from them only in having a stony till mineral substrate rather than a stone-free medium to fine textured lacustrine substrate. These soils are suitable for agricultural development, but stones may be a problem should the organic layer subside or for other reasons, be reduced substantially so that the very stony, glacial till comes close to the surface.

Madill Series (MXH)

The Madill series consists of well drained Orthic Regosol soils on stony, very strongly to extremely calcareous loamy glacial drift of limestone and granitic origin. The glacial drift may contain strata of variable coarse material. These soils occur on the upper slope and knoll positions of undulating to irregular, moderately rolling topography. Originally, these soils had a dark surface and profile development, but have been sufficiently eroded that little of the original horizon remains. Runoff is moderately rapid to rapid; permeability is moderate to moderately slow, depending on the strata and compaction of the drift. The soil is characterized by a gray plow layer 10 to 18 cm thick and a light gray to white C horizon.

Magnet Series (MGT)

The Magnet series is a carbonated Rego Humic Gleysol soils developed on poorly drained, moderately to strongly calcareous, thin 25 to 100 cm, fine loamy (CL, SiCL, SCL) deltaic and lacustrine sediments overlying extremely calcareous, loamy (SiL, L, CL) till. These soils occur in association with McCreary soils on level to depressional topography. Surface runoff is slow, and permeability is impeded for much of the year by a high water table. In areas where groundwater contains high salt concentrations, salt sensitive crops can be adversely affected. Native vegetation consists of sedges, meadow grasses and willows. These soils are wet for much of the year which causes a very severe agricultural limitation that restricts their capability to produce perennial forage.

The Magnet soil profile has a carbonated, very dark gray Ah horizon, 10 to 25 cm thick; a transitional gray to light gray carbonated AC horizon, 20 to 40 cm thick; a light gray to white, carbonated Ckg horizon 20 to 35 cm thick, and a light gray, extremely calcareous II Ckg horizon with prominent iron mottles. The surface mantle of these soils is coarser textured than the clayey mantle of the Kline soils, and finer textured than the sandy mantle of the Sprague soils.

Malonton Series (MNT)

The Malonton series consists of carbonated, poorly drained Rego Humic Gleysol soils developed on moderately to strongly calcareous deltaic and lacustrine sandy sediments. Finer textured sediments may be present near the 1 m depth. The surface texture ranges from loamy fine sand to loam and the topography is depressional, level or very gently sloping. Soil drainage is poor because of a lack of runoff, high water table or lateral seepage above the finer textured sediments below. Vegetation consists of sedges, reed grasses, with areas of balsam poplar, willow, and dogwood.

The soil is characterized by a very dark gray, carbonated Ah horizon 15 to 20 cm thick and a gray, carbonated AC horizon. Prominent yellowish brown iron mottles are present in the Ckg horizon. In native sites, up to 15 cm of fibric to humic peat may be present. Malonton, peaty phase soils have a 15 to 40 cm fibric to humic peat surface. Malonton, drained phase soils have had significant drainage to lower the high seasonal water table to make these soils somewhat similar to the Poppleton series.

Manitou Series (MXS)

The Manitou series consists of well drained Orthic Black Chernozem soils developed on weakly calcareous to neutral, deep, uniform, fine loamy and fine silty (L, CL, SiL) glacial till derived predominantly from shale bedrock deposits. These soils occur in middle and upper positions of very gentle slopes on undulating landscapes and have medium permeability moderate surface runoff and a medium water table during the growing season. Manitou soils are slightly eroded and non-stony. They have medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes tall prairie grasses interspersed with aspen-oak groves. The majority of these soils are currently used for crop production.

In a representative profile the solum is approximately 75 cm thick. The profile is characterized by a very dark gray Ap or Ah horizon, 15 to 20 cm thick, with fine shale flakes, a dark gray Bm horizon, 20 to 60 cm thick and a transitional BC horizon, 10 to 15 cm thick. The parent material is typically light gray non-calcareous till derived from shale. Manitou soils occur in close association with Fifere and Darlingford soils. They are similar to Fifere soils by having a shale till parent material but differ from Fifere soils because of their relatively darker surface color and lack of Bt horizon. Manitou soils were previously mapped as the dominant associate of the Manitou association in the reconnaissance soil survey of South-Central Manitoba (1943).

Mansfield Series (MFI)

The Mansfield series consists of imperfectly drained Gleyed Rego Black Chernozem soils developed on moderately to strongly calcareous, stratified, deep, sandy skeletal (S, GrS, CoS), glaciofluvial deposits. These soils occur in middle positions of nearly level landscapes and have rapid permeability, moderately slow surface runoff, and a high water table during the growing season. Mansfield soils are non-eroded, non-stony, and non-saline. They have a low available water holding capacity, medium organic matter content, and low natural fertility. Native vegetation includes prairie grasses, shrubs, aspen and bur oak. The majority of these soils are currently used for grazing or forage crops.

In a representative profile the solum is approximately 20 cm thick. The profile is characterized by a very dark gray Ah horizon, 15 to 25 cm thick, a dark gray to grayish brown AC horizon, 8 to 15 cm thick, moderately calcareous, a Cca horizon, 5 to 8 cm thick and a Ck horizon, with distinct yellowish brown mottles.

Mansfield soils occur in close association with Dorset and Fortina soils. They are similar to Dexter soils by having an imperfectly drained profile in sandy skeletal deposits but differ from them in having no Bm horizon. Mansfield soils were mapped as associates of the Marringhurst and Agassiz Associations in the South-Central or Carberry soil reports. The Mansfield series, shaly variant, MFI1, occurs in close association with Mansfield soils and differs from them in having varying amounts of shaly fragments throughout the profile.

Manson Series (MXD)

The Manson series consists of moderately well drained Cumulic Regosol soils on moderately to strongly calcareous, stratified dominantly clayey (SiC, C) alluvial deposits with layers of silty clay loam and clay loam. These soils are located in flood plain areas that have been inundated during years of high flood waters. They occur in association with Assiniboine and Kerran soils. Topography is gently sloping to gently undulating; runoff is moderate; permeability is moderately slow to slow.

The soil is characterized by a dark gray to gray surface horizon (Ah or Ap) 8 to 15 cm thick and generally lighter colored (C) substratum, but some dark stratum consisting of former organic material or Ah horizon may be present. Weak profile development may occur on the upper terrace positions.

Mantagao Series (MTG)

The Mantagao series consists of imperfectly drained Gleyed Gray Luvisol soils developed on 15 to 100 cm of moderately to strongly calcareous clayey lacustrine deposits overlying extremely calcareous loamy till. The topography is level to gently undulating. Due to the fine clay texture of the Mantagao series the permeability is slow. However, runoff is generally moderate. The surface may be slightly stony. Aspen and spruce with an understory of willow, feathermosses and sedges constitute the native vegetation.

The solum is usually developed within the lacustrine veneer, and is generally clay textured and neutral to mildly alkaline. These soils have a thin brownish gray Ae horizon overlying a well developed Bt horizon. Mantagao soils of the Low Boreal climatic zone are

similar to the less degraded Peguis soils of the High Boreal-temperate climatic zone. Mantagao soils occur primarily in the north-east corner of the mapsheet. These soils are commonly mapped in association with soils of the Napanee Bay series, peaty phase, the Kinwow series, and the Chitek series. A representative profile is described below.

L-H - 13 to 0 cm, leaf and sod mat; neutral; abrupt, smooth boundary.

Ae - 0 to 5 cm, very dark gray (10YR 3/1 moist), clay; strong coarse to medium granular; firm when moist, hard when dry; neutral; abrupt, smooth boundary.

Bt - 5 to 18 cm, black (10YR 2/1 moist), clay; weak medium to coarse prismatic breaking to strong coarse to medium granular; firm when moist, very hard when dry; neutral; moderately calcareous; clear, wavy boundary.

BCkg - 18 to 30 cm, dark gray (5Y 4/1 moist), clay; moderate medium to fine granular; firm when moist, hard when dry; moderately alkaline; strongly calcareous; clear, smooth boundary.

Ckg - 30 to 60cm, gray (5Y 4/1 moist), clay; moderate medium to fine granular; firm when moist,hard when dry; moderately alkaline; strongly calcareous; abrupt, smooth boundary.

II Ckg - 60 to 76 cm, gray brown (2.5Y 5/2 moist); clay; weak medium blocky breaking to moderate coarse granular; firm when moist, hard when dry; moderately alkaline; strongly calcareous.

Maon Series (MON)

The Maon series is the well drained Rego Black Chernozem member of the Lyleton Association, developed on deep, moderately calcareous, coarse loamy lacustrine sediments. This soil has a loamy very fine sand surface texture, gently sloping to gently undulating topography, moderate permeability and slow surface runoff. The drainage is moderately good and the estimated depth to water table is 2 m. In the cultivated state this soil is moderately susceptible to erosion as is indicated by the gray white buff colored spots in the field where C material has been incorporated into the Ap horizon.

Maples Series (MPS)

The Maple series is the well drained, Orthic Black Chernozem member of the Maples Association, developed on thin (< 1m) weakly to moderately calcareous medium to moderately coarse textured lacustrine sediments deposited on hard gray siliceous (Riding Mountain Formation) shale. This soil commonly has a loam to fine sandy loam surface texture, very gently sloping topography, moderate permeability and moderate surface runoff. These well drained soils are usually cultivated. The thin profile usually makes this soil droughty in periods of low precipitation. The soil consists of black Ap horizons 10 to 20 cm thick, dark brown Bm horizons 12 to 15 cm thick overlying dark reddish gray to dark gray shale.

Marchand Series (MAR)

The Marchand series consists of poorly drained Rego Humic Gleysol, carbonated phase soils developed on moderately to strongly calcareous, stratified coarse to moderately coarse textured alluvial sediments. They occur in the lower slope position of the stream channels. The upper 25 to 50 cm usually contains strata high in organic matter; textures may range from loamy sand to sandy loams. Shell fragments of aquatic organisms are usually present in these soils. The soils are subject to seasonal inundation, and subsequent water table near the surface. Native vegetation consists of willow, sedge, reeds and aquatic grasses.

The soils are characterized by a partially decomposed leaf and fen peat layer 8 to 15 cm thick, a thin dark gray, strongly calcareous Ah horizon 10 to 20 cm thick and a light brownish gray to light olive gray Ckg horizon with prominent mottles. Thin very dark gray to dark gray strata may be found in the subsequent stratified layers indicating former surfaces. The Marchand, peaty phase are similar to the Marchand soils except they have a thicker (15 to 40 cm) peaty surface.

Margaret Series (MRE)

The Margaret series is the moderately well drained, Orthic Black Chernozem member of the Terence Association, developed on thin (25 to 100 cm) weakly to moderately calcareous, coarse textured (FS, LCoS, LS, LFS) lacustrine sediments overlying strongly calcareous, medium to moderately fine textured (VFSL, L, CL, SiCL) glacial till. A very thin (< 5 cm) gravelly stratum or pebble line may occur at the contact. This soil has a loamy fine sandy surface texture, very gently sloping topography, moderately rapid permeability and moderate surface runoff. In the uncultivated condition the native vegetation consists chiefly of grasses, poplar, and western snow bush. The Margaret series resembles the Stanton series of the Souris Association. The only difference is that the Margaret series is underlain by glacial till.

The soil profile consists of black Ah horizons 5 to 25 cm thick, dark gray brown Bm horizons 15 to 30 cm thick, occasionally a thin stone line and an underlying light olive brown II Ck horizon with a few prominent iron concretions. A representative profile is presented.

Ah - 0 to 25 cm, black (10YR 2/1 moist), very dark gray (10YR 3/1 dry), loamy fine sand; single grained; loose, dry; clear wavy boundary; pH 6.1.

Bm - 25 to 56 cm, dark brown (10YR 3.5/3 moist), dark grayish brown to grayish brown (10YR 4.5/2 dry), loamy fine sand; weak medium prismatic breaking to weak fine subangular blocky; loose when moist; clear, smooth boundary; pH 6.4.

IICk - 56 to 61 cm, stone line, gravelly sand loam; single grained; loose, moist, clear, smooth boundary; strongly calcareous; pH 7.8.

IIICK - 61 cm +, olive brown to light olive brown (2.5Y4.5/4 moist), very pale brown (10YR 7/3 dry), clay loam till; amorphous; friable when moist; strongly calcareous; pH 8.1.

Marquette Series (MRQ)

The Marquette series consists of imperfectly drained Gleyed Rego Black soils developed on thin (< 1 m), fine textured, moderately to strongly calcareous lacustrine deposits overlying extremely calcareous, medium to moderately fine textured stony glacial till. They occupy the very gently sloping sites in the transition belt between the lacustrine and high lime glacial till soils. Runoff is moderately slow; and permeability is slow. Natural vegetation consisted of tall prairie grasses, herbs and some aspen.

The Marquette soils are characterized by a very dark gray Ah horizon 20 to 40 cm thick, a dark gray to gray AC horizon 8 to 20 cm thick, and an olive gray C horizon in which gypsum crystals may be present. Where the clay mantle is shallow the AC horizon may be partly in the extremely calcareous till. A thin pebbly horizon may be present at the contact of the lacustrine and till deposits. The solum is similar to the Red River clay soil where the clay is deeper; the subsoil is similar to the Ck horizon of the Inwood, Aneda or Garson soils. The Marquette, clay till variant, MRQ1, is similar to the normal Marquette series except for the subsoil which consists of a clay till (a mixture of clay and extremely calcareous loamy sediments) instead of the extremely calcareous loamy till.

Marringhurst Series (MRH)

The Marringhurst series consists of moderately well to well drained Calcareous Black Chernozem soils developed on moderately strongly to strongly calcareous, stratified, deep, sandy (CoS, S, LS) and sandy skeletal (GrS, GrCoS) glaciofluvial deposits. These soils occur in upper positions of very gentle slopes on rolling to irregular landscapes and have very rapid permeability, low surface runoff, and a low water table during the growing season. Marringhurst soils are often moderately eroded, non-stony, and non-saline. They have a low available water holding capacity, low organic matter content, and low natural fertility. Native vegetation includes shrubs, bur oak, and prairie grasses. The majority of these soils are currently excavated for gravel or used for grazing.

In a representative profile soil the solum is approximately 25 cm thick. The profile is characterized by a very dark gray to very dark grayish brown Ah horizon, 14 to 18 cm thick, a dark brown to brown Bmk horizon, 10 to 18 cm thick, a Cca horizon, 20 to 30 cm thick with coarser gravelly strata and a Ck horizon.

The Marringhurst, shale gravel variant, MRH1, occurs in close association with normal Marringhurst soils and differs by having a dominantly shale derived gravel. Marringhurst soils occur in close association with Dorset, Dexter and Fortina soils. They are similar to Dorset soils by having a well drained profile in sandy skeletal deposits but differ from them in having a Bmk rather than Bm horizon. Marringhurst soils were mapped as the dominant associate of the Marringhurst in the Carberry (1957) soil report.

Marsden Series (MDN)

The Marsden series consists of poorly drained Rego Humic Gleysol, carbonated soils developed on a sequence of strata consisting of a thin lacustrine mantle (25 to 60 cm) of moderately to strongly calcareous loamy sediments (VFSL to SiCL) over thin (10 to 40 cm) of medium sand to gravel strata over strongly calcareous loam to clay loam glacial till of shale, limestone and granitic origin. The topography is level to depressional; runoff is negligible, and permeability is restricted during periods when free water is at or near the surface.

The soils are characterized by a thin, moderately decomposed organic layer, 1 to 4 cm, a very dark gray Ah horizon, 12 to 18 cm and an olive brown AC frequently developed in the sand strata. The C horizon is olive gray with many prominent mottles and usually occurs at the till contact. Marsden soils were previously mapped as minor associates of the Heaslip complex in the Reconnaissance soil survey of South-Central Manitoba (1943).

Marsh Complex (MHC) or ($MH)

The Marsh complex consists of very poorly drained Rego Gleysol soils developed on lacustrine clay or thin mucky loam deposits over extremely calcareous till and/or moderately calcareous clay. These soils occur on level to depressional areas that are covered with water and are usually saturated for most of the year. The native vegetation consists entirely of reeds and sedges.

These soils have a thin surface layer of either muck or mineral material high in organic matter content and are underlain by strongly gleyed, olive gray mineral materials. A very thin Ahg horizon, less than 3 cm thick, may be present below the muck surface layer. Marsh soils are undifferentiated with respect to texture and composition of their parent material. They also are much more poorly drained than other Gleysolic soils.

Marshy Lake Series (MYK)

The Marshy Lake series is the imperfectly drained, saline, Gleyed Black Chernozem member of the Whitewater Association, developed on deep, strongly calcareous, moderately fine to fine textured, moderately saline, stratified alluvial and lacustrine sediments. This soil has a clay loam to clay surface texture, nearly level topography, slow permeability and slow surface runoff. The drainage is imperfect and the depth to water table is estimated at 1 to 2 metres during the growing season. The soil usually cultivated although the yields and growth of most crops are severely reduced due to salinity.

Martinville Series (MNV)

The Martinville series is the poorly drained, carbonated Rego Humic Gleysol member of the Wawanesa Association developed on thin (25 to 100 cm), strongly calcareous, medium textured (VFSL, L, SiL) lacustrine deposits overlying moderately calcareous, coarse textured (FS, LCoS, LFS) lacustrine deposits. These soils have a silt loam to loam surface texture, nearly level to depressional topography, moderate permeability and virtually no surface runoff. The water table is usually at or very near the soil surface. Most of these soils have hydrophytic native vegetation and may be used as pasture or left undisturbed.

Maskawata Series (MAW)

The Maskawata series consists of well-drained Rego Black Chernozem soils of the Waskada Association, developed on thin (25 to 100 cm), strongly calcareous, medium textured, discontinuous eolian and lacustrine sediments overlying strongly calcareous, medium to moderately fine textured glacial till. The dominant surface texture is a fine sandy loam, topography is gently undulating, permeability and surface runoff moderate. They are moderately well drained soils and usually occur in the upper mild slope position. Maskawata soils are found in close association with Waskada soils. The estimated depth to water level is 3 metres during the growing season. In the cultivated state these soils are moderately eroded and in many of these soils, most of the Ah horizon has been eroded by accelerated removal by wind and water as a result of cultivation. The surface soils have a general gray color due to the incorporation of AC and Ck horizons in the Ap.

Recognition of the overlay in these soils is sometimes difficult because the underlying till is relatively stone free. The Maskawata series is similar to the Argue series of the Cameron Association, except for the underlying glacial till.

Mather Series (MTR)

The Mather series consists of moderately well to well drained Orthic Black Chernozem soil developed on a mantle (25 to 90 cm) of moderately to strongly calcareous, shallow, loamy (VFSL, L, SiL), lacustrine deposits over moderately calcareous, stratified, deep, sandy (FS, LFS, LS) deposits. These soils occur in upper positions of gentle slopes on sloping to undulating landscapes and have moderate over moderately rapid permeability, moderately slow surface runoff, and a low water table during the growing season. Mather soils are often slightly eroded, non-stony, and non-saline. They have medium available water holding capacity, high organic matter content, and high natural fertility. Native vegetation includes tall prairie grasses and aspen-oak groves. The majority of these soils are currently cultivated for crop production.

Mather soils occur in close association with Wawanesa soils. They are similar to Cameron soils by having an Orthic Black Chernozem profile and loamy surface mantle but differ from them in having a sandy substrate.

McArthur Series (MRU)

The McArthur series consists of well drained, Orthic Gray Luvisol soils developed on weakly to moderately calcareous, sandy to loamy-skeletal glacial till. The surface of these soils is slightly to moderately stony and the surface texture ranges from loamy sand to loam. The topography varies from level to gently undulating, and in several locations in the western portion of the Lac Du Bonnet map area these soils occur on northeast-southwest trending drumlinoid ridges. McArthur soils are quite permeable, contributing to good internal drainage with little surface runoff. Vegetation consists of Balsam fir and birch.

These soils have a thin, light gray, medium to strongly acid Ae horizon and a moderately developed Bt horizon, grading into a loamy sand to sandy loam textured C horizon. McArthur soils occur on deep, well drained till deposits throughout the map area, occasionally in combination with the similar, but imperfectly drained Pinawa series.

McClernon Series (MND)

The McClernon series consists of imperfectly drained, Gleyed Rego Black Chernozem soils developed on thin (25 to 100 cm) moderately to strongly calcareous fine textured (SiC, C), lacustrine sediments overlying extremely calcareous, medium textured (VFSL, L, SiL), stony glacial till. This soil series is found mainly adjacent to the Dauphin soils in areas of the Dauphin Lake Plain where the clayey lacustrine deposits are shallow. The topography is level to very gently sloping and runoff is slow. Permeability is very slow in the upper clay materials and slow in the underlying till. Native vegetation was mainly tall prairie grass associations and occasional bluffs of aspen and willow.

Profile development in this soil is similar to that described for the Dauphin soils. The surface Ah horizon is usually very dark gray in color, caly textured with a granular structure. This horizon ranges from about 12 to 35 cm in thickness and often tongues through a

gray AC transitional horizon downward into the grayish brown calcareous C horizon. A thin, gravelly or cobbly water-worked lens often occurs at the contact of the upper lacustrine deposits and the underlying till. These soils can have some scattered small stones on the surface. McClernon soils correlate with Dauphin till substrate phase soils as mapped in the Westlake and Grandview Map Sheet areas (Soil Reports No. 8 and 9).

McCreary Series (MCR)

The McCreary series is a carbonated Gleyed Rego Black Chernozem soil developed on imperfectly drained, moderately to strongly calcareous, thin 25 to 100 cm, fine loamy (CL, SiCL, SCL) deltaic and lacustrine sediments overlying extremely calcareous, loamy (SiL, L, CL) till. These soils occur in association with Magnet soils on level to very gently sloping topography. Surface runoff is slow, and permeability is moderate to moderately slow. In areas where groundwater contains high salt concentrations, salt sensitive crops can be adversely affected. Native vegetation on undisturbed sites consists of prairie grasses, aspen and willows.

The McCreary soil profile has a carbonated, very dark gray Ah or Ap horizon, 15 to 25 cm thick; a calcareous, gray AC horizon, 15 to 25 cm thick; a calcareous C horizon with many prominent mottles 25 to 40 cm thick, and an extremely calcareous, light gray to white IIC horizon. A layer of lime accumulation (Cca horizon), 10 to 15 thick, often occurs below the AC horizon. The solum is usually developed in the fine loamy sediments which normally range from 55 to 90 cm thick with a thin (5 cm), water modified pebble lens at the till surface. These soils have a finer textured surface mantle than the similar Colby soils, and a coarser textured mantle than Marquette soils. They also differ from the somewhat similar Lakeland soils in having a loamy till substrate within a metre of the soil surface. The McCreary clay till variant, MCR1, consists of a mixture of strongly calcareous, fine (SiC, C) and extremely calcareous medium (silt loam to silty clay loam) material.

McKinley Series (MLI)

The McKinley series consists of carbonated, poorly drained Rego Humic Gleysol soils developed on strongly calcareous, medium to moderately coarse textured (VFSL, L, SiL to VFS, LVFS, FSL), lacustrine and alluvial sediments underlain by moderately calcareous, clayey lacustrine deposits. These deposits are usually stratified. Surface textures range from fine sandy loam to silt loam. They are level to depressional and have very slow surface runoff. While the soils are highly permeable internal drainage is normally impeded by a high water table. These soils are mostly stone-free. Native vegetation is mixed stands of aspen and balsam poplar with a thick cover of shrubs, herbs and grasses. The McKinley peaty phase is similar to the normal series except for the 15 to 40 cm of mesic fen peat on the surface.

McMunn Series (MMN)

The McMunn series consists of imperfectly drained, Gleyed Cumulic Regosol soils, developed on moderately to strongly calcareous stratified alluvial deposits ranging in texture from very fine sand to silty clay loam, and which are underlain by moderately calcareous clayey lacustrine deposits. These soils are developed on flood plain deposits bordering the Whitemouth and Birch Rivers mainly in the vicinity of Hadashville. The topography is smooth very gently sloping but appears undulating in areas containing moderately developed levees and meandering channels. Soil drainage over most of the area is moderate, but subject to flooding in very wet seasons and during spring run off. Native vegetation is principally aspen and balsam poplar, with some short black ash, elm, and Manitoba maple. In open stands of trees a dense undergrowth of shrubs and herbs such as alder, some rose, willow, cranberry, raspberry, saskatoon, sweet coltsfoot, aster, anemone, and several species of grass occur. The soils are stone free. Soil development on these alluvial sediments is limited to a thin weak Ahg horizon. This soil was formerly mapped as Medika, clay substrate phase in Soils of the Lac Du Bonnet Area (Soils Report No. 15).

Meadowbrook Series (MWK)

The Meadowbrook series consists of well drained Orthic Dark Gray Chernozem soils developed on deep (>100 cm), moderately to strongly calcareous, clayey (SiC, C) textured till deposits derived predominantly from Cretaceous shales. These soils occur in upper to middle positions of gently sloping to hummocky landscapes and have very slow permeability, moderately rapid surface runoff and a low water table during the growing season. Meadowbrook soils are slightly eroded, slightly stony and non-saline. They have clayey, cloddy surface horizons, high available water holding capacity, and medium organic matter content. Native vegetation often includes aspen, shrubs, herbaceous plants, and grasses. The majority of these soils are currently used for forages and annual crop production.

In a representative profile the solum is approximately 37 cm thick. The profile is characterized by dark gray clay textured Ap horizon, 10 to 20 cm thick, a medium to strong sub-angular blocky, dark grayish brown clay textured Bt horizon, 15 to 25 cm thick. The lower portion of the profile has a grayish brown clayey BC horizon, 10 to 15 cm thick with some carbonates and faint mottling, and a strongly calcareous, gray, massive clayey Ckgj horizon, with many medium, prominent mottles. A typical profile also contains occasional coarse fragments and cobbles.

Meadowbrook soils occur in close association with the poorly drained Breckon soils. Meadowbrook soils were mapped as the Meadowbrook soil association in the reconnaissance survey of soils in the Rossburn and Virden map sheet areas.

Medard Series (MDR)

The Medard series consists of poorly drained Rego Gleysol soils developed on weakly to moderately calcareous, uniform deep clayey lacustrine deposits. Occasionally, thin interstratified layers of organic materials are found in the profile. These soils occur in depressional positions of nearly level landscapes and have very slow permeability, very slow surface runoff and a high water table during the growing season. Medard soils are non eroded, non stony and non saline. They have high available water holding capacity, medium to high organic matter content, and medium natural fertility. Native vegetation often includes black spruce, willow, Labrador tea, alder, horsetail and sedges. The majority of these soils remain in their natural conditions.

In a representative profile the solum is approximately 40 cm thick. The profile is characterized by a peaty Om horizon, 15 to 35 cm thick, overlying a more decomposed dark brown to black Oh horizon, 2 to 10 cm thick with some mineral inclusions, a dark grayish brown Ckg horizon, and 10 to 50 cm thick with common coarse prominent mottles. The parent material is typically gray to olive gray clay with mottles and contains a few coarse fragments. Medard soils occur in close association with Roe Lake, Atik and Reed Lake soils and were mapped in the Cormorant Lake report.

Medika Series (MDK)

The Medika series consists of imperfectly drained, Gleyed Regosol soils developed on stratified alluvial deposits ranging in texture from very fine sand to silty clay loam and may be underlain by a clay substrate within 76 cm of the surface. These soils are developed on flood plain deposits bordering the Whitemouth, Birch, Boggy and Rat Rivers, mainly in the vicinity of Hadashville. The topography is very gently sloping but appears undulating in the areas containing moderately developed levees and meandering channels. Soil drainage over most of the area is moderate but subject to flooding in very wet seasons and during spring runoff. Native vegetation is dominantly aspen and balsam poplar, with some short black ash, elm and Manitoba maple. In open stands of trees a dense undergrowth of shrubs and herbs such as alder, some rose, willow, cranberry, raspberry, saskatoon, sweet colts foot, aster, anemone and several species of grass occur. These soils are stone free.

Soil development on these alluvial sediments is limited to a thin, weak Ahg horizon. The surface layer is 5 to 15 cm thick, dark gray, fine granular, friable, neutral to mildly alkaline in reaction and is usually contains calcium carbonate. The underlying material is stratified, moderately to strongly calcareous and contains dark colored layers of some soil development on former surfaces. A representative virgin soil profile is described below:

L-H - 3 to 0 cm, very dark brown (10YR 2/2, dry), moderately to well decomposed litter; neutral; weakly calcareous; abrupt, smooth, lower boundary.

Ahg - 0 to 8 cm, dark gray to very dark gray (10YR 4/1 to 3/1, dry), silt loam; moderate medium granular; friable when moist, soft when dry; neutral to mildly alkaline; weakly calcareous; a number of small iron mottles; abrupt, wavy, lower boundary.

Ckg1 - 8 to 20 cm, grayish brown to light grayish brown (2.5Y 5/2 to 10YR 6/2, dry), loam; weak fine granular; friable when moist, slightly hard when dry; flecked with iron stains; mildly alkaline; moderately calcareous; clear, wavy, lower boundary.

Ckg2 - 20 to 30 cm, light gray (2.5Y 7/2, dry), loam; weak fine granular; friable when moist, slightly hard when dry; mildly alkaline; moderately calcareous; strongly flecked with iron stains; gradual, wavy, lower boundary.

Ckg3 - 30 to 51 cm, white (2.5Y 8/2, dry), silty clay loam; weak, fine granular; friable when moist, hard when dry; mildly alkaline; moderately calcareous; flecked with iron stains; abrupt, wavy, lower boundary.

Ckg4 - 51 to 71 cm, dark gray (5Y 4/1, dry), clay; moderate medium to coarse granular; firm when moist; very hard when dry; mildly alkaline; strongly flecked with iron concretions; slightly calcareous.

Ckg5 - 71 cm +, light gray (5Y 7/2, dry), loam; moderate medium granular; friable when moist to slightly hard when dry; mildly alkaline; moderately calcareous; iron stained.

Medora Series (MDO)

The Medora series is the well to moderately well drained, Calcareous Black Chernozem member of the Ryerson Association, developed on deep, strongly calcareous, medium to moderately fine textured glacial till composed of mixed materials derived from shale, limestone and granitic rock. These soils usually have loam to clay loam surface textures, complex gently sloping to undulating topography, moderate permeability and rapid surface runoff. The depth to water table is estimated at 3 to 4 metres during the growing season. The surface is cultivated and occasionally slightly stony. These soils are moderately susceptible to erosion and in many cases much of the Ah horizon has been removed. Cultivation has incorporated some of the calcareous Bmk and occasionally part of the Cca horizons into the Apk resulting in a brownish gray coloring to the land surface. Medora soils commonly occur in the middle, upper slope and knoll positions.

The soil is characterized by weakly calcareous, very dark gray Apk horizons 10 to 15 cm thick, calcareous very dark grayish brown Bmk horizons 8 to 13 cm thick, light brownish gray Cca horizons 13 to 18 cm thick and light yellowish brown Ck horizons. A representative profile description of the Medora series is presented.

Apk - 0 to 10 cm, very dark brown (10YR 2/2 moist), very dark gray to dark gray (10YR 3.5/1 dry), loam; weak, fine granular; very friable when moist; soft when dry; abrupt, smooth boundary; weakly calcareous.

Bmk - 10 to 20 cm, very dark grayish brown (10YR 3/2), loam; coarse, granular breaking to fine granular; friable when moist; soft when dry; abrupt, wavy boundary; moderately calcareous.

Ck1 - 20 to 51 cm, dark grayish brown (10YR 4/2 moist), loam; weak, fine granular; firm when moist; slightly hard when dry; abrupt, smooth boundary; moderately calcareous.

Cca - 51 to 66 cm, light olive brown (2.5Y 4/4 moist), loam; weak, fine granular; firm when moist; soft when dry; abrupt, smooth boundary; strongly calcareous.

Ck2 - 66 cm +, light yellowish brown (2.5Y 6/4 moist), loam; weak, fine granular; firm when moist; slightly hard when dry; strongly calcareous.

Meharry Series (MEH)

The Meharry series consists of well drained Rego Black Chernozem soils developed on very strongly calcareous, deep, uniform, loam to clay loam morainal till deposits. These soils occur on upper and mid slopes of very gently sloping undulating deposits and have moderate permeability, slow surface runoff and a low water table during the growing season. Meharry soils are moderately stony. Meharry soils have medium available water holding capacity, medium organic matter levels, and medium natural fertility. The native vegetation often comprises mixed aspen and black poplar with shrubs such as dogwood and ground cover of tall prairie grasses. The majority of these soils are currently used for crop production although some areas remain in native bush or improved pasture.

In a representative profile the solum is generally 30 cm thick varying between 15 and 40 cm. The profile is characterized by a thin (20 cm) very dark gray non-calcareous fine sandy loam to loamy textured A horizon overlying a grayish brown loam to silt loam textured carbonated AC transition horizon, and often a well developed light gray strongly calcareous Cca horizon. The parent material is typically uniform, compact, very pale brown, very strongly calcareous clay loam to silty clay loam till.

The Meharry, deep phase variant, MEH1, consists of of soils with a thicher solum than the normal Meharry, due to the presence of up to 50 cm of wind blown or water deposited material above the strongly calcareous till. The surface texture ranges from sandy loam to clay loam and is generally less cobbly than the modal Meharry soils. Meharry soils occur in close association with the Gleyed Rego Black Chernozem, imperfectly drained Oaknook soils and correlate with the well drained member of the Meharry Association described in the Swan River soil report.

Meleb Series (MEB)

The Meleb series consists of poorly drained Rego Humic Gleysol, carbonated phase soils developed on very strongly to extremely calcareous, stony glacial till. A thin peat covering of 0 to 15 cm may be present and underlain by textures ranging from sandy loam to clay due to some wash or sorting in the level to depressional topographic position. They occur in association with the Garson, Aneda and Inwood soils. The native vegetation is dominantly meadow grasses, sedges and herbs with inclusions of willow, black poplar and some aspen.

The Meleb soil consists of thin layer of fen peat overlying a thin black to dark gray (10YR 2/1 moist, 10YR 4/1 dry) Ah horizon 6 to 10 cm thick, alkaline and calcareous, and underlain by a light gray to white (2.5 Y 7/2 moist, 10YR 7/1 dry), very strongly to extremely Ckg horizon. In soils that have had some wash or sorting, the Ah horizon terminates at the contact of the modified sediments and the till. If the surface mantle is thicker, a thin gravelly or cobble lens may occur at the contact. The Meleb carbonated, peaty phase has a 15 to 40 cm of mesic fen peat on the surface.

Melita Series (MLT)

The Melita series is the well drained, Cumulic Regosol member of the Melita Association developed on deep, moderately calcareous, loamy recent alluvial sediments. These deposits are stratified and contain numerous dark colored bands of former Ah horizons in the profile. The soil has a very fine sandy loam to silt loam surface texture, nearly level to depressional topography, moderate permeability and moderate surface runoff. They are moderately well drained soils and have an estimated depth to water table of 2 m. In the uncultivated state they are covered by lush growth of native vegetation such as western snowberry, (Symphoricarpus occidentalis), elm, (Ulmus americana), maple, (Acer negundo), forbs, grasses and chokecherry. In the cultivated state these soils produce excellent crops.

The soil usually consists of thick dark gray brown Ah horizons 15 to 30 cm thick and very dark grayish brown C horizons. They also have buried surface horizons as indicated by dark bands in the profile. The Melita series corresponds with the Mowbray series in climatic subregion MBT2.

Melland Series (MXT)

The Melland series consists of the imperfectly drained, Gleyed Rego Black Chernozem, carbonated soils developed on a sequence of materials consisting of a thin mantle (25 to 60 cm) of moderately to strongly calcareous loamy (VFSL to SiCL) sediment over a thin (10 to 40 cm) layer of medium sand to gravel strata over strongly calcareous loam to clay loam glacial till of shale, limestone, and granitic origin. Topography is level to gently sloping; runoff is moderately slow; permeability is moderate in the upper strata, but

restricted above the till due to perched water conditions. Lateral flow of water occurs through the gravel strata during the spring or following heavy rains.

The soil is characterized by a very dark gray Ah horizon 18 to 25 cm thick, and a dark gray to grayish brown AC horizon, 10 to 15 cm thick. A lime accumulation (Cca) horizon is usually present at the transition from loamy to gravel strata. Melland soils are more permeable than the very similar, finer textured Beresford series.

Melnice Series (MLC)

The Melnice series consists of carbonated, Rego Humic Gleysol soils developed on thin (25 to 100 cm) moderately to strongly calcareous, coarse to moderately coarse textured lacustrine and outwash deposits underlain by extremely calcareous, medium textured, stony till. The texture of the surface horizon varies from sand to fine sandy loam. Several areas of normal Melnice soils and the peaty phase soils occur in association with areas of water-worked ground moraine in the Dauphin Lake Plain. The Melnice soils occupy level to depressional areas often adjacent to better drained sand and gravel beach ridges. Runoff is slow and permeability, although rapid in the upper soil materials is impeded by a water table at or near the surface for a considerable part of the year. The underlying till substrate is moderately permeable and helps to maintain the water table. Native vegetation is dominantly meadow and slough grasses, sedges and reeds with scattered clumps of willow and swamp birch.

Melnice soils have a thin, very dark gray to black Ahg horizon (7 to l2 cm) which is usually carbonated. The A horizon fades into a mottled calcareous Ckg horizon. These soils are similar to the Valpoy soils, differing only in the presence of the less permeable, stony till materials below the surface. The Melnice soils correlate with Valpoy till substrate phase soils described in the Grahamdale Map Area (Soil Report No. l6).

Mentieth Series (MNH)

The Mentieth series is the imperfectly drained, Gleyed Rego Black Chernozem, carbonated member of the Mentieth Association, developed on thin moderately calcareous, coarse loamy lacustrine sediments overlying strongly calcareous loamy glacial till. A very thin (< 5 cm) gravelly pebble line may occur at the contact. This soil has a very fine sand to loamy very fine sand surface texture, nearly level topography, moderate permeability and moderately slow surface runoff. These soils are imperfectly drained because of their position in the landscape and the proximity of the underlying less permeable till. Although ponded surface waters are not common the profile is frequently saturated due to the high water table. The surface is non-stony and cultivated.

The Mentieth series resemble the Switzer series of the Souris Association, the difference is that Mentieth series is underlain by glacial till.

Merle Series (MRL)

The Merle series is the imperfectly drained, Gleyed Black Chernozem member of the Maples Association, developed on thin (< 1 m), weakly to moderately calcareous, moderately coarse to medium textured (VFS, LVFS, SL, FSL to VFSL, L, SiL), lacustrine sediments deposited on hard gray siliceous (Riding Mountain Formation) shale. The soil is characterized by a loam to fine sandy loam surace texture, gently sloping topography, moderate permeability and moderate surface runoff. Drainage is slightly restricted because of the close proximity of the underlying shale. Water tends to pond on the surface once the underlying soil is saturated. Merle soils occur at lower slopes and depressional positions.

Merridale Series (MRA)

The Merridale series consists of Gleyed Black Chernozem soils developed on thin, moderately calcareous, moderately fine to fine textured lacustrine sediments overlying weakly to moderately calcareous, shaly clay till. A water-worked gravelly and cobbly lens of variable thickness (25 to 90 cm) may occur between the two materials. Although surface texture of the Merridale soils varies from clay to clay loam, clay is dominant. The Merridale soils are found in level to very gently sloping, dominantly imperfectly drained areas. Runoff is moderate but internal soil permeability is slow. Lateral seepage can be extensive in those soils where continuous water-worked gravelly layers lie above the less permeable shale till or shale bedrock. These soils occur at higher elevations in the southwest portion of the Dauphin Lake Plain. Areas of Merridale soils occur in association with the Stony Point, Norgate, Favel and Aubrey soils, mainly in a narrow belt immediately below the Manitoba Escarpment. Surface lacustrine and till deposits are very thin in this area and the underlying shale bedrock or shaly clay till is exposed or occurs very close to the surface.

Native vegetation consists of semi-open stands of aspen and balsam poplar, a shrub under story of willow and alder and a continuous ground cover of grasses and sedges. The soil surface is widely covered with cobbles and boulders, which could be a serious hindrance to cultivation in portions of the area. These soils show the influence of grassland vegetation in their profile. The soils range in thickness from 25 to 35 cm, and are characterized by a thin black A horizon grading into a weakly expressed B horizon marked by slight color and structural change from the surface horizon. The subsoil is weakly calcareous and often weakly saline. A description representative of the Merridale series is given:

> **L-H** - 5 to 0 cm, moderately well to well decomposed leaf litter and sod mat; mildly alkaline in reaction; abrupt, smooth boundary.

Ah - 0 to 8 cm, black (10YR 2/1 moist), clay loam; weak, fine granular; firm when moist; hard when dry; mildly alkaline; clear, wavy boundary.

Bmgj - 8 to 25 cm, very dark gray (10YR 3/1 moist), silt loam; weak, coarse columnar breaking to weak, fine granular; very friable when moist; very hard when dry; mildly alkaline; clear, smooth boundary.

Ckg - 25 to 55 cm, very dark gray (2.5Y 3/1 moist), clay; structureless; amorphous breaking to weak, fine granular; firm when moist; hard when dry; mildly alkaline; weakly calcareous; gradual, smooth boundary.

Csg - 55 to 100 cm, very dark grayish brown (10YR 3/2 moist and 2.5Y 4/2-3/2 moist), silty clay loam; structureless; amorphous breaking to moderate, fine granular; firm when moist; hard when dry; mildly alkaline; non-calcareous; weakly saline containing many gypsum crystals.

Methley Series (MHY)

The Methley series consists of carbonated, Gleyed Rego Black Chernozem soils developed on a variable depth (30 to 150 cm) of extremely calcareous, moderately fine textured (SCL, CL, SiCL), glacial till overlying extremely calcareous, medium textured (VFSL, L SiL), stony till. Most of the Methley soils occur in the Dauphin Lake Plain to the east and north of Dauphin Lake. The upper materials on which the Methley soils have formed are relatively stone-free except for a concentration of small stones and flat cobbles on the soil surface. The underlying materials are usually very stony and somewhat lighter in texture than the surface layers. These lower deposits are fairly compact and have a fissile, pseudo platy structure characteristic of much of the regional till throughout the Interlake Plain and Westlake Till Plain. The upper materials are thought to be a stone-free till resulting from a minor ice advance over a small area of lacustrine deposits. Topography is level to very gently undulating; surface runoff is moderate and internal soil permeability is moderately slow. Native vegetation was dominantly aspen and willow with a ground cover of meadow grasses and sedges.

The solum is relatively thin (7 to 20 cm) and depth of development has been strongly influenced by both the high lime content of the parent material and the imperfect drainage. The dark gray Ah horizon is 10 to 15 cm thick, alkaline in reaction and usually calcareous to the surface. The surface color of cultivated soils is often gray due to the incorporation of the calcareous parent materials with dark A horizon. A thin, transitional horizon containing moderate amounts of organic matter may separate the surface horizon from the more calcareous C horizon. A white colored horizon of carbonate enrichment (Cca) may occur immediately below the A horizon. These soils have clay loam to silty clay loam textures in the upper materials which commonly grade into loam textures with increasing depth. The Methley soils occur in association with Magnet peaty phase soils. A small area of Methley saline phase soils occurs to the west of Dauphin Lake. A representative Methley soil is described below:

Apk - 0 to 17 cm, dark gray to black (10YR 2/1 to 10YR 4/1 moist) silt loam; weak, medium to coarse granular; friable when moist, hard when dry; mildly alkaline; strongly calcareous; abrupt, smooth boundary.

Cca - 17 to 23 cm, light gray to light yellowish brown (2.5YR 7/2 to 6/3 moist) silty clay loam; strong, medium granular; friable when moist, very hard when dry; moderately alkaline; extremely calcareous; abrupt, wavy boundary.

Ckg1 - 23 to 50 cm, light olive brown to light yellowish brown (2.5YR 5.5/4 moist) silty clay loam; moderate, medium granular; firm when moist, very hard when dry; moderately alkaline; extremely calcareous; clear, smooth boundary.

Ckg2 - 50 to 90 cm, light olive brown to light yellowish brown (2.5YR 5.5/4 moist) silty clay loam with thin lenses of very fine sand; moderate, medium granular; firm when moist, very hard when dry; moderately alkaline; extremely calcareous.

Methvin Series (MHV)

The Methvin series is the imperfectly drained, Gleyed Black Chernozem member of the Chaucer Association, developed on thin (25 to 100 cm), weakly to moderately calcareous, coarse textured (FS, LCoS, LS, LFS) lacustrine sediments overlying coarse textured, gravelly deltaic, beach and outwash deposits. This soil has a fine sand surface texture, nearly level to gently sloping topography, rapid permeability and very slow surface runoff. The estimated depth to water table is less than 2 m during the growing season. This soil is imperfectly drained as a result of seasonally high groundwater levels that occasionally come very close to ground surface. These soils have no significant stones and are usually cultivated. The Methvin series resembles the Eramosh series, except that the Eramosh series is underlain with glacial till.

Middlebro Series (MDB)

The Middlebro series is an imperfectly drained, Gleyed Dark Gray Luvisol soil developed on a thin mantle of weakly calcareous lacustrine clay overlying very strongly calcareous silty sediments. The clay overlay varies in thickness from 15 to 76 cm, but is usually 38 to 50 cm thick. The underlying sediments are usually stratified and range in texture from loam to clay. These soils occur on level to irregular, very gently sloping terrain along the Winnipeg River. Surface and internal drainage is slow. In their native condition, Middlebro soils have a thin leaf and forb layer that grades abruptly into a platy structured, iron stained Ae horizon. In cultivated fields, however, the Ap layer is usually dark gray to gray in color and overlies a very thin remnant of the Aeg horizon. This soil has a relatively deep, well developed B horizon. A representative Middlebro soil profile is described below:

L-H - 5 to 0 cm, brown to dark reddish brown (10YR 4/3 to 5YR 3/2, dry), leaf, forb and grass liter; acid, abrupt, smooth, lower boundary.

Ahe - 0 to 3 cm, gray (10YR 5/1, dry), silty clay, moderate coarse granular; friable when moist, soft when dry; medium acid; abrupt, broken boundary.

Aegj - 3 to 13 cm, light gray (10YR 7/2, dry), silty clay loam; moderate, coarse platy to coarse granular; friable when moist, soft when dry; mottled; slightly acid; clear, wavy, lower boundary.

Btgj - 13 to 36 cm, very dark grayish brown (10YR 3/2, dry), clay; massive breaking readily to strong, fine blocky; very firm when moist, very hard when dry; iron stained; slightly acid; clear, wavy, lower boundary.

II BC - 36 to 51 cm, grayish brown (10YR 5/2, dry), silty clay; strong coarse granular; very firm when moist, hard when dry; mildly alkaline and strongly calcareous; iron stained; gradual, wavy, lower boundary.

II Ckgj - 51 cm +, very pale brown to white (10YR 7/3 to 8/2, dry), stratified clay and silt loam; massive breaking to moderate coarse platy structure in the silt layers; firm when moist, hard when dry; moderately alkaline and very strongly calcareous.

Minago Series (MIG)

The Minago series consists of well drained, Orthic Gray Luvisol soils developed on well sorted, strongly calcareous lacustrine sediments with textures that range from silt loam to silty clay loam. This soil has a thin (< 25 cm) solum which is characteristic of soils developed from strongly calcareous material. The topography is irregular, very gently sloping to gently sloping, except in areas where some dissection by water courses has occurred. Internal drainage is moderate, yet sufficiently rapid under the local climatic conditions to impart favorable soil drainage. Permeability may be temporarily reduced by cementation of the silty sediments during prolonged dry periods. Native vegetation is dominantly jack pine with spruce, aspen and birch. A generalized profile description is given.

LFH - 8 to 0 cm, very dark brown (10YR 2/2 moist and dry), moderately well decomposed; medium acid.

Ae - 0 to 5 cm, dark grayish brown (10YR 4/2 moist) and grayish brown (10YR 5/2 dry), very fine sandy loam to silt loam; weakly developed, fine platy structure; soft; medium acid.

Bt - 5 to 20 cm, very dark grayish brown (10YR 3/2 moist) and dark grayish brown (10YR 4/2 dry), silty clay loam; medium granular to fine sub-angular blocky; sticky and plastic when wet; slightly hard when dry; slightly acid.

Ck - 20 cm +, grayish brown (10YR 5/2 moist) and light gray (10YR 7/2 dry), silt loam to silty clay loam; fine pseudo-granular; sticky when wet; cemented when dry; moderately alkaline; strongly calcareous.

Miniota Series (MXI)

The Miniota series consists of moderately well to well drained Orthic Black Chernozem soils developed on a thin mantle (<1 m) of moderately to strongly calcareous very fine sand to fine sandy loam textured sediments over moderately to strongly calcareous, medium sand to gravelly textured deposits. The topography varies from gently sloping to irregular, moderately rolling. Runoff is moderate to moderately rapid, and permeability is rapid in the sandy strata and very rapid in the lower coarser strata. They occur in close association with the imperfectly drained Wytonville and Kilmury soils and the poorly drained Bornett series.

The soil is characterized by a very dark gray to very dark grayish brown Ah horizon, 12 to 20 cm thick, a dark brown to brown Bm horizon, 10 to 18 cm thick, and a pale brown BC horizon. The depth of solum varies with the depth of the sandy strata; the lime accumulation (Cca) horizon usually occurs at the transition from sandy to coarser sediments. Miniota soils are less permeable and less droughty than the very similar coarser textured Wheatland and Dorset soils. The similar, finer textured Croyon soils are less droughty.

Minitonas Series (MNS)

The Minitonas series consists of imperfectly drained Gleyed Rego Black Chernozem soils developed on moderately to strongly calcareous, shallow, fine loamy lacustrine sediments less than 1 m thick overlying loamy morainal deposits. These soils occur on mid slopes of gently sloping lacustrine veneer deposits and have moderate permeability, slow surface runoff and a medium water table during the growing season. Minitonas soils are slightly to moderately stony. Minitonas soils have moderate available water holding capacity, moderate organic matter levels, and moderate natural fertility. The native vegetation often consists of mixed aspen and black poplar, shrubs such as willow and a ground cover of meadow grasses. A majority of these soils are currently used for crop production.

In a representative profile the solum is generally about 40 cm thick ranging from 20 to 45 cm. The profile is characterized by a 30 cm thick very dark gray loamy textured, Ap and Ah horizon overlying a 15 cm thick grayish brown, loam textured, carbonated transitional AC horizon, and a light gray, strongly calcareous, loam textured mottled Ckgj horizon. The parent material of the till substrate is typically uniform, compact, pale yellow loam and very strongly calcareous and mottled.

Minitonas soils occur in close association with Timberton and Pineimuta soils. They are similar to these soils in texture but differ from Pineimuta because of better drainage and from Timberton soils because of absence of a B horizon and because of imperfect drainage. Minitonas soils correlate with Valley, till substrate phase, soils previously published in the Swan River soil report (Soil Report No. 13).

Minto Series (MTO)

The Minto series is the imperfectly drained, Gleyed Eluviated Black Chernozem member of the Elva Association, developed on deep (>100 cm), strongly calcareous moderately fine textured (SCL, CL, SiCL) lacustrine sediments. This soil usually has a silty clay loam surface texture, occurs in the depressions of gently undulating topography, and has moderately slow permeability and slow surface runoff. The estimated depth to water table is less than 2 metres. This imperfectly drained soil is usually cultivated and is moderately susceptible to flooding and surface ponding particularly after heavy rains.

Mockry Series (MKY)

The Mockry series consists of poorly drained Rego Humic Gleysol soils developed on weakly to noncalcareous, stratified, deep, sandy (FS, LFS, S), eolian deposits. These soils occur in depressional positions of moderate slopes on hummocky landscapes and have rapid permeability, slow surface runoff, and a high water table during the growing season. Mockry soils are non-eroded, non-stony, and often slightly saline. They have a low available water holding capacity, high organic matter content, and low natural fertility. The majority of these soils are currently in native vegetation that includes rushes, sedges, reeds and willows.

In a representative profile the solum is approximately 15 cm thick. The profile is characterized by a moderately decomposed organic horizon, 2 to 5 cm thick, a very dark gray Ah horizon, 10 to 10 cm thick, an olive gray AC horizon, 10 to 15 cm thick, moderately calcareous and frequently a Cca horizon, 5 to 8 cm thick. The parent material is typically olive gray and mottled. Mockry soils occur in close association with Shilox and Onahan soils. They are similar to Sewell soils by having a poorly drained profile in sandy deposits but differ from them in having deposits of eolian rather than lacustrine origin. Mockry soils were previously mapped as Meadow associates of the Stockton Association in the Carberry (1957) soil report.

Molson Complex (MLS)

The Molson complex comprises a group of very poorly drained shallow to thick organic soils developed on (65-160 cm) fibric Sphagnum moss peat which may be underlain by significant amounts of mesic forest and/or fen peat. Moderately to strongly calcareous, loamy to clayey lacustrine sediments occur within 160 cm of the surface. Topography of these areas is depressional to level. Native vegetation associated with the Molson Complex is dominantly stunted black spruce and tamarack with an under story of Sphagnum mosses and ericaceous shrubs.

The Molson series, a Terric Mesic Fibrisol, is the dominant soil in this complex. It has a fibric Sphagnum peat surface tier. The organic section is dominantly fibric Sphagnum peat underlain by subdominant layers of mesic forest and/or fen peat. Other soils in the Molson complex are the Sisib series, a Terric Fibric Mesisol and the Sadlow series, a Terric Fibrisol. These soils are only of minor significance in the complex.

The soils of the Molson complex are similar to those of the Kilkenny and Sand River complexes, differing from them only in the nature of the underlying mineral substrate. Molson complex soils are found throughout the map area and often occur in association with organic soils of the Cayer and Howell series and the Okno and Orok complexes. A representative series of the Molson Complex, the Sisib series is described below.

Of - 0 to 66 cm, pale brown to brown (10YR 5/3 to 6/3 moist), non-woody; coarse fibered; fibric spongy Sphagnum moss; unrubbed fiber content approximately 99 percent; strongly acid.

Om - 66 to 92 cm; very dark brown to dark reddish brown (10YR 2/2 to 5Y 3/2 moist), mesic to humic, fine fibered to amorphous; granular material derived from mixed moss; woody and herbaceous material; neutral; unrubbed fiber content approximately 69 percent; considerable coarse woody material at contact of the upper layer.

II Ahg - 92 to 100 cm, black (2.5Y 3/0 wet), clay; strong, fine, granular; sticky, very plastic; slightly acid; abrupt, wavy boundary.

II Cg - 100 cm +, light gray (5Y 5/1 wet), clay; amorphous & weak, fine pseudo granular; sticky & very plastic when wet; neutral.

Montgomery Series (MOT)

The Montgomery series is the imperfectly drained, carbonated Gleyed Rego Black Chernozem member of the Waskada Association, developed on thin (25 to 100 cm), strongly calcareous, medium to moderately fine textured, discontinuous aeolian and lacustrine sediments overlying strongly calcareous medium to moderately fine textured glacial till. A very thin (<5cm), pebbly stratum may occur at the contact. This soil has a fine sandy loam surface texture, gently sloping to depressional topography, moderate permeability and moderate surface runoff. This soil has an estimated depth to water table within 2 metres. The cultivated surface may be slightly stony. The soil consists of very dark gray Apk horizons 10 to 20 cm thick, light gray Ccagj horizons 20 to 30 cm thick, light gray Ckgj horizons 25 to 33 cm thick overlying light brownish gray, loam to clay loam, II Ckgj horizons.

Moore Park Series (MPK)

The Moore Park series is characterized by a Gleyed Black Chernozem (carbonated) solum on moderately to strongly calcareous, loamy (L, CL) morainal till of limestone, granite and shale origin. These soils are imperfectly drained and occur in the lower slope positions of undulating to hummocky landscapes in close association with Varcoe soils. They receive runoff from the upper slopes, and in some landscapes, may be influenced by seepage. Permeability is slow and may be restricted during periods of subsoil saturation.

Morris Series (MRS)

The Morris series consists of imperfectly drained Gleyed Solonetzic Black Chernozem soils developed on moderately to strongly calcareous fine textured (C, HC) lacustrine deposits. They occur on level to very gently sloping topography usually adjacent to or intermediate between poorly drained Osborne clay soils and the imperfectly drained Red River or Scanterbury clay soils. Runoff is moderately slow to slow; permeability is very slow and restricted by the columnar and fine subangular blocky to massive, high swelling B horizons.

In the virgin state, these soils are characterized by a shallow dark gray to gray Ah or Ahej horizon 5 to 8 cm thick, a dark gray to gray columnar Bnjgj1 horizon 10 to 15 cm thick and an amorphous dark gray to black, waxy Bnjgj2 horizon that breaks into coarse subangular blocky peds. Gypsum may be present in the olive gray to grayish brown weakly mottled Ckgj horizon. Under cultivation, most of the columnar Bnjgj1 horizon is incorporated with the Ap horizon. In the moist condition, the Ap is sticky and massive and breaks under pressure into weak, medium to fine granular peds; in the dry condition, the Ap is cloddy and hard, and breaks with difficulty into coarse clods or rounded blocks. The Morris soils occur in close association with the Red River, Scanterbury and Osborne soils. They were previously mapped as the alkalinized associate of the Red River Association in the Winnipeg-Morris (1953) soil report.

Morton Series (MOO)

The Morton series consists of moderately well to well drained Orthic Dark Gray Chernozems to Dark Gray Luvisol soils developed on strongly to extremely calcareous, moderately coarse to medium textured (VFS, LVFS, FSL to VFSL, L, SiL) lacustrine deposits. Generally the texture gets coarser with depth. Surface textures range from loamy very fine sand to silt loam. The topography is very gently to gently sloping; runoff is moderate; and permeability is variable from moderately rapid to moderately slow due to variability of the texture. The native vegetation consists dominantly of trembling aspen, hazel, some oak and grasses.

The Morton soil is characterized a variable degree of degradation. Soils with a fine sandy surface layer have a better developed and thicker, leached A (Ahe or Ae) horizon than those with finer surface layers. A thin, very dark gray Ah is present in some soils. The Bt horizon is well developed and is clay loam to clay in texture. The solum seldom exceeds 30 cm in thickness and is underlain by very strongly calcareous stratified sediments. A description of the Morton series is given below.

L-H - 2.5 to 0 cm, very dark brown (10YR2/2 dry) leaf mat, partially decomposed; neutral; grades through a clear, smooth boundary.

Ah - 0 to 3 cm, very dark gray (10Y 3/1 dry) fine sandy loam; weak fine granular; very friable when moist; soft when dry; neutral; clear, smooth boundary.

Ae - 3 to 8 cm, light grayish brown (10YR 6/2 dry) fine sandy loam; weak fine platy; very friable when moist; soft when dry; slightly acid; clear, smooth boundary.

BA - 8 to 13 cm, grayish brown (10Y 5/2) fine sandy clay loam; moderate fine to medium blocky; firm when moist; hard when dry; slightly acid; clear, smooth boundary.

Bt - 13 to 20 cm, very dark grayish brown to dark grayish brown (10YR 3/2 to 4/2 dry) clay; strong fine to medium subangular blocky; firm when moist; hard when dry; medium acid; clear, smooth boundary.

BC - 20 to 28 cm, grayish brown (10YR 5/2 dry) clay loam; moderate fine granular; friable when moist; slightly hard when dry; mildly alkaline and moderately calcareous; gradual, smooth boundary.

Ck - 28 to 75 cm, light gray (2.5Y 7/2 dry) loam to silt loam; weak fine granular; friable when moist; soft when dry; moderately alkaline and strongly calcareous; iron stained in lower portion.

Mossey River (MSV)

The Mossey River series is a poorly drained, carbonated phase of a Rego Gleysol soil developed on weakly to moderately calcareous, medium textured (VFSL, L SiL), stratified fluvial deposits with layers ranging in texture from sand to clay. Thin, dark layers rich in organic matter are common in most profiles. Surface textures are usually loam to silt loam. Most of the Mossey River soils occur as a level to depressional, poorly drained plain near the Wilson and Vermillion Rivers. They also occur in small depressional areas along Edwards Creek and are closely associated with Edwards and Paulson soils. Mossey River is equivalent to a poorly drained Turtle River soil and is coarser textured than the Paulson soils. Native vegetation is dominantly meadow grasses, sedges, willow and variable amounts of salt tolerant species in salt affected areas. A saline, Mossey River series follows:

Ah - 0 to 20 cm, dark colored mineral-organic mucky clay; neutral, abrupt, smooth boundary.

Cksg1 - 20 to 50 cm, dark olive gray to olive gray (5Y 3/2 to 4/2 moist) loam; few, medium, faint mottles; weak, fine granular; friable when moist, slightly hard when dry; moderately alkaline; very strongly calcareous; contains numerous gypsum crystals; abrupt, wavy boundary.

Cksg2 - 50 to 70 cm, olive gray (5Y 4/2 moist) loam; few, medium, faint mottles; weak, fine granular; friable when moist, slightly hard when dry; mildly alkaline; very strongly calcareous; contains numerous gypsum crystals; abrupt, wavy boundary.

Cksg3 - 70 to 110 cm, olive gray (5Y 5/2 moist) very fine sandy loam; few, medium, faint mottles; weak, structureless; single grained; loose when moist, soft when dry; moderately alkaline; very strongly calcareous; contains numerous gypsum crystals.

Mountainside Series (MUE)

The Mountainside series is the imperfectly drained, carbonated, Gleyed Rego Black Chernozem member of the Maples Association, developed on thin (< 100 cm), weakly to moderately calcareous, moderately coarse to medium textured (VFS, LVFS, FSL, to VFSL, L, SiL) lacustrine sediments deposited on hard gray siliceous (Riding Mountain) shale. This soil occurs below the escarpment in a prominent glacial melt water channel near Dand. The surface texture is loam, topography is very gently sloping, and permeability and surface runoff are moderate. These imperfectly drained soils are non-stony, occasionally saline in the lower part of the profile.

This soil consists of gleyed, dark grayish brown Ap horizons 10 to 15 cm thick, gleyed, non to weakly calcareous Cg horizons 20 to 30 cm thick with very dark gray, II Cg horizons of underlying shale bedrock. A morphological description of this soil is presented.

Ap - 0 to 15 cm, dark grayish brown to very dark grayish brown (10YR 3.5/2 moist), grayish brown to dark grayish brown (10YR 4.5/2 dry), loam; fine granular; very friable when moist; clear boundary; non-calcareous; neutral.

Cg - 15 to 43 cm, loam and shale fragments; non-calcareous; neutral.

II Cg - 43 cm +, shale bedrock; neutral.

Mowat Series (MWT)

The Mowat series consists of poorly drained Rego Humic Gleysol soils developed on thin (25 to l00 cm), moderately to strongly calcareous, fine textured lacustrine sediments, overlying extremely calcareous, medium textured (VFSL, L, SiL), stony till. The Mowat soils are mapped in an area of the northern portion of the Dauphin Lake Plain near Winnipegosis. They occupy level to depressional, poorly drained areas in which a thin layer of mesic fen peat has accumulated at the surface. Surface runoff is slow; internal soil permeability is very slow in the upper materials and moderate in the underlying till substrate. Native vegetation on the Mowat soils is sedges, meadow grasses and clumps of willow.

All of the Mowat soils are mapped as the peaty phase. A very thin (l5 to 40 cm), organic surface horizon of mesic fen peat is underlain by a thin, very dark gray to gray Ah horizon and a calcareous C horizon that is strongly gleyed and mottled with iron. Cultivation of these soils may result in an Ap horizon that is somewhat peaty due to mixing of the surface organic layer with underlying mineral horizons.

Mowbray Series (MOW)

The Mowbray series consists of a well drained, Cumulic Regosol soils developed on deep, moderately to strongly calcareous, loamy (L, SiL, CL, SiCL) recent alluvial sediments. These deposits are stratified and contain dark colored bands of former Ah horizons in the profile. The soils are located in upper terrace and flood plain areas that have been inundated during years of high flood waters. Topography is very gently to moderately sloping, runoff is moderate and permeability is moderate.

The soil is characterized by a dark gray to gray surface horizon (Ah or Ap) 8 to 20 cm thick and a lighter colored (C) substratum with dark bands consisting of former organic layers or buried Ah horizons. These soils may exhibit weak profile development. They occur in association with the Levine and Basker soils. The Mowbray, shaly variant, MOW1, is similar to the normal Mobray except for a higher proportion of shale derived fragments throughout the profile.

Mud Lake Series (MXB)

The Mud Lake soils are poorly drained Terric Humisols developed on shallow (40 to 130 cm) deposits of rnesic to humic forest peat. Stony, medium textured, extremely calcareous till occurs within 130 cm of the surface. The Mud Lake soils have a very thin (< 15 cm) fibric surface layer of mixed mosses underlain by dominantly well decomposed forest peat that is slightly acid to neutral. Feathermosses and herbaceous plants, which are the dominant peat sources in these soils, decompose readily into a black to very dark brown, slightly sticky amorphous material. Logs and other woody debris occur in various quantities throughout the soil.

The Mud Lake soils occur on gently sloping mesic swamp landforms, characterized by shallow accumulations of peat over till. These soils are under the influence of slowly percolating, aerobic, mineral-rich groundwater from adjacent upland areas. Native vegetation on the Mud Lake soils is dominantly cedar with some black spruce and an under-story of mixed mosses and various herbaceous plants common to better drained mineral terrain.

The Mud Lake soils are very similar in site condition and soil characteristics to those described under the Haute and South Junction series. They differ only because they have a stony till mineral substrate rather than the stone-free lacustrine materials that are characteristic of the Haute and South Junction series.

Mukatawa Series (MUW)

The Mukatawa series consists of imperfectly drained, Gleyed Solonetzic Gray Luvisol soils developed on moderately to strongly calcareous lacustrine clay. They occupy topographic level to undulating sites. Surface drainage is moderate, while internal drainage is impeded due to texture, structure, and higher water table. The native vegetation is dominantly spruce and aspen with smaller amounts of balsam poplar.

Muriel Lake Series (MUR)

The Muriel Lake series consists of imperfectly drained, Gleyed Gray Luvisol soils developed on 25 to 100 cm of weakly to moderately calcareous, sandy deposits overlying moderately to strongly calcareous, clayey lacustrine sediments. Topography is level and runoff is slow. Permeability is limited by the underlying clay substrate of these soils. Native vegetation is dominantly birch and aspen, with an understory of mountain maple, bunchberry and sarsaparilla.

The light colored Ae horizon generally develops in the overlying sandy parent material, while the Bt and C horizons occur in the underlying lacustrine clay sediments. Soils of the Muriel Lake series are limited in extent, and only occur in mappable areas on Janora Island.

Murray Hill Series (MYI)

The Murray Hill soils are very poorly drained Terric Mesisols developed on shallow (40 to 130 cm) deposits of mesic fen peat underlain by loamy lacustrine deposits. The surface peat is usually a thin (< 25 cm), fibric, dark yellowish brown fen peat, which is acid to neutral in reaction. This fibric peat overlies a very dark brown mesic fen peat, which in turn grades into a thin dark brown to black humic fen peat or aquatic peat, or both, above the mineral substrate.

The Murray Hill soils occupy level to depressional mesic horizontal fen landforms in the Sundown peat land. They occur usually near the mineral margin of the peat land, where organic accumulation is shallow. Native vegetation on the Murray Hill soils is dominantly sedges, reed grass, and aquatic mosses; a woody herbaceous cover of willows and dwarf birch is found on better drained sites. The landform and vegetative characteristic associated with the Murray Hill soils are similar to that described for the Cayer soils.

Murray Hill, burnout phase - The burnout phase soils differ from the normal Murray Hill soils in that during years when the water table is lower, fires have removed the surface peat in some places. These are characterized by a hummocky micro-relief marked by small, steep-sided burnouts.

Myrtle Series (MYT)

The Myrtle series consists of well to moderately well drained Orthic Black Chernozem soils developed on moderately to strongly calcareous, clayey (SiC, C, HC) lacustrine deposits. The surface texture ranges from silty clay to clay. The topography is very gently to gently sloping; runoff is moderate; and permeability is moderate in the solum due to granular structure, but moderately slow to slow at greater depths.

The Myrtle soil is characterized by a deep dark gray Ah horizon 30 to 45 cm thick, with friable fine granular structure, a dark brown to dark grayish brown Bm horizon, 25 to 40 cm thick, with moderate medium prismatic breaking to medium granular structure. The Ck horizon is light brownish gray to pale brown and has a pseudosubangular blocky structure. The Myrtle soil is differentiated from the Scanterbury soil by a deeper, friable Ah horizon, brighter chroma in the B horizon and lack of any mottles in the B or upper part of the Ck horizon. The chemical and physical analyses of the Myrtle soil are similar to the Scanterbury series.

Namew Series (NEW)

The Namew, shallow phase soils are imperfectly drained, Gleyed Eluviated Eutric Brunisols, developed on less than 20 cm of weakly to moderately calcareous, sandy to loamy-skeletal glacial till overlying limestone bedrock. According to current soil depth criteria, these soils are classified as extremely shallow lithic phases. The Namew soils are moderately stony, and occur in areas of level to gently sloping topography. Vegetation is normally Balsam fir and aspen, with an understory of sarsaparilla and feathermoss. These soils are slightly to moderately stony, and occur in areas of level to gently sloping topography. Although the permeability of these till materials is moderate to high, the underlying bedrock is relatively impermeable, resulting in a high water table and imperfectly drained conditions.

These soils generally have a thin light colored eluvial (Ae) horizon overlying a darker, gleyed Bt horizon. Textures are generally sandy loam, with a slight to moderate increase in clay content in the B horizon. Namew, shallow phase soils have similar profile development to that of the normal Namew series, consisting of a thin eluvial Ae horizon overlying a gleyed, weakly developed textural B horizon. Due to the shallower depth of till, the solum commonly extends to the lithic contact, although a thin, cobbly Ck

horizon is sometimes present. Namew, shallow phase soils occur in bedrock dominated map units in the vicinity of Grindstone Point, and also to the south of Little Grindstone Point. These soils often occur in association with other shallow till soils such as the Black Duck series, shallow phase, and the Cowan Bay series, shallow phase.

Nanton Series (NTO)

The Nanton series is characterized by a Gleyed Black Chernozem solum, imperfect soil drainage, and materials of shallow (< 90 cm) loamy (VFSL, L, SiL, CL, SiCL) moderately to strongly calcareous fluvial and lacustrine sediments over strongly calcareous water modified glacial till. The change from the loamy strata to the water modified till is abrupt; a gravelly or cobbly strata usually occurs at the contact. They occur in the western part of the Red River Plain, lower slopes of Escarpment and some areas along the Pembina River Valley. Weakly calcareous shale bedrock may be present at depths of 1 to 1.5 m below the surface. Surface runoff is slow. Some seepage may occur along the shale bedrock or the modified till. Permeability is moderate in the upper loamy strata and slow in the underlying till and shale bedrock.

The solum has a very dark gray Ah horizon 6 to 15 cm thick, a dark grayish brown Bmgj horizon 10 to 14 cm thick, and a transitional BC horizon of variable thickness; the solum commonly varies with the thickness of the loamy overlay. A light gray lime accumulation layer (Cca) 5 to 8 cm thick may be present at the contact of the lacustrine and till sediments. The underlying till is a light olive brown with distinct yellowish brown mottles.

Napanee Bay Series, peaty phase (NEY)

The Napanee Bay series consists of poorly drained Rego Humic Gleysol, peaty phase soils developed on 15 to 100 cm of moderately to strongly calcareous clayey lacustrine deposits underlain by extremely calcareous loamy till. A thin surface layer (15-40 cm) of mesic peat generally blankets the surface of these soils. The depressional to level topography of the areas of Napanee Bay soils as well as their slow permeability commonly leads to water ponding after heavy rains or after snow melt in the spring. Runoff is very slow and except for areas where the underlying extremely calcareous till is close to the surface, the Napanee Bay soils are relatively stone-free. Native vegetation is dominantly dense black spruce and tamarack stands, with an understory of Labrador tea, Sphagnum and feathermosses. A representative profile is described below:

Of - Oh - 40 to 0 cm, dark reddish brown (5YR 2/2 dry), matted, fibrous to moderately decomposed sedge peat; medium to fine fibered; neutral; abrupt, smooth boundary.

II Ahkg - 0 to 10 cm, dark gray (2.5Y 4/0 dry), silty clay, moderate medium, granular; very plastic when wet, firm when moist, slightly hard when dry; neutral; moderately calcareous; clear, irregular boundary.

II AC - 10 to 36 cm, gray (5Y 5/1 dry), clay; moderate, coarse granular; very plastic when wet, firm when moist, slightly hard when dry; mildly alkaline, very strongly calcareous; tonques into the IIIC horizon; abrupt, irregular boundary.

III Ckg - 36 to 60 cm, light gray (5Y 7/1 dry), clay loam; few, medium distinct light yellowish brown mottles; amorphous; sticky when wet, hard when dry; mildly alkaline; extremely calcareous.

Napanee Bay soils generally have a surface layer of dark brown, slightly acid, moderately decomposed peat derived from sedges, herbaceous plants, and mosses. This organic layer is usually underlain by a thin, neutral to slightly alkaline, dark gray Ah horizon and a gleyed, moderately alkaline, gray Ckg horizon. Napanee Bay soils of the Low Boreal climatic zone correlate with the Partridge Creek soils of the High Boreal-temperate zone.

Napinka Series (NPK)

The Napinka series is the imperfectly drained, carbonated, Gleyed Rego Black Chernozem member of the Bede Association, developed on deep, strongly calcareous, coarse textured (FS, LCoS, LS, LFS) gravelly deltaic, beach and outwash deposits. The topography varies from nearly level to gently sloping; permeability is rapid and surface runoff is slow. Drainage is imperfect due to seasonally high water tables estimated to be between 1 to 2 m during the growing season. Few of these soils are cultivated due to their low moisture holding capacity and low fertility. Many Napinka soils are used for pastures; however the carrying capacity for animals is low because of the poor growth of native grasses.

A typical profile consists of black Ahk horizons 13 to 20 cm thick, light gray Ccagj horizons 20 to 30 cm thick and light yellowish brown Ckgj horizons. Analytical and morphological data are presented below.

Apk - 0 to 13 cm, black (10YR 2/1 moist), dark gray (10YR 4/1 dry), medium sandy clay loam; friable, moist, abrupt smooth boundary; moderately calcareous; pH 7.9.

Ccagj - 13 to 15 cm, gray to light gray (10YR 6/1 moist), white (10YR 8/1 dry), medium sandy clay loam, friable when moist; clear wavy boundary: very strongly calcareous; pH 8.1.

II Ccagj - 15 to 23 cm, gray (10YR 6/1 moist), white (10YR 8/1 dry), gravelly coarse sandy clay loam, common mottles: friable, moist, very strongly calcareous; clear, wavy boundary; pH 8.1.

II Ckgj - 23 cm +, gravelly loamy very coarse sand; single grained, loose when moist, strongly calcareous: pH 8.0.

Naples Series (NPS)

The Naples series is the poorly drained, Orthic Humic Gleysol member of the Elva Association, developed on deep, strongly calcareous fine loamy (CL, SiCL) lacustrine sediments. These soils have a dominantly clay loam surface texture, nearly level to depressional topography, slow permeability and no surface runoff. Naples soils are poorly drained, and have an estimated depth to water table of less than 1 m during the summer. Naples soils are rarely cultivated and usually support lush growth of slough grass. In late summer they are frequently dry enough to permit access for haying purposes. These soils sometimes occur in the bottom of depressions with Bunclody soils around the outer edge or they sometimes occur around the edge of depressions which have Fairfax soils in the central portion. They may also occur in stream channels.

Narcisse Series (NCS)

The Narcisse series are Orthic Black Chernzoem, lithic phase soils developed on a thin (0 to 50 cm) mantle of stratified extremely calcareous, medium textured till over limestone bedrock. The surface textures range from sandy loam to clay loam. The Narcisse soils are found on well-drained sites which are locally arid due to the low water-holding capacity of the thin till deposits over the bedrock. The topography is level to very gently sloping. Permeability is moderate throughout the till but is impeded at the bedrock. These soils are exceedingly stony and the vegetation consists mainly of grasses and open stands of stunted aspen, oak and jack pine.

The solum of the Narcisse soils is thin (10-20 cm). A thin to discontinuous leaf mat is underlain by a black to very dark gray A horizon and a dark grayish brown B horizon. The B horizon may be calcareous due to incomplete dissolution and removal of small particles of limestone. A gravelly lens of variable thickness may occur between the till and the underlying bedrock. Narcisse soils are usually associated with Fairford, Faulkner and Rock outcrop.

Narish Series (NSH)

The Narish series consists of poorly drained Rego Humic Gleysol soils developed on a mantle (25 to 100 cm) of moderately to strongly calcareous, uniform, fine loamy (L, CL, SiCL), lacustrine deposits over moderately to strongly calcareous, deep, uniform, fine loamy (L, CL, SICL), mixed till deposits. These soils occur in level to depressional positions of hummocky landscapes and have slow permeability very slow surface runoff and a high water table during the growing season. Narish soils are occasionally slightly saline. They have a medium available water holding capacity, high organic matter content, and low natural fertility. Native vegetation often includes sedges, rushes and willows. The majority of these soils are currently used for natural grazing.

In a representative profile the solum is approximately 25 cm thick. The profile is characterized by a black Ah or Ahk horizon, 15 to 30 cm thick, a very dark gray transitional AC horizon, 5 to 15 cm thick with many, fine, prominent iron mottles, and a dark olive gray Ckg horizon with many, fine prominent, iron mottles. The parent material is typically relatively free of coarse fragments.

Narish soils occur in close association with Altamont and Tellier soils. Narish soils are virtually the same as Guerra soils differing from them only because they occur in close association with Dark Gray soils found in locally more cool soil climate areas. Narish soils were previously mapped as poorly drained minor associates of the Altamont association in the reconnaissance soil survey of South-Central Manitoba (1943).

Nayler Series (NYO)

The Nayler series consists of well to rapidly drained Orthic Dark Gray Luvisol soils developed on weakly calcareous to neutral, uniform, deep, fine loamy to fine silty (SiL, L, CL), glacial till of shale bedrock origin. These soils occur in upper slope and crest positions of hummocky to ridged landscapes and have rapid permeability rapid surface runoff and a low water table during the growing season. Nayler soils are slightly eroded, slightly stony and non-saline. They have a low available water holding capacity, low organic matter content, and low natural fertility. Native vegetation often includes forests of bur oak and aspen poplar. The majority of these soils are currently used for improved pasture and forage crop production.

In a representative profile the solum is approximately 90 cm thick. The profile is characterized by a gray brown Ap or Ah horizon, 15 to 20 cm thick, a light yellowish brown Ae horizon, 5 to 30 cm thick with fine, platy structure, a light yellowish gray Bt horizon 20 to 60 cm thick with thin clay skins and a yellowish brown non-calcareous C horizon. The parent material is typically composed of gray shaly till containing weathered Odanah shale fragments. Nayler soils occur in close association with Fifere and Fresno soils. They are similar to Fifere soils by having well drained profiles developed in non-calcareous shale till but differ from Fifere soils by possessing Ae horizons below their Ap or Ahe horizons at least 5 cm thick. Nayler soils were previously mapped as gray-wooded associates of the Snowflake association in the reconnaissance soil survey of South-Central Manitoba (1943).

Neelin Series (NEI)

The Neelin series is the imperfectly drained, Gleyed Cumulic Regosol member of the Coulter Association, developed on deep, moderately calcareous, moderately fine to fine (CL, SiCL to SiC, C) textured recent alluvial sediments. Neelin soils are frequently stratified with layers ranging in texture from very fine sand to clay. The topography is level to depressional, surface runoff is very slow, and permeability is slow. The depth to water table is estimated to be within 2 metres. Some of these soils are cultivated, others are still in their native state with vegetation consisting of elm, oak, poplar, and various shrubs and grasses. Soluble salts may occur

to a moderate degree in some of the Neelin soils. This soil usually consists of dark gray Ah horizons less than 20 cm thick, and light brownish gray, stratified and banded Ck horizons.

Nekik Lake Complex (NKL)

The Nekik Lake complex consists of imperfect to poorly drained Mesic Organic Cryosol and Fibric Organic Cryosol soils developed on deep, perennially frozen forest peat or thin (65 cm) Sphagnum peat overlying mesic forest peat. The topography is level or irregular domes or palsas and peat plateaus. The vegetation is black spruce with an understory of Labrador tea and Cladonia. The active layer is weakly decomposed fibric feathermoss peat. The frozen layer consists of feathermoss peat, which is moderately to moderately well decomposed. A representative series description is provided:

Of1 - 0 to 20 cm, dark red (2.5YR 3/6 broken) red (2.5YR 5/6 pressed) red (2.5YR 4/6 rubbed) fibric feathermoss, medium to fine fibered; non-woody; very stronly acid; unrubbed fiber content approximately 88% rubbing to 48%.

Of2 - 20 to 30 cm, dark reddish brown (5YR 2/2 broken) reddish brown (5YR 5/4 pressed) yellowish red (5YR 4/6 rubbed) moderately decomposed feathermoss; medium to fine fibered; non-woody; extremely acid; unrubbed fiber content approximately 76% rubbing to 24%; clear wavy boundary.

Oh1 - 30 to 45 cm, black (5YR 2/1 broken) yellowish red (5YR 4/6 pressed) very dark gray (5YR 3/1 rubbed) well decomposed herbaceous peat; fine fibered with some coarse fibered wood; low wood, slightly acid; unrubbed fiber content approximately 32% rubbing to 4%; clear smooth boundary.

Ohz - 45 to 50+ cm, black (5YR 2/1 broken) dark reddish gray (5YR 4/2 pressed) very dark gray (5YR 3/1 rubbed) frozen; well decomposed herbaceous peat; fine to very fine fibered; non-woody; slightly acid; unrubbed fiber content approximately 24%, rubbed 4%.

Nels Series (NLS)

The Nels series consists of imperfectly drained Gleyed Cumulic Regosol soils developed on moderately calcareous coarse loamy textured recent alluvium. The topography is level. Vegetation on these sites consists of aspen, balsam poplar, willow and black spruce. The Nels soils have a very weak or no profile development. On the prominent levees the soils show a darkening on the surface indicating incipient soil formation. Soils are none to slightly saline. Both carbonates and reaction are fairly uniform throughout the soil section, except in the areas of slightly better drained soils where some downward movement of carbonates has occured. Iron mottling is high throughout the profile. The Nels series is only found within the Saskatchewan River Delta and is usually found mapped in association with the Big Lake series, Big Lake peaty phase or the Cayer series. A typical Nels series is described below.

Ckg1 - 0 to 17 cm, very dark grayish brown (10YR 3/2 moist) gray to light gray (10YR 6/1 dry) silt loam; common fine distinct dark brown to brown (7.5YR 4/4) mottles; weak fine granular; moist friable, dry slightly hard; mildly alkaline; moderately calcareous; abrupt wavy boundary.

Ckg2 - 17 to 22 cm, grayish brown (10YR 5/2 moist) light brownish gray to light gray (10YR 6/2 to 7/2 dry) very fine sandy loam; few fine faint yellowish brown (10YR 5/4) mottles; single grained; loose moist and dry; mildly alkaline; moderately calcareous; abrupt smooth boundary.

Ckg3 - 22 to 29 cm, dark gray (10YR 4/1 moist) light brownish gray (10YR 6/2 dry) silt loam; few fine distinct dark yellowish brown (7.5YR 4/4) mottles; moist very friable, dry soft; mildly alkaline moderately calcareous; clear smooth boundary.

Ckg4 - 29 to 32 cm, olive brown (2.5Y 4/4 moist) light brownish gray (2.5Y 6/2 dry) loam; few fine faint light olive brown (2.5Y 5/4) mottles; weak fine granular breaking readily to single grained; moist very friable, dry soft; mildly alkaline; moderately calcareous; clear smooth boundary.

Ckg5 - 32 to 56 cm, dark grayish brown (2.5Y 4/2 moist) light brownish gray (2.5Y 6/2 dry) silt loam; few fine prominent light brown (7.5YR 6/4) mottles; weak fine pseudo-platy breaking to weak fine granular; moist friable, dry slightly hard; mildly alkaline; strongly calcareous; abrupt smooth boundary.

Ckg6 - 56 to 70 cm, olive brown (2.5Y 4/4 moist) grayish brown (2.5Y 5/2 dry) very fine sandy loam; few fine faint light olive brown (2.5Y 5/6) mottles; single grained to weak fine granular; moist very friable, dry soft; mildly alkaline; moderately calcareous; abrupt smooth boundary.

Ckg7 - 70 to 98 cm, dark grayish brown (2.5Y 4/2 moist) light brownish gray (2.5Y 6/2 dry) silt loam; weak fine pseudo-platy breaking to weak fine granular; moist friable, dry slightly hard; mildly alkaline; moderately calcareous.

Nesbitt Series (NBT)

The Nesbitt series is the well drained, Calcareous Black Chernozem member of the Mentieth Associatibn, developed on thin (25 to 100 cm), moderately calcareous, coarse to moderately coarse textured (FS, LS,LFS, to VFS, LVFS, FSL) lacustrine sediments overlying strongly calcareous medium to moderately fine (L, SiL to CL, SiCL) textured glacial till. A very thin (5 cm) gravelly stratum or pebble line may occur at the contact. This soil has a loamy very fine sand surface texture, nearly level to gently sloping

topography, moderate permeability and moderate surface runoff. This soil has a water table at approximately 3 metres and the surface is non-stony and cultivated. Nesbitt soils are found in close association with Langvale soils. The Nesbitt series resembles the Langvale series of the Lyieton Association. The only difference is the Nesbitt series is underlain by glacial till.

Netley Series (NLY)

The Netley series consists of moderately well to well drained Orthic Dark Gray Chernozem soils developed on a thin strata of lacustrine clay over strongly to very strongly calcareous silty sediments. The silty sediments are variable in thickness and are underlain by lacustrine clay usually within a meter of the surface. The topography is very gently to gently sloping; runoff is moderate; and permeability is moderately slow in the upper clay strata, variable moderate to moderately slow in the silt strata depending on the texture and thickness of the silt strata, and slow in the underlying clay strata. The native vegetation consists of trembling aspen, hazel, and some bur oak and white spruce. These soils are similar in properties to the Framnes series, but have brighter chromas and lack mottles except in the lower part of the control section; the solum is variable depending on the thickness of the surface clay strata.

The Netley soil is characterized by a thin dark brown to brown leaf mat 4 to 6 cm thick; a dark gray to gray, medium to coarse granular Ahe horizon 7 to 12 cm thick and a dark grayish brown subangular blocky Bt horizon 20 to 30 cm thick; a thin irregular transition horizon to the light gray, strongly to very strongly calcareous silty sediment is usually present.

Neuenberg Series (NBG)

The Neuenberg series consists of imperfectly drained, Gleyed Rego Black Chernozem soils developed on a mantle (70 to 90 cm) of moderately to strongly calcareous, shallow, loamy (VFSL, L, SiL) fluvial and lacustrine deposits over moderately calcareous, stratified, deep, coarser (LFS, FS, VFS, LVFS), lacustrine deposits. These soils occur in middle positions of nearly level to very gentle slopes on undulating landscapes and have moderate over rapid permeability, moderate to moderately slow surface runoff, and a high water table during the growing season. Neuenberg soils are non-eroded, non-stony, and often slightly saline. They have a medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation includes aspen, oak, shrubs and prairie grasses. The majority of these soils are currently cultivated for crop production.

In a representative profile the solum is approximately 20 cm thick. The profile is characterized by a very dark gray Ah horizon, 15 to 25 cm thick, moderately calcareous, an AC horizon, 10 to 20 cm thick, frequently a Cca horizon, 5 to 8 cm thick, and a Ckgj horizon, with many distinct mottles. A typical profile contains VFSL, L textures grading to VFS and FS with depth. Neuenberg soils occur in close association with Rosengart and Jasset soils. They are similar to Gnadenthal soils by having a Gleyed Rego Black Chernozem profile and loamy surface mantle but differ from them in having coarser textures rather than finer textures at depth. Neuenberg soils were previously mapped as Black Meadow associates of the Altona (light) Association in the Winnipeg-Morris (1953) soil report.

Neuhorst Series (NUH)

The Neuhorst series consists of imperfectly drained Gleyed Rego Black Chernozem soils developed on moderately calcareous, deep, uniform, fine loamy (SCL, CL, SiCL), fluvial and lacustrine deposits. These soils occur in middle positions of undulating landscapes and have moderately slow to slow permeability, slow surface runoff, and a medium water table during the growing season. Neuhorst soils are non-eroded, non-stony, and occasionally slightly saline. They have a medium available water holding capacity, medium organic matter content, and high natural fertility. Native vegetation includes tall prairie grasses, prairie-meadow grasses and shrubs. The majority of these soils are currently cultivated for crop production.

In a representative profile the solum is approximately 30 cm thick. The profile is characterized by a very dark gray Ah horizon, 25 to 40 cm thick, weakly calcareous, a dark gray to gray AC horizon, 8 to 20 cm thick, frequently a light gray Cca horizon, 10 to 15 cm thick and a light gray to pale yellow Ckgj horizon, with many distinct mottles. A typical profile also contains gypsum crystals below the AC or Cca horizon. The Neuhorst loam variant, NUH1, has a loam surface textuxe that ranges from 15 to 20 cm in thickness. The Neuhorst clay variant, NUH2, has a clay surface textuxe that ranges from 15 to 20 cm in thickness. Neuhorst soils occur in close association with Eigenhof soils. They are similar to Newton Siding soils by having Gleyed Rego Black profile and fine loamy surface but differ from them in having no sandy substrate. Neuhorst soils were previously mapped as Black Meadow associates of the Altona Association in the Winnipeg-Morris (1953) soil report.

Newdale Series (NDL)

The Newdale series is characterized by an Orthic Black Chernozem solum on moderately to strongly calcareous, loamy (L, CL) morainal till of limestone, granitic and shale origin. These soils are moderately well to well drained and occur in mid to upper slope positions of undulating to hummocky landscapes. Surface runoff is moderate to moderately rapid; permeability is moderately slow. Most of these soils are presently cultivated; they have formed under intermixed aspen grove and grassland vegetation.

The Newdale solum has a very dark gray Ah horizon, commonly 25 cm thick and ranging from 15 to 35 cm, a dark brown Bm horizon, 10 to 30 cm thick, and a transitional BC horizon, 3 to 15 cm thick. A lime carbonate horizon, 10 to 15 cm thick is often present in shallower soils but is not evident in deeper profiles. Its solum depth averages 58 cm and ranges from 25 to 90 cm. Minor amounts of well drained Eluviated Black Chernozem soils are included within the Newdale mapping units. They have solum

thickness ranging from 75 cm to greater than 1 m. They also have thicker A (combined Ah, Ahe) horizons, 30 to 60 cm and Bt horizons that are 40 cm thick.

The Newdale soils differ from Erickson soils in being less strongly leached and having less distinct and shallower solum. Newdale soils, on the other hand, differ from the very similar Rufford and Cordova soils in being more strongly leached, deeper and free of lime carbonate in the A and B horizons.

Newstead Series (NWS)

The Newstead series is the well drained, Orthic Black Chernozem member of the Newstead Association, developed on thin (25 to 95 cm), strongly calcareous, medium to moderately fine textured lacustrine sediments overlying strongly calcareous, medium to moderately fine textured glacial till. A coarse textured layer (5 to 75 cm) occurs at the contact. Newstead soils commonly have loam to fine sandy loam surface textures, gently sloping to very gently sloping topography; moderate permeability and slow surface runoff. The depth to water table is at about 3 metres during the growing season. These soils commonly occur in areas adjacent to the channels where outwash material deposited on the till is covered by finer textured alluvial and lacustrine material.

A typical profile has a black Ap horizon 5 to 13 cm thick, a very dark grayish brown Bm horizon 20 to 30 cm thick, very coarse textured pale brown II Ck horizon and a light yellowish brown III Ck horizon.

Newton Siding Series (NWN)

The Newton Siding series consists of imperfectly drained Gleyed Rego Black Chernozem soils developed on a mantle (40 to 90 cm) of moderately to strongly calcareous, shallow, fine loamy (SCL,CL,SiCL), fluvial and lacustrine deposits over moderately calcareous, stratified, deep, sandy (LFS, FS), fluvial and lacustrine deposits. These soils occur in middle positions of undulating landscapes and have moderately slow over moderately rapid permeability, slow surface runoff, and a high water table during the growing season. Newton Siding soils are non-eroded, non-stony, and occasionally slightly saline. They have a medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation includes prairie-meadow grasses, shrubs and tall-prairie grasses. The majority of these soils are currently cultivated for crop production.

In a representative profile the solum is approximately 30 cm thick. The profile is characterized by a very dark gray Ah horizon, 25 to 40 cm thick, weakly calcareous, a gray AC horizon, 8 to 20 cm thick, moderately calcareous, a Ccagj horizon, 10 to 15 cm thick is often present, and a IICkgj horizon, with prominent mottles. The Newton Siding clay variant, NWN1, has a clay surface textuxe that ranges from 15 to 20 cm in thickness. Newton Siding soils occur in close association with Edenberg soils. They are similar to Neuhorst soils by having an imperfectly drained profile developed in fine loamy deposits but differ by having a sandy substrate. Newton Siding soils were previously mapped as inclusions of the Altona Association in the Winnipeg-Morris (1953) soil report.

Nichols Lake Series (NIC)

The Nichols Lake soils are Terric Mesic Organic Cryosols developed in 40 to 100 cm of moderately well decomposed forest peat, underlain by moderately to strongly calcareous fine textured sediments. These soils are permanently frozen in the lower portion of the organic deposits and in the mineral substrate. The frozen layers have moderate amounts of crystal and vein ice and thawing occurs to a depth of about 60 cm (active layer) each year. Topography is undulating in the form of irregular raised domes or ridges and drainage is imperfect to poor. The Nichols Lake soils are normally found on raised palsas or peat plateaux, characterized by a micro hummocky surface and pronounced collapse scars around the edges and within the landform. Native vegetation is dominantly dense stands of black spruce with an understory of Labrador Tea, feathermosses and Cladonia.

The surface portion of the active layer consists of a thin (5 to 15 cm) layer of non-decomposed fibric feathermoss peat. The remainder of the active layer is comprised of moderately well decomposed brown, strongly acid, mesic forest peat. The frozen portion of the organic layer section is moderately well to well decomposed mesic to humic forest peat, black to dark brown in color, amorphous to very fine fibered and strongly acid. Inclusions of soft woody materials are common. The fine textured sediments are moderately calcareous, yellowish brown, massive heavy clay with moderate amounts of vein ice within 100 cm of the surface.

Nikkel Series (NKK)

The Nikkel series consists of imperfectly drained Gleyed Black Chernozem soils developed on moderately to strongly calcareous deep, uniform, fine loamy and coarse loamy (L, CL, SiCL), mixed till deposits of granite, limestone and shale origin. These soils occur in lower slope positions of hummocky landscapes and have moderate permeability moderately slow surface runoff and a medium water table during the growing season. Nikkel soils are non-eroded, slightly stony and occasionally slightly saline. They have a medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes tall prairie and meadow grasses. The majority of these soils are currently used for crop production.

In a representative profile the solum is approximately 45 cm thick. The profile is characterized by a black Ap or Ah horizon, 20 to 25 cm thick, a dark grayish brown Bm horizon, 5 to 15 cm thick with many, faint, fine iron mottles, a light gray Cca horizon, 5 to 10 cm thick of lime accumulation and a pale brown Ck horizon with many, fine, distinct iron mottles. The parent material is typically relatively stone-free.

Nikkel soils occur in close association with Darlingford, Ferris and Cazlake soils. They are similar to Ullrich soils by having Gleyed Black Chernozem profile and a fine-loamy till substrate but differ from them in not having 25 to 100 cm of lacustrine veneer overlying the till substrate. Nikkel soils were previously mapped as imperfectly drained blackearth associates of the Pembina association in the reconnaissance soil survey of South-Central Manitoba.

Ninette Series (NTT)

The Ninette series is the imperfectly drained Gleyed Black Chernozem member of the George Lake Association, developed on thin (25 to 100 cm), weakly to moderately calcareous, moderately coarse textured (VFS, LVFS, SL, FSL) lacustrine sediments overlying coarse textured (FS, LCoS, LFS) gravelly deltaic beach and outwash deposits. This soil has simple, very gently sloping topography, a fine sandy loam surface texture, moderately rapid permeability and very little surface runoff. The depth to water table is estimated at 1.5 m during the growing season. The surface is non-stony and cultivated. The profile consists of black Ap - Ahgj horizons 10 to 20 cm thick, usually with prominent iron staining and concretions, gleyed dark brown Bmgj horizons 5 to 8 cm thick, light gray Cca horizons 15 to 25 cm thick, may be present and gleyed light gray, coarse textured II Ckgj horizons. Analytical and morphological data are presented below.

Ahgj - 0 to 18 cm, black (10YR 2/1 moist), very dark gray (10YR 3/1 dry), sandy loam; weak fine to weak medium granular; friable when moist, soft when dry; clear smooth boundary; non-calcareous pH 7.2.

Bmgj - 18 to 41 cm, very dark grayish brown (10YR 3/2 moist), dark grayish brown to grayish brown (10YR 4.5/2 dry), sandy loam; medium coarse prismatic breaking to weak medium subangular blocky; friable when moist, soft when dry; clear smooth boundary; non- calcareous; few prominent brown (7.5YR 4/4) iron concretions; neutral; pH 7.6.

BC - 41 to 43 cm, dark brown (10YR 3.5/3 moist), sandy loam; pseudo fine granular; friable when moist; soft when dry; mildly alkaline; moderately calcareous; clear, smooth boundary.

Ccagj - 43 to 71 cm, very pale brown (10YR 7/3 moist), light gray (10YR 7/2 dry) sandy loam; pseudo fine granular; friable when moist, slightly hard when dry; strongly calcareous; clear, smooth boundary; pH 7.9.

II Ckgj - 71 cm +, light gray (10YR 7/1, moist & dry) sand; single grained; loose when moist and dry; moderately calcareous; pH 7.9.

Ninga Series (NNG)

The Ninga series is the imperfectly drained, Gleyed Black Solonetz member of the Elva Association, developed on deep, strongly calcareous, moderately fine textured (SC, SiC, C) lacustrine sediments. These soils have a clay loam surface texture, nearly level to very gently sloping topography, slow permeability and slow surface runoff. The depth to water table is estimated at 1 to 2 m during the grownig season. Soluble salts are prevalent in the lower B and C horizons. Some soils are cultivated but produce very poor crops; others are used for pasture and support vegetation such as Gumweed, Silver Willow, Artemesia, Western Snowbeny and Vetch. Ninga soils commonly occur in areas of shallow lacustrine deposits and overlying glacial till that borders glacial Lake Souris.

The profile consists of black to dark gray Ahe horizons 0 to 5 cm thick, black, massive, extremely hard Bnt horizons 20 to 41 cm thick, very dark gray, saline BC horizons 15 to 20 cm thick and occasionally light olive gray, saline II Cskgj horizons. Analytical and morphological data for a shallow representative profile of the Ninga series are presented below.

Ahe - 0 to 5 cm, black to very dark gray (10YR 2.5/1 moist), very dark gray to dark gray (10 YR 3.5/1 dry), loam; weak, fine granular; soft when dry; abrupt, wavy boundary; pH 6.4.

Bnts1 - 5 to 23 cm, black (10YR 2/1 moist), clay; strong coarse columnar breaking to moderate medium subangular blocky; extremely hard when dry; gradual, smooth boundary; weakly saline; pH 7.8.

Bnts2 - 23 to 43 cm, very dark gray, (10YR 3/1 moist), clay; weak medium columnar; friable when moist; gradual, smooth boundary; moderately saline; pH 8.5.

BC - 43 to 64 cm, very dark gray (10YR 3/1 moist), silty clay; structureless; friable when moist; diffuse wavy boundary; weakly calcareous; strongly saline; pH 8.5.

II Cskgj1 - 64 to 84 cm, light olive gray (5Y 6/2 moist), loam; structureless, friable when moist; clear, wavy boundary; strongly calcareous; moderately saline; pH 9.0.

II Cskgj2 - 84 cm +, light brownish gray (2.5Y 6/2 moist), loam till; structureless; firm when moist; strongly calcareous; moderately saline; pH 8.9.

Niverville Series (NIV)

The Niverville series consists of imperfectly drained, carbonated, Gleyed Rego Black Chernozem soils developed on strongly calcareous, medium to moderately fine textured (VFSL, L, SiL to SCL, CL, SiCL), alluvial and lacustrine deposits overlying lacustrine clay within a meter of the surface. The surface texture is variable ranging from loam, silty loam, silty clay loam and silty clay. The topography is level, runoff is slow, and permeability is moderately slow. Some areas are prone to flooding following the spring snow melt. These soils are similar to the Lakeland series, but differ due to the underlying clay strata.

The soil is characterized by a carbonated, very dark gray Ah horizon 15 to 22 cm thick and a carbonated AC horizon 6 to 15 cm thick which may tongue into the Ckgj horizon. Occasionally, former surface horizons may be present within the control section. The silty stratum usually contains a greater proportion of carbonates than do the layers with less silt.

Nobess Series (NBS)

The Nobess series consists of imperfectly drained Gleyed Cumulic Regosol soils developed on deep (>100 cm), moderately to strongly calcareous (6 to 25 % CaCO3), stratified, dominantly clayey, recent alluvial deposits with some shale. They occur in the flood plain of stream channels. The permeability is moderately slow to slow and runoff is slow. The topography is level to gently sloping. Native vegetation includes ash and elm.

The Nobess soil is characterized by a weak dark gray to gray Ah or Ahb horizon that is somewhat darker than the Cgj horizon. The C horizon is stratified and may contain dark stratum of former surfaces. Flakes of shale occur within the profile.

Nora Lake Series (NOL)

The Nora Lake series consists of well drained Eluviated Dystric Brunisol soils developed on neutral to medium acid, shallow (< 1 m) skeletal and coarse loamy textured veneer of morainal, igneous till over granitic bedrock. These soils occur in areas of moderately sloping (9 to 15 %) topography and have moderate permeability and moderate surface runoff. The vegetation is a mixture balsam fir and black spruce with a groundcover of feathermoss. A description of a representative profile is provided.

L - 8 to 5 cm, horizontal and oblique, inped roots; highly porous; 40 % cobbly and angular cobbly and stony coarse fragments; abrupt, smooth boundary; medium acidity.

F - 5 to 0 cm, horizontal and oblique, inped roots; highly porous; 40 % cobbly and angular cobbly and stony coarse fragments; abrupt, wavy boundary; strongly acidic.

Aej - 0 to 8 cm, yellowish brown (10YR 5/4 moist), silt loam; very weak, fine, granular structure; very friable when moist; non plastic; abundant, very fine to coarse, horizontal and oblique, inped roots; highly porous, many, very fine, random, inped pores; 40 % cobbly and angular cobbly and stony coarse fragments; clear, wavy boundary; extremely acidic.

Bm - 8 to 22 cm, dark yellowish brown to yellowish brown (10YR 4.5/4 moist), silt loam; weak, fine, granular structure; very friable when moist; non plastic; few, fine to coarse, horizontal and oblique, inped roots; highly porous, many, very fine, random, inped pores; 40 % cobbly and angular cobbly and stony coarse fragments; clear, wavy boundary; extremely acidic.

C - 22 to 34 cm, yellowish brown to light yellowish brown (10YR 6.5/4 moist), silt loam; very weak, fine, granular structure; very friable when moist; non plastic; very few, fine horizontal and oblique roots; highly porous, many, very fine, random, inped pores; 40 % cobbly and angular cobbly and stony coarse fragments; very strongly acidic.

R - 34 + cm, igneous bedrock.

Norgate Series (NGT)

The Norgate series consists of carbonated, Gleyed Rego Black Chernozem soils developed on thin (15 to 100 cm), moderately calcareous, moderately fine to fine textured (CL, SiCL, SiC, C) lacustrine sediments overlying weakly to moderately calcareous, shaly clay till. A gravelly to cobbly lens varying in thickness from 25 to 90 cm may occur between the two materials. Surface textures of the Norgate soils vary from clay to clay loam; clay is dominant. The Norgate soils are found in the Dauphin Lake Plain in a narrow belt immediately below the Riding Mountain Escarpment. Here the surface lacustrine deposits are thin and discontinuous and the underlying shale bedrock or shaly clay till is exposed or is very close to the surface. They occur in level to very gently sloping dominantly imperfectly drained areas. Runoff is moderate, but internal soil permeability is slow, particularly in the upper materials and in the underlying shaly clay material. Extensive lateral seepage can take place in these soils where the water-worked coarse textured layers are continuous. Native vegetation consists of aspen and balsam poplar, a shrub layer of willow and dogwood and a ground cover of meadow grasses and sedges.

The Norgate soils are characterized by dark colored surface horizons resulting from development under grassland vegetation. The solum ranges from 30 to 50 cm in thickness; the dark colored organic rich surface horizons are usually underlain by a thin, dark gray transitional AC horizon. This horizon can grade into weakly calcareous, often weakly saline and gypsiferous, lighter colored, strongly mottled subsoils. The Ah and AC horizons may be separated from the subsoil by severely water-worked sandy to gravelly and cobbly lenses of variable thickness. Norgate soils correlate with the dominant member of the Norgate Association in the Westlake map sheet area (Soil Report No. 8). They occur in homogeneous mapping units in association with the Merridale soils. Poorly drained Aubrey soils may occur in minor amounts in some mapping units. Although much of this soil area has been cleared for agriculture, the cobbly, bouldery surface in some areas can be a severe hindrance to cultivation. A soil profile representative of the Norgate series is described:

Ahk1 - 0 to 15 cm, black (10YR 2/1 moist) clay loam; moderate, medium granular; friable when moist, slightly hard when dry; mildly alkaline; moderately calcareous; gradual, irregular boundary.

Ahk2 - 15 to 36 cm, very dark brown (10YR 2/2 moist) clay loam; weak, medium prismatic; friable when moist, slightly hard when dry; mildly alkaline; weakly calcareous; clear, wavy boundary.

ACkgj - 36 to 53 cm; dark gray to dark grayish brown (10YR 3/1 to 4/2 moist) clay; structureless; massive; firm when dry; mildly alkaline; weakly calcareous; clear, smooth boundary.

Cksg1 - 53 to 65 cm; light gray and dark grayish brown (10YR 7/1 and 4/2 moist) silt; structureless; massive; firm when moist, slightly sticky when wet; mildly alkaline; weakly calcareous; many, fine to medium gypsum crystals; diffuse, irregular boundary.

Csg1 - 65 to 75 cm; light gray and dark grayish brown (10YR 7/1 to 7/7 and 10YR 4/2 moist) silt loam; structureless; massive; firm when moist; mildly alkaline; noncalcareous; many, fine to medium gypsum crystals; diffuse, wavy boundary.

Csg2 - 75 to 90; very pale brown (10YR 7/4 moist) clay; common, medium distinct dark grayish brown (10YR 4/2 moist) and yellow (10YR 8/6 moist) mottles; structureless; firm when moist, very sticky when wet; mildly alkaline; many, fine to medium gypsum crystals; gradual, smooth boundary.

Cg - 90 to 100 cm; dark grayish brown to dark brown (10YR 4/2 to 4/3 moist) heavy shaly clay; structureless; amorphous; very sticky when wet, firm when moist, hard when dry; mildly alkaline; noncalcareous.

Norris Series, peaty phase (NRS)

The Norris series are poorly drained Rego Gleysol, carbonated, peaty phase soils developed on stratified and strongly calcareous sand and gravel deposits. These soils occupy level to depressional areas bordering gravelly beach ridges, and are generally covered by a thin (15 to 40 cm) blanket of mesic fen peat. Both runoff and permeability are very slow due to the lack of relief and the high groundwater table characteristic of Norris soil areas. The native vegetation is black spruce and some aspen, with an understory of Labrador tea and feathermoss.

Norris soils generally have a surface layer of very dark brown, slightly acidic, moderately decomposed peat overlying a gleyed, extremely calcareous Ckg horizon. A thin Ahkg or AC horizon may occur above the C horizon. The Norris series, peaty phase is similar to the Easterville series, peaty phase, differing only in the lack of a till substrate within the control section. Norris soils are found in association with soils of the Tremauden, Woodridge, Rat River, and Guy Hill complexes. A description of a representative Norris series follows.

Om - 25 to 15 cm, black (5YR 2/2 moist) moderately decomposed herbaceous and mossy material; extremely acid; clear smooth boundary.

Oh - 15 to 0 cm, black (5YR 2/1 moist) moderately well decomposed herbaceous and mossy material, neutral reaction; clear wavy boundary.

II Ahkg - 0 to 10 cm, very dark gray (5YR 3/1 moist) gravelly loam; single grained; slightly sticky wet, soft dry; neutral reaction, strongly calcareous; clear wavy boundary.

II Ckg - 10+ cm, very pale brown (10YR 7/4 moist) very gravelly loamy coarse sand; single grained; nonsticky wet, loose dry; mildly alkaline; extremely calcareous.

Nourse Series (NUS)

The Nourse series consists of imperfectly drained Gleyed Dark Gray Chernozem soils developed on thin (< 40 cm) moderately to strongly calcareous, moderately coarse to medium textured (VFS, LVFS, FSL, L) sediments overlying a significant lacustrine clay strata (50 to 80 cm) over extremely calcareous loamy glacial till. These soils are similar to the Greenwald series which has a thicker lacustrine clay strata and absence of the loamy till at or below 1 meter. The surface texture varies from loamy very fine sand to loam. The topography is very gently to gently sloping; runoff is moderate; and permeability is moderately rapid in the surface strata and moderately slow to slow in the clay and till substrata. The native vegetation consists of trembling aspen, balsam poplar, hazel, dogwood, and native grasses.

The soil is characterized by a dark gray A horizon 15 to 25 cm thick, and a brown to dark brown prismatic to granular Bt horizon 10 to 18 cm thick. The solum is usually developed within the moderately coarse to medium textured sediments, but in some cases the Bt may extend into the fine textured sediments. Some pebbles are commonly encountered at the contact below the coarse to moderately coarse textured sediments and below the fine textured sediments.

Novra Series (NOV)

The Novra series consists of poorly drained Rego Gleysol soils developed on moderately to strongly calcareous, deep, stratified coarse loamy to fine (LVFS, FSL, VFSL, L) loamy fluvial (alluvial) deposits. These soils occur in depressional positions of gently undulating deposits and have moderate permeability, very slow surface runoff and a high water table during the growing season. Novra soils have moderate available water holding capacity, low organic matter levels, and low natural fertility. The native vegetation often comprises of balsam poplar, black spruce and willow with a ground cover of sedge and meadow grass. The majority of these soils are currently in unproductive woodland.

In a representative profile the solum is generally about 15 cm thick corresponding to the plow layer. The profile is characterized by a 10 to 20 cm thick Ap horizon overlying grayish brown, weakly calcareous loam to clay loam textured, mottled Ckg horizon, which is

stratified with thin bands of fine sand and clay and dark coloured layers representing former surface horizons buried by deposition of fresh alluvium. The parent material is typically dull coloured strongly mottled and strongly calcareous. Novra soils occur in close association with Homestead soils. They are similar to Homestead soils by having similar stratification and the same texture, but differ from Homestead soils because of drainage.

Nowell Series (NOW)

The Nowell series is characterized by a Gleyed Black Chernozem solum, imperfect soil drainage, and materials of non to weakly calcareous fine loamy (CL, SiCL) variable lacustrine and morainal deposits that are derived dominantly from cretaceous shales. These deposits are usually shallow and are underlain by shale bedrock at depths commonly within 2 m. They occur in association with other Black soils in the Manitou Plain and in transition to the Pembina Hills, mainly in the mid to lower slopes of very gently sloping, undulating landscapes. Runoff is moderately slow; permeability is moderate to moderately slow and may be restricted in areas where the bedrock may be nearer the surface. Most of these soils are under cultivation.

The solum has a very dark gray to black Ap and Ah horizon 20 to 30 cm thick, a dark gray to grayish brown Bm horizon 15 to 20 cm thick with distinct mottles, and a transitional BC horizon 10 to 15 cm thick. The C horizon is weakly mottled and variable in carbonate content; depth to carbonates varies from 60 to greater than 100 cm.

Oak Lake Series (OKL)

The Oak Lake series is the poorly drained, Rego Humic Gleysol, carbonated member of the Souris Association, developed on deep, weakly to moderately calcareous, sandy lacustrine sediments. This poorly drained soil generally has level to depressional topography; a loamy fine sand surface texture, moderately slow permeability and slow surface runoff. The depth to water table is usually less than 1 m. These soils are seldom under cultivation because of their poor drainage. These soils are generally used for native hay production. The profiles are often strongly iron stained and contain prominent, abundant iron and manganese concretions.

A typical profile would have very dark gray Ah horizons 10 to 30 cm thick; gleyed, gray AC horizons 12 to 18 cm thick, and stratified, strongly gleyed gray brown Ckg horizons containing prominent mottles and iron concretions.

Oakley Series (OAY)

The Oakley series consists of moderately well to well drained Orthic Dark Gray Chernozem soils developed on a mantle (25 to 90 cm) of moderately to very strongly calcareous, shallow loamy (CL, SiCL), till of shale, limestone and granitic origin over weakly to noncalcareous, weathered, Odanah, siliceous, shale bedrock. These soils occur in crest and upper positions of inclined, undulating and hummocky landscapes, and have moderate permeability, moderate to rapid surface runoff, and a low water table during the growing season. Oakley soils are often severely water eroded, slightly stony, and non-saline. They have a medium available water holding capacity, low organic matter content, and low natural fertility. Native vegetation includes aspen, oak, ash and mixed grasses. The majority of these soils are currently used for natural grazing.

In a representative profile the solum is approximately 40 cm thick. The profile is consists of a dark gray Ah horizon, 15 to 20 cm thick, a Bm or Btj horizon, 20 to 30 cm thick and a calcareous C horizon. Oakley soils are similar to Dezwood soils by having a well drained profile in mixed till but differ from them in having bedrock with in a meter of the surface. Oakley soils were previously mapped as minor inclusions of the Pembina Association in the South-Central (1943) soil report.

Oaknook Series (ONK)

The Oaknook series consists of imperfectly drained Gleyed Rego Black Chernozem soils developed on very strongly calcareous, deep uniform loamy morainal deposits. These soils occur on level deposits and have moderate permeability, slow surface runoff and a medium water table during the growing season. Oaknook soils are moderately stony. Oaknook soils have medium available water holding capacity, medium organic matter levels, and medium natural fertility. The native vegetation is aspen and black poplar and shrubs such as willow and dogwood and a ground cover of meadow grasses. The majority of these soils are currently used for crop production.

In a representative profile the solum is generally about 25 cm, ranging from 12 to about 60 cm. The profile is characterized by a 22 cm thick very dark gray, calcareous loam textured Ap and Ah horizon overlying a transitional light brownish gray loamy textured AC horizon about 10 cm thick and a pale yellow, loam to clay loam textured Ckgj horizon. The parent material is typically compact, mottled and very strongly calcareous below the 40 cm depth. Oaknook soils occur in close association with Meharry soils. They are similar to Meharry soils by having dark surface colours, but differ from Meharry soils because of poorer drainage and carbonates in the surface horizons. Oaknook soils correlate with the imperfectly drained member of the Meharry Association published in the Swan River (1962) soil report.

Oberon Series (OBR)

The Oberon series consists of imperfectly drained Gleyed Black Chernozem soils developed on a thin mantle (<1 m) of strongly calcareous clay loam to sandy clay loam sediments grading to moderately calcareous sandy (FS, LFS, LS) deposits. They occur on level to gently sloping topography. Runoff is moderate to moderately slow; permeability is moderate in the upper loamy strata and moderately rapid in the sandy subsoil when not restricted by a high water table in early spring or summer.

The soil is characterized by a very dark gray Ah horizon, 18 to 25 cm thick, a subangular blocky brown to olive brown Bmgj horizon, 12 to 22 cm thick with yellowish brown mottles in the lower part of the horizon; a BC horizon, 8 to 16 cm thick. Carbonate accumulation (Cca horizon) is usually present within the loamy strata. The sandy substrata is light yellowish brown with yellowish brown to strong brown mottles of iron. The Oberon, clayey variant, OBR1, differs from the modal Oberon by having a silty clay to clay textured layer, 10 to 40 cm thick, often forming part of the Bmgj horizon.

Ochre River Series (OHV)

The Ochre River series consists of imperfectly drained Gleyed Rego Black Chernozem soils developed on weakly to moderately calcareous, moderately fine textured (SCL, CL, SiCL), nearly level, alluvial deposits in the Dauphin Lake Plain. Surface textures range from clay loam to a light clay and the soils are stratified with layers ranging from sand to clay. Dark coloured organic-rich layers indicating periods of flooding and deposition occur throughout the soil. The larger areas of Ochre River soils are found in the Ochre River flood plain. They commonly occur at a distance away from the very recent alluvial soils (Turtle River and Edwards series) found adjacent to the river. Surface runoff is moderate and internal soil permeability is moderately slow. Although most Ochre River soils are cultivated, native vegetation was dominantly hardwood forest comprised of elm, ash, Manitoba maple, willow, dogwood and a ground cover of grasses and meadow grasses.

Profile development is restricted to a dark coloured Ah horizon, high in organic matter content and ranging in thickness from 25 to 30 cm. This Ah horizon has a fine granular structure, is usually quite friable, neutral in reaction and may be weakly calcareous. It grades into a stratified moderately calcareous C horizon which is usually mottled with iron staining and banded with dark coloured layers of former surface horizons which have been buried by deposition of fresh alluvium. The Ochre River soils, because they have been in place for a longer period of time have greater Ah development than that found in the closely related Edwards soils. The Ochre River soils correlate with the Edwards, semi-mature phase as described in the Westlake Map Sheet area (Soil Report No. 8). A representative profile is described below:

Apk - 0 to 13 cm; very dark gray (10YR 3/1 dry, 10YR 2/1 moist), clay; weak, coarse blocky breaking to weak, coarse granular; very firm when moist, very hard when dry; neutral, moderately calcareous; abrupt, smooth boundary.

Ahk - 13 to 30 cm; black (10YR 2/1 moist), clay; strong medium granular; very firm when moist, hard when dry; neutral; moderately calcareous; clear, smooth boundary.

ACkgj - 30 to 35 cm, very dark grayish brown (10YR 3/2moist), silty clay; moderate, medium granular; firm when moist; hard when dry; mildly alkaline; strongly calcareous; abrupt, irregular boundary.

Ckg1 - 35 to 55 cm; dark gray (10YR 4/1 moist), clay; moderate, fine granular; firm when moist, slightly hard when dry; moderately alkaline; very strongly calcareous; abrupt, smooth boundary.

Ckg2 - 55 to 100 cm; light olive brown (2.5Y 5/4 moist), silt loam; moderate, fine granular; friable when moist, slightly hard when dry; moderately alkaline; extremely calcareous.

Okno Complex (OKO)

The dominant soil within the Okno complex is the Okno series, a Terric Mesisol with less than 15 cm of fibric Sphagnum peat at the surface. The Okno complex is composed of a group of poorly to very poorly drained organic soils developed on mesic forest peat, frequently a thin (0 to 65 cm) discontinuous layer of fibric Sphagnum moss peat overlies the mesic forest peat. Moderately to strongly calcareous loamy to clayey lacustrine sediments occur within 160 cm of the surface. Okno areas are depressional to level. Permeability and runoff are very slow to nil on these soils. Native vegetation is dominantly black spruce with an understory of feather mosses, ericaceous shrubs and Sphagnum moss.

The soils of the Orok complex are commonly associated with the Okno complex. This is due to the hummocky nature of the Sphagnum moss layer overlying the mesic forest peat. The soils of the Orok complex are similar to the Okno series but possess a thicker (15-65 cm) layer of fibric Sphagnum moss peat at the surface. These include dominantly the Orok series, a Terric Mesisol, sphagnic phase, with minor areas of the Kalevala series, a Terric Fibric Mesisol, and the Baden series, a Terric Mesic Fibrisol. The soils of the Okno complex are similar to those of the Grindstone and Rat River complexes, differing from them only in the nature of the mineral substrate. Okno soils occur often in association with soils of the Molson complex and the Orok complex and Howell series. The profile of a representative Okno series may be described as follows:

Om1 - 0 to 15 cm, very dark brown to dark reddish brown (10YR 2/2, to 5YR 2/2, wet), amorphous granular; woody; unrubbed fiber content approximately 46 percent; neutral.

Om2 - 15 to 36 cm, very dark brown to dark brown (10YR 2/2, to 3/3, wet), mixture of coarse woody fibered and moderately coarse non-woody fibered mossy material; unrubbed fiber content approximately 64 percent; medium acid.

Om3 - 36 to 60 cm, very dark brown to dark reddish brown (10YR 2/2 to 5YR 2/2, wet), mixture of mossy, herbaceous and woody material; compacted; unrubbed fiber content approximately 63 percent; medium acid.

II Ahg - 60 to 66 cm, black (2.5Y 2/1, wet), silty clay; massive, plastic and very sticky when wet; medium acid.

Oliver Series (OIV)

The Oliver series consists of imperfectly drained Gleyed Black Solonetz soils developed on a mantle (25 to 100 cm) of moderately to strongly calcareous, uniform, clayey (SiC, C), lacustrine deposits over moderately to strongly calcareous, stratified, deep sandy to coarse loamy (LS, SL, L) lacustrine deposits. These soils occur in middle slope positions of nearly level landscapes and have slow permeability very slow surface runoff and a high water table during the growing season. Oliver soils are non-eroded, non-stony and slightly saline. They have high available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes tall prairie and salt-tolerant grasses. The majority of these soils are currently used for crop production.

In a representative profile the solum is approximately 60 cm thick. The profile is characterized by a very dark gray to black Ap or Ah horizon, 10 to 20 cm thick, a dark grayish brown Bn or Bnt horizon, 15 to 25 cm thick with very strong columnar to massive structure a very dark grayish brown transitional BC horizon, 10 to 15 cm thick and a yellowish brown C horizon with many distinct iron mottles. The parent material is typically saline at depth. A typical profile also contains gypsum crystals in the C horizon.

The Oliver Shaly variant, OIV1, differs from the modal Oliver series by having a shaly component in the undelying, stratified loamy sediments. Oliver soils were previously mapped as the dominant associate of the Oliver association in the reconnaissance soil survey of South-Central Manitoba (1943).

Ollneck Series (OLK)

The Ollneck series consists of imperfectly drained Gleyed Dark Gray Luvisol soil developed on moderately to strongly calcareous, deep, uniform, fine loamy to fine silty, slightly stony mixed till deposits. These soils occur in lower slope positions of undulating to hummocky landscapes and have moderately slow permeability, slow surface runoff, and a medium water table during the growing season. Ollneck soils are non-eroded, slightly stony, and occassionally slightly saline. They have a high available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation includes aspen-oak groves, willows and prairie grasses. The majority of these soils are currently cultivated for crop production.

In a representative profile the solum is approximately 55 cm thick. The profile is characterized by a dark gray Ah horizon, 5 to 10 cm thick, a light gray Ae horizon, 5 to 10 cm thick with platy structure, a brown Bt horizon, 15 to 25 cm thick with faint mottles and a yellowish brown Ck horizon, with many prominent mottles. A typical profile also contains a weakly developed lime accumulation (Cca) layer.

Ollneck soils occur in close association with Pembina and Horose soils. They are similar to Zaplin soils by having an imperfectly drained profile in mixed till but differ from them in having a diagnostic Ae horizon. Ollneck soils were previously mapped as minor inclusions of Pembina in the soil survey of South-Central Manitoba (1943).

Onahan Series (ONH)

The Onahan series is a Gleyed Regosol soil developed on imperfectly drained, weakly to noncalcareous, sandy (FS, LS, S), eolian sediments. These soils occur in lower and mid-slope positions on complex hummocky topography in association with the Shilox series which is found on upper slopes, and Mockry soils in associated depressions. Surface runoff is low, and permeability is rapid, but can be restricted by a high water table in the spring and early summer. These soils have been stabilized for more than 60 years as indicated by tree growth. Some areas have been seeded to grasses and used for pasture.

The Onahan soil profile has a partially decomposed LH horizon, 1 to 3 cm thick, and a gray to dark gray Ah horizon, 5 to 18 cm thick. The Cgj horizon is pale brown with strong brown to yellowish brown mottles. This profile differs from the somewhat similar Hummerston soil series, in not having a Chernozemic A horizon. Onahan soils were included in duned landscape areas of the Stockton Association in the Carberry (1957) soil report.

Onanole Series (OOL)

The Onanole series consits of moderately well to well drained Orthic Dark Gray Chernozem soils developed on moderately to strongly calcareous, loam textured lacustrine sediments. These soils are moderately pervious to water and have moderate surface runoff, due to their complex topography (2 to 5 percent slopes). The majority of Onanole soils have a slight susceptibility to water erosion and are used mainly for production of cereal crops. In the non-cultivated state, native vegetation consists of aspen with an understory of rose, grasses, and herbaceous plants.

A typical profile for Onanole soils consists of a dark gray Ap-Ah horizon 22 cm thick, a dark grayish-brown Bm or Bt horizon, approximately 30 cm thick. A transitional BC horizon or a lime accumulation horizon (Cca) may be present between the B horizon and the underlying calcareous parent material. The depth of the profile varies with slope, generally deeper profiles at lower slope positions and shallower profiles on upper slopes. The average solum thickness is greater than 50 cm with the A horizon generally greater than 20 cm. Onanole soils are more permeable and less stony than the very similar Banks and Ozerna soils which are underlain by compact, moderately impermeable till.

Optic Lake Complex (OPC) or (OLX)

The Optic Lake Complex soils are dominantly Terric Mesic Fibrisols with inclusions of Terric Fibric Mesisols and Terric Fibrisols. These soils are developed in 60 to 160 cm of fibric sphagnum peat which may be underlain by significant amounts of forest or fen peat. The underlying mineral sediments are non-calcareous till. A profile description is provided:

Of1 - 0 to 60 cm, very dark grayish brown (10YR 3/2 moist), non-woody, fibrous, spongy Sphagnum mosses; very strongly acid; fiber content approximately 76 percent.

Of2 - 60 to 104 cm, dark gray (10YR 3/1 moist), mixed fibrous Sphagnum and woody forest peat; strongly acid; fiber content approximately 75 percent.

Om - 104 to 155 cm, black (10YR 2/1 moist), moderately decomposed, mesic, woody forest peat; strongly acid; fiber content approximately 60 percent.

IICg - 155 +, non-calcareous sandy loam till.

Orok Complex (OOK)

The Orok complex consists of essentially the same group of poorly to very poorly drained organic soils as the Okno complex but differs from the latter in the dominance of specific member series. The areas mapped as Orok complex have a thicker and more continuous layer of Sphagnum moss overlying the mesic forest peat. Moderately to strongly calcareous clayey to loamy lacustrine sediments occur within 160 cm of the surface. The topography of Orok areas may be slightly more depressional than that of Okno areas and consequently natural drainage may be somewhat more impeded for the Orok soils. Native vegetation associated with Orok areas is largely stunted black spruce with some tamarack and an understory composed of Sphagnum mosses and ericaceous shrubs.

The dominant soil within the Orok complex is the Orok series, a Terric Mesisol, Sphagnic phase, with a significant layer (15 to 65 cm) of fibric Sphagnum moss peat at the surface. Minor significant soils in the Orok complex include the Baden series, a Terric Mesic Fibrisol; the Kalevala series, a Terric Fibric Mesisol and the Okno series, a Terric Mesisol. These organic soils correspond very closely to those of the Lamb Lake and Guy Hill complexes, differing from them only in the nature of the mineral substrate. Soils of the Orok complex occur in association with the Napanee Bay series, peaty phase and the Okno and Molson complexes. A representative profile of the Orok complex is given below.

Of1 - 0 to 40 cm, strong brown (7.5YR 5/6 wet) fibric Sphagnum moss; medium to fine fibered; non-sticky; non woody; extremely acid; unrubbed fiber approximately 100% rubbing to 94%; clear wavy boundary.

Om1 - 40 to 100 cm, dark reddish brown (5YR 2/2 wet) moderately decomposed herbaceous forest; fine fibered with some coarse wood fragments non sticky; low wood; neutral; unrubbed fiber approximately 70% rubbing to 40%; clear wavy boundary.

Oh1 - 100 to 110 cm, black (5YR 2/1 wet) moderately well to well decomposed herbaceous forest; dominantly fine to very fine fibered with some coarse wood fragments; slightly sticky; low wood; unrubbed fiber approximately 38% rubbing to 17%; abrupt smooth boundary.

II Ckg - 110+ cm, dark grayish brown to grayish brown (10YR 5/2 moist) clay; massive; very sticky wet; very plastic; mildly alkaline; weakly calcareous.

Orr Lake Series (ORK)

The Orr Lake series consists of Regosolic Static Cryosol soils developed on deep, moderately to strongly calcareous fine textured lacustrine sediments. The Orr Lake soils are permanently frozen at about 100 cm below the surface, but show only slight evidence of cryoturbation. The ice content of the cryic layer is low and occurs in the form of crystal and vein ice. These soils are found in areas of subdued hummocky relief; surface runoff is moderate and the soils are imperfectly to moderately well drained. The soil materials are slowly pervious to moisture movement.

The Orr Lake soils occur mainly on the upper slopes near the edge of the raised hummocky areas. The soil surface has a slightly mounded micro topography and is marked by prominent cracks and trenches up to 25 cm deep. The center of the trench has accumulations of organic material and the soil material adjacent to the cracks shows little evidence of profile development. Dark coloured intrusions of displaced Ah horizons are noted in the upper 50 cm. These horizons are generally oriented parallel to the surface topography and indicate that frost action at various times has disrupted the profile. The soil material below 30 to 40 cm is calcareous and grades into silty clay textures with increasing depth.

Orthez Series (OHZ)

The Orthez series is the poorly drained, Humic Luvic Gleysol member of the Cameron Association, developed on deep, strongly calcareous, medium textured (VFSL, L SiL) lacustrine sediments. This soil has a loam to very fine sandy clay loam surface texture, nearly level to depressional topography, moderately slow permeability, and little surface runoff. These soils have a high water table and are extremely susceptible to flooding and ponding in the spring and after heavy rains. They generally occur in low areas and stream runoff channels and usually support native hydrophytic vegetation.

Osborne Series (OBO)

The Osborne series consists of poorly drained Rego Humic Gleysol soils developed on moderately to strongly calcareous, deep uniform, clayey (C, HC), lacustrine deposits. These soils occur in lower to depressional positions of level to nearly level landscapes and have very slow permeability, slow to very slow surface runoff and a high water table during the growing season. Osborne soils are non-eroded, non-stony and may be saline. They have high available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes meadow grasses, reeds, sedges and willow. The majority of these soils are currently used for crop production and have improved surface drainage.

In a representative profile the solum is approximately 30 cm thick. The profile is characterized by a very dark gray, noncalcareous, clay, Ap horizon, 15 to 20 cm thick, with a thin transitional, dark gray to olive gray weakly calcareous AC horizon, 8 to 10 cm thick and an olive gray, moderately to strongly calcareous, clayey, mottled Ckg horizon. The parent material is typically a uniform clayey lacustrine deposit.

Osborne soils occur in close association with Red River, Morris and Scanterbury soils. They are similar to these soils by having developed on the same parent material but differ because of poorer drainage. Osborne soils were previously mapped as Osborne clay in the Winnipeg-Morris Map Sheet (Report No. 5, 1953).

Oskar Series (OSK)

The Oskar series is the well drained, Rego Dark Gray Chernozem member of the Horton Association, developed on deep, strongly calcareous, medium to moderately fine textured (VFSL, L, SiL to SCL, CL, SiCL) glacial till. These soils occur on the upper slopes of the undulating and gently rolling topography of Turtle Mountain area. They have a clay loam surface texture, slow permeability and rapid surface runoff. They are occasionally slightly stony and some are cultivated. The undisturbed sites have native stands of Poplar, Birch and Oak. In the cultivated state they are moderately to strongly susceptible to erosion.

Ospwagan Series (OPW)

The Ospwagan series consists of imperfectly drained Brunisolic Static Cryosol soils developed on deep (> 1 m), moderately to strongly calcareous fine textured lacustrine sediments. The Ospwagan soils are permanently frozen at about 100 cm below the surface. The ice content of the cryic layer is low and occurs in the form of dispersed crystals and veins. These soils are found in areas of subdued hummocky relief; surface runoff is moderate and the soils are imperfectly to moderately well drained. The soil materials are slowly pervious to moisture movement. The surface soil materials are often dry but moisture content increases with depth and the soil is usually saturated immediately above the cryic layer.

These soils have a thin surface organic horizon comprised of feathermoss, needles and the remains of ericaceous shrubs. A thin, organic rich mineral surface horizon (Ah) is underlain by a weakly leached Ahe horizon or a weak Bm horizon characterized by slight color and structure change from the materials above and below. The upper soil materials contain intrusions of dark colored organo-mineral horizons which occur as thin, wavy bands and discontinuous organic smears and blobs. A representative profile is described:

L-F - 12 to 4 cm, slightly to non-decomposed forest litter (remains of feathermoss, spruce needles and ericaceous plants); moderate, fine to medium fibered; few, fine horizontal roots; extremely acid; abrupt, wavy boundary.

F-H - 4 to 0 cm, slightly to well decomposed forest litter; amorphous and very fine fibered; few, fine horizontal roots; extremely acid; abrupt, smooth boundary.

Ah - 0 to 10 cm, very dark brown (10YR 2/2 moist) clay; structureless; massive breaking to weak, fine granular; firm when moist and slightly hard when dry; few, very fine random roots; medium acid; abrupt, wavy boundary.

Ahe - 10 to 20 cm, dark brown (10YR 3/3 moist) clay; weak, fine granular breaking to moderate, medium shotty; friable when moist and slightly hard when dry; very few, very fine random roots; neutral; abrupt, wavy boundary.

Ahy - 20 to 30 cm, black (10YR 2/1 moist) clay; weak, fine granular breaking to moderate, medium shotty; friable when moist and slightly hard when dry; very few, very fine random roots; neutral; abrupt, wavy boundary.

Bm - 30 to 40 cm, brown to dark brown (10YR 4/3 moist) heavy clay; structureless, massive breaking to weak, fine shotty; firm when moist and hard when dry; mildly alkaline; abrupt, wavy boundary.

Ckg1 - 40 to 65 cm, dark yellowish brown (10YR 3.5/4 moist) and light yellowish brown (10YR 6/4 moist) heavy clay; structureless, massive breaking to weak, fine granular; firm when moist and hard when dry; mildly alkaline; very strongly calcareous; gradual, smooth boundary.

Ckg2 - 65 to 85 cm, dark yellowish brown (10YR 3.5/4 moist) and light yellowish brown (10YR 6/4 moist) clay; structureless, massive breaking to weak, fine granular; firm when moist and hard when dry; mildly alkaline; very strongly calcareous; gradual, smooth boundary.

Ckg3 - 85 to 100 cm, dark yellowish brown (10YR 4/4 moist) and light yellowish brown (10YR 6/4 moist) silty clay; structureless, massive breaking to weak, fine granular; fvery sticky and plastic when wet; mildly alkaline; very strongly calcareous; abrupt, smooth boundary.

Ckgz - 100 to110 cm, dark yellowish brown (10YR 4/4 moist) and light yellowish brown (10YR 6/4 moist) frozen clay; structureless, massive; low ice content, vein and crystal ice and some ice lenses; very sticky and very plastic when wet; very firm when moist and very hard when dry; mildly alkaline; very strongly calcareous.

Osterwick Series (OWK)

The Osterwick series is a Rego Humic Gleysol soil developed on poorly drained, moderately to strongly calcareous, coarse loamy (VFS, LVFS, FSL, VFSL, L), lacustrine and fluvial sediments. These soils occur on depressional topography in association with Reinland and Kronstal soils. Surface runoff is very slow. Permeability is moderately rapid, but is restricted by a seasonal high water table. Improved surface drainage has occurred, but some areas have not been adequately improved and surface ponding is common. Some forage crops are grown but a few areas remain as pasture or wetland.

The Osterwick soil profile has a thin, moderately decomposed organic, Om horizon, 6 to 12 cm thick; a very dark gray Ah horizon, 15 to 25 cm thick; a light gray transitional AC horizon, 5 to 20 cm thick, and a gray Ckg horizon with yellowish brown mottles. A carbonate accumulation layer (Cca), 20 to 25 cm thick, is usually found below the AC horizon. This soil differs from the similar Lelant series in having coarse loamy sediments instead of sandy deposits. Osterwick soils have limitations for agriculture due to excess water in the soil profile for much of the growing season. These soils were mapped as the poorly drained, Meadow associate of the Altona Association in the Winnipeg-Morris (1953) report.

Overflowing Series (OVO)

The Overflowing series consists of very deep organic soils developed on greater than 160 cm of saturated mesic fen peat with little or no (<15 cm) fibric Sphagnum peat at the surface. A hydric layer occurs from 40 to 130 cm. The Overflowing series is a Hydric Mesisol. These very poorly drained soils are generally underlain by strongly calcareous lacustrine sediments. These areas support dominantly sedges, reeds, and brown mosses. Minor areas of open water and the Stead series a Typic Mesisol may occur within some map units. The Overflowing soils occur in very poorly drained areas and represent very late stages of lake filling and accumulation of organic deposit.

Ozerna Series (OZA)

The Ozerna series consists of well drained Dark Gray Chernozem soils developed on thin (less than 1 m) loamy textured water laid sediments, overlying loam to clay loam textured, moderately to strongly calcareous morainal till derived from shale, limestone, and granitic rocks. These soils are characterized by a thin (less than 25 cm) loamy surface overlying a substantial layer of sand to gravel which, in turn, overlies till. With this stratified lithology, the surface soils are often droughty because of the low moisture holding capacity of the coarse subsoil layers. Surface runoff is slow; much of the precipitation enters rapidly into the soil. The upper part of the soil is highly permeable but internal drainage may be restricted by the underlying till.

The Ozerna series is characterized by a dark grayish-brown sandy loam Ap and/or Ah horizon (~ 18 cm thick), a dark brown Bm or Bt horizon (~ 10 cm thick) overlying a coarse sandy Ck horizon and a loam textured IICk horizon. Ozerna soils occur with various phases of topography, erosion and stoniness. Ozerna soils also occur as the minor component in a compound map unit associated with Erickson soils.

Ozerna soils differ from the very similar Banks soils in having strongly contrasting, stratified surface layers. They differ from the more uniform textured Davidson soils in being less permeable and stonier. Erickson and Waitville soils tend to be stonier and less permeable. Ozerna soils are more permeable than Onanole soils because of the presence of the coarse textured layer (Soils of the South Riding Mountain Planning District, Report D-35, 1990).

Pakwa Series (PKW)

The Pakwa series consists of imperfectly drained Gleyed Eluviated Dystric Brunisol soils developed on non-calcareous, non-stony glacio fluvial sand deposits. These sediments were derived mainly from granitoid rock through the glacial action. The topography is undulating to gently rolling. The vegetative cover is dominantly jack pine and black spruce with some trembling.

The Pakwa soils contain calcuim carbonate in the upper part of the C horizon, where the groundwater level fluctuates. The B horizon contains iron and some organic smaller, but no clay accumulation. The C horizon is gleyed and iron stained. The Pakwa soils are found in the Mid Boreal climatic zone around Playgreen Lake. They are usually found in complex map units in association with the Clarke series.

Pansy Series (PAN)

The Pansy series consists of imperfectly drained Gleyed Eluviated Eutric Brunisol soils developed on moderately to strongly calcareous, sandy deltaic and lacustrine deposits. The texture tends to be fine sand throughout the profile. Topography is generally level to gently sloping. Surface drainage is slow and internal drainage is impeded by a high water table. The native vegetation consists dominantly of aspen with some balsam poplar, dogwood or willow.

The Pansy soil is characterized by a very thin (0 to 2 cm) decomposed leaf mat, a light gray iron stained acidic Aeg horizon, and a friable brownish yellow, acidic B horizon with iron mottling. The iron mottles in the B horizon tend to increase in size and abundance with depth. The C horizon is carbonated and mottled.

Parlee Complex (PAR) or (PLX)

The Parlee complex consists of very poorly drained soils developed on 40 to 160 cm of moderately well decomposed mesic sedge peat with little or no sphagnum surface peat. These organic soils are underlain by moderately to strongly calcareous fine textured lacustrine sediments. The Parlee complex includes a Terric Mesisol and a Terric Fibric Mesisol. Native vegetation is dominantly sedge, reed grass and aquatic mosses; small amounts of willow, swamp birch and tamarack are also found.

The Terric Mesisol soils have a thin (15 to 30 cm) fibric fen peat surface layer underlain by dominantly mesic fen peat. The clayey textured lacustrine sediments occur within 160 cm of the surface and may have a thin, weakly developed Ahg horizon. The mesic fen peat is very dark brown to dark reddish brown, very fine to fine fibered, matted or felt-like, becoming darker in color, less fibrous and more compacted at lower depths.

The Terric Fibric Mesisol soil usually is developed on less than 100 cm of mesic fen peat. The thin surface fibric layer varies from 15 to 30 cm in thickness and is subdominant; the remainder of the organic section is moderately well decomposed fen peat. The clayey sediments usually occur within 100 cm of the surface. A profile description is provided:

Of1 - 0 to 15 cm, yellowish brown (10YR 5/6 wet) to black (7.5YR 2.5/0 wet) fibric sedge peat; fine to medium fibered; loose; slightly acid; about 90 % fiber.

Om1 - 15 to 35 cm, dark brown (7.5YR 3/2 wet) moderately well decomposed sedge peat; moderate fine fibered; non-woody; compacted; felt-like; slightly acid; about 50 % fiber.

Om2 - 35 to 50 cm, very dark brown (10YR 2/2 to 2/1 wet) moderately well decomposed sedge peat; non-woody; matted and weak, very fine to fine fibered; slightly acid; about 30 % fiber; abrupt, smooth boundary.

IICkg - 50 to 80 cm, grayish brown (2.5Y 5/2 wet) heavy clay; structureless; massive; very sticky and very plastic when wet; mildly alkaline; moderately calcareous.

Partridge Series (PDG)

The Partridge series is the poorly drained, carbonated, Rego Humic Gleysol member of the Bede Association, developed on deep (>100 cm), strongly calcareous, coarse textured (FS, LCoS, LS, LFS), gravelly deltaic, beach and outwash deposits. This soil occurs in depressional positions and has moderate permeability and very slow surface runoff. The depth to groundwater is usually less than 1 metre. The native vegetation consists of Slough Grasses, Smartweed, Spear Grass and Willows. A typical profile has a black Ahg horizon 10 to 20 cm thick, a gray Ccag horizon 10 to 20 cm thick, a light brownish gray Ckg horizon with prominent iron staining and abundant mottling. Analytical and morphological data for this series are presented below.

Ahkg - 0 to 18 cm, black (10YR 2/1 moist), gray (10YR 5/1 dry), medium sandy loam; weakly coarse columnar; friable when moist; abrupt, smooth boundary; very strongly calcareous; pH 7.9.

AC - 18 to 25 cm, dark gray (10YR 4/1 moist), gray to light gray (10YR 6/1 dry), medium sandy loam; weakly coarse columnar; friable when moist; clear, broken boundary; strongly calcareous; pH 7.9.

Ckg1 - 25 to 36 cm, gray (5Y 5/1 moist), light gray (10YR 7/1 dry), medium sandy loam; structureless; very friable when moist; clear, wavy boundary; strongly calcareous; pH 7.9.

Ckg2 - 36 to 56 cm, light olive brown (2.5Y 5/4 moist), light brownish gray (10YR 6/2 dry), coarse sand, structureless; loose when moist and dry; abrupt, smooth boundary; moderately calcareous; pH 7.9.

Ckg3 - 56 to 97 cm, yellowish brown (10YR 5/7 moist), yellowish brown (10YR 5/6 dry), coarse sand; few, fine, faint iron mottles; structureless; loose when moist and dry; smooth wavy boundary; strongly calcareous; pH 8.0.

Ckg4 - 97 cm +, yellowish brown (10YR 5/8 moist), very pale brown (10YR 7/4 dry), coarse sand; few, fine, faint iron mottles; structureless; loose when moist and dry; strongly calcareous; pH 7.9.

Partridge Creek Series (PGE)

The Partridge Creek series consists of poorly drained Rego Humic Gleysol soils developed on thin (15 to 90 cm), moderately to strongly calcareous lacustrine clay overlying stony, water-modified, and extremely calcareous till. They occur in the level to depressional sites in the transitional areas between the lacustrine and high lime glacial till soils. Native vegetation is dominantly sedges, with willow, alder and some balsam poplar.

The Partridge Creek soils have a thin (0-15 cm) surface layer of very dark brown, slightly acid, moderately decomposed fen peat derived from sedges, hydrophytic herbaceous plants and mosses. This thin organic layer is usually underlain by a thin, neutral to mildly alkaline, very dark gray Ah horizon. The Ckg horizon is grayish brown, contains numerous large concretions of lime carbonate, is iron stained, and is moderately alkaline.

The Partridge Creek, clay till variant, PGE1, has similar profile characteristics as the normal Partridge Creek series, differing from it in the composition and texture of the underlying till. This till consists of a mixture of strongly calcareous clayey and extremely calcareous loamy materials. This till is less compact and less stony than the extremely calcareous till.

Partridge Crop Series (PCP)

The Partridge Crop series consists of well drained Eluviated Dystric Brunisol soils developed on very strongly acidic, stratified, fluvial deposits more than 1 metre in thickness. These soils occur in upper positions of steep slopes on hummocky landscapes and have rapid permeability and slow surface runoff. Partridge Crop soils are non-eroded, and moderately stony. They have low available water holding capacity, low organic matter content, and low natural fertility. Native vegetation often includes mixed coniferous and hardwood species such as black spruce, jack pine, aspen, and birch. Shrubs consist of dogwood and ericaceous types. Herbaceous plants consist of bunchberry, feathermosses, sedges and grass species. The majority of these soils are currently used for gravel and aggregate source areas if accessible.

In a representative profile the solum is approximately 38 cm thick. The profile is characterized by thin very dark grayish brown LFH horizon, 2 to 10 cm thick, with abundant fine and medium roots, a brown, structureless Ae horizon, 1 to 6 cm thick with about 60% coarse fragments, a dark yellowish brown Bm horizon, 10 to 35 cm thick with loose single grain structure, and a yellowish brown single grained C horizon. A typical profile also contains stones, cobbles and coarse fragments throughout.

Partridge Crop soils occur in close association with Channing and Clarke soils. They are similar to Channing soils by having similar drainage and parent material but differ from Channing soils because of their deeper depth of fluvial sediments. Channing soils are underlain by clay within 1 m depth. Partridge Crop soils are more gravelly than Clarke soils. Partridge Crop soils were previously mapped as Clarke soils in the Cormorant Lake report.

Pasquia Series (PQU)

The Pasquia series consists of poorly to very poorly drained, carbonated, Rego Gleysol soils developed on recent alluvium. The topography is level. The vegetation consists of reeds, sedges, willows and some aspen. The Pasquia soils, like the other alluvial types have a thin layer of peat on the surface and have bands of peat within the profile. The solum is moderately calcareous and moderately coarse in texture. Salinity varies between sites and from season to season. This variation is due to rapid changes in the groundwater level. When the water table is low, the salt concentration in the sandy surface layers is quickly lowered through the leaching effects of percolating rain waters. If the water table is kept at a low level, soil salinity would not be a serious problem.

Paulson Series (PUO)

The Paulson series consists of poorly drained Carbonated Rego Gleysol soils developed on weakly to moderately calcareous, moderately fine textured (CL, SiCL), recent alluvial deposits in the Dauphin Lake Plain. Surface textures are usually silty clay to light clay and the soils are stratified with layers ranging from sand to clay in texture. Dark colored layers rich in organic matter are found throughout the profile. Most of the Paulson soils occur in level to depressional areas, along the base of Riding Mountain Escarpment. The surface deposits are very complex in this area and small pockets of alluvium are often impounded behind low ridges of till or gravel. Surface drainage of the Paulson soils is impeded where such ridges lie across the downslope area. In addition, the poor surface drainage of these soils may be worsened by lateral groundwater flow from the Riding Mountain area. Native vegetation on the Paulson soils is willow, balsam poplar, elm, ash, maple and a ground cover of sedges and meadow grasses. The Paulson series is found in complexes with Edwards soils and as minor inclusions associated with the Ochre River series mapping units. A representative profile of this series is described below:

Ah - 0 to 25 cm, very dark brown (10YR 2/2 moist) clay; weak, medium granular; friable when moist, slightly hard when dry; neutral, weakly calcareous; clear, smooth boundary.

Cg - 25 to 50 cm, very dark gray (10YR 3/1 moist) heavy clay; few, weak, fine mottles; structureless; amorphous breaking to weak, fine granular; sticky when wet, firm when moist, hard when dry; neutral; noncalcareous; clear, smooth boundary.

Ckg - 50 to 90 cm; dark olive gray (5Y 3/2 moist) heavy clay; few, common, distinct mottles; structureless; amorphous; sticky when wet, firm when moist, hard when dry; mildly alkaline; strongly calcareous.

Peguis Series (PGU)

The Peguis series consists of imperfectly drained Gleyed Dark Gray Chernozem soils developed on a moderately to strongly calcareous lacustrine clay strata underlain by extremely calcareous loamy glacial till within a metre of the surface. The topography is level to very gently sloping; runoff is moderately slow; permeability is moderately slow in the upper clay strata and moderate to moderately slow in the loamy substrata. The native vegetation consists mainly of aspen, white spruce, hazel, and native grasses.

The soil is characterized by a thin leaf mat 2 to 4 cm, and a dark gray, granular A horizon 3 to 10 cm, and a medium granular dark gray Bt horizon 12 to 25 cm thick, and a gray Ck horizon. An increase in pebble and stone content may be noticeable at the contact of the clay and loamy till strata.

The Peguis, clay till variant, PGU1, has similar profile characteristics as the normal Peguis series, differing from it in the composition and texture of the underlying till. This till consists of a mixture of strongly calcareous clayey and extremely calcareous loamy materials. This till is less compact and less stony than than the extremely calcareous till.

Pelan Series (PLN)

The Pelan series consists of imperfectly drained Gleyed Dark Gray Chernozem soils developed on thin moderately to strongly calcareous, coarse textured (FS, LS, LFS) deltaic or lacustrine deposits overlying stony, extremely calcareous glacial till. The surface texture ranges from loamy fine sand to fine sand. A thin stone lime or pebble layer may be present at the contact of the overlay and the extremely calcareous till. The topography is level to very gently sloping; permeability is moderate in the surface layers and moderately slow in the subsoil; this results in impeded internal drainage and temporary saturation conditions, following the snow melt period or above normal precipitation. Runoff is slow. Native vegetation consists of dominantly aspen with some balsam poplar, dogwood or willow.

The Pelan soils are characterized by a thin partially decomposed leaf mat and a dark gray Ah or Ahe horizon 8 to 15 cm thick and a brown to pale brown B horizon of variable thickness from 15 to 40 cm thick that may have slight accumulation or coatings of clay on the sand grains. The solum usually is developed within the overlay, but where the overlay is shallow, part of the B horizon occurs at the contact of the extremely calcareous till. A thin pebble layer or stone line is common at this contact; mottles of iron are common at or above this contact zone.

The Pelan, clay till variant, PLN1, has similar profile characteristics as the normal Pelan series, differing from it in the composition and texture of the underlying till. This till consists of a mixture of strongly calcareous clayey and extremely calcareous loamy materials. This till is less compact and less stony than than the extremely calcareous till. These soils have a similar solum as the Poppleton series. The Poppleton soils have sandy sediments beyond the metre depth while the Pelan soils have extremely calcareous loamy till within the metre depth. The Pelan soils have a coarser overlay than the Woodmore series; the textures of the Pelan are loamy fine sand to fine sand while the Woodmore are dominantly fine sandy loam to loam textured (Soils of the Rockwood Area, Report D-27).

Pembina Series (PBI)

The Pembina series consists of moderately well to well drained Dark Gray Luvisol soils developed on moderately to very strongly calcareous, deep, uniform, loamy, mixed till deposits. These soils occur in middle to upper positions of hummocky landscape and have moderate permeability rapid surface runoff and a low water table during the growing season. Pembina soils are moderately to severely eroded in upper slope positions, slightly stony and non-saline. They have high available water holding capacity, moderate organic matter content and moderate natural fertility.

In a representative profile the solum is approximately 50 cm thick. The profile is characterized by a dark grayish brown Ah or Ap horizon, 15 to 20 cm thick, a light gray Ae horizon, 5 to 8 cm thick with platy structure, a brown to pale brown, clay loam to silty clay textured Bt horizon 15 to 30 cm thick, a white Cca horizon of lime accumulation and a Ck horizon.

Pembina soils occur in close association with Dezwood, Vandal and Firdale soils. They are similar to Poyser soils by having a luvisolic profile developed in mixed till but differ from them because of an Ah or Ahe horizon more than 5 cm thick in undisturbed profiles. Pembina soils were previously mapped as the well drained, dominant associates of the Pembina association in the reconnaissance soil survey of South-Central Manitoba (1943).

The Pembina series, coarse-loamy (L, SiL, VFSL) substrate variant, PBI1, occurs in close association with typical Pembina soils and differs from them in having light yellowish brown, relatively stone-free, coarse-loamy substrate material within a metre of the soil surface. The Pembina series, sandy-skeletal (LCoS, GrS, LGrS), substrate variant, PBI2, occurs in close association with Pembina soils and differs from them in having sandy-skeletal substrate material of glacio-fluvial origin within a metre of the mineral surface.

Pendennis Series (PDN)

The Pendennis series is the well to moderately well drained, Orthic Black Chernozem member of the Carniege Association developed on thin (25 to 100 cm), weakly to moderately calcareous, coarse textured (FS, LCoS, LS, LFS) lacustrine mantle on glacial till. A substantial coarse textured gravelly layer (5 to 76 cm) occurs at the contact. This soil has a fine sandy loam surface texture, complex gently sloping topography, moderately rapid permeability and moderate surface runoff. The estimated depth to water table is approximately 3 metres. The surface is non-stony and cultivated.

The soil is characterized by black Ap horizons, brown Bm horizons, yellowish brown BC horizons overlying gravelly, pale brown II Ck horizons; and light yellowish brown III Ck horizons with faint iron mottling and staining. The Pendennis series resembles the Chaucer series except that the Pendennis series is underlain by glacial till. Analytical and morphological data are presented below.

Ap - 0 to 15 cm, black to very dark brown (10YR 2/1.5 moist), very dark gray to dark gray (10YR 3.5/1 dry), coarse sandy loam; structureless; very friable when moist; abrupt, smooth boundary; pH 7.5.

Bm - 15 to 30 cm, dark brown to brown (10YR 4/3 moist & dry), fine sandy loam; moderate medium blocky; very friable when moist; abrupt wavy boundary; pH 7.6.

BC - 30 to 38 cm, dark brown (10YR 3/3 moist), yellowish brown (10YR 5/4 dry), very fine sandy loam; moderate medium blocky; very friable when moist; abrupt, wavy boundary; moderately calcareous; pH 7.8.

II Ckgj1 - 38 to 46 cm, pale brown (10YR 6/3 moist), very pale brown (10YR 8/3 dry), few, fine, faint iron mottles; coarse sandy loam (gravel); structureless; loose when moist; clear broken boundary; strongly calcareous, pH 7.9.

II Ckgj2 - 46 to 71 cm, dark brown to brown (7.5YR 4/4 moist), yellowish brown (10YR 5/4 dry), coarse sandy (gravel); few, fine, faint iron and manganese mottles; structureless; loose when moist; clear, wavy boundary; strongly calcareous; pH 8.0.

III Ckgj - 71 to 130 cm, light yellowish brown (2.5Y 6/4 moist), light olive brown to olive yellow (2.5Y 5.5/6 dry), silt loam till; few, fine, faint iron mottles; weak, fine; granular; slightly plastic when wet; clear, smooth boundary; very strongly calcareous; pH 8.0.

Penrith Series (PEN)

The Penrith series is a Humic Luvic Gleysol solum developed on moderately to strongly calcareous, loamy (L, CL) morainal till of limestone, granitic and shale rock origin. These soils are poorly drained and occur in depressional positions of undulating to hummocky landscapes. These soils are ponded for a variable period in the spring and early summer; they usually are free of water in the summer and fall, unless replenished by heavy rains and runoff. Permeability is very slow within the solum and moderately slow in the subsoil. Vegetation consists of sedge and ringed with willow.

The solum of the Penrith series commonly has a moderately to strongly decomposed organic layer, 4 to 8 cm thick, a dark gray to gray Ahe horizon, 6 to 10 cm thick, a light gray, platy Aeg horizon, 6 to 10 cm thick, a dark gray to gray Btg horizon, 35 to 45 cm thick, and a gray transitional BC, 15 to 25 cm thick. The A horizon thickness averages 22 cm and ranges from 5 to 45 cm; the average solum depth is 77 cm and ranges from 30 to 105 cm. These soils differ from the Drokan soils in being more strongly leached and having more distinct and thicker horizons.

Perillo Series (PER)

The Perillo series consists of very poorly drained Terric Mesisol soils developed on a mantle (40 to 160 cm) of moderately decomposed organic, material composed of fen peat over moderately to strongly calcareous, deep, uniform, coarse loamy (L, SiL, VFSL), lacustrine deposits. These soils occur in depressional positions on rolling to hummocky landscapes and have slow permeability very slow surface runoff and a very high water table during the growing season. Perillo soils are occasionally slightly saline. They have a high available water holding capacity, very high organic matter content, and low natural fertility. Native vegetation often includes sedges, reeds, and clumps of willow or swamp birch. The majority of these soils are currently used for natural grazing.

In a representative profile the solum is approximately 50 cm thick. The profile is characterized by a black Om horizon, 5 to 15 cm thick, a black Oh horizon, 20 to 45 cm thick, a black Ah horizon, 15 to 25 cm thick, with a few large iron mottles and a light brownish gray AC horizon 10 to 25 cm thick, with many large prominent iron mottles. The mineral soil parent material is typically light gray in color with numerous prominent mottles and manganese concretions. A typical profile also contains snail shells on the surface and throughout the profile.

Perillo soils occur in association with sloughs, lakes and areas of restricted drainage. They are similar to Tadpole peaty phase soils but differ from them in having an organic surface horizon greater than 40 cm thick to the mineral soil substrate. Perillo soils were previously mapped as meadow or marsh inclusions of many soil associates in the reconnaissance soil survey of South-Central Manitoba (1943).

Petlura Series (PTU)

The Petlura series consists of Gleyed Dark Gray Chernozem soils developed under imperfect drainage on strongly calcareous, loam to clay loam textured glacial till derived from shale, limestone, and granitic rocks. The surface texture is dominantly loam; surface runoff is moderate to slow. Typically, Petlura soils are slightly stony, slightly eroded and occur in lower slope positions of complex topography with slopes in the range of 2 to 5 percent. The majority of these soils are cultivated for annual crop production. Native vegetation, where it exists, consists of aspen, balsam poplar, some willow, herbaceous plants, and grasses.

A typical cultivated soil profile consists of a dark gray, granular Ap or Ahe horizon (average 23 cm thick), a dark grayish-brown to olive-brown Bt to Btgj horizon (average 29 cm thick), with a thin transitional BC horizon or a zone of lime accumulation (Cca horizon) between the Bt horizon and the underlying strongly calcareous parent material Ckgj horizon. Iron mottling is present in all horizons. The presence of iron mottling in the soil profile is indicative of the soil water regimes that have a higher, more persistant moisture status than the associated well drained Erickson soils. On the other hand, these soils have a lower moisture status than the associated poorer drained Roblin and Sinnott soils.

Petrel Series (PTR)

The Petrel series consists of imperfectly drained Gleyed Black Chernozem soils developed on a mantle (25 to 75 cm) of moderately to strongly calcareous, shallow, loamy (VFSL, L, SiL), deposits over moderately calcareous, uniform, deep, sandy (FS, LFS, LS), lacustrine and fluvial deposits. These soils occur in middle positions of very gentle slopes on undulating landscapes and have moderate over moderately rapid permeability, moderately slow surface runoff, and a high water table during the growing season. Petrel soils are non-eroded, non-stony, and occasionally slightly saline. They have medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation includes prairie grasses, shrubs, aspen and oak. The majority of these soils are currently cultivated for crop production.

In a representative profile the solum is approximately 40 cm thick. The profile is characterized by a very dark gray Ah horizon, 18 to 25 cm thick, a brown Bm horizon, 14 to 20 cm thick, a BC horizon, 20 to 30 cm thick with faint mottles and a light yellowish brown Ckgj horizon, with yellowish brown to strong brown mottles. A typical profile also contains a weak Cca in the upper part of the sandy substrate. The PTR1 variant differs from the modal Petrel by having a layer of CL, SICL sediments overlying the sandy materials.

Petrel soils occur in close association with Glenboro, Grover and Grayson soils. They are similar to Torcan soils by having imperfect drainage and a loamy surface but differ from them in having a sandy substrate. Petrel soils were previously mapped as Black Meadow associates of the Glenboro Association in the Carberry (1957) soil report.

Pierson Series (PIS)

The Pierson series is the poorly drained, carbonated, Rego Humic Gleysol member of the George Lake Association, developed on thin (25 to 100 cm), weakly to moderately calcareous, moderately coarse textured (VFS, LVFS, SL, FSL) lacustrine sediments overlying coarse textured (FS, LCoS, LFS) gravelly deltaic beach and outwash deposits. This soil has a loamy very fine sand surface texture, depressional to nearly level topography, moderate permeability and slow surface runoff. Surface ponding and flooding are common on these soils and a water table occurs within 1 m of the surface for most of the growing season.

Pigeon Lake Series (PGK)

The Pigeon Lake series is a Gleyed Cumulic Regosol developed on imperfectly drained, shallow (<1 meter), moderately to strongly calcareous, loamy (SiL, L, SiCL, CL), recent fluvial sediments overlying clayey (SiC, C), lacustrine and fluvial sediments. These soils occur in the western portion of the Red River Plain in proximity to the Assiniboine, Elm, La Salle and Boyne Rivers on level to very gently sloping topography. Pigeon Lake soils are situated in a transition area between deep, loamy, recent fluvial deposits such as La Salle or Gervais soils, and clayey, lacustrine deposits such as the Red River or Scanterbury soils. Surface runoff is moderately slow to slow. Permeability is moderate to moderately slow in the upper loamy sediments, and slow in the clayey sediments. Inundation and periodic flooding are common during periods of rapid or excess snowmelt. Most of these soils have been cultivated. Tall prairie grasses and deciduous trees occur in small, remnant stands of native vegetation.

Pinawa Series (PIW)

The Pinawa series consists of imperfectly drained, Gleyed Gray Luvisol soils developed on moderately coarse to medium textured, very stony, moderately calcareous, glacial till. The topography is gently sloping and the native vegetation consists dominantly of aspen, spruce, and some balsam fir. The Pinawa soils are considerably stonier and more uniform in texture than the similar, clayey textured Mantagao soils or the sandy Caliento soils.

These soils have a thin, medium acid, Ae horizon and a gleyed, moderately well developed Bt horizon grading into a very stony, gleyed and iron stained C horizon.

Pine Dock Series, peaty phase (PDC)

The Pine Dock series consists of poorly drained Rego Gleysol soils, developed on weakly to moderately calcareous, sandy to loamy-skeletal, glacial till. These soils occur in areas of level to depressional topography, and are overlain by 15 to 40 cm of mesic peat. Profile development is limited to a gleyed and strongly mottled Ckg horizon underlying the peat. Surface runoff is slow to very slow. Vegetation consists of Balsam fir, Labrador tea, horsetail, and feathermoss.

Pine Dock, peaty phase, soils often occupy transitional areas between well drained mineral soil upland areas and organic peatlands. These soils occur primarily to the south of Wells Harbour.

Pine Ridge Series (PRG)

The Pine Ridge series consists of well drained Eluviated Eutric Brunisol soils developed on moderately calcareous, sandy, deltaic and lacustrine deposits. Surface textures are loamy fine sand to sand. The topography is very gently sloping to irregular, gently sloping and permeability is rapid. Native vegetation consists dominantly of jack pine.

The Pine Ridge soils are developed on sandy deposits with a very low clay content and consequently, the accumulation of clay in the B horizon is usually very low. Frequently the B horizon is developed in a thin gravel lense comprised of decomposing dolostones

coated with silt and clay. Very often, the B horizon is not continuous. The horizon appears as an Aej and Btj or Bm horizon and the Aej is thick, often extending to 50 cm or more below the surface.

Pine River Series (PIV)

The Pine River series consists of poorly drained Carbonated Rego Gleysol soils devloped on thin (25 to 100 cm), weakly to moderately calcareous, moderately fine textured (SCL, CL, SiCL), alluvial deposits overlying coarse textured (FS, LCoS, LFS) deposits. Surface textures are usually clay loam to light clay; the alluvial deposits are stratified with materials ranging from sand to clay in texture and dark coloured organic bands of former surface horizons. The Pine River soils occur in the Dauphin Lake Plain below the Riding Mountain Escarpment in a few level to depressional areas where the alluvium is shallow and underlain by sandy outwash deposits. Surface runoff is slow and internal drainage is moderately slow in the upper materials and rapid in the underlying sandy materials. The native vegetation is dominantly willow, balsam poplar with some elm, ash and maple and a ground cover of sedges and meadow grasses.

Profile development in this soil is similar to the Paulson soils. The Pine River soils differ from them mainly in the presence of the underlying coarse textured outwash materials. The surface horizons are usually clay loam textured and range in color from very dark gray to gray brown and gray. The stratified Ckg horizon is moderately calcareous and weakly mottled; the underlying sand substrate is strongly gleyed and iron stained.

Pine Valley Series (PVY)

The Pine Valley series consist of imperfectly drained, Gleyed Dark Gray Luvisol soils developed on weakly to moderately calcareous lacustrine clay that may be underlain by till within 75 cm of the surface. Surface textures range from loamy sand to clay because of the inclusion of soils with a thin sandy mantle (< 15 cm thick) over the clay. The topography is smooth to irregular, very gently sloping. Run off and internal drainage are slow. Native vegetation consists mainly of aspen, balsam poplar, white spruce, birch and balsam fir; shrubs, such as willow and dogwood; and dense ground cover of herbs and grasses. The normal Pine Valley soils are stone free. Scattered stones occur on the surface of areas of the till substrate phase but do not seriously hinder cultivation.

The Pine Valley soils are moderately degraded soils characterized by thin Aheg and Aeg horizons, which may occur completely within a very thin sandy outwash mantle, and by a textural B horizon with strongly developed coarse granular to medium subangular blocky structure. The solum is iron stained and slightly acid in the Ahg, Ae and upper part of the B horizon. The lower part of the B horizon is usually mildly alkaline and slightly calcareous. Tongues of dark gray Ahe and Bt material may extend down into the Ckg horizon.

Pine Valley, Till Substrate Phase - Areas of Pine Valley soils where a till substrate occurs within 75 cm of the surface; the depth of clay to the underlying calcareous till varies considerably over short distances. These soils occur in small scattered, level to irregular very gently sloping areas throughout the water-worked till areas of the Whitemouth Lake Plateau. Minor occluded areas are mainly Peguis, Peguis till substrate phase, Pine Valley and Piney soils. A representative virgin profile of Pine Valley clay is described:

Aheg - 0 to 8 cm, dark gray (10YR 4/1 dry), sandy clay loam; moderate, fine granular; friable when moist; soft when dry; slightly acid; clear, irregular, lower boundary.

Aeg - 8 to 15 cm, light gray (10YR 6/1 dry), fine sandy loam; moderate, fine platy; friable when moist; soft when dry; neutral; flecked with iron stains; clear, smooth, lower boundary.

BAg - 15 to 20 cm, grayish brown (10YR 5/'2 dry), sandy clay; moderate, coarse granular; friable when moist; slightly hard when dry; neutral; flecked with iron stains; clear, wavy, lower boundary.

Btg1 - 20 to 33 cm, very dark grayish brown (10YR3/2 dry), clay; moderate, medium subangular blocky; very firm when moist; very hard when dry; neutral; flecked with iron stains; clear, wavy, lower boundary.

Btg2 - 33 to 43 cm, dark grayish brown (2.5Y 4/2 dry), clay; moderate, fine subangular blocky; very firm when moist; very hard when dry; mildly alkaline and slightly calcareous; iron stained; gradual, wavy, lower boundary.

Ckg - 43 to 60 cm, light brownish gray (2.5Y 6/2 dry), clay; massive breaking to weak, coarse granular; very firm when moist; very hard when dry; moderately alkaline and calcareous; flecked with iron stains and contains numerous concretions of lime carbonate.

Pineimuta Series (PMU)

The Pineimuta series consists of poorly drained, carbonated Rego Humic Gleysol soils developed on thin, strongly calcareous, moderately fine textured (SCL, CL, SiCL) sediments over extremely calcareous loamy till. The surface textures range from loam to silty clay. Topography is level to depressional; runoff is slow; and permeability is moderately slow, usually impeded by a high water table. The native vegetation consists of sedges, reed grasses and willow.

The Pineimuta soil is characterized by a black to very dark gray, friable carbonated Ah horizon 10 to 25 cm thick and a thin transitional gray to light gray AC horizon; the light gray to white Ckg horizon is stratified with layers of silt loam to silty clay loam sediments. Extremely calcareous, loamy glacial till usually occurs at 50 to 75 cm depth; a thin water-modified pebble line may occur at the surface of the till. The solum is similar in physical and chemical characteristics as the Balmoral series.

L-H - 5 to 0 cm, black (5YR 2/1 dry), leaf mat, partially to well decomposed leaf and shrubs; neutral reaction.

Ahegj - 0 to 5 cm, very dark gray (10YR 3/1 dry) with dark gray (10YR 4/1 dry) blotches, clay; few, medium, distinct mottles; moderate, medium granular; firm when moist, hard when dry; slightly acid; clear, smooth boundary.

Btjgj - 5 to 15 cm, dark gray (10YR 4/1 dry), clay; few, medium distinct dark brown mottles; strong, medium granular; firm when moist, hard when dry; neutral, abrupt, wavy boundary.

BC - 15 to 20 cm, gray (10YR 5/1 dry), clay; moderate, medium granular; firm when moist, hard when dry; mildly alkaline; strongly calcareous; clear, irregular boundary.

Ckg1 - 20 to 60 cm, gray (5Y 6/1 dry), clay; moderate, medium pseudogranular; firm when moist, hard when dry; mildly alkaline; strongly calcareous; separated by an abrupt, irregular boundary.

Ckg2 - pockets of white (2.5Y 8/2 dry), silty clay loam; moderately, fine pseudogranular; friable when moist, very hard when dry; strongly cemented when dry; extremely calcareous.

Piney Series (PIY)

The Piney Series consists of imperfectly drained, Gleyed Gray Luvisol soils developed on strongly calcareous glacial till and waterworked till. Surface texture varies from fine sandy loam to clay because of the inclusion of soils with a very thin lacustrine mantle less than 15 cm thick. They occur on low, broad ridges with a smooth, level surface where run-off is slow and internal drainage is moderate to slow. The native vegetation is dominantly aspen with an association of some balsam poplar; shrubs such as dogwood, rose, raspberry and brush-honeysuckle; and a ground cover of northern bedstraw, wild pea, coltsfoot, aster, poison ivy, strawberry, bunchberry, and several species of grass.

In the virgin condition Piney soils are characterized by a thin Aeg horizon overlying a thin, moderately developed textural B horizon that grades abruptly into stony, strongly calcareous till. These soils, with a solum generally less than 20 cm thick, when cultivated have a plow layer consisting of a mixture of A and B horizons; and in some sites the layer may include some calcareous material from the C horizon.

Pipestone Series (PPT)

The Pipestone series is the imperfectly drained, carbonated, Gleyed Rego Black Chernozem member of the Pipestone Association, developed on deep (> 100 cm), weakly to moderately calcareous, fine textured (SiC, C) lacustrine and alluvial sediments. These soils have nearly level topography, light clay surface texture, very slow permeability and slow surface runoff. This soil has an estimated depth to water table of 2 to 3 metres. These soils are usually cultivated and produce excellent crops. Weak to moderate salinity may be present in some areas.

The Pipestone, sand substrate variant, PPT1, differs from the modal Pipestone by having sandy sediments, commonly occuring at 75 to 100cm below the surface.

Pipun Series (PPU)

The Pipun series consists of moderately well drained Orthic Gray Luvisol soils developed on a mantle (30 to 75 cm) of moderately to strongly calcareous, clayey lacustrine sediments overlying very strongly calcareous, fine silty and fine loamy lacustrine deposits. These soils occur in the middle to upper slope positions of gently to moderately sloping, undulating blanket landscapes. They have moderate permeability, slow surface runoff and a low water table during the growing season. Pipun soils are non-eroded, non-stony and non-saline. They have high available water holding capacity and low organic matter content. Native vegetation includes black spruce, jack pine and trembling aspen with alder in the understory. Ground cover is dominantly feathermosses with some herbs and ericaceous shrubs. The majority of these soils are currently under forest cover. These soils occur in association with Wabowden and Sipiwesk soils.

In a representative profile the solum is approximately 40 cm thick. The profile is characterized by a medium acidic, moderately decomposed LFH horizon, 6 to 15 cm thick, with medium fibered remains of mosses and leaves; a very strongly acidic, clay Ae horizon, 4 to 6 cm thick; a very strongly acidic, clay Bt horizon, 25 to 30 cm thick; a strongly acidic, a strongly calcareous, silty clay Ck1 horizon, 30 to 35 cm thick; and a very strongly calcareous, silt loam Ck2 horizon. The parent material is typically laminated (varved) with increasingly thicker silt layers with depth. The transition from clay to loam is usually gradual.

Plainview Series (PVW)

The Plainview series consist of imperfectly drained, Gleyed Rego Black Chernozem soils developed moderately calcareous (6 to 15 % $CaCO_3$), fine textured (SiC, C) lacustrine deposits. Surface textures are dominantly clay. The topography is level to very gently sloping with slow to medium runoff and slow permeability. Stones are present only in areas where the till is close to the surface. Native vegetation includes aspen with balsam poplar and willow.

The solum consists of Ah and AC horizons to a depth of 25 to 40 cm. These horizons are underlain by moderately calcareous (6 to 15 % CaCO3) lacustrine clay that, in turn, is underlain by strongly calcareous (16 to 25 % CaCO3), moderately fine (SCL, CL, SiCL) textured till.

L-H - 5 to 0 cm, very dark grayish brown (10YR 3/2, dry), leaf mat; neutral.

Ah - 0 to 15 cm, very dark gray (10YR 3/1, dry), clay; column-like macro-structure breaking into medium granular aggregates; very hard when dry; mildly alkaline.

AC - 15 to 30 cm, dark gray (10YR 4/1, dry), clay; medium granular; very hard when dry; weakly calcareous; mildly alkaline.

Ckgj1 - 30 to 50 cm, grayish brown (10YR 5/2, dry), clay; fine pseudo-granular; hard when dry; moderately calcareous; iron stained; moderately alkaline.

Ckgj2 - 50 to 100 cm, dark grayish brown (10YR 4/2, dry), clay; fine pseudo-granular; hard when dry; moderately calcareous; iron stained; moderately alkaline.

Pleasant Series (PLE)

The Pleasant series consists of imperfectly drained Gleyed Rego Black Chernozem soils developed on moderately to strongly calcareous, deep, uniform, coarse loamy (VFS, LVFS, FSL), lacustrine and fluvial deposits. These soils occur in middle positions of irregular to undulating landscapes and have moderate permeability, moderately slow surface runoff, and a high water table during the growing season. Pleasant soils are non-eroded, non-stony, and frequently slightly saline. They have a medium available water holding capacity, high organic matter content, and high natural fertility. Native vegetation includes tall prairie grasses, prairie-meadow grasses, shrubs and aspen-oak groves. The majority of these soils are currently cultivated for crop production.

In a representative profile the solum is approximately 20 cm thick. The profile is characterized by a very dark gray Ah horizon, 15 to 25 cm thick, a dark grayish brown AC horizon, 6 to 10 cm thick, a Cca horizon, 10 to 15 cm thick and a light olive brown Ckgj horizon, with yellowish brown mottles. A typical profile also contains gypsum crystals below the Cca horizon.

Pleasant soils occur in close asociation with Prosser, Gateside and Poolex soils. They are similar to Taggart soils by having an imperfectly drained Gleyed Rego Black Chernozem profile but differ from them in having coarse loamy rather than loamy deposits. Pleasant soils were previously mapped as Black Meadow associates of the Holland Association in the Carberry (1957) soil report.

Plum Coulee Series (PME)

The Plum Coulee series is a Gleyed Black Chernozem soil developed on imperfectly drained, moderately calcareous, stratified, clayey (SiC, C), fluvial and lacustrine sediments. These soils occur in the western part of the Red River Plain on level to very gently sloping topography, in association with Winkler and Deadhorse soils. Surface runoff is moderately slow, and permeability is slow. Most of these soils are used for crop production. Native vegetation consists of tall prairie and prairie-meadow grasses.

The Plum Coulee soil profile has a firm to friable, very dark Ah horizon, 13 to 25 cm thick; a dark gray to dark grayish brown Bmgj horizon, 15 to 30 cm thick with compound weak, medium prismatic and moderate, medium granular structure. Faint mottles are apparent in the lower B horizon and are more noticeable with increasing depth. The mottled Ckgj horizon is usually stratified (C, SiC, SiCL) with dominantly clay textures. Gypsum crystals also occur in the Ckgj horizon. This soil differs from the very similar Deadhorse soil in having a prominent Bmgj horizon.

The Plum Coulee, clay loam variant, PME1, has similar profile characteristics as the normal Plum Coulee series, differing from it by having a surface layer which is a clay loam instead of a clay texture. Plum Coulee soils occur in association with the Winkler and Deadhorse series. They were mapped as the Blackearth-Meadow associate of the Horndean Complex in the Winnipeg-Morris (1953) report.

Plum Creek Series (PUE)

The Plum Creek series is the imperfectly drained, Gleyed Regosol member of the Lyleton Association, developed on deep (> 100 cm), moderately calcareous, coarse to moderately coarse textured (FS, LS, LFS to VFS, LVFS, FSL) lacustrine sediments. This soil has a loamy very fine sand surface texture, gently undulating topography, moderate permeability and slow surface runoff. The estimated depth to water table during the growing season is 1.5 to 2 metres. Deposition of eroded material may be common on these soils under cultivation.

Plum Lake Series (PAK)

The Plum Lake series is the poorly drained, Rego Humic Gleysol, carbonated member of the Lyleton Association, developed on deep moderately calcareous, coarse loamy lacustrine sediments. A water table within 1 m of ground level occurs throughout most of the year. They have a loamy very fine sand surface texture and occur in depressional areas. They have moderately good permeability but no surface runoff, and surface ponding or flooding is a common occurrence in the spring and after heavy summer rains. Some of these soils may be saline.

Plum Ridge Series (PMG)

The Plum Ridge series is a carbonated, Gleyed Rego Black Chernozem soil developed on imperfectly drained, very strongly to extremely calcareous, dominantly coarse loamy (VFSL, L, SiL) lacustrine sediments. These soils occur on level to very gently sloping topography, in the Red River Valley physiographic region associated with the poorly drained, Wentland soils. Surface runoff is slow, and soil permeability is moderate but may be impeded by a high water table. In areas where the groundwater contains high salt concentrations, sufficient soluble salt can be present in the profile to interfere with plant growth. Tall-prairie grasses with scattered groves of aspen, black poplar and willow once indigenous to Plum Ridge soils have been mostly replaced by cultivated fields.

The Plum Ridge soil profile has a very dark gray to black, Apk or Ahk horizon, 10 to 15 cm thick, separated by a transitional AC horizon, 20 to 30 cm thick, from an extremely calcareous, very pale brown to white Ck horizon. Iron mottling begins in the AC horizon and becomes prominent in the Ckgj horizon. This soil differs from the very similar Reinland soils in having a very strongly to extremely calcareous horizon in the soil profile. Plum Ridge soils are finer textured and less rapidly permeable than the similar Willowcrest and Almasippi soils, and in turn, are coarser textured and more rapidly permeable than Neuenberg soils. These soils have a moderate agricultural limitation due to moderate surface and internal drainage problems.

Plumas Series (PUS)

The Plumas series consists of carbonated, Gleyed Rego Black Chernozem soils developed on thin (25 to 100 cm), very strongly to extremely calcareous, medium textured (VFSL, L, SiL) sediments grading into coarse textured (FS, LS, LFS) sediments with increasing depth. Surface textures range from very fine sandy loam to silt loam. The upper medium textured sediments grade into very fine sand to fine sand sediments usually within 1 m of the surface. These soils are dominantly imperfectly drained and occur in areas of level to very gently sloping topography. Runoff is slow but internal soil permeability is moderate in the surface materials and rapid in the underlying sand substrate. Native vegetation is dominantly semi-open stands of aspen and balsam poplar with an understory of grasses, meadow grasses and willow. Most of the Plumas soils have been cleared and are now cultivated.

Profile characteristics in the upper portion of the Plumas soils are similar to the Plum Ridge, Glenella and Glenhope soils. Development of these soils has been strongly influenced by both the high lime content of the parent material and the imperfect drainage. A thin, very dark gray to black cultivated Ap horizon is usually separated by a transitional AC horizon from the very pale brown to white, mottled and weakly iron stained Ckgj horizon. All of the horizons are calcareous and the surface colors of the Plumas soils become light gray to gray on drying due to the presence of carbonates. The Plumas soils correlate with portions of the Lakeland loam association as described in the Westlake and Grandview Soil Map Areas (Soil Reports No. 8 and 9).

Poolex Series (POX)

The Poolex series consists of poorly drained Rego Humic Gleysol soils developed on moderately to strongly calcareous, deep, uniform, coarse loamy (VFS, LVFS, FSL, SL) lacustrine and fluvial deposits. These soils occur in level to depressional positions on undulating landscapes and have moderate permeability, slow surface runoff, and a high to ponded water table during the growing season. Poolex soils are non-eroded, non-stony, and often slightly saline. They have a medium available water holding capacity, medium organic matter content, and low natural fertility. Native vegetation includes sedges, rushes, seeds and willows. The majority of these soils are currently in native vegetation.

In a representative profile the solum is approximately 20 cm thick. The profile is characterized by a moderately decomposed organic horizon, 1 to 4 cm thick, a very dark gray Ah horizon, 15 to 22 cm thick, an olive gray to gray AC horizon, 6 to 12 cm thick, moderately calcareous and a Cca horizon, 10 to 15 cm thick. The parent material is typically olive brown to pale olive with yellowish brown mottles.

Poolex soils occur in close association with Porple, Pleasant and Gateside soils. They are similar to Vordas soils by having a poorly drained profile in loamy deposits but differ from them by having slightly coarser textures. Poolex soils were previously mapped as Meadow associates of the Poolex Association in the Carberry (1957) soil report.

Poplar Point Series (PPR)

The Poplar Point series consists of imperfectly drained Gleyed Cumulic Regosol soils developed on weakly to moderately calcareous, deep, stratified loamy (L, SiL, SiCL, CL), recent fluvial deposits. These soils occur in middle positions of very gentle slopes on flood prone terrace, levee and meander landscapes and have moderate permeability, slow surface runoff, and a high water table during the growing season. Poplar Point soils are slightly water eroded, non-stony, and often slightly saline. They have a medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation includes deciduous trees and prairie grasses. The majority of these soils are currently cultivated for crop production.

In a representative profile the solum is not developed. The profile is characterized by a very weak Ah or Ap horizon, 10 to 20 cm thick, and a slightly lighter Ck horizon with distinct iron mottles. Poplar Point soils occur in close association with Elm River and Willowbend soils. They are similar to Gervais soils by having Gleyed Cumulic Regosol profile in loamy alluvium but differ from them by having no distinct A horizon. Poplar Point soils were previously mapped as inclusions of the Assiniboine Complex in the Carberry (1957) soil report.

Poppleton Series (PPL)

The Poppleton series consists of imperfectly drained Gleyed Dark Gray Chernozem soils developed on moderately to strongly calcareous, coarse textured (FS, LS, LFS) deltaic and lacustrine deposits. The surface texture is fine sand to loamy fine sand. The topography is level to very gently sloping; runoff is moderately slow and permeability is moderately rapid in the surface, but decreases with depth because of the influence of a capillary fringe above a water table. The native vegetation consists dominantly of aspen with some balsam poplar, dogwood or willow.

The Poppleton soil is characterized by a partially decomposed leaf mat 5 to 12 cm thick, a dark gray to gray Ahe horizon 7 to 12 cm thick; a pale brown B horizon that may have slight accumulation or coating of clay on the sand grains. Iron mottles are common in the lower B horizon, generally increasing in size and abundance with depth. Extremely calcareous, loamy glacial till may occur immediately below the metre depth; some small areas of Pelan soils may be present in areas mapped as Poppleton.

Porple Series (POR)

The Porple series is a Rego Black Chernozem soil developed on moderately well to well drained, moderately to strongly calcareous, coarse loamy (VFS, LVFS, FSL, SL), fluvial and lacustrine sediments. These soils occur on the upper slope positions of gently undulating topography associated with Prosser and Pleasant soils. Surface runoff is moderately rapid, and permeability is moderate to moderately rapid. These soils have had some erosion and susceptible to both wind or water erosion if not protected. Included with this series are some of the moderately eroded Prosser soils.

The Porple series is characterized by a very dark gray Ap and Ah horizon 15 to 20 cm thick and a calcareous AC horizon 8 to 15 cm thick. A layer of lime carbonate accumulation (Cca horizon) may be present. This soil differs from the similar Prosser soils in not having a prominent Bm horizon. Porple soils are finer textured and less permeable than the sandy Stockton soils, and in turn, are coarser textured and more permeable than the very similar loamy textured Durnan and Fairland soils.

Pouchal Series (POU)

The Pouchal series is characterized by a Humic Luvic Gleysol profile developed under poorly drained conditions on moderately to very strongly calcareous loamy (L, CL, SiCL) glacial till of shale, limestone and granitic origin. The soils occur in depressional positions of undulating to hummocky landscapes in association with Dark Gray Chernozem, Dezwood and the Luvisolic, Pembina Associations. A variable depth of inwash material is usually present in the surface due to erosion from the upper slopes, particularly in cultivated areas. Runoff is negligible except when drainage has been improved, permeability is moderately slow. These soils are saturated for most of the spring and early summer. Vegetation consists of sedges and ringed with willow. Many areas have been cleared and now are used for hay or pasture. The Pouchal soil has a dark gray Ah (Ap) horizon 10 to 15 cm thick, a gray to light gray loam Aeg horizon 5 to 8 cm thick, a clay Btg 25 to 35 cm thick, and a thin transitional BC to the Ckg parent till material.

Poyser Series (PYR)

The Poyser series consists of well drained Orthic Gray Luvisol soils developed on moderately to strongly calcareous, deep, uniform, fine to coarse loamy (L, CL, SiCL) mixed till deposits. These soils occur in upper slope and crest positions on hummocky landscapes and have moderate permeability rapid surface runoff and a low water table during the growing season. Poyser soils are moderately eroded, moderately stony and non-saline. They have medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes tall prairie grasses interspersed with aspen-oak groves. The majority of these soils are currently used for crop production.

In a representative profile the solum is approximately 50 cm thick. The profile is characterized by a gray Ap or Ah horizon, 10 to 20 cm thick, a light grayish brown Ae horizon, 5 to 10 cm thick with thin platy structure, a dark brown transitional AB horizon, 10 to 15 cm thick and a dark brown Bt horizon 15 to 20 cm thick with thick clay skins. The parent material is typically yellowish brown calcareous till. Poyser soils are similar to Nayler soils by having a well drained Dark Gray Luvisol profile developed in fine loamy till deposits but differ from them in having been developed in mixed till rather than dominantly shaly till. Poyser soils were previously mapped as gray-wooded associates of the Pembina association in the reconnaissance soil survey of South-Central Manitoba (1943).

The Poyser series, coarse-loamy (L, SIL, VFSL) substrate variant, PYR1, occurs in close association with typical Poyser soils and differs by having a light yellowish brown relatively stone-free, coarse-loamy substrate material within a metre of the mineral surface. The Poyser series, sandy-skeletal (LCoS, GrS, LGrS) substrate variant, PYR2, occurs in close association with Poyser soils and differs by having sandy-skeletal substrate material of glacio-fluvial origin within a metre of the mineral surface.

Prawda Series (PRA)

The Prawda series consists of poorly drained, carbonated, Rego Humic Gleysol soils developed on moderately to strongly calcareous, sandy, deltaic and lacustrine sediments, which are underlain by weakly calcareous clayey lacustrine deposits. The surface texture ranges from loamy fine sand to fine sand. The topography is depressional, level to very gently sloping. The drainage

is poor due to a lack of runoff, a perched water table or lateral seepage. A clay substrate makes these soils differ from the Malonton series. Vegetation consists of sedges, reed grasses, balsam poplar, trembling aspen, willow and dogwood.

This soil can have a 0 to 15 cm peat surface, and a very dark gray carbonated Ah horizon (15 to 20 cm thick), and a gray carbonated AC horizon. Prominent yellowish brown iron mottles are present. When 15 to 40 cm of peat surface occurs, the soil is called a peaty phase of the Prawda series.

Prodan Series (PDA)

The Prodan series is a Gleyed Rego Black Chernozem, carbonated soil developed on imperfectly drained, strongly to very strongly calcareous, fine loamy (CL, SiCL), lacustrine sediments. These soils occur in the Upper Assiniboine Delta and Brandon Lakes Plain on gently sloping topography in association with Ramada, Charman, Carroll and Tadpole soils. Surface runoff is moderately slow, and permeability is moderate to moderately slow. A seasonal water table frequently occurs within 70 cm of the surface.

The Prodan soil profile has a very dark gray Ah horizon, 18 to 25 cm thick; a dark gray to gray AC horizon, 8 to 15 cm thick, and a Cca horizon. The Ckgj horizon is light brownish gray with yellowish brown mottles. This soil differs from the similar Charman series in not having a prominent Bmgj horizon. Prodan soils are finer textured and less permeable than the similar loamy textured Taggart and Torcan soils. The very similar Capell soils have coarse, sandy and gravelly textured subsoils that are very rapidly permeable. Prodan soils were previously mapped as Black Meadow associates of the Holland Association in the reconnaissance soil survey of South-Central Manitoba (1943).

Prosser Series (PSE)

The Prosser series is an Orthic Black Chernozem soil developed on moderately well to well drained, moderately to strongly calcareous, coarse loamy (VFS, LVFS, FSL, SL), lacustrine sediments. These soils occur in the Upper Assiniboine Delta and Brandon Lakes Plain in association with Porple, Gateside, Pleasant and Poolex soils, on mid and upper slopes of undulating to gently rolling topography. Surface runoff is moderate to rapid, and permeability is moderate to moderately rapid.

The Prosser soil profile has a very dark gray Ah horizon, 18 to 25 cm thick; a dark brown to brown Bm horizon, 12 to 20 cm thick; a pale brown BCk horizon, and usually a Cca horizon, 12 to 18 cm thick. This soil differs from the similar Porple series in having a prominent Bm horizon. The coarse loamy Prosser soils are somewhat finer textured and less permeable than the sandy Stockton and Cactus soils, and in turn, are coarser textured and more permeable than the similar loamy textured Fairland and Durnan soils. The Prosser, fine loamy variant, PSE1, is found in association with the normal Prosser soils. It differs from the normal Prosser by having a finer textured (clay loam to silty clay loam) soil at or within a 1 metre depth.

Proven Lake Series (PVK)

The Proven Lake series consists of Rego Humic Gleysol soils developed under poorly to very poorly drained conditions on deep, moderately calcareous, loam to silty loam textured glacio-lacustrine sediments. The topography is generally depressional or gently sloping with poorly drained conditions due to seepage. Native vegetation consists of both black spruce and feathermoss, or more open stands of balsam poplar with sedges and meadow grasses.

The soil profile consists of a mesic peat surface layer, a thin dark gray to black Ah horizon, grading through a thin transitional AC horizon to a strongly mottled, light colored Ckg horizon. In some sites, the peaty layer may be thicker, ranging from 15 to 40 cm, and is designated as a peaty phase. Proven Lake soils occur in transitional areas where till, outwash, and glaciolacustrine sediments occur in close conjunction.

Punk Series (PUK)

The Punk series consists of well drained, Eluviated Eutric Brunisol soils developed on 20 to 100 cm of weakly to moderately calcareous, sandy deposits overlying limestone bedrock. The sandy parent material has a high permeability, so that most moisture percolates downwards through the soil, with little surface runoff. The low clay content of the parent material does not permit development of illuvial Bt horizons, and consequently these soils are classified as Brunisols. The topography is usually gently sloping to ridged, as the Punk soils are developed from shallow beach deposits associated with the final stages of Lake Agassiz. These beaches occur at the crest of bedrock escarpments and vegetation is dominantly Balsam fir, birch, and aspen.

Rackham Series (RKH)

The Rackham series consists of moderately well to well drained Orthic Gray Luvisol soils developed on deep, moderately to strongly calcareous, loam to silty clay loam textured glacio-lacustrine sediments. The landscape varies from gently to moderately sloping. Runoff and infiltration is moderately rapid. Native vegetation is a mixture of aspen, white spruce and birch, with an understory of hazel, rose, and dogwood.

The Rackham soil profile is characterized by a partially decomposed leaf mat about 5 cm thick, a light gray, very fine sandy loam textured Ae horizon, 5 to 15 cm thick, which grades into a well developed clay textured Bt horizon. The Bt horizon is blocky

structured, dark brown in color, and ranges in thickness from 20 to 30 cm. This is underlain by a transitional BC horizon and a light colored, moderately calcareous, silt loam to silty clay loam textured Ck horizon. Non-pedogenic layers of variable texture are common within Rackham parent materials. Rackham soils occur in several localities in the Wellman-Glad Lake area, often bordering on sandy glaciofluvial and clayey glaciolacustrine sediments of the Copernicus complex and Blackstone series, respectively.

Ralston Series (RTO)

The Ralston series is the imperfectly drained, Gleyed Regosol member of the Grande Clairiere Association, developed on deep, weakly to noncalcareous, sandy eolian deposits. This soil has a fine sand surface texture, rapid permeability, no surface runoff and occurs in lower slope and depressional positions of undulating duned topography. The drainage is imperfect and the water table occurs within 3 m of the surface. The vegetation consists of poplar, aspen, rose bushes, willows, saskatoons and various shrubs. These soils have a weakly developed Ah horizon and have been stabilized for 30 to 60 years as is indicated by the tree growth. Occasionally, these soils are cultivated but most are used for grazing. Many Ralston soils have a dark gray to black band 5 to 10 cm thick, containing iron and manganese concretions within 1 m of the surface. This layer appears to affect the moisture regime of this soil because it is less permeable than the soil above and below.

This soil is characterized by partially decomposed L-H horizons 5 to 10 cm thick, gray to dark gray Ah horizons 5 to 20 cm thick, pale brown Cgj horizons and commonly a grayish brown to brown band 30 to 60 cm thick containing abundant iron and manganese concretions, mottles and stains.

Ramada Series (RAM)

The Ramada series is an Orthic Black Chernozem soil developed on well to moderately well drained, strongly to very strongly calcareous, fine loamy (CL, SiCL), lacustrine sediments. These soils occur in the Upper Assiniboine Delta, and Brandon Lakes Plain on very gently sloping topography or on mid and upper slope positions of undulating topography associated with Barren, Carroll, Charman, Prodan and Tadpole soils. Surface runoff is moderately rapid, and permeability is moderate to moderately slow.

The Ramada soil profile has a very dark gray Ah horizon, 10 to 20 cm thick; a dark grayish brown to brown Bm horizon, 8 to 12 cm thick, and a BC horizon, 6 to 10 cm thick. A Cca horizon is usually present. The Ck horizon is pale brown to light yellowish brown. This soil differs slightly from the Carroll soil in having a prominent Bm horizon. Ramada soils are finer textured and less permeable than the similar coarser textured, loamy Fairland soils, as well as, the Croyon and Zarnet soils which have coarse sandy and gravelly textured subsurface layers and very rapid permeability. Ramada soils were previously mapped as the dominant associate of the Holland Association in the reconnaissance soil survey of South-Central Manitoba (1943).

Rat Lake Series (RTK)

The Rat Lake series consists of well drained Solonetzic Gray Luvisol soils developed on weakly calcareous, shallow (< 1 m) clayey textured lacustrine deposits over a strata of sandy, neutral to acidic, igneous till over granitic bedrock. These soils occur in areas of moderately sloping (9 to 15 %) topography and have slow permeability and moderate surface runoff. The vegetation is a mixture of trembling aspen and shrubs. A description of a representative profile is provided.

LFH - 12 to 0 cm, black (10YR 2/1 moist), moderately porous; clear, smooth boundary; slightly acidic.

Ahe - 0 to 4 cm, black to very dark gray (10YR 2.5/1 moist), silty clay loam; weak, fine, granular structure; very friable when moist; many horizontal, inped roots; moderately porous, many, fine, random, exped pores; clear, smooth boundary; strongly acidic.

Ae - 4 to 10 cm, dark grayish brown to gray (10YR 4/2 moist, 10YR 6/1 dry), heavy clay; moderate, medium, subangular blocky structure; friable when moist; many horizontal, inped roots; moderately porous, many, fine, random, exped pores; clear, broken boundary; very strongly acidic.

AB - 10 to 18 cm, very dark grayish brown (10YR 3/2 moist), heavy clay; moderate, medium, subangular blocky structure; friable when moist; many, fine, vertical, inped roots; moderately porous, common, fine, vertical, exped pores; clear, wavy boundary; very strongly acidic.

Btnj1 - 18 to 40 cm, very dark grayish brown (10YR 3/2 moist), heavy clay; weak, medium, prismatic structure; firm when moist; few, coarse, oblique, inped roots; moderately porous, few, medium, vertical, exped pores; diffuse, wavy boundary; extremely acidic.

Btnj2 - 40 to 62 cm, very dark grayish brown (10YR 3/2 moist), heavy clay; weak, medium, prismatic structure; firm when moist; few, medium, vertical, exped roots; moderately porous, few, medium, vertical, exped pores; abrupt, wavy boundary; extremely acidic.

2 C - 62 to 65 cm, brown (10YR 4.5/3 moist), loam; 50 % coarse fragments; few, coarse, prominent mottles (7.5YR 5/8 moist); weak, medium, platy structure; non plastic; very few, fine, vertical, exped roots; moderately porous, few, very fine, random, inped pores; abrupt, irregular boundary; extremely acidic.

R - 65 to 100 cm, igneous bedrock.

Rat River Series (RTV)

The Rat River series consists of poorly drained Terric Mesisol soils developed on shallow (40 to 160 cm) deposits of mesic forest peat underlain by coarse to moderately coarse textured (FS, LS, LFS, LVFS, FSL) lacustrine sediments. The organic portion has a very thin (<15 cm) fibric moss peat layer, and underlain by dominantly mesic grading into humic forest peat. The mesic forest peat is very dark brown, slightly acid to neutral, fine fibered, sticky material layered with variable amounts of woody debris. This layer grades into black, highly decomposed peat which may be of fen or forest origin. The native vegetation consists of productive stands of black spruce with some tamarack and understory of Labrador Tea, and feathermosses. Sphagnum moss is of limited occurrence being found as small raised hummocks.

Rathwell Series (RWL)

The Rathwell series consists of imperfectly drained Gleyed Black Chernozem soils developed on strongly calcareous, deep, uniform, fine loamy (CL, SiCL) lacustrine sediments. These soils occur in middle positions of level to undulating landscapes and have moderate to moderately slow permeability, moderate surface runoff, and a high water table during the growing season. Rathwell soils are non-eroded, non-stony, and often slightly saline. They have medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation includes prairie grasses, prairie-meadow grasses, deciduous trees and shrubs. The majority of these soils are used for crop production.

In a representative profile the solum is approximately 50 cm thick. The profile is characterized by a very dark gray to black Ap or Ah horizon, 20 to 30 cm thick, a brown Bmgj horizon, 15 to 20 cm thick with distinct mottles, a transitional BC horizon, 8 to 12 cm thick and a Ckgj horizon, with many distinct mottles. Rathwell soils occur in close association with Eigenhof and Neuhorst soils. They are similar to Rignold soils by having imperfect drainage and loamy surface deposits but differ by having no clayey substrate. Rathwell soils were previously mapped as Black Meadow associates of the Rathwell Association in the Carberry (1957) soil report.

Reaper Series (RPR)

The Reaper series is the well drained, Orthic Black Chernozem member of the Reaper Association, developed on thin (< 100 cm), moderately to strongly calcareous, coarse textured (FS, LCoS, LFS) glacial material overlying unconsolidated coarse textured (FS, LCoS, LFS) Boissevain sandstone. These soils usually have sandy loam surface textures, complex gently sloping topography, moderate permeability, and moderate surface runoff. Under cultivation, Reaper soils are moderately susceptible to erosion by wind and water, and in many cases, much of the Ah horizon has been removed, to the extent that the B horizon comprises a high proportion of the tilled layer. Reaper soils usually occur on the upper slope and knoll position.

Rebecca Series (RCC)

The Rebecca series is the poorly drained, saline, carbonated Rego Humic Gleysol member of the Whitewater Association, developed on deep (> 100 cm), strongly calcareous, moderately fine to fine textured (SCL, CL SiCL to SiC, C) saline lacustrine sediments. These soils occur primarily in the vicinity of Whitewater Lake. This soil has level to depressional topography, slow permeability and no surface runoff. The water table is within 1 metre of the surface during most of the growing season. The native vegetation consists of foxtail, sour dock, sow thistle, various species of salt tolerant slough grass and some species of ground moss. The subsoil may contain small stones but it is more common to find large gypsum rosettes at depths up to 5 metres. Some Rebecca soils are used for pasture, but it soon deteriorates with massive infestations of wild foxtail. Some are used for native hay production particularly around the west end of Whitewater Lake.

Rebecca soils are characterized by very dark gray Ahsg horizons, dark gray to gray AC horizons and gray Cskg horizons. Some of these soils may have thin (5 to 13 cm) layers of light gray calcareous sandy material on the surface which are probably beach sand deposits resulting from water and wave erosion. The Ah below this sand cracks during dry conditions and has very coarse prismatic structure similar to solonetzic soils. Areas of Rebecca soils are closely associated with the slightly better drained Whitewater soils and Verner Lake soils which have much deeper overlying sand and gravel surface deposits. Most of the water ponded on Rebecca soils is lost by evaporation and evapotranspiration rather than by surface runoff. Rebecca soils are frequently flooded in the spring, after heavy rains and in some cases, when strong winds blow the waters from Whitewater Lake onto these level soils. Analytical and morphological data for a representative profile are presented below.

L-H - 5 to 0 cm, abrupt, smooth boundary; weakly calcareous; pH 7.6.

Ahk - 0 to 5 cm, dark gray (10YR 4/1 moist), gray (10YR 5/5.1 dry), clay loam; massive; hard, dry; abrupt, smooth boundary; strongly calcareous; pH 8.1.

Ahskg - 5 to 28 cm, very dark gray (10YR 3/1 moist), gray (10YR 5/1 dry), clay; weak, coarse prismatic breaking to strong medium granular; friable when moist, hard when dry; gradual, wavy boundary; strongly calcareous; weakly saline; pH 8.4.

AC - 28 to 46 cm, very dark gray (10YR 3/1 moist), dark gray to gray (10YR 4.5/1 dry), clay; weak, fine granular; friable when moist, hard when dry; diffuse, smooth boundary; strongly calcareous; moderately saline; pH 8.6.

Cskg - 46 to 74 cm, dark gray (10YR 4/1 moist), gray (10YR 5.5/1 dry), silty clay; weak, fine granular; friable when moist, hard when dry; abrupt, wavy boundary; strongly calcareous; moderately saline; pH 8.5.

II Cskg1 - 74 to 94 cm, olive (5Y 5/3 moist), pale yellow (5Y 7/3 dry), clay loam till; few, fine, faint iron mottles; massive; friable when moist; diffuse boundary; strongly calcareous; moderately saline; pH 8.8.

II Cskg2 - 94 cm +, olive (5Y 5/3 moist), pale yellow (5Y 7/3 dry), silty loam till; few, fine, faint iron mottles; massive; friable when moist; strongly calcareous; strongly calcareous; strongly saline; pH 8.7.

Red River Series (RIV)

The Red River series consists of imperfectly drained Gleyed Rego Black Chernozem soils developed on moderately to strongly calcareous, deep, uniform, clayey (C, HC), lacustrine deposits. These soils occur in level to upper positions of level to very gentle slopes on level landscapes and have slow permeability, slow to moderate surface runoff and a medium water table during the growing season. Red River soils are non-eroded, non-stony and may be saline. They have a high available water holding capacity, medium organic matter content, and medium natural fertility. The majority of these soils are currently used for crop production.

In a representative profile the solum is approximately 30 cm thick. The profile is characterized by a black, to very dark gray, clayey Ap horizon, 15 to 20 cm thick, a very dark gray, clayey Ah horizon, 8 to 10 cm thick, a thin, dark gray, calcareous, clay, AC horizon, 6 to 10 cm thick and a dark grayish brown, calcareous, clay Ckgj horizon with faint mottles are present. The parent material is typically a clay texture. A typical profile contains frequent tonguing of the A horizon into the C horizon.

Red River soils occur in very close association with Scanterbury, Morris and Osborne soils. They are similar to the above soils by having developed on the same parent material but differ because of drainage and profile development. Red River soils were previously mapped as the Red River Association in the Winnipeg-Morris Map Sheet, Report No. 5, 1953.

Reed Lake Complex (REX)

The Reed Lake Complex consists of very poorly drained Terric Mesisol soils developed on weak to moderately acidic, shallow (50 to 100 cm thick), uniform, fen peat overlying neutral to weakly acidic, uniform, clayey lacustrine deposits. These soils occur in depressions in horizontal fens, have moderate to slow permeability due to the lacustrine clay substrate and also because of very high (0.1 m) water table overlying the clay. The native vegetation is comprised of fen type vegetation such as sedges, reed grasses, willows and alder groves. Stunted black spruce and tamarack may also encroach from slightly better drained wooded fringe areas. The majority of these soil areas exist as unused wetlands.

In a representative profile of the Reed Lake Complex, the peat is generally 50 to 100 cm thick. The profile is characterized by a dark brown fibric Of (10 to 40 cm thick) horizon overlying a very dark brown mesic Om (30 to 85 cm thick) horizon, and a black to very dark olive gray, mildly acidic, massive structured clayey Cg horizon. The dark gray color is indicative of strong gleying conditions.

Reed Lake Complexes occur in close association with the Rock Island Complex. These complexes have similar organic parent material, but differ in their depth to mineral soils, the Rock Island Complex being much deeper than the Reed Lake (Typic vs Terric Mesisols). Reed Lake Complex correlates with the Reed Lake Complex described in the previously published Cormorant Lake interim soil report. In the Flin Flon area, the clay substrate lacks carbonates.

Reed River Series (RRV)

The Reed River soils are poorly drained Terric Humisols developed on shallow (40 to 130 cm) deposits of mesic to humic forest peat. Moderately coarse to coarse textured lacustrine sediments occur within 130 cm of the surface. The Reed River soils have a very thin (< 15 cm), fibric, mixed moss surface layer underlain by dominantly well decomposed forest peat, which is slightly acid to neutral. The dominant peat sources in these soils are feathermosses and herbaceous shrubs, which readily decompose into a black to very dark brown, slightly sticky, amorphous material. Varying amounts of logs and woody debris are found layered throughout the soil.

The Reed River soils occur on gently sloping mesic swamp landforms, usually near the peat land margin. They are found where streams once flowed into the peat land swiftly enough to transport the coarse textured deposits that underlie the soils, and then created a minerotrophic environment so that swamp landforms could develop. Native vegetation on the Reed River soils is dominantly cedar with various amounts of black spruce and tamarack. The understory is mixed mosses and various herbaceous plants characteristic of better drained upland areas.

The Reed River soils are similar in site, vegetation and soil characteristics to those described for Haute and South Junction soils. They differ only in that they have a coarse to moderately coarse textured material substrate.

Reeve Series (REV)

The Reeve series consists of imperfectly drained, Gleyed Rego Black Chernozem soils developed on thin, weakly to moderately calcareous, moderately fine textured, alluvial deposits underlain by extremely calcareous, stony, medium textured till. Surface textures are dominantly clay loam; the soils are stratified with layers ranging from sand to clay and the underlying till substrate occurs between 25 and l00 cm of the surface. Dark coloured layers rich in organic matter indicative of various periods of flooding and deposition on former surface horizons occur throughout the soil. The Reeve soils occur on nearly level areas with moderate runoff and moderately slow internal permeability. They were mapped in the Ochre River floodplain of the Dauphin Lake Plain. The

Reeve soils developed under hardwood forest vegetation with significant grass and herbaceous ground cover. Most of the soils are cultivated and a slightly stony surface condition reflects the presence of the underlying glacial till.

Profile development on the Reeve soils is restricted to a dark coloured Ah horizon which grades through a transitional AC horizon into the stratified, moderately calcareous C horizon. The C horizon is usually mottled with iron staining and banded with dark coloured layers of former surface horizons. The boundary of the C horizon and the underlying till is often marked by a coarse textured or cobbly water-worked lag. A representative Reeve soil is described as follows:

Ahk - 0 to 28 cm; very dark gray to very dark grayish brown (l0YR 3/l to 2/2 dry, l0YR 2/l moist) clay; strong coarse granular breaking to moderate, fine to coarse granular; firm when moist, hard when dry; mildly alkaline; moderately calcareous; gradual, smooth boundary.

AC - 28 to 45 cm; dark grayish brown to very dark grayish brown (10YR 4/2 to 3/2 moist) clay loam; weak, coarse granular; firm when moist, hard when dry; moderately alkaline; weakly calcareous; clear, smooth boundary.

Ckg - 45 to 57 cm; light brownish gray (10YR 6/2 moist) sandy loam; few, medium, faint, brown (10YR 5/3 moist) mottles; weak, very fine granular breaking to single grained; loose when moist and dry; moderately alkaline; strongly calcareous; clear, smooth boundary.

Cca - 57 to 70 cm; white (10YR 8/2 moist) loam; few, medium, faint very pale brown (10YR 7/3 moist) mottles; weak, fine granular; friable when moist, slightly hard when dry; moderately alkaline; extremely calcareous; weakly saline; abrupt, smooth boundary.

II Ckg - 70 to 100 cm plus; very pale brown (10YR 7/4 moist) very fine sandy loam; few, medium, faint, yellow (10YR 7/6 moist) mottles; weak, fine granular; friable when moist, soft when dry; moderately alkaline; extremely calcareous.

Regent Series (RGT)

The Regent series is the imperfectly drained, Gleyed Black Chernozem member of the Ryerson Association, developed on deep (> 100 cm) strongly calcareous, medium to moderately fine (VFSL L SiL to CL, SiCL) textured glacial till. The till is composed of mixed materials derived from shale, limestone, and granitic rock. A thin overlay (< 25 cm) may occur on some soils. The topography is gently sloping, permeability is moderate, and surface runoff is slow. These soils occur in lower slope and depressional positions and are cultivated. Ryerson and Hazeldean soils are commonly found in close association with Regent soils. The depth to water table in Regent soils is estimated at approximately 2.1 metres during the growing season. These soils are occasionally weakly saline and sometimes have a few isolated stones on the surface.

A typical profile of the Regent series has a black Ap 10 to 15 cm thick, a very dark grayish brown Bmg 10 to 15 cm thick, a grayish brown to white Cca horizon 18 to 25 cm thick and a light olive brown Ck horizon. Analytical and morphological data are presented below.

Ap - 0 to 15 cm, black to very dark gray (10YR2.5/1 moist), very dark, gray to dark gray (10YR 3.5/1 dry), loam; massive; friable when moist; abrupt, smooth boundary; pH 6.3.

Bmgj - 15 to 28 cm, very dark brown to dark brown (10YR 3/2.5 moist), dark yellowish brown to yellowish brown (10YR 4.5/4 dry), loam; moderate coarse to medium columnar breaking to moderate, fine subangular blocky; friable when moist; abrupt, smooth boundary; pH 6.5.

BC - 28 to 30 cm, dark brown (10YR 3/3 moist), yellowish brown to light yellowish brown (10YR 5.5/4 dry), loam; moderate, coarse to medium columnar breaking to moderate, fine subangular blocky; friable when moist; clear, irregular boundary; moderately calcareous; pH 6.3.

Ckgj - 30 cm +, yellowish brown (10YR 5/4 moist), very pale brown (10YR 7/3 dry), loam; massive; friable when moist; few, fine, faint iron mottles; strongly calcareous; pH 8.3.

Reinfeld Series (RFD)

The Reinfeld series consists of moderately well to well drained Orthic Black Chernozem soils developed on moderately to strongly calcareous, stratified, deep, loamy (VFSL, L, SiL) grading to fine loamy (SCL, CL, SiCL), fluvial and lacustrine deposits. These soils occur in upper positions on undulating landscapes and have moderate permeability, moderate surface runoff, and a low water table during the growing season. Reinfeld soils are non-eroded, non-stony, and non-saline. They have a medium available water holding capacity, medium organic matter content, and high natural fertility. Native vegetation includes tall prairie grasses. The majority of these soils are currently cultivated for crop production.

In a representative profile the solum is approximately 50 cm thick. The profile is characterized by a very dark gray Ah horizon, 15 to 40 cm thick, a brown Bm horizon, 15 to 25 cm thick, and a pale brown Ck horizon, with occasional faint mottles. Reinfeld soils occur in association with Gnadenthal and Blumenfeld soils. They are similar to Rosengart soils by having a well drained Black profile and a loamy surface but differ from them by having no coarse loamy substrate. Reinfeld soils were previously mapped as Blackearth associates of the Altona Association in the Winnipeg-Morris (1953) soil report.

Reinland Series (RLD)

The Reinland series consists of imperfectly drained, Gleyed Rego Black Chernozem soils developed on moderately to strongly calcareous, stratified, deep, coarse loamy (LVFS, VFS, SL, FSL), fluvial and lacustrine deposits. These soils occur in middle positions of undulating landscapes and have moderate to moderately rapid permeability, moderate surface runoff, and a high water table during the growing season. Reinland soils are non-eroded, non-stony, and occasionally slightly saline. They have a medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation includes prairie grasses and deciduous tree clumps. The majority of these soils are currently cultivated for crop production.

In a representative profile the solum is approximately 25 cm thick. The profile is characterized by very dark gray Ah horizon, 15 to 30 cm thick, weakly calcareous, a dark gray to grayish brown AC horizon, 8 to 20 cm thick, a light gray Cca horizon, 8 to 10 cm thick and a pale brown to light gray Ckgj horizon, with faint mottles. Reinland soils occur in close association with Hochfeld, Kronstal and Osterwick soils. They are similar to Rosebank soils by having imperfect drainage and a coarse loamy surface but differ from them in having no clayey substrate. Reinland soils were previously mapped as associates of the Altona Association in the Winnipeg-Morris (1953) soil report.

Rempel Series (RMP)

The Rempel series consists of moderately well to well drained Calcareous Black Chernozem soils developed on strongly to very strongly calcareous, deep, uniform, fine loamy (CL, SiCL), lacustrine deposits. These soils occur in upper positions of undulating landscapes and have moderate permeability, moderately rapid surface runoff, and a low water table during the growing season. Rempel soils are occasionally slightly eroded, non-stony, and non-saline. They have a medium available water holding capacity, medium organic matter content, and high natural fertility. Native vegetation includes tall prairie grasses, meadow grasses and aspen-oak groves. The majority of these soils are cultivated for crop production.

In a representative profile the solum is approximately 20 cm thick. The profile has a weakly calcareous, very dark gray to very dark grayish brown Ah horizon, 15 to 22 cm thick, a dark grayish brown to brown Bmk horizon, 10 to 15 cm thick, a pale brown BC horizon, 5 to 10 cm thick, moderately calcareous and a light gray to white Cca horizon, 10 to 15 cm thick. Rempel soils occur in close association with Ramada, Prodan and Tadpole soils. They are similar to Ramada soils by having well drained, fine loamy soils but differ from them in having a Bmk rather than Bm horizon. Rempel soils were previously mapped as Blackearth associate of the Holland Association in the Carberry (1957) soil report.

Renwer Series (RWR)

The Renwer series consists of peaty, Rego Gleysol soils developed on weakly calcareous (1 to 5 % $CaCO_3$), fine textured alluvial deposits. Surface textures are dominantly silty clay. These soils occur in depressional areas subject to sedimentation from water carried in by small streams. The runoff is ponded and permeability is slow because of the fine textures. The native vegetation consists of water tolerant plants such as sedges, black spruce, tamarack, willow and balsam poplar. Due to frequent flooding, these soils do not have well developed mineral horizons. Buried, thin organic horizons in the profile are characteristic. The soils are fine textured and generally low in calcium carbonate.

L-H - 15 to 0 cm, dark reddish brown (5YR 3/3, dry), peat; weakly calcareous; mildly alkaline.

Ckg 1 - 0 to 15 cm, gray (5Y 5/1, dry), clay; fine pseudo-granular; very hard when dry; weakly calcareous; iron stained; mildly alkaline.

Ckg 2 - 15 to 30 cm, gray (5Y 5/1, dry), clay; fine pseudo-granular; very hard when dry; weakly calcareous; iron stained; mildly alkaline.

Cg 1 - 30 to 60 cm, olive gray (5Y 5/2, dry), clay; fine pseudo-granular; iron stained; neutral.

Cg 2 - 60 to 100 cm, olive (5Y 5/3, dry), clay; fine pseudo-granular; iron stained; neutral.

Reston Series (RST)

The Reston series is the imperfectly drained, carbonated, Gleyed Rego Black Chernozem member of the Chaucer Association, developed on thin (25 to 100 cm), weakly to moderately calcareous, coarse textured (FS, LCoS, LFS) lacustrine deposits overlying coarse textured, gravelly deltaic, beach and outwash deposits. This soil has a loamy fine sand surface texture, gently sloping topography, moderate permeability and slow surface runoff. The estimated depth to water table is about 1 metre during the growing season.

Rhodes Series (RHD)

The Rhodes series is the well drained, Rego Black Chernozem member of the Terence Association, developed on thin (25 to 100 cm), weakly to moderately calcareous, coarse textured (FS, LCoS, LFS) lacustrine sediments overlying strongly calcareous, medium to moderately fine textured (L, SiL to CL, SiCL) glacial till. A very thin (< 5 cm) gravelly pebble line may occur at the contact. This soil usually has a loamy fine sand surface texture, gently undulating topography, moderate permeability and moderate surface

runoff. This soil occurs in upper slope positions and in the cultivated state, it is moderately susceptible to erosion. The Rhodes series resembles the Stanton series of the Souris Association. The only difference is the Rhodes series is underlain by glacial till.

Rickson Series (RKS)

The Rickson series consists of well drained Orthic Regosol soils developed on poorly sorted or poorly stratified materials of variable texture and composition. These soils are very unstable and are displaced downward along slopes and inclines through gravity movement. The processes responsible for this type of deposition are sliding or falling and slump. The soils occur on strongly to very steeply sloping topography of the Lake Minnewasta area. The dominant soil has a loam to clay loam texture and is moderately to strongly calcareous.

Rickson soils are characterized by a lack of or disturbed profile development. These soils may have an A horizon less than 10 cm thick and buried mineral-organic layers. The common horizon sequence consists of only a C horizon.

Ridley Series (RDY)

The Ridley series consists of imperfectly drained, Gleyed Rego Black Chernozem soils developed on moderately to strongly calcareous, fine textured till. Pockets of extremely calcareous loam textured till are randomly distributed within the matrix of this parent material. Surface texture is usually clay. The Ridley soils occur in the Lake St. Martin Lowland and are found in the lower slope positions in areas of level to irregular, gently undulating topography. Runoff and permeability are slow and the soils are moderately stony. The native vegetation is dominantly meadow-prairie grasses and herbs with scattered groves of aspen, black poplar and willow.

Ridley soils have a thin dark colored Ah horizon which may be underlain by a transitional AC horizon. The Ah horizon may tongue into the C horizon sometimes to depths of 50 cm. The underlying C horizon is amoderately calcareous clay textured till which usually contains increasing amounts of extremely calcareous till as depth increases A generalized profile description is given.

L-H - 4 to 0 cm, very dark brown (10YR 2/2 dry); leaf and sod mat; neutral; weakly calcareous; abrupt, smooth boundary.

Ahgj - 0 to 13 cm, black (10YR 2/1 dry); clay; compound, moderate, medium, subangular blocky and strong, fine to medium granular; firm when hard; neutral; weakly calcareous; tongues into C horizon; abrupt, irregular boundary.

Ckg1 - 13 to 50 cm, gray (10YR 6/1 dry); clay; moderate, fine, granular; friable when hard; moderately alkaline; very strongly calcareous; clear, wavy boundary.

Ckg2 - 50 to 86 cm, light gray (10YR 7/1 dry); clay; weak, fine, granular; firm when hard; moderately alkaline; strongly calcareous.

Ckg3 - 86 cm +, dark olive gray (5Y 3/2 dry); clay; weak, fine, pseudo-granular; very firm when hard; moderately alkaline; moderately calcareous.

Ridgely Series (RGY)

The Ridgely series consists of carbonated, Rego Humic Gleysol soils developed on thin, very strongly to extremely calcareous, moderately fine (SCL, CL, SiCL) textured lacustrine sediments overlying sand. These deposits may have some vertical stratification and the surface textures range from clay loam to silty clay. These soils occur as the normal series, mainly in one area of the Dauphin Lake Plain. The Ridgely soils occupy poorly drained, level to depressional areas from which runoff is slow. Permeability within these soils is slow in the upper materials and moderate to rapid in the underlying sand substrate. Native vegetation is mainly sedges and meadow grasses with clumps of willow, swamp birch, and balsam poplar on slightly better drained sites.

The Ridgely soils have profile characteristics similar to the Glenfields series, differing from them mainly in the presence of the underlying coarse textured substrate. They have a thin, black Ah horizon, 8 to 15 cm thick, which is usually carbonated and underlain by a gray, transitional AC horizon. The C horizon is usually light gray to pale yellow, extremely calcareous, silty clay loam in texture and grades into very fine sand within 1 m of the soil surface. A typical profile also contains a pale brown Ckg horizon.

Rignold Series (RGD)

The Rignold series consists of imperfectly drained Gleyed Black Chernozem soils developed on a mantle (60 to 90 cm) of moderately calcareous, shallow, uniform, loamy (VFSL, L, SiL, SCL, CL, SiCL), fluvial and lacustrine deposits over moderately calcareous, deep, uniform, clayey (SiC, C), lacustrine deposits. These soils occur in middle positions of nearly level slopes on level landscapes and have moderate over slow to very slow permeability, slow surface runoff, and a high water table during the growing season. Rignold soils are non-eroded, non-stony, and occasionally slightly saline. They have a medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation includes tall prairie grasses, meadow grasses and shrubs. The majority of these soils are currently in annual crop production.

In a representative profile the solum is approximately 50 cm thick. The profile is characterized by a very dark gray Ah horizon, 18 to 25 cm thick, a light brown Bm horizon, 20 to 30 cm thick, a transitional BC horizon, 10 to 15 cm thick with faint mottles and a light olive brown Ckgj horizon with fine yellowish brown mottles.

Rignold soils occur in close association with Denham, Graysville and Edkins soils. They are similar to Graysville soils by having imperfect drainage and loamy over clayey deposits but differ from them by having a prominent Bm horizon. Rignold soils were previously mapped as Black Meadow associates of the Altona (clay substrate) Association in the Winnipeg-Morris (1953) soil report.

Roblin Series (RBN)

The Roblin series consists of poorly drained Humic Luvic Gleysols developed on moderately to strongly calcareous, loam to clay loam textured till derived from shales, limestone, and granitic rock origin. Roblin soils occur in depressional areas of the landscape and because of this, the soil profile contains sediments and materials deposited by surface waters. Coarse textured gravely layers are common at the contact with the underlying morainal till. Roblin soils have a loamy surface texture, a clayey Bt and a clay loam parent material. The high clay content in the B horizon is the result of translocated clay from the strongly leached and eluviated surface horizon. Roblin soils have very slow surface runoff and moderate to slow permeability. Roblin soils in shallow depressions are often cultivated. Native vegetation consists of grasses and sedges.

A typical soil profile consists of a gray to dark gray Ap-Aeg horizon (average 28 cm thick), a dark brown Btg horizon (average 41 cm thick), and an underlying Cg or Ckg horizon. The abundance of iron mottles throughout these soils is an indication of their persistant high moisture status.

Roblin soils are identified in the landscape by their light gray surface colours, particularly in cultivated fields where the strongly eluviated Aeg horizon has been disturbed and brought up to the surface by cultivation. The deeply eluviated profile of the Roblin soils indicate that a significant quantity of water moves down through the soil profile, and is probably added to the groundwater zone. For these reasons, Roblin soils are interpreted as local sites of fast groundwater recharge. Most Roblin soils are dry by early to mid summer (Soils of the Roblin Area, Report D-47).

Rochelle Series (RLL)

The Rochelle series consists of poorly drained, carbonated Rego Humic Gleysol soils developed on moderately to very strongly calcareous, stratified dominantly moderately fine textured (SCL, CL, SiCL), fluvial sediments. They occur in the lower slope position of the stream channels. The upper 25 to 50 cm usually contains layers high in organic matter; textures may range from fine sandy loam to clay loam. Carbonated shell fragments of aquatic organisms are usually present. These soils are subject to seasonal inundation and subsequent high water table levels. Native vegetation consists of willow, sedge, reeds, and aquatic grasses. The soils are characterized by a partially decomposed leaf and fen layer 8 to 15 cm thick; a thin dark gray, strongly calcareous Ah horizon 10 to 20 cm thick and a light brownish gray to light olive gray Ckg horizon with prominent mottles.

Rock Island Complex (RLX)

The Rock Island Complex consists of very poorly drained Typic Mesisol soils developed on deep (>165 cm) strongly acidic, uniform, fen peat overlying neutral to weakly acidic, uniform, clayey lacustrine sediments. These soils occur in bedrock depressions as horizontal fens and have decreasing permeability with increasing depth, and a very high (0.25 m) water table. Occasionally, open pools of water occur in the central portions. The native vegetation is comprised of fen type vegetation such as sedges, reed grasses with groves of dwarfed bog birch, paper birch, Labrador tea. Stunted black spruce, tamarack, alder and other shrubs encroach from wooded fringe areas. The majority of these soils occur as unused wetlands.

In a representative profile the peat is generally 1.6 to 5.0 m thick. The profile is characterized by a dark yellowish brown fibric of (5 to 40 cm thick) surface tier, overlying a very dark brown, strongly acidic mesic Om (130 to 300 cm thick) horizon. A very dark grayish brown, acidic, humified Oh horizon occurs above the clay mineral substrate.

Rock Island soils occur in close association with Reed Lake soils. They are similar to Reed Lake Complexes by having the same organic material composition, but differ from them in thickness to underlying clay. Reed Lake soils contain clay within 1.2 m depth. Rock Island Complex correlates with Rock Island Complex described in the previously published Cormorant Lake interim soil report.

Roddan Series (ROD)

The Roddan series consists of well to excessively drained Orthic Regosol soils on a thin mantle (25 to 60 cm) of loamy sediments over a thin strata (10 to 40 cm) of very strongly calcareous, loamy glacial till of limestone and granitic origin over a strongly calcareous loam to clay loam glacial till of shale, limestone and granitic origin. These soils occur in the upper slope and knoll positions of irregular undulating to moderately rolling topography. Runoff is moderate to rapid, depending on the gradient; permeability is moderate to moderately slow. Originally, these soils had a dark surface and profile development, but have been sufficiently eroded that little of the original horizons remain. They continue to be very susceptible to both wind and water erosion.

The soil is characterized by a 10 to 15 cm gray to light gray, calcareous plow layer and a very pale brown to white, Ck horizon.

Roe Lake Series (ROK)

The Roe Lake series consists of imperfectly drained Gleyed Gray Luvisol soils developed on weakly to moderately calcareous, deep uniform, clayey lacustrine deposits. These soils occur in lower positions of gently sloping to level landscapes and have slow permeability, slow surface runoff and a water table (approx. 1 m) during the growing season. Roe Lake soils have high available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes black spruce, jack pine, aspen, and dogwood, along with sedges and grasses. The majority of these soils are currently in their natural condition.

In a representative profile the solum is approximately 50 cm thick. The profile is characterized by a very dark brown LH horizon, 2 to 10 cm thick, a light gray to gray, loamy textured, platy structured Ae horizon, 10 to 20 cm thick, a clayey, prismatic AB horizon, 10 to 15 cm thick and a dark brown, blocky structured, clayey Bt horizon, 20 to 35 cm thick. The underlying 15 to 30 cm thick BC horizon is usually dark grayish brown, blocky structured and clayey textured. The parent material is typically clay textured, calcareous, and massive structured and usually dark gray in color indicative of gleying conditions. A typical profile also contains reddish brown mottles in all mineral horizons.

Roe Lake soils occur in close association with the better drained Sipiwesk and more poorly drained Medard soils. Roe Lake soils were previously mapped and described in the Cormorant Lake interim soil report.

Rose Ridge Series (RDG)

The Rose Ridge series consists of well drained Orthic Dark Gray Chernozem soils developed on very strongly calcareous, deep, uniform loamy (L, SiL, CL, SiCL) morainal till deposits. These soils occur on crest and upper slopes of moderately sloping ridged deposits and have moderate permeability, moderate surface runoff and a low water table during the growing season. Rose Ridge soils are very stony. The native vegetation often comprises of mixed aspen and bur oak or white spruce, tall shrubs and a ground cover of tall grasses. The majority of these soils are currently used for crop production although stonier areas remain in native bush or improved pasture.

In a representative profile of Rose Ridge soil, the solum is generally 23 cm thick. The profile is characterized by a thin (13 cm), dark gray loam textured Ap horizon overlying a dark grayish brown, loam textured Bt horizon, and a light gray loam textured Ck horizon. The parent material is typically uniform, compact, moderately cobbly and very strongly calcareous.

Rose Ridge soils occur in close association with Meharry soils. They are similar to Meharry soils by having similar texture and drainage, but differ because of lighter surface colour and the presence of a B horizon. Rose Ridge soils have moderate available water holding capacity, low organic matter levels, and low natural fertility. Rose Ridge soils correlate with the well drained Orthic Dark Gray Chernozem member of the Rose Ridge association published in the Swan River Soil Report No. 13, 1962.

Rosebank Series (RBK)

The Rosebank series is a carbonated, Gleyed Rego Black Chernozem soils developed on imperfectly drained, moderately calcareous, thin (25 to 100 cm), coarse loamy (LVFS, VFS, FSL), sediments overlying moderately calcareous, clayey (SiC, C), lacustrine sediments. The coarse loamy sediments are usually stratified and include strata of coarser or finer textures. These soils occur on level to very gently sloping topography in association with Hibsin and Elm Creek soils. Surface runoff is slow and permeability is moderate in the coarse loamy sediments and slow to very slow in the underlying clayey sediments. These soils are also somewhat suseptible to wind erosion and must be carefully managed.

The Rosebank soil profile has a very dark gray to black, very friable, weakly granular Ah horizon, 15 to 30 cm thick that is often weakly calcareous and mildly alkaline in reaction, and a dark gray to grayish brown AC horizon that is granular, very friable to loose, calcareous and mildly alkaline. The Ckgj horizon is pale brown, very friable to loose, mildly alkaline and faintly mottled. Calcium carbonate concretions and many, fine to medium mottles often occur at the clay contact.

The Rosebank, loamy (L, SIL, VFSL) substrate variant, RBK1, occurs in close association with typical Poyser soils and differs by having silt loam to loam textured materials within a meter of surface. Rosebank soils have a finer textured and less permeable subsoil than the very similar coarse loamy Reinland soils. They are coarser textured in their surface layers and finer textured in their subsurface layers than the very similar, uniformly loamy textured Gnadenthal and Neuenberg soils. Both the Rosebank and the very similar Graysville soils have clayey textured subsurface layers; however, Graysville soils with their finer textured surface layers are less droughty and less permeable than Rosebank soils.

Roseisle Series (RSI)

Roseisle series are well drained, Orthic Black Chernozem soils that have developed on thin medium grading to moderately fine textured (VFSL, L to CL, SiCL) deltaic and lacustrine sediments overlying stony, moderately to strongly calcareous, medium to moderately fine textured water-worked glacial till. Shale bedrock may occur below the till at 1 to 1.5 metres. Depth of the lacustrine mantle over the till is variable ranging from 25 to 100 cm in thickness; a thin (<10 cm) gravelly or cobbly lense usually occurs at this contact. Texture of the surface sediments are variable, ranging from fine sandy loam to clay loam. Topography is smooth, gently sloping, dipping very gently eastward in a series of wave-washed terraces formed during the recession of glacial Lake Agassiz. Runoff is moderate; internal drainage is moderately rapid to the contact of the medium textured compacted till where it is moderately slow.

Roseisle soil profiles are characterized by very dark gray to black, granular Ah horizons, friable and neutral in reaction overlying a dark grayish brown, granular Bm horizon that is also friable and neutral to mildly alkaline in reaction. The B horizon often terminates at the gravelly to stony contact of the underlying glacial till. The pale brown granular-like C horizon usually occurs in the till deposit below the sandy mantle, but occasionally occurs within the sandy layer.

Rosenburg Series (RBG)

The Rosenburg series consists of imperfectly drained, Gleyed Solonetzic Dark Gray Chernozem, shallow lithic phase soils developed on 20 to 100 cm of weakly to strongly calcareous, clayey lacustrine sediments overlying limestone bedrock. Topography is level to gently undulating. Native vegetation is dominantly Balsam fir and aspen, with an understory of mountain maple, sarsaparilla and feathermoss.

Rosenburg soils have a very tough columnar structure in the upper B horizon which is characteristic of an intergrade to the Solonetzic order. The Ae horizon is thin, light gray in color, and has a platy structure.

Because of the proximity to the soil climatic boundary to the south, both Gleyed Solonetzic Dark Gray Chernozem and Gleyed Solonetzic Gray Luvisols occur in the imperfectly drained positions. Since the variability in these soil types can not be mapped at this scale of survey, these areas are represented on the soil map by the Rosenburg series alone. Rosenburg soils are most common in map units near the eastern and southern shorelines, where they often occur in association with the poorly drained Thickwood series, peaty phase.

Rosengart Series (RSG)

The Rosengart series consists of moderately well drained Orthic Black Chernozem soils developed on a mantle (70 to 95 cm) of moderately to strongly calcareous, shallow, uniform, loamy (VFSL, L, SiL) deposits over moderately calcareous, stratified, deep, sandy (FS, VFS, LFS, LVFS) lacustrine deposits. These soils occur in upper positions of undulating landscapes and have moderate over moderately rapid permeability, moderate to moderately rapid surface runoff, and a medium water table during the growing season. Rosengart soils are non-eroded, non-stony, and non-saline. They have medium available water holding capacity, medium organic matter content, and high natural fertility. Native vegetation includes tall prairie grasses, shrubs and aspen-oak groves. The majority of these soils are used for crop production.

In a representative profile the solum is approximately 45 cm thick. The profile is characterized by a very dark gray Ah horizon, 15 to 35 cm thick, a dark grayish brown Bm horizon, 15 to 25 cm thick, a BC horizon, 10 to 18 cm thick and a pale brown Ckgj horizon with faint to distinct mottles.

Rosengart soils occur in close association with Jasset and Neuenberg soils. They are similar to Reinfeld soils by having an Orthic Black Chernozem profile and loamy surface but differ from them by having a sandy substrate. Rosengart soils were previously mapped as Blackearth associates of the Altona Association in the Winnipeg-Morris (1953) soil report.

Rufford Series (RUF)

The Rufford series is characterized by a Rego Black Chernozem solum on moderately to strongly calcareous, loamy (L, CL) morainal till of limestone, granite and shale origin. These soils are moderately well to well drained and occur on the upper slopes and knoll positions in undulating to hummocky landscapes in close association with Cordova and Newdale soils. Runoff is moderately rapid to rapid; permeability is moderately slow.

Rufford profiles have a very dark gray to very dark grayish brown Ah horizon, 12 to 18 cm thick and a thin AC horizon, 6 to 10 cm thick. A carbonate accumulation (Cca) layer, 5 to 15 cm thick, is usually present. In the Russell area, the A horizon averages 28 cm and ranges from 10 to 50 cm; the solum depth averages 37 cm and ranges from 20 to 55 cm. Rufford soils differ from Cordova soils in being less leached and having thinner, less distinct horizons. Both Rufford and Cordova differ from Newdale in being less leached and having free lime carbonate in their A and B horizons.

Rutledge Series (RUG)

The Rutledge series is the imperfectly drained, Gleyed Regosol member of the Grande Clairiere Association, developed on deep, weakly to non-calcareous coarse textured (FS, LCoS, LFS) eolian deposits. These soils occur on lower and middle slope positions in areas of undulating duned topography. They have rapid permeability, no surface runoff and a water table at approximately 3 metres. They may have a thin L-H surface horizon. They are gleyed with prominent iron staining and a few iron concretions in the top 100 cm of soil. They usually have coarse grass type vegetation and are used mainly as pasture. Ralston and Grande Clairiere soils are found in close association with Rutledge soils.

Ryerson Series (RYS)

The Ryerson series is the well drained, Orthic Black Chernozem member of the Ryerson Association, developed on deep (> 100 cm), strongly calcareous, medium to moderately fine textured (L, CL, SiCL) glacial till. Coarse fragments in the till are composed of

shale, limestone, and granite rocks. The surface 25 cm may have a variable texture although the most common textures range from loam to clay loam. These soils are found in the upper and mid slope of undulating to gently rolling topography. This soil has moderate permeability and moderate surface runoff. In some areas it is slightly to moderately stony. The depth to water table is estimated at 3 to 4 metres during the growing season.

Ryerson profiles are generally thin with the entire Ah and occasionally the upper part of the Bm horizon incorporated into the Ap horizon. The Ap horizon, therefore, tends to be dark gray in color. The Bm horizon is quite variable in thickness ranging from 10 to 30 cm depending on the topography and amount of mechanical disturbance. The Bm horizons are characterized by moderate, fine prismatic to weak, moderate, medium granular structure and a dark grayish brown color. A light gray Cca horizon, 20 to 30 cm thick, commonly occurs below the Bm horizon. The pale brown to yellowish brown Ckgj horizon may contain weak concentrations of soluble salts, lime carbonates, and prominent iron mottles and concretions.

Sagemace Series, peaty phase (SGM)

The Sagemace series comprises poorly drained Rego Humic Gleysol, peaty phase soils developed on moderately to strongly calcareous clayey till. The surface of these soils is generally clay textured and overlain with 15 to 40 cm of mesic peat. Topography of the Sagemace series is depressional to level. Fine textures and high ground water tables impede internal drainage and result in very slow permeability. Runoff is slow. The surface may have some stones depending upon the absence or presence of a thin lacustrine overlay. Vegetation is mainly meadow grasses and scattered willow clumps. In the northern portions of the soil zone the Sagemace soils supports fair closed stands of black spruce. The Sagemace soils usually have a layer of moderately decomposed peat at the surface, and a dark gray Ahg horizon overlying a gleyed Cg horizon. Numerous isolated pockets of extremely calcareous, loamy till occur within the clayey matrix of the parent material. A representative profile of the Sagemace series is described below:

Of-Om - 15 to 0 cm, dark reddish brown (5YR 2/2 moist), non-woody fine fibered sedge and moss peat; compacted; slightly acid; mottled; abrupt, smooth boundary.

II Ahg - 0 to 10 cm, very dark gray brown to very dark gray (2.5Y 3/2 to 10YR 3/1 moist), clay; weak, fine to medium granular; sticky and very plastic when wet, hard when dry; slightly acid; clear, wavy boundary.

II Cg - 10 to 36 cm, dark gray to olive gray (5Y 4/1.5 moist), silty clay; weak, fine to medium granular; sticky and very plastic when wet, hard when dry; neutral; clear, wavy boundary.

II Ckg1 - 36 cm. plus, dark gray to olive gray (5Y 4/1.5 moist), silty clay; weak coarse platy breaking to moderate fine subangular blocky ; sticky and very plastic when wet, hard when dry; neutral; very strongly calcareous; separated by an abrupt, broken boundary.

II Ckg2 - Pockets of light gray (2.5Y 7/2 moist), silty clay loam; weak coarse platy breaking to weak fine subangular blocky; slightly plastic when wet, hard when dry; mildly alkaline; extremely calcareous; some iron mottles.

Sand Beaches (SDB) or ($SB)

Sand beaches are stratified, sandy ridges of recent origin. They are presently in the process of formation in relatively sheltered locations along the lake shorelines. The material varies from relatively pure deposits of fine and medium sand, to gravelly deposits containing many large rounded stones and pebbles. Drainage varies from poor to rapid, but is dominantly imperfect to rapid, depending upon the topographic position and level of the adjacent lake waters. These areas have little or no profile development, and therefore are considered to be Orthic Regosols. These soil areas have no agricultural or forestry value, but do provide excellent recreational sites. Some sand beaches support scattered stands of willow, aspen, and grasses. A poorly drained, peaty phase of Sand Beach is generally found in the back beach areas.

Sand River Complex (SRX) or (SDV)

The Sand River complex consists of poorly to very poorly drained organic soils developed on relatively thick (65 to 160 cm) fibric Sphagnum peat which may be underlain by significant amounts of mesic forest and/or fen peat. Moderately to strongly calcareous sandy sediments occur within 160 cm of the surface. These underlying sandy sediments are usually moderately calcareous, mildly to moderately alkaline, and stone free. Sand River areas are depressional to level. Native vegetation is dominantly stunted black spruce and tamarack with an understory of dominantly Sphagnum moss and ericaceous shrubs.

The Sand River series is the dominant soil of the complex, a Terric Mesic Fibrisol. The Turnberry series, a Terric Fibric Mesisol, and the Monkman series, a Terric Fibrisol, are the other members of the Sand River complex. The Sand River soils are very comparable to the soils described under the Molson and Kilkenny complexes, differing from them only in the nature of the underlying mineral substrate. Soils of the Sand River complex occur in only a few localities, often in association with Kircro and Stead series.

Sandilands Series (SDI)

The Sandilands series consists of moderately well to well drained Degraded Dystric Brunisols developed on siliceous sandy (FS, LFS) outwash deposits. These deposits are usually quite thick and appear to have been reworked by water and wind. The

topography is irregular, gently sloping. Internal drainage is very rapid and runoff is negligible. The native vegetation consists dominantly of Jack-pine forest with an under story of low ericaceous shrubs, lichens, herbs and grass species.

Sandilands soils have weakly developed horizons distinguished by faint changes in color and reaction. They have a thin discontinuous organic layer, a thin, light brownish gray A horizon, and an indefinite Bm (Bfj) that grades gradually into very pale brown fine sand which may contain slight amounts of lime carbonate below a metre of the surface. A representative Sandilands soil profile is described below.

L-H - 1 to 0 cm, brownish gray to very dark brown (10YR 5/2 to 2/2 dry) partially to well decomposed pine needle and forb litter; very strongly acid; abrupt, broken, lower boundary.

Aej - 0 to 5 cm, light brownish gray to light (10 YR 6/2 to 7/1 dry) sand; loose; medium acid; clear, smooth boundary.

AB - 5 to 10 cm, very pale brown (10YR 7/3 dry) fine sand, loose; medium acid; gradual, smooth boundary.

Bm - 10 to 45 cm, very pale brown (10YR 8/4 dry) fine sand; loose; medium acid; gradual, smooth boundary.

C - 45 to 150 cm, very pale brown (10YR 8/3 dry) fine sand; loose; medium acid.

Sandridge Series (SDE)

The Sandridge series consists of moderately well drained Dark Gray Chernozem, lithic phase soils developed on thin, (less than 50 cm), extremely calcareous till over limestone bedrock. These soils are similar to the Stonewall soils whose parent material ranges from 50 to 100 cm over limestone bedrock. Topography is irregular, gently sloping; runoff is moderate. Permeability is moderately slow in the loamy till and variable in the fractured permeable bedrock below. The native vegetation consists of bur oak, trembling aspen, hazel, and occasional jack pine.

The soil is characterized by a solum less than 25 cm thick, having a thin, leaf mat, a thin dark gray somewhat blotched A horizon, 4 to 6 cm thick and a granular grayish brown B horizon with some clay and organic coatings on the peds. These soils have similar physical and chemical properties as the Aneda and Stonewall soils, differing only in the depth of glacial till to limestone bedrock.

Sanger Series (SGR)

The Sanger series is the poorly drained, Orthic Humic Gleysol member of the Cameron Association, developed on deep (> 100 cm), strongly calcareous, medium textured (VFSL, L, SiL) lacustrine sediments. This soil has a loam to fine sandy loam surface texture, nearly level to depressional topography, moderately slow permeability and no surface runoff. These soils have a high seasonal water table and are very susceptible to flooding and surface ponding. Sanger soils are not cultivated and generally support hydrophytic slough grasses that in dry years are sometimes harvested for hay.

Santon Series (STO)

The Santon series consists of poorly to very poorly drained Typic Mesisols, sphagnic phase, developed on dominantly mesic forest or fen peat, or both, and capped with a thin (60 to 90 cm) continuous surface layer of fibric sphagnum moss peat. Undifferentiated mineral substrates occur more than 160 cm below the soil surface.

The Santon soils occur on plateau raised bog landforms in the forested eastern part of the watershed. These landforms form over large areas in which the rapid buildup of peat has raised the soil surface above the influence of minerotrophic groundwater. They are found usually in the central areas of a peat land, often near a drainage divide where they receive moisture only from the atmosphere. Growth and accumulation of sphagnum mosses on the Santon soils are rapid, but have progressed for a shorter time than on the associated Julius and Whithorn soils. As a result, the part of a raised bog where the Santon soils are found is not greatly domed, and the surface of the landform has a level, plateau like horizon. Higher domes are found at the center of the landform.

Topography is usually level, with a subdued hummocky micro-relief. Rapid sphagnum growth from bog pools into pillows of sphagnum moss soon masks differences of height between hummocks and adjacent depressions. Native vegetation is dominantly stunted stands of black spruce with an under story of Labrador-tea, leatherleaf, bog rosemary, and sphagnum mosses.

Scanterbury Series (SCY)

The Scanterbury series is a Gleyed Black Chernozem soils developed on imperfectly drained, moderately to strongly calcareous, clayey (SiC, C, HC), lacustrine deposits. These soils occur on level to very gently sloping topography on the Red River Plain in association with Red River, Morris and Osborne soils. Surface runoff is slow and permeability is very slow. The tall prairie and prairie-meadow grasses once found associated with these soils have been mostly replaced by cultivated fields.

The Scanterbury soil profile has a very dark gray Ah horizon, 15 to 30 cm thick that frequently tongues through the B horizon; a very dark gray to dark grayish brown Bmgj horizon, 12 to 40 cm thick; a very dark grayish brown BC, 10 to 15 cm thick, and an olive gray calcareous Ckgj horizon with many, fine, faint mottles. This soil differs from the similar Plum Coulee soil series in having more uniform textures in the subsoil. It differs from Red River soils in having a prominent Bmgj horizon. Scanterbury, Red River and Morris soils are usually found together in such close and intricate association with each other that all three can occur in the same

field. Scanterbury soils were part of the Red River Association in the Winnipeg-Morris (1953) soil report.

Scarth Series (SCH)

The Scarth series is the well drained, Rego Black Chernozem member of the Souris Association, developed on deep (> 100 cm), weakly to moderately calcareous, coarse textured (FS, LCoS, LFS) lacustrine sediments. This soil has a fine sand to loamy fine sand surface texture, gently undulating topography, moderate permeability, slow surface runoff and moderately good drainage. The depth to water table is estimated at 2 to 3 metres during the growing season. Most of these soils are cultivated.

Schaffner Series (SFR)

The Schaffner series is the well drained, Calcareous Black Chernozem member of the Cameron Association, developed on deep, strongly calcareous, medium textured (VFSL, L, SiL) lacustrine deposits. This soil has simple smooth topography, moderately good drainage, a fine sandy loam to loam surface texture, moderately slow permeability and slow surface runoff. The depth to water table is estimated at 2 to 3 metres and the subsoil may occasionally be weakly saline. Under cultivation, the upper part of the B horizon is usually incorporated into a very dark gray brown Ap horizon 10 to 15 cm thick. The weakly calcareous, dark grayish brown Bmk horizon generally has weak granular structure and is 10 to 15 cm thick; a grayish brown BC horizon, 5 to 13 cm thick and a stratified light yellowish brown to pale olive brown Ck horizon occur below.

Seech Series (SHH)

The Seech series consists of well drained Calcareous Black Chernozem soils developed on deep (>100 cm) moderately calcareous, coarse sandy to gravelly deltaic, beach or outwash deposits. These soils occur on upper slope to crest positions of moderately sloping hummocky landscapes and have high permeability, low surface runoff and a very low water table during the growing season. Seech soils are slightly eroded by wind and water, slightly to moderately stony and non-saline. They have very low available water holding capacity, and low organic matter content. Native vegetation often includes prairie grasses, herbs, and shrubs. The majority of these soils are currently used for improved pasture, forage and annual crop production.

In a representative profile the solum is approximately 32 cm thick. The profile is characterized by dark gray to black, gravelly loamy fine sand Apk horizon, 10 to 35 cm thick, with inclusions of coarse fragments of shale and limestone, a yellowish brown, moderately calcareous loamy sand Bmk horizon, 10 to 40 cm thick, with abundant coarse fragments; overlying a strongly calcareous stratified gravelly Ck horizon. The parent material contains abundant coarse fragments derived from shale, limestone, and granite rocks. A typical profile also contains unweathered limestone throughout which accounts for the high carbonate content in a highly porous soil.

Seech soils occur in close association with the imperfectly drained Katherine and Bethany soils which are developed in similar parent material. Katherine soils are more leached, due to the increased amount of moisture in concave shaped slope positions. Bethany soils on the other hand occur in slight depressions and have a high water table which restricts leaching. Seech soils were previously mapped as the Seech association in the reconnaissance survey of soils in the Rossburn and Virden map sheet areas.

Seine River Series (SRE)

The Seine River series consists of imperfectly drained Gleyed Cumulic Regosol soils developed on moderately to strongly calcareous, clayey alluvial deposits. They occur mainly on the intermediate position between the river bed and upper levees of the Assiniboine, La Salle, Rat, Red and Seine Rivers. They are subject to seasonal flooding during the spring runoff period; otherwise they have moderate runoff, and moderately slow to slow permeability. The native vegetation consists of Manitoba maple, elm, ash, basswood and native grasses.

The soil is characterized by a thin partially decomposed leaf mat 2 to 4 cm thick, and a variable dark gray Ah horizon of 3 to 6 cm thick; the Ckgj horizon has a variable texture of silty clay to clay and may have thin former Ah horizons in the stratified layers below. In the upper slope positions these soils may have weak development of an Ah and Bm horizon grading to the Scanterbury or Myrtle series. This soil was mapped as the immature alluvial soil of the Riverdale Association in the Winnipeg-Morris (1953) soil report.

Selina Series (SLN)

The Selina series consists of Gleyed Dark Gray Luvisol soils developed on thin (25 to 100 cm), moderately to strongly calcareous, sandy sediments overlying stony, extremely calcareous till. The texture of the surface horizon can range from fine sand to fine sandy loam, but fine sand is dominant. Scattered surface stones occur on the Selina soils, becoming more numerous where the lacustrine mantle is thin. The Selina soils occupy level to very gently sloping areas, often adjacent to better drained sand and gravel ridges. Runoff is moderate and permeability, although rapid in the upper soil materials, is impeded by the underlying till substrate. The till is moderately permeable and helps to maintain a water table and imperfectly drained soil conditions. Native vegetation is dominantly aspen, balsam poplar and willows with a ground cover of meadow grasses and sedges.

The Selina soils are characterized by a thin, leaf and sod mat underlain by a dark gray Ah horizon and a light gray coloured Ae horizon. The A horizons are in turn underlain by weakly developed brownish gray Btjgj or Bmgj horizons. The lower portion of the B horizon and the light yellowish brown Chgj horizon is gleyed and mottled with iron staining. The Ckgj horizon is moderately

calcareous and is underlain by extremely calcareous, stony loam till. The contact of the two materials is often marked by a water-worked cobbly and gravelly lens.

Seven Sisters Series (SVT)

The Seven Sisters series consists of moderately well drained, Dark Gray Luvisol soils developed on slightly to moderately calcareous, moderately fine to fine textured lacustrine deposits. The surface textures vary from clay loam to clay. These soils occur in small scattered areas throughout the Whitemouth Till Plateau; mainly in the Sprague and South Junction districts. The topography is smooth, level to very gently sloping. Runoff is moderately slow and permeability of the clay is moderately slow. The native vegetation is comprised principally of aspen, white spruce, balsam fir, some birch and balsam poplar and an undergrowth of dogwood, hazelnut, rose, raspberry, wild sarsaparilla, northern bedstraw, rose mandarin, wild pea, vetch, sweet colts-foot, strawberry, wild lily-of-the-valley, bunch-berry and several grass species.

The Seven Sisters soils are suited to sustained production of field crops but have moderately severe limitations restricting the choice of crops. These soils are productive forest soils and presently are supporting merchantable stands of aspen, some white spruce, balsam fir and birch. Minor occluded areas are principally Arnes and Pine Valley soils.

The solum of Seven Sisters series is characterized by a thin, dark gray, leached Ahe horizon, a light gray, platy, strongly acid, Ae horizon and a moderately well developed textural B horizon with a well developed blocky structure that is dark grayish brown in colour and neutral in reaction. The description of a representative virgin Seven Sisters clay profile is given below:

L-H - 3 to 0 cm, very dark brown (10YR 2/2 dry), partially to well decomposed herb, grass and leaf-litter; neutral; abrupt, smooth, lower boundary.

Ahe - 0 to 5 cm, very dark gray (10YR 3/1 dry), loam; moderate, fine granular; friable when moist; slightly hard when dry; strongly acid; clear, smooth, lower boundary.

Ae - 5 to 10 cm, grayish brown (10YR 5/2 dry), clay loam; moderate, fine granular; strong fine to medium granular; friable when moist; slightly hard when dry; clear, smooth, lower boundary.

Bt - 10 to 30 cm, dark grayish brown (10YR 4/2 dry), clay; strong, coarse granular to fine subangular blocky; firm when moist; very hard when dry; neutral; clear, wavy, lower boundary.

BC - 30 to 41 cm, light brownish gray (10YR 6/2 dry), clay; moderate, coarse granular to fine subangular blocky; very firm when moist; hard when dry; mildly alkaline and calcareous; gradual, wavy, lower boundary.

Ck1 - 41 to 61 cm, light brownish gray (2.5Y 6/2), clay; moderate, coarse granular; firm when moist and very hard when dry; moderately alkaline and strongly calcareous; numerous medium sized lime carbonate concretions; gradual, wavy, lower boundary.

Ck2 - 61 cm +, grayish brown (2.5Y 5/2 dry), clay; massive to moderate, fine blocky; plastic and sticky when wet; very firm when moist; moderately alkaline and strongly calcareous.

Sevick Series (SVC)

The Sevick series consists of imperfectly drained Gleyed Rego Black Chernozem soils developed on moderately to strongly calcareous, shallow, sandy to coarse loamy lacustrine sediments less than 1 m in thickness overlying loamy, very calcareous morainal deposits. These soils occur on nearly level, lacustrine veneer deposits and have rapid surface permeability and low subsoil permeability, slow surface runoff and a medium water table during the growing season. Sevick soils are slightly to moderately stony. The native vegetation often comprises of black poplar and aspen with shrubs such as willow and dogwood and a ground cover of meadow grasses. The majority of these soils are currently used for crop production.

In a representative profile of Sevick soil, the solum is generally about 48 cm thick. The profile is characterized by a 30 cm thick very dark gray, loamy fine sand, Ap and Ah horizon overlying a grayish brown, calcareous, loamy fine sand mottled AC transition horizon, and very pale brown strongly calcareous and mottled fine sand Ckgj horizon. The parent material of the till substrate is typically uniform, compact, very strongly calcareous and mottled loam to clay loam.

Sevick soils occur in close association with Lenswood and Ethelbert soils. They are similar to Ethelbert soils by having the same texture and till substrate and to the Lenswood soils by having the same drainage, but differ from the Ethelbert soils because of poorer drainage. Sevick soils have low available water holding capacity, medium organic matter levels, and medium natural fertility. Sevick soils correlate with Lenswood till substrate phase soils in the Swan River soil report.

Sewell Series (SEE)

The Sewell series consists of poorly drained Rego Humic Gleysol soils developed on weakly to moderately calcareous, deep, uniform, sandy (FS, LS, LFS) lacustrine and fluvial deposits. These soils occur in depressional positions of gentle slopes on hummocky landscapes and have moderately rapid permeability, very slow surface runoff, and a high to ponded water table during the growing season. Sewell soils are non-eroded, non-stony, and often slightly saline. They have a low available water holding capacity, high organic matter content, and low natural fertility. Native vegetation includes sedges, rushes, reeds and willows. The majority of these soils are currently in native vegetation.

In a representative profile the solum is approximately 15 cm thick. The profile is characterized by moderately decomposed organic horizon, 2 to 5 cm thick, a very dark gray Ah horizon, 10 to 18 cm thick, a dark gray to gray AC horizon, 10 to 15 cm thick with carbonates and mottles, and usually a Cca horizon, 5 to 8 cm thick. A typical profile also contains an olive to pale olive Ckg horizon with yellowish brown mottles and manganese concretions.

Sewell soils occur in close association with Stockton, Lavenham and Hummerston soils. They are similar to Osterwick soils by having poor drainage and a Rego Humic Gleysol profile but differ from them in having sandy rather than coarse loamy deposits. Sewell soils were previously mapped as Meadow associates of the Stockton Association in the Carberry (1957) soil report.

Shelley Series (SLY)

The Shelley series consists of poorly drained organic soils, developed on shallow (40 to 130 cm) mesic forest peat underlain by medium textured lacustrine sediments. The Shelley soils are Terric Mesisols characterized by a very thin (< 15 cm) surface layer of fibric moss underlain by moderately well decomposed very dark brown, slightly acid to neutral forest peat layered with various amounts of logs and woody debris. This layer grades into black, more decomposed peat of forest or fen origin. The dominant peat source in the Shelley soils is feathermosses, which are readily decomposed and give the peat its very dark brown to black color.

The Shelley soils occur on flat and sloping bogs in the eastern part of the Roseau River watershed. Peat accumulation is shallow on the parts of bogs near the margin of the peat land. Native vegetation is black spruce with some tamarack and an understory of Labrador tea and feathermosses. Sphagnum moss species are rare, and usually occur in the form of pillows or hummocks.

Shellmouth Complex (SEU)

The Shellmouth Complex consists of well to excessively drained Orthic Regosol soils developed on variable textured deposits. These soils occur in crest to lower positions of very strong to extreme slopes on river and streambank landscapes and have variable permeability, rapid surface runoff, and a low water table during the growing season. Shellmouth soils are usually severely eroded, non-stony, and non-saline. They have variable available water holding capacity, low organic matter content, and low natural fertility. Native vegetation includes forests of aspen, oak and willow. The majority of these soils are currently too steep to be cultivated.

In a representative profile of Shellmouth soil the solum is not developed. The profile is characterized by a very thin LF horizon, 1 to 3 cm thick, and a Ck horizon. Shellmouth soils occur in close association with alluvial soils along stream banks. Shellmouth soils were previously mapped as Eroded Slopes (ERX) in the Carberry (1957) soil report.

Shergrove Series (SGV)

The Shergrove series consists of imperfectly drained, carbonated Gleyed Rego Black Chernozem soils developed on moderately to strongly calcareous, stratified, sand and gravel outwash and beach deposits. The surface texture ranges from loamy sand to sandy loam and loam. Areas of Shergrove Series are found in association with beach and water worked till deposits at scattered locations in the Dauphin Lake Plain and in the southern portion of the Westlake Till Plain. They occupy level to very gently sloping areas downslope from beach ridges or areas of water worked till. Natural drainage of the Shergrove soils is affected by both lateral seepage from adjacent beaches at higher elevations and by groundwater discharge. Surface runoff is slow to moderate but lateral soil permeability is rapid. Vegetation consists of aspen and balsam poplar with dense ground cover of meadow grasses, sedges and scattered shrubs such as dogwood, willow and swamp birch.

The Shergrove soil is characterized by a thin leaf and sod litter underlain by a very dark gray to black loamy sand to sand textured A horizon which is usually calcareous to the surface. A dark gray to gray transitional AC horizon separates the dark surface from the underlying very pale brown to light gray, stratified sand and gravel parent material. Many of the Shergrove soils are underlain by extremely calcareous stony loam textured till at depths between 1.5 and 3 m from the surface. A representative profile of the Shergrove series is described as follows:

L-H - 5 to 0 cm, partially decomposed deciduous leaf litter and grass mat; neutral; weakly calcareous; abrupt, smooth, boundary.

Ahk - 0 to 5 cm, black (10YR 2/1 moist) loam; moderate fine granular; very friable when moist; soft when dry; neutral; moderately calcareous; clear smooth boundary.

AC - 5 to 10 cm, very dark gray (10YR 3/1 moist) sandy loam; moderate fine granular; friable when moist; slightly hard when dry; moderately alkaline; very strongly calcareous; abrupt, smooth boundary.

Ckgj - 10 to 90 cm +, pale brown (10YR 6/3 moist) gravelly loamy sand; structureless; single grained; loose when moist and dry; mildly alkaline; extremely calcareous.

II Ckg - at approximately 150 cm in ditch cut, very pale brown to white (10YR 7/3 moist, 10YR 8/2 dry) clay loam, moderate fine pseudo platy breaking to moderate course granular; friable when moist; slightly hard when dry; moderately alkaline; extremely calcareous.

Shilox Series (SHX)

The Shilox series consists of moderately well to excessively drained Orthic Regosol soils developed on weakly to noncalcareous, deep, uniform, sandy (FS, LS, S), eolian deposits. These soils occur in middle and upper positions of moderate to strong slopes on hummocky to duned landscapes and have rapid to very rapid permeability, minimal surface runoff, and a low water table during the growing season. Shilox soils are severely wind eroded, non-stony, and non-saline. They have low available water holding capacity, low organic matter content, and low natural fertility. Native vegetation includes oak, black spruce, juniper and prairie grasses. The majority of these soils are currently wooded.

In a representative profile the solum is not developed. The profile is characterized by a partially decomposed LH horizon, 1 to 2 cm thick, a grayish brown to pale brown Ah horizon, 6 to 10 cm thick, and a light yellowish brown to pale brown C horizon. A typical profile also contains an occasional buried Ah horizon, 2 to 4 cm thick.

Shilox soils occur in close association with Onahan and Mockry soils. They are similar to Arizona soils by having a Regosol profile in sandy deposits but differ from them in having less stratification and more uniform textures. Shilox soils were previously mapped as duned associates of the Stockton Association in the Carberry (1957) soil report.

Sifton Series (SFT)

The Sifton series consists of carbonated, Rego Humic Gleysol soils developed on thin, very strongly to extremely calcareous, moderately fine textured (CL, SiCL) sediments underlain by fine textured (SiC, C) lacustrine deposits. The upper deposits may be stratified and surface textures range from clay loam to silty clay. The topography is smooth and level and the soils are dominantly poorly drained as surface runoff and internal percolation are slow. The Sifton soils mapped as the saline phase are affected by the discharge of saline groundwaters. The surface distribution of salts is variable and sporadic so that the native vegetation consists of sedges and meadow grasses and patches of salt tolerant species.

Profile development in the Sifton saline phase soils is similar to that described for the Glenfields series. The dark coloured surface Ah horizon is thin, 8 to l5 cm, usually carbonated and saline. A transitional gray coloured AC horizon commonly separates the surface horizon from the light gray to pale yellow extremely calcareous, weakly saline C horizon. This soil differs from the Glenfields soil mainly in that the moderately fine textured C horizon is variably saline and grades into clay sediments usually within 1 m of the surface. They occur in a low lying area near where the Wilson and Vermillion Rivers flow into the west side of Dauphin Lake.

Sigmund Series (SGO)

The Sigmund series consists of imperfectly drained, Gleyed Rego Black Chernozem soils developed on moderately to strongly calcareous, deep, uniform clayey (SiC, C), lacustrine deposits. These soils occur in lower slope positions of very gentle slopes on undulating landscapes and have slow permeability, moderately slow surface runoff, and a high water table during the growing season. Sigmund soils are non-eroded, non-stony, and frequently slightly saline. They have high available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation includes aspen-oak groves, well and prairie grasses. The majority of these soils are currently annual crop production.

In a representative profile the solum is approximately 20 cm thick. The profile is characterized by a very dark gray Ah horizon, 15 to 25 cm thick, a dark gray AC horizon, 5 to 18 cm thick with many faint mottles, a light gray Cca horizon, 5 to 15 cm thick with many prominent mottles and a light olive brown Ckgj horizon, with many prominent mottles. A typical profile also contains gypsum crystals in the subsoil.

Sigmund soils occur in close association with Janick, Harding and Lowton soils. They are similar to Harding soils by having an imperfectly drained profile in clayey deposits but differ from them by having no B horizon. Sigmond soils were previously mapped as minor inclusions of the Oliver Association in the soil survey of South-Central Manitoba (1943).

Silver Creek Series (SVK)

The Silver Creek series consists of well drained Orthic Regosol soils developed on weakly to moderately calcareous, deep, uniform sandy eolian deposits. These soils occur on crest, upper and mid slopes of hummocky eolian deposits and have rapid permeability, low surface runoff and a low water table during the growing season. Silver Creek soils have low available water holding capacity, low organic matter levels, low natural fertility and are severely eroded. The native vegetation often comprises of aspen, short shrubs such as rose and saskatoon and a ground cover of grass and sage with patches of bare soil. The majority of these soils currently support native vegetation and are used for pasture. Some Silver Creek soils occur in severely eroded portions of cultivated areas.

In a representative profile the solum is restricted to a very thin (5 to 10 cm) grayish brown A horizon. The profile is characterized by this A horizon overlying a very pale brown, weakly calcareous Ck horizon, which may contain dark coloured bands representing former surface horizons. The parent material is typically very pale brown to light gray, moderately calcareous fine sand.

Silver Creek soils occur in close association with Gilbert and Davidson soils. They are similar to Davidson soils by having a light coloured surface horizon but lack a B horizon. They differ from the Gilbert soils because of light surface colours. Silver Creek soils correlate with duned areas of Davidson and Gilbert soils published in the Swan River soil report.

Simonhouse Series (SIU)

The Simonhouse series consists of Eluviated Eutric Brunisol soils developed on deep (> 100 cm), moderately to very strongly calcareous, sandy loam to loam textured till. The soil materials are usually skeletal due to large amounts of channery and flaggy limestone and/or dolostone fragments. These soils occur on the apex and upper slopes of gently undulating or hummocky terrain. The soils are well drained due to the coarser texture of the material and runoff is slow and generally occurs only in spring when the soil is frozen and permeability is reduced. Vegetation is dominantly black and white spruce, trembling aspen, jack pine with an understory of soapberry, rose and alder. Groundcover consists of small raspberries, strawberries, other herbs and patches of mosses and lichens. Associated soils are Leak Lake and Limestone Point soils.

L - 5 to 2 cm, dark grayish brown (10YR 4/2 dry), non-decomposed leaf mat; medium acid; abrupt, smooth boundary.

FH - 2 to 0 cm, black (5YR 2.5/1 wet) to very dark brown (10YR 2/2 dry), moderately to well decomposed leaf litter; abundant, very fine horizontal roots; neutral; abrupt, smooth boundary.

Ae - 0 to 5 cm, brown to dark brown (7.5YR 4/4 moist and dry) skeletal, fine sandy loam; very weak, coarse platy breaking to very weak medium granular; slightly sticky and slightly plastic when wet; friable when moist and slightly hard when dry; abundant, medium horizontal roots; 40 % channery, angular cobbly and flaggy limestone and dolostone fragments; neutral; clear, smooth boundary.

Bmk - 5 to 20 cm, dark reddish brown (5YR 3.5/4 moist) to reddish brown (5YR 4/4 dry) skeletal fine sandy loam; very weak, coarse granular breaking to very weak, fine to medium granular; slightly sticky and slightly plastic when wet; friable when moist and slightly hard when dry; abundant, fine, vertical roots; 40 % channery, angular cobbly and flaggy limestone and dolostone fragments; neutral; moderately calcareous; clear, wavy boundary.

BCk - 20 to 40 cm, olive brown to light olive brown (2.5Y 4.5/4 moist) to pale brown (10YR 6/3 dry) skeletal fine sandy loam; weak, fine platy breaking to weak to moderate, very fine subangular blocky; slightly sticky and slightly plastic when wet; friable when moist and slightly hard when dry; abundant, fine, oblique roots; 40 % angular cobbly and flaggy limestone and dolostone fragments; mildly alkaline; very strongly calcareous; clear, wavy boundary.

Ck - 40 to 55 cm, light yellowish brown (2.5Y 6/4 moist) to light gray (2.5Y 7/2 dry) skeletal fine sandy loam; weak, fine platy breaking to weak to moderate, very fine subangular blocky; slightly sticky and slightly plastic when wet; friable when moist and slightly hard when dry; few, fine, vertical roots; 40 % angular cobbly and flaggy limestone and dolostone fragments; mildly alkaline; very strongly calcareous.

Sinclair Series (SIC)

The Sinclair series consists of poorly drained, Orthic Gleysol soils developed on acidic, siliceous fine sand. The topography is depressional and the vegetation is predominantly aspen, willow, sedges and grasses. A generalized profile description is given.

LF - 2 to 0 cm, thin leaf and sod mat; abrupt, smooth boundary.

Aeg - 0 to 18 cm, light brownish gray (10YR 6/2 moist) and white (10YR 8/1 dry); fine sand; structureless; loose when moist and dry; extremely acid; clear, wavy boundary.

Bmg - 18 to 30 cm, brown (7.5YR 5/4 moist) and light yellowish brown (10YR 6/4 dry); fine sand; structureless; loose when moist and dry; extremely acid; clear, smooth boundary.

Cg1 - 30 to 61 cm, light yellowish brown (10YR 6/4 moist) and very pale brown (10YR 7/4 dry); fine sand; structureless; loose when moist and dry; extremely acid; gradual, smooth boundary.

Cg2 - 61 to 91 cm, light yellowish brown (10YR 6/4 moist) and very pale brown (10YR 7/4 dry); fine sand; structureless; loose when moist and dry; extremely acid.

Singush Series (SGU)

The Singush series consists of imperfectly drained, Gleyed Gray Luvisol soils developed on 20 to 100 cm of silty clay textured, stone-free glacio-lacustrine sediments overlying moderately calcareous, loam textured glacial till. Topography is depressional to very gently sloping. Surface drainage is impeded by the fine textured solum. Dominant vegetation is white spruce and aspen with a ground cover of feathermoss and bunchberry. The white spruce reach a height of 25 metres or more in the Childs Lake and Blue Lake areas.

Singush soils have a leaf mat (LFH) approximately 10 cm thick, a light gray Ae horizon, a slightly gleyed, silty clay to clay textured illuvial, Bt or Btg horizon. The underlying II Ckg is strongly gleyed and mottled glacial till.

Singush soils are of minor extent in the map area, occupying only a few map units in conjunction with well and poorly drained soils developed from similar parent materials, the Duck Mountain and Whitefish series respectively.

Sinnott Series (SNT)

The Sinnott series consists of Rego Humic Gleysolic soils developed in moderately to very strongly calcareous, fine loamy textured morainal till derived from shales, limestone, and granite rocks. Sinnott soils are non-stony, level depressional, poorly drained, slowly permeable and often ponded. Surface runoff is nil to very slow. Sinnott soils commonly occur in the lowest depressions in the landscape. Although some are used for crops, land use is primarily marsh and natural grazing. Vegetation often consists of cattails, bullrushes, and slough grass.

Uncultivated Sinnott soils are characterized by thin (< 40 cm) surface layers of mesic to humic organic materials. These soils were mapped as Sinnott peaty phase. Cultivated Sinnott soils have a loam textured Ap horizon (average 22 cm thick) overlying a clay loam textured Ckg horizon. Many Sinnott soils contain carbonates at the soil surface which indicates a lack of leaching. Infiltration is very slow in these soils. The lack of leaching, the dull matrix colours, high water table, abundance of mottling and the deep depressional locations of Sinnott soils are indicative of local groundwater discharge conditions. Sinnott soils are closely associated with Petlura, Roblin and Cayer soils and semi-permanent and permanent water bodies. They differ from the Roblin soils by being less leached and by having shallower soil profiles.

Sipiwesk Series (SWK)

The Sipiwesk series consists of well drained Orthic Gray Luvisol soils developed on weakly to moderately calcareous, deep, clayey lacustrine deposits. These soils occur in middle and upper positions of moderate slopes on undulating to level landscapes and have slow permeability and moderate surface runoff. Sipiwesk soils are prone to erosion if unprotected; are non stony and non saline. They have high available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes mixed coniferous and hardwood forest species, white spruce, aspen, jack pine, alder with minor amounts of birch, horsetail and willow. The majority of these soils remain in natural woodland.

In a representative profile the solum is approximately 60 cm thick. The profile is characterized by very dark brown, acidic LH horizon, 5 to 20 cm thick, a light gray, platy structured, loamy Ae horizon, 15 to 30 cm thick with an underlying transitional AB horizon grading to a dark brown, clay textured, strong medium angular blocky structured Bt horizon, 30 to 50 cm thick, and a dark grayish brown BC horizon, 15 to 25 cm thick. The parent material is calcareous dark gray clay.

Sipiwesk soils occur in close association with clayey textured more poorly structured Wabowden soils and the imperfectly drained Roe Lake soils. They differ from Wabowden soils because of their more subangular blocky to granular structure. Wabowden soils have very hard, strongly developed, coarse columnar structures in their AB and Bt horizons. Sipiwesk soils were previously mapped and described in the Cormorant Lake report. However, the clayey sediments in the Flin Flon area appear to be less calcareous than those in the Cormorant Lake area.

Sirko Series (SIK)

The Sirko series consists of imperfectly drained Gleyed Gray Luvisol soils developed on moderately to strongly calcareous coarse sandy to gravelly outwash, beach and stratified drift deposits. There is commonly a thin sandy surface mantle over the gravelly material and surface textures range from loamy coarse sand to clay loam. These soils occur throughout the map area but are most common on the beach ridges bordering the lowlands. The topography is level to irregular gently sloping. There is little or no surface runoff as these soils are very permeable, but internal drainage is impeded by a high groundwater table. Native forest consists mainly of aspen, balsam poplar with some jack pine. Shrubs are mainly dogwood, rose, some alder, willow and raspberry.

In their natural condition Sirko soils are characterized by a thin light brownish gray, acid, Aeg horizon and a Btg horizon. These surface horizons are commonly developed partly in the surface sandy mantle and in the coarse sand and gravel.

Skelding Series (SKL)

The Skelding series consists of excessively drained Orthic Regosol soils developed on weakly calcareous, deep, uniform, sandy (FS, LFS), recent eolian deposits. These soils occur in upper positions of gentle slopes on duned landscapes and have rapid to very rapid permeability, low surface runoff, and a low water table during the growing season. Skelding soils are severely wind eroded, non-stony, and non-saline. They have a low available water holding capacity, low organic matter content, and low natural fertility. Native vegetation includes aspen, juniper, oak and short prairie grasses. The majority of these soils are currently stabilized by being seeded to grasses.

In a representative profile of Skelding soil the solum is not developed. The profile is characterized by a dark yellowish brown Ah horizon, 5 to 10 cm thick, and a dark yellowish brown C horizon. A typical profile extends to more than a meter before carbonates occur. Dunes that are presently active are designated as SkLa.

Skelding soils occur in close association with Long Plain, Almasippi and Lelant soils. They are similar to Shilox soils by having sandy eolian deposits and a Regosol profile but differ from them by occurring in a slightly warmer climate. Skelding soils were previously mapped as inclusions of the Almasippi Association in the Carberry (1957) soil report.

Snow Lake Complex (SOW1 & SOW2)

The Snow Lake complex consists of well drained Eluviated Dystic and Eutric Brunisols, lithic phases and bedrock (non-soil). The Brunisol soils have developed on thin veneers of slightly acidic to neutral, loamy to sandy till and on residual and colluvial materials collected in pockets and bedrock fissures. The complex also includes thin organic deposits of mesic forest and sedge peat accumulated in small bedrock depressions.

The Snow Lake, thick organic material variant (SOW1) areas are characterized by a thick (15 to 30 cm) LFH layer overlying most of the unconsolidated mineral materials as well as large parts of the bedrock. The Snow Lake, thin organic material variant (SOW2) generally lacks this deep LFH layer and more bedrock surface is exposed. Differences in fire history may be the cause of the variable accumulation of organic material. There also is a generally greater accumulation and more widespread presence of residual and colluviated materials in the SOW1 areas compared to the SOW2 areas. Snow Lake soils occur in close association with and include small areas of Fay Lake, Hat Lake and Wolverton soils.

In a representative profile the solum is approximately 25 cm thick. The profile is characterized by weakly to moderately decomposed, strongly acidic, black, feathermoss and forest debris LFH horizon, 8 to 30 cm thick, with occasional rock fragments; a very strongly acidic, dark reddish brown, very fine sandy loam Bm1 horizon, 10 to 20 cm thick, with some coarse fragments; a strongly acidic, brown, very fine sandy loam Bm2 horizon, 10 to 15 cm thick, with angular, coarse fragments overlying bedrock.

LFH - 8 to 0 cm, black (5YR 2.5/1 moist) and dark reddish brown (5YR 2.5/2 dry), strongly fibered, moderately decomposed feathermoss, needles and leaves; abundant, very fine random roots; moderately acid; abrupt, smooth boundary.

Bm1 - 0 to 15 cm, dark reddish brown (2.5YR 3/4 moist) and reddish brown (5YR 4/4 dry) very fine sandy loam; weak, very fine granular structure; non sticky, very friable and non-plastic; abundant, fine, random roots; coarse cherty fragments; very strongly acid; clear, wavy boundary.

Bm2 - 15 to 25 cm, strong brown (7.5YR 4/6 moist, 7.5 YR 5/6 dry), very fine sandy loam; weak, very fine granular; non sticky; very friable and non-plastic; abundant, medium, random roots; coarse cherty fragments; strongly acid; abrupt boundary.

R - 25 cm +

Somme Series (SMM)

The Somme series consists of poorly drained, carbonated Rego Humic Gleysol soils developed on stratified, moderately to strongly calcareous, sand and gravel deposits. These materials usually exceed 1 metre in thickness but are often underlain by extremely calcareous stony, medium textured till several metres below the surface. A thin (<15 cm) layer of loamy sand to sandy loam and loam textured materials usually occurs on the surface of the stratified sand and gravel. Topography is level to depressional and runoff is slow. Although permeability is rapid in these soils, they are saturated for significant periods throughout the year as the ground water levels are high.

The Somme soils have a thin (10 to 15 cm) granular, very dark gray to black A horizon developed in the finer textured surface materials. This horizon is usually carbonated and grades through a transitional grayish brown AC horizon into a light gray sand and gravel Ckg horizon. The lower horizons are always calcareous and usually strongly gleyed and mottled with iron staining. These soils are similar to the Eddystone soils differing from them only in that the less permeable till substrate is found at greater depths below the surface.

The Somme soils occur in a few small areas in the southern portion of the Interlake Plain and Westlake Till Plain. They occur in level to depressional areas bordering gravelly beach ridges or in narrow swales associated with areas of severely water-worked till. Vegetation on these soils is mainly sedges, meadow grasses and reeds with scattered clumps of willow and swamp birch.

Soul Lake Complex (SOX) or (SOK)

The Soul Lake complex consists of well drained soils developed on thin (25 to 100 cm), stratified, strongly calcareous, sand and gravel deposits overlying extremely calcareous, loamy glacial till. The dominant member of the complex is the Soul Lake series, an Eluviated Eutric Brunisol. Other members are the Long Point series, an Orthic Gray Luvisol, and the Pim Lake series, an Orthic Eutric Brunisol. The Soul Lake series has a thin, light brownish gray Ae or Aej horizon overlying a weakly developed Bm or Btj horizon.

These soils are developed on glacial till landforms which have been waterworked, producing shallow beach and outwash deposits in the higher topographic positions. The fragmental to sandy-skeletal texture of these deposits inhibits profile development, and results in rapid runoff and moderate to rapid permeability. Native vegetation is jack pine with some black spruce and aspen. The Soul Lake soils occur mainly on The Pas Moraine. These soils often occur in association with soils of the Chitek series, and the Freshford complex. A representative description of a member of the Soul Lake complex (the Long Point series) follows.

L - 8-6 cm, dark reddish brown (5YR 3/2 moist) undecomposed leaves and needles; neutral.

F-H - 6-0 cm, dark reddish brown (5YR 2/2 moist) slightly decomposed leaves and needles; neutral; clear smooth boundary.

Ae - 0-7 cm, gray to light gray (10YR 6/1 moist) loamy sand; structureless; moist loose; non-plastic; neutral; clear wavy boundary.

Bt - 7-22 cm, dark yellowish brown (10YR 4/4 moist) fine sandy loam; very weak fine granular moist friable; neutral; clear wavy boundary.

II Ck - 22-50 cm, pale brown (10YR 6/3 moist) very gravelly coarse sand; structureless; moist loose; non-plastic; mildly alkaline; extremely calcareous; clear wavy boundary.

III Ck - 50-90 cm, light brownish gray to light gray (10YR 6.5/2 moist) silt loam; weak fine to medium subangular blocky; moist friable; mildly alkaline; extremely calcareous.

Souris Series (SOU)

The Souris series is the imperfectly drained, carbonated Gleyed Rego Black Chernozem member of the Souris Association, developed on deep (> 100 cm), weakly to moderately calcareous, sandy lacustrine deposits. This soil has a fine sand to loamy fine sand surface texture, nearly level to depressional topography with simple and complex slopes, no surface runoff and moderately rapid permeability. The depth to water table is estimated at about 1.5 m during the growing season. This soil is generally cultivated or used for pasture.

A typical profile usually has a black Apk horizon, 12 to 15 cm thick, a black Ahk horizon, 5 to 7 cm thick, a gleyed, dark grayish brown AC horizon, 7 to 12 cm thick and a gleyed yellowish brown stratified Ckgj horizon. The soil parent materials have strata ranging in texture from fine sand to coarse gravel.

South Junction Series (SUJ)

The South Junction series consists of poorly drained, organic soils developed on shallow (40 to 160 cm) deposits of mesic to humic forest peat, underlain by fine textured lacustrine sediments. The South Junction soils are Terric Humisols composed of dominantly well decomposed forest peat, which is slightly acid to neutral and contains large amounts of logs and woody debris. Feathermosses and herbaceous plants, the dominant sources of peat in the South Junction soils, readily decompose, resulting in a black, fibered to amorphous, slightly sticky material.

The South Junction soils occur on gently sloping mesic swamp landforms at, or near, the margin of peatlands. Native vegetation consists of eastern white cedar in various proportions with black spruce and tamarack. The understory is characterized by tall shrubs such as alder and birch, with a ground cover of low herbaceous plants, ericaceous species and mixed mosses.

Spearhill Series (SRL)

The Spearhill series consists of imperfectly drained Gleyed Rego Dark Gray Chernozem soils developed on moderately to strongly calcareous sandy and gravelly outwash or beach deposits. The surface texture ranges from a fine sandy loam to loam. The topography is very gently sloping to level. Surface runoff is slow; permeability is rapid. Drainage is imperfect because of a fluctuating water table that rises to within 50 cm of the surface during the spring or due to lateral seepage. Vegetation consists dominantly of aspen and grasses with some dogwood, balsam poplar and few willows.

The Spearhill soil is characterized by a thin layer of decomposing leaf litter and grasses, a dark gray Ah to Ahe horizon 10 to 24 c m thick, and a grayish brown, carbonated transitional AC horizon 15 to 25 cm thick.

Sprague Series (SPG)

The Sprague series consists of poorly drained, carbonated Rego Humic Gleysol soils developed on moderately to strongly calcareous sandy lacustrine and outwash deposits overlying extremely calcareous, loamy glacial till within one metre of the surface. The texture of the surface horizon varies from sand to fine sandy loam. Surface drainage is slow and the water table is at or near the surface for the greater part of the growing season. Some scattered surface stones may be present within the map unit. Native vegetation consists of sedge, reeds, and willow.

The Sprague soils have a fibrous to mucky organic surface layer of 6 to 15 cm and a thin very dark gray, moderately alkaline Ahg horizon 7 to 12 cm thick, which overlies the iron stained calcareous parent material. The extremely calcareous loamy till occurs at depths ranging from 30 to 100 cm. The solum is similar to the Malonton series. The underlying loamy till substrates is similar to that described for the related Colby, Pelan and Caliento series. With a greater depth of peat surface (15 to 40 cm), the peaty phase of the Sprague soil is encountered.

Springwell Series (SGW)

The Springwell series consists of poorly drained, carbonated Rego Humic Gleysol soils developed on thin, very strongly to extremely calcareous, medium textured (VFSL, L, SiL) sediments overlying extremely calcareous, stony medium textured till. Surface textures are very fine sandy loam to silt loam grading into coarser textured sediments above the till substrate. The

Springwell soils occur mainly in the Dauphin Lake Plain where the lacustrine overlays are shallow. The topography in these soil areas is level to depressional and runoff is slow. Internal soil permeability is moderate in the surface materials and usually somewhat impeded in the loamy till substrate. Depth to the underlying till is variable, resulting in moderately stony conditions where the till is close to the soil surface. Native vegetation is dominantly sedges and meadow grasses with clumps of willow and swamp birch.

Profile characteristics of the upper portion of the Springwell soils are similar to the Wentland soils. A thin, very dark gray to black, calcareous A horizon is underlain by a grayish brown, mottled AC transition horizon. This, in turn, grades into the strongly gleyed, iron stained extremely calcareous parent material. A gravelly or cobbly lens usually occurs at the contact of the upper water laid sediments and the underlying till. The till is white, to very pale brown, iron stained and extremely calcareous. It is commonly amorphous but may break into a weak fine pseudo platy structure. The peaty phase soils have a thin (15 to 40 cm) organic surface layer comprised of moderately well decomposed fen peat. The saline phase soils contain sufficient soluble salts in the solum to adversely affect plant growth.

Spruce Siding Series (SPS)

The Spruce Siding series consists of imperfectly drained Gleyed Dark Gray Luvisol soils developed on moderately to strongly calcareous, stratified, medium to moderately coarse textured alluvial and lacustrine deposits which are underlain by weakly calcareous clayey lacustrine sediments within 1 metre.

These soils occur on thin alluvial sediments over clay along the Whitemouth River in the Hadashville-Medika district. Drainage is impeded by the clay substrate. Variability in texture and profile development is characteristic of these soils.

This soil was previously mapped as the Hadashville clay substrate phase in the Soils of the Lac Du Bonnet Area (Soils Report No. 15, 1967).

Squirrel Creek Series (SQR)

The Squirrel Creek series consists of imperfectly drained Gleyed Rego Black Chernozem soils developed on a mantle (60 to 90 cm) of strongly to very strongly calcareous, shallow, loamy (FSL, L, SiL, SCL), lacustrine deposits over moderately calcareous, uniform, deep, clayey (SiC, C) lacustrine deposits. These soils occur in middle positions of undulating landscapes and have moderately slow over slow permeability, slow surface runoff, and a high water table during the growing season. Squirrel Creek soils are non-eroded, non-stony, and occasionally slightly saline. They have medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation includes aspen, willow, poplar and prairie grasses. The majority of these soils are currently cultivated for crop production.

In a representative profile the solum is approximately 15 cm thick. The profile is characterized by a dark gray Ah horizon, 13 to 20 cm thick, strongly calcareous, an AC or Cca horizon, 13 to 2 5 cm thick, strongly to extremely calcareous, and a moderately calcareous II Ck horizon, with prominent iron mottles. A typical profile also contains sandy strata above the clay substrate.

Squirrel Creek soils occur in close association with Denham, Rignold and Edkins soils. They are similar to St. Claude soils by having a prominent Cca horizon and imperfect drainage but differ from them in having a clayey substrate. Squirrel Creek soils were previously mapped as minor inclusions of the Rathwell Association in the Carberry (1957) soil report.

St. Claude Series (SUE)

The St. Claude series consists of imperfectly drained Gleyed Rego Black Chernozem soils developed on a mantle (50 to 75 cm) of strongly to very strongly calcareous, shallow, loamy (SCL, L, SiL), lacustrine deposits over moderately calcareous, uniform, shallow, sandy (FS, LFS), lacustrine deposits. These soils occur in middle to lower positions of very gentle to gentle slopes on undulating landscapes and have moderately slow to slow over rapid permeability, slow surface runoff, and a high water table during the growing season. St. Claude soils are non-eroded, non-stony, and often slightly saline. They have a medium available water holding capacity, medium organic matter content, and low natural fertility. Native vegetation includes aspen, black poplar, willow and prairie grasses. The majority of these soils are currently cultivated for crop production.

In a representative profile the solum is approximately 15 cm thick. The profile is characterized by a dark gray, strongly calcareous Ah horizon, 13 to 20 cm thick, a strongly to extremely calcareous Cca or AC horizon, 13 to 25 cm thick with prominent mottles, and a light yellowish brown to olive gray, moderately calcareous Ckgj horizon with many prominent mottles. The parent material is typically finer textured at 1.5 to 5 metres depth. A typical profile also contains silt and clay sized carbonates and little clay in the loamy sediments. The SUE1 variant contains a CKgj that is dominantly coarse sand.

St. Claude soils occur in close association with Rosengart, Neuenberg and Jasset soils. They are similar to Almasippi soils by having imperfect drainage and a sandy substrate but differ from them in having a loamy, prominent Cca or AC horizon. St. Claude soils were mapped as inclusions of the Almasippi Association in the Carberry (1957) soil report.

St. Labre Series (SLB)

The St. Labre series consists of moderately well to well drained Orthic Gray Luvisol soils developed on moderately to strongly calcareous, moderately coarse to coarse textured deltaic and lacustrine deposits overlying strongly to extremely calcareous loam textured till deposits. The surface layers range from a fine sand to loamy sand and averages about 30 to 60 cm in thickness. The topography is irregular, very gently sloping. Runoff is moderately rapid and permeability is moderately rapid. The native vegetation consists of bur oak, grasses, some aspen, choke cherry, and saskatoon.

The St. Labre soil is characterized by a thin partially decomposed leaf mat, a thick light gray to gray Ae horizon within the sandy overlay and a thin moderately developed Bt horizon either within the sandy layer or in the finer textured substrate. A pebble line may be encountered at the contact of the extremely calcareous loam to clay loam till.

St. Lazare Complex (SZR)

The St. Lazare complex is characterized by variable soil development on poorly to non-sorted materials of variable texture and composition deposited at various positions of valley slopes and inclines by mass wasting or slumping. The materials vary in composition depending on the nature of the surrounding surface deposits, and in some cases, the underlying bedrock. They include the clays, from weathered shale, sand and gravel from adjacent upland fluvial sediments, till-like deposits, or a mixture of all three.

Moderately decomposed organic materials overlying any of the above materials are frequently found in localized depressions or flowages as a result of impeded surface drainage by slump ridges. The presence of a well developed solum and a range of parent materials and drainage positions indicate that present slopes have been stable for a considerable period following initial mass-wasting or slumping. Well drained Orthic Dark Gray Chernozem profiles are the dominant types found on the sandy and glacial till-like material, while Calcareous Black Chernozem profiles are dominant on the coarser sandy to gravelly materials. In the lower slope positions of the valley where considerable clay or weathered shale is present, the dominant sola are Solonetzic Dark Gray Chernozems. In poorly drained depressions and flowage areas, a complex of Rego Humic Gleysol and Terric Mesisols are found on a wide range of mineral soil parent materials.

Topography is complex with hummocky, inclined and ridged (or saw-tooth-like) landscape features; slopes range from moderate to very steep. Generally, the steeper slopes occur along upper valley walls. Surface erosion by water is minimal. The shoreline soils, predominantly, clayey textured, have not stabilized and continue to erode slowly due to wave impact. Along some portions of the shoreline, considerable ice transported stony and cobbly ridges have been observed. Vegetation consists primarily of aspen with some birch, ash, and elm; oak and grasses occur on the drier upper slopes and knolls associated with the sandy and gravelly soils. In the areas affected by ponding and seepage, vegetation varies from sedge and willows on the Rego Humic Gleysols to swamp birch, mosses, and Labrador tea on the organic soils.

The landscape characterized by the St.Lazare Complex (SZR) has been subdivided into 5 mapping unit variants based on soil parent material composition. They are:

SZR1 - The soil parent material is dominantly till-like and similar to the regional upland till. The soil profile is dominantly the Orthic Dark Gray Chernozem and appears similar inmost properties to the Erickson series.

SZR2 - The soil parent material is dominantly sand and gravel and occurs down slope adjacent to areas of Davidson, Marringhurst, or Leary soils. The sola vary from Orthic Dark Gray Chernozem on sandy deposits to Calcareous Black Chernozem on sediments having coarser sandy and gravelly textured surface layers.

SZR3 - Soil parent material is dominantly clay textured derived from weathered shale, or is composed of a shallow veneer of clayey till-like material at the surface. Sola developed on these materials have properties similar to those of the Benton series. Sola developed on the thin variable textured (loam to clay) mantle of till-like material, are similar to those of the Erickson soils. Some mixing of the loamy till (Erickson) and the clayey (Benton) material has occurred as a result of mass wasting. Shale bedrock with ironstones maybe present within one to two metres of the surface.

SZR4 - The soil parent materials are a mixture of the clay, sand, gravel and loamy till. The change in texture may occur abruptly in a horizontal direction or in a vertical direction. The soils of this unit are so variable that soil behavior cannot be predicted on the basis of a single set of soil properties. Individual site locations maybe similar to Benton, the Erickson, the Davidson, the Leary, or the Marringhurst soils and predicting the extent of their properties is only possible within a few metres of such individual sites.

SZR5 - The soil parent materials are dominantly a variable depth of moderately decomposed organic material overlying mineral sediments of variable composition. This unit occurs at the base of back slope positions of slump ridges and along flowages where coarse materials occur. Ponding and seepage influence them for a considerable period of the year. The thickness of the organic layer may vary from 15 cm to greater than 1 metre.

St. Malo Series (SMA)

The St. Malo series consists of well to moderately well drained Orthic Dark Gray Chernozem soils developed on a thin, moderately to strongly calcareous, moderately coarse to medium textured (VFS, LVFS, SL, FSL to VFSL, L, SiL) deltaic and lacustrine sediments over extremely calcareous stony till. The surface texture varies from a fine sandy loam to loam and occasionally clay loam. The topography is very gently sloping; runoff is moderate; and permeability decreases from moderate in the near surface to very slow in the underlying compacted fissile lodgement till. A thin gravelly layer may be present at the contact of the two deposits.

St. Norbert Series (SOR)

The St. Norbert series consists of moderately well to well drained Orthic Dark Gray Chernozem soils developed on moderately calcareous, fine textured (SiC, C) lacustrine and alluvial deposits. They occur on the well drained upper slope of the floodplain. They have moderate runoff, and moderately slow to slow permeability. The native vegetation is dominantly bur oak, with some maple, elm, aspen, herbs, and grasses.

The soils are characterized by a thin leaf mat 2 to 3 cm thick, a granular, gray Ahe 5 to 8 cm thick, a coarse prismatic, dark gray Btj 30 to 60 cm thick, and an olive gray clay Ck horizon.

Stallar Series (SXG)

The Stallar series consists of a well drained Orthic Regosol, lithic phase soil profile developed on a variable mantle (0 to 50 cm) of weakly calcareous loam to clay loam textured materials derived from fragmental, weathered shale, overlying shale bedrock. These soils have moderate surface runoff, moderate permeability in the surface materials and slow to very slow permeability in the underlying shale bedrock. The thin profile usually makes this soil droughty in periods of low precipitation.

These soils are characterized by little or no profile development. The profile is typified by a weak Ah less than 10 cm thick and a C horizon of uniform color. The underlying shale is clay textured and has had some softening near the surface.

Stanton Series (STU)

The Stanton series is the well drained, Orthic Black Chernozem member of the Souris Association, developed on deep (> 1 m), weakly to moderately calcareous, sandy lacustrine sediments. This soil has a fine sand to loamy fine sand surface texture, complex undulating topography, good internal drainage, rapid permeability and low surface runoff. The depth to water table is estimated to be 3 m during the growing season. These soils are susceptible to wind erosion.

Stanton soils usually have deep profiles consisting of black Ap horizons, 10 to 15 cm thick, very dark gray Ah horizons, 20 to 25 cm thick, dark brown to brown Bm horizons 25 to 50 cm thick, and stratified grayish brown Ck horizons. Stanton is equivalent to the Stockton soils in climatic subregion MBT2.

Statley Series (SXB)

The Statley Series consists of well to moderately well drained Orthic Dark Gray Chernozem soils developed on stony, very strongly to extremely calcareous loamy glacial drift of limestone and granitic origin. The soil occurs mainly on the mid and upper slopes of irregular undulating to moderately rolling topography, generally near or above an elevation of 457 metres (1500 ft) in the Brandon Hills, and may occur at lower elevations on the north and east facing slopes. Runoff is moderately rapid; permeability is moderately slow. Under cultivation, these soils are susceptible to both wind and water erosion, particularly on the steeper gradients. Native vegetation consists of bur oak, trembling aspen, shrubs and grasses. Stone content is quite variable.

The soil is characterized by a partially decomposed leaf mat (LH), 2 to 4 cm thick, a dark gray to dark grayish brown Ahe horizon 5 to 10 cm thick, a dark brown to brown Btj or Bt horizon, 10 to 15 cm thick, a pale brown BC horizon, 4 to 6 cm thick, and a white lime accumulation (Cca) horizon. A description of a representative Statley soil is provided below:

LH - 2 to 0 cm, very dark brown (10YR 2.5/2 dry, 10YR 2.5/1 moist) fine mull; neutral; abrupt, smooth boundary.

Ahe - 0 to 7 cm, grayish brown to brown (10YR 5/2.5 dry, 10YR 3/2 moist) loamy sand; weak, very fine granular; very friable when moist; soft when dry; non-plastic; neutral; abrupt, smooth boundary.

Aej - 7 to 13 cm, pale brown (10YR 6/3 dry, 10 YR 4/3 moist) loamy sand; weak, very fine granular; very friable when moist; soft when dry; non plastic; neutral; abrupt, smooth boundary.

Btj - 13 to 36 cm, yellowish brown (10YR 5.5/4 dry, 10YR 3.5/4 moist) fine sandy loam; moderate, fine subangular blocky; very friable when moist; soft when dry; slightly plastic; neutral; clear, smooth boundary.

BC - 36 to 50 cm, pale brown (10YR 6/3 dry, 10YR 5/3 moist) fine sandy loam; weak to moderate, fine, subangular blocky; very friable when moist; soft when dry; non-plastic; mildly alkaline; moderately calcareous; clear, irregular boundary.

Cca - 50 to 62 cm, white to light gray (10YR 7.5/2 dry, 10YR 6/3 moist) loam; weak to moderate, very fine granular; very friable when moist; slightly hard when dry; slightly plastic; mildly alkaline; extremely calcareous; clear, irregular boundary.

Ck1 - 62 to 135 cm, pale brown to very pale brown (10YR 6.5/3 dry, 2.5Y 4/3 moist) loam; moderate, fine, pseudo subangular blocky; very friable when moist; non-plastic; mildly alkaline; clear, wavy boundary.

Ck2 - 135 to 155 cm, pale brown to very pale brown (10YR 6.5/3 dry, 2.5Y 4/4 moist) sandy loam; very weak, fine pseudo granular; very friable when moist; non-plastic; mildly alkaline; strongly calcareous; few, medium, distinct olive yellow (2.5Y 6/6 moist) mottles.

Ck3 - 155+ cm, pale brown to very pale brown (10YR 6.5/3 dry, 2.5Y 4.5/4 moist) loam; moderate, medium, pseudo granular; very friable when moist; non-plastic; mildly alkaline; strongly calcareous; few, coarse, prominent olive yellow (2.5Y 6/8 moist) mottles.

Stead Series (STD)

The Stead series consists of very deep organic soils developed on greater than 160 cm of mesic herbaceous peat with little (< 15 cm) or no fibric Sphagnum peat on the surface. These very poorly drained soils are generally underlain by moderately to strongly calcareous loamy to clayey lacustrine sediments at depths below 160 cm. Stead soils, located in depressional to level areas, support vegetation which is dominantly sedges, reeds, brown mosses and meadow grasses with scattered clumps of swamp birch and willow.

The Stead series is a Typic Mesisol. Minor areas of the Overflowing series, a Hydric Mesisol, may occur within some map units represented by the Stead series. The Overflowing series usually occurs in areas occurring adjacent to open water.

Stewart Series (SWR)

The Stewart series consists of well to excessively drained Rego Black Chernozem soils developed on stony, very strongly to extremely calcareous loamy glacial drift of limestone and granitic origin, and usually has some coarser strata with depth. They occur on the upper slope and knoll positions of irregular, undulating to moderately rolling topography in the Brandon Hills. Runoff is rapid; permeability is moderate. Under cultivation, these soils have had some soil loss of topsoil due to wind and water erosion.

A partially decomposed leaf mat 2 to 4 cm thick; a very dark gray to very dark grayish brown Ahk horizon, 10 to 15 cm thick, and a thin AC horizon characterize the soil. A white lime accumulation (Cca) horizon, 8 to 12 cm thick is usually present. A description of the Stewart series is given below:

LH - 3 to 0 cm, dark reddish brown (5YR 3/2 dry, 7.5YR 3/3.5 moist) partially decomposed leaves and herbaceous plant material, slightly acid; abrupt, clear boundary.

Ahk1 - 0 to 12 cm, very dark grayish brown (10YR 3/2 dry, 10YR 2/1 moist) loam; weak, fine granular; very friable when moist; soft when dry; slightly plastic; neutral; moderately calcareous; clear, smooth boundary.

Ahk2 - 12 to 22 cm, dark grayish brown (10YR 4/2 dry, 10YR 3/1.5 moist) loam; weak, fine, granular; very friable when moist; soft when dry; slightly plastic; neutral; strongly calcareous; clear, wavy boundary.

AC - 22 to 28 cm, grayish brown (10YR 5/2 dry, 10YR4/2 moist) loam; weak, fine granular; very friable when moist; soft when dry; slightly plastic; neutral; very strongly calcareous; clear, wavy boundary.

Cca - 28 to 40 cm, light brownish gray to pale brown (10YR 6/2.5 moist) loam; weak, fine granular; very friable when moist; slightly hard when dry; slightly plastic; neutral; very strongly calcareous; clear, wavy boundary.

Ck1 - 40 to 70 cm, pale brown (10YR 6/3 dry, 10YR 5/4 moist) loam; very weak, fine pseudo granular; very friable when moist; soft when dry; non-plastic; mildly alkaline; very strongly calcareous; clear, wavy boundary.

Ck2 - 70 to 110 cm, pale brown to light yellowish brown (10YR 6/3 dry, 10YR 5/3.5 moist) fine sandy loam; weak fine pseudo granular; very friable when moist; soft when dry; non-plastic; moderately alkaline; strongly calcareous; few, coarse, prominent yellowish red (5YR 5/6 m)mottles; clear, wavy boundary.

Ck3 - 110 to 130 cm, pale brown to light yellowish brown (10YR 6/3 dry, 10YR 5.5/4.5 moist) fine sandy loam; weak, fine, pseudo granular; very friable when moist; soft when dry; non-plastic; moderately alkaline; few, fine, prominent yellowish red (7.5YR 5/6 moist) mottles.

Ck4 - 130 cm +, pale brown (10YR 6/3 dry, 10YR 5/4 moist) sandy loam; weak, fine, pseudo granular; very friable when moist; soft when dry; non-plastic; moderately alkaline; strongly calcareous.

Stockton Series (SCK)

The Stockton series is an Orthic Black Chernozem soil developed on moderately well to well drained, weakly to moderately calcareous, sandy (FS, LFS, LS), lacustrine sediments. These soils occur in the Upper Assiniboine Delta, the Brandon Lakes Plain and a few areas within the Lower Assiniboine Delta on very gently sloping to irregular undulating topography in association with Cactus, Lavenham, Hummerston and Sewell soils. Surface runoff is moderate, and permeability is rapid. Wind erosion is common if the soil is not protected with adequate surface residue.

The Stockton soil profile has a very dark gray to very dark grayish brown Ah, 18 to 25 cm thick; a brown to grayish brown Bm horizon, 12 to 22 cm thick; a pale brown to light yellowish brown BC horizon, 8 to 12 cm thick, and a very pale brown Ck horizon with a few yellowish brown mottles at approximately 70 cm depth. A Cca horizon is also frequently present. This soil differs from the very similar Cactus series by having a prominent Bm horizon. The sandy Stockton soils are coarser textured and significantly more rapidly permeable than the finer textured Prosser, Fairland and Ramada soils. The SCK1 variant has a clay loam to silty clay loam substrate and is currently described as the Hallboro series.

Stonewall Series (STW) or (SWW)

The Stonewall series consists of moderately well to well drained Orthic Dark Gray Chernozem soils developed on less than one meter (50 to 100 cm) of extremely calcareous, loamy till over limestone bedrock. These soils have a similar solum to the Sandridge and Aneda series but differ in the depth to bedrock. The topography is irregular, gently sloping; runoff is moderate; and permeability is moderate in the loamy till and variable in the fractured, permeable limestone bedrock. The native vegetation consists of trembling aspen, bur oak, hazel, forbs and native grasses.

The soil is characterized by a thin, moderately decomposed leaf mat; a thin (4 to 8 cm) dark gray friable A horizon, and a thin (12 to 20 cm) granular, brown B horizon. The solum is normally less than 25 cm thick. The physical characteristics of the solum and parent material are similar to the Aneda series.

Stoney Creek Series (SYE)

The Stoney Creek series is the poorly drained, Orthic Humic Gleysol member of the Ryerson association, developed on deep, strongly calcareous, medium to moderately fine textured (L, CL, SiCL) till composed of mixed materials containing coarse fragments of shale, limestone and granitic rock. This soil occurs in depressional areas and has slow permeability, no surface runoff, a loam to clay loam surface texture and an estimated depth to water table of less than 0.9 m. These soils support the growth of hydrophytic vegetation such as willows, water hemlock, smartweed, and slough grasses. Stoney Creek soils are usually dry during the summer but remain susceptible to flooding and water ponding throughout the year. These soils can occur alone in the bottom of a depression surrounded by Tilston soils or they can occur as intermediates between Ewart and Tilston soils.

This profile is characterized by a moderately decomposed L-H horizon, 2.5 to 7 cm thick, a black Ah horizon, 12 to 18 cm thick, a gleyed gray brown Bmg horizon, 20 to 30 cm thick, a dark gray BC horizon 10 to 20 cm thick, a white Ccag horizon, 10 to 20 cm thick and a light gray Ckg horizon.

Stony Point Series (SYI)

The Stoney Point series consists of well drained, Orthic Dark Gray Chernozem soils developed on thin, moderately to strongly calcareous, moderately fine to fine textured sediments overlying weakly to moderately calcareous, shaly clay till. A water-worked gravely and cobbly lens (25 to 90 cm thick) may occur between the two materials. Surface texture may range from clay to clay loam. The surface lacustrine deposits are very thin throughout the area and the underlying shale bedrock or shaly clay till is exposed or occurs within the control section of the soils. The Stony Point soils are found in areas of irregular gently undulating topography with good soil drainage. Surface runoff is moderate and internal soil permeability is slow. Lateral seepage occurs where continuous, water worked gravely layers lie above the less permeable shaly till or shale bedrock. Cobbles and boulders are widespread at the surface and could be a serious hindrance to cultivation in some areas. Native vegetation consists of open stands of bur oak and aspen with an understory of grasses and shrubs such as snowberry.

The Stony Point soil profile has a thin leaf and grass sod mat underlain by 15 to 20 cm of dark gray, granular Ah horizon. The Ahe horizon (8 to 12 cm) is characterized by subangular blocky structure and blotches of lighter colored leached materials. The B horizon ranges from 8 to 12 cm in thickness and is extremely hard, coarse prismatic breaking to coarse and medium blocky aggregates. A calcareous BC horizon grades into a silty clay C horizon high in soluble sulphates. A concentration of calcite, gypsum and jarosite is commonly found in association with the coarser lens which occurs above the till or bedrock. A profile description follows.

Ah - 0 to 15 cm, very dark gray (10YR 3/1moist & dry) clay; moderate, fine granular; firm when moist; slightly hard when dry; slightly acid; abrupt, smooth boundary.

Ahe - 15 to 28 cm, dark gray (10YR 4/1 moist) clay; weak, fine subangular blocky breaking to moderate, fine granular; very firm when moist, very hard when dry; slightly acid; abrupt, wavy boundary.

Bt - 28 to 40 cm, very dark grayish brown (2.5Y 3/2 moist) to dark grayish brown (10 YR 4/2, dry) clay; moderate coarse prismatic breaking to moderate, coarse to medium blocky; very plastic when wet; very firm when moist and extremely hard when dry; slightly acid; abrupt, smooth boundary.

BC - 40 to 48 cm, dark olive gray (5Y 3/2 moist) heavy clay; weak coarse prismatic breaking to moderate, coarse to medium blocky; very plastic when wet; very firm when moist and extremely hard when dry; mildly alkaline; moderately calcareous; abrupt, smooth boundary.

Ck - 48 to 73 cm, very dark gray (5Y 3/1 moist) heavy clay; massive; slightly plastic when wet, very firm when moist and very hard when dry; mildly alkaline; moderately calcareous; gradual, smooth boundary.

Csk - 73 to 105 cm, dark gray (2.5Y 4/1 moist) clay; many medium, prominent yellow (2.5 Y 7/6 moist) concentrations of jarosite and gypsum; massive; slightly plastic when wet; firm when moist and hard when dry; mildly alkaline; weakly calcareous; weakly saline; gradual, smooth boundary.

Cg - 105 to 135 cm, dark gray (2.5Y 4/1 moist) silt loam; massive; slightly plastic when wet, firm when moist and hard when dry; mildly alkaline; weakly calcareous.

Sturgeon Gill Series (SNL)

The Sturgeon Gill series are very poorly to poorly drained Terric Mesisol, sphagnic phase soils developed on 40 to 160 cm of dominantly mesic fen peat underlain by moderately to strongly calcareous sandy lacustrine sediments. A mat of 15 to 65 cm of fibric Sphagnum moss peat covers the surface. Sturgeon Gill soils occupy areas of depressional to level topography often occupying the swales in areas of ridge and swale topography. These soils support sedge meadow plant communities in close association with Sphagnum mosses and some ericaceous shrubs. The overstory is dominantly tamarack occurring in thin scattered stands along with some stunted black spruce.

The Sturgeon Gill soil profile resembles that of the Howell and Halcro series differing from them only in the nature of the mineral substrate. The Sturgeon Gill series occurs in the Low Boreal climatic zone in an area between Limestone Lake and Limestone Bay.

Summerberry Series (SMY)

The Summerberry series consists of poorly to very poorly drained Cumulic Mesisols developed on shallow (40 to 130 cm) deposits of moderately well decomposed fen peat, alternating with layers of buried mineral materials or organic layers with a high mineral content. Their surface is a very thin layer of fibric fen peat; the mesic peat that alternates with buried mineral layers usually becomes more decomposed as depth increases. Medium textured alluvial sediments occur within 130 cm of the surface.

The Summerberry soils are found on floodplain fens associated with Pine Creek and the Sprague River. Topography is depressional to very gently sloping and native vegetation is dominantly sedges and reed grasses with a woody herbaceous shrub cover of dwarf birch and willows on better drained ridges.

Sundown Series (SUW)

The Sundown series consists of poorly drained, carbonated Rego Humic Gleysol soils developed on thick, stratified, strongly calcareous sand and gravel deposits which are greater than a metre thick and usually underlain by loamy glacial till. Usually a thin (<15 cm) strata of moderately coarse to fine textured sediments occurs at the surface. They occur in level to depressional areas bordering gravelly beach ridges or in narrow swales. Runoff is very slow, but lateral movement of water through the gravelly layers is common. The vegetation is mainly sedges, meadow grasses and reeds, with scattered clumps of willow, tamarack and black spruce.

The soil is characterized by a moderately decomposed black fen peat layer, 6 to 15 cm thick, and thin (10 to 15 cm) granular, black A horizon grading abruptly into the light gray sand and gravel Ckg horizon. The sand and gravel deposits may extend for a considerable depth. Sundown peaty phase, has a 15 to 40 cm layer of mesic fen peat which covers the mineral soil surface.

Sutton Series (SXP)

The Sutton series consists of poorly drained Rego Humic Gleysol soils developed on a mantle (25 to 100 cm) of moderately calcareous, fine loamy (CL, SiCL), lacustrine deposits over moderately calcareous, deep, stratified, sandy (FS, LFS, LS), fluvial lacustrine deposits. These soils occur in depressional positions on nearly level landscapes and have restricted permeability, negligible surface runoff, and a near surface water table during the growing season. Sutton soils are non-eroded, non-stony, and frequently weakly saline. They have moderate available water holding capacity, high organic matter content, and low natural fertility. Native vegetation includes sedges, hydrophytic grasses and willows. The majority of these soils are currently in native vegetation.

In a representative profile the solum is approximately 20 cm thick. The profile is characterized by a moderately decomposed organic horizon, 2 to 4 cm thick, a very dark gray Ah horizon, 10 to 18 cm thick, a dark gray AC horizon, 4 to 8 cm thick with carbonates and a light gray Cca horizon, 5 to 8 cm thick with many distinct mottles. The parent material is typically olive brown in colour with many prominent mottles. A typical profile also contains gypsum crystals at depth.

Sutton soils occur in close association with Wellwood soils. They are similar to Tadpole soils by having a poorly drained profile and a fine loamy surface but differ by having a sandy substrate while Tadpole soils are fine loamy throughout. Sutton soils were previously mapped as poorly drained associates of the Wellwood Association in the soil survey of South-Central Manitoba (1943).

Swan Series (SWN)

The Swan series consists of imperfectly drained Gleyed Dark Gray Chernozem soils developed on deep (>100 cm), moderately to strongly calcareous, loamy to fine loamy (L, SiL, CL, SiCL) lacustrine deposits. These soils occur in middle to lower positions of very gently sloping to undulating landscapes and have moderately slow permeability, moderate surface runoff and a medium to low water table during the growing season. Swan soils are susceptible to erosion, and are non-stony and non-saline. They have medium high available water holding capacity, and high organic matter content. Native vegetation often includes aspen, balsam poplar, and birch with an understory of hazel, rose, dogwood, willow, herbaceous plants and grasses. These soils are currently used for forage and annual crop production.

In a representative profile the solum is approximately 42 cm thick. The profile is characterized by a dark gray, granular, loamy Ap-Ah horizon, 15 to 22 cm thick, with few medium, distinct mottles in the lower part, a fine loamy transitional BC horizon, 15 to 20 cm thick may occur between the Bt and Ckgj horizon. The Ckgj horizon is a yellowish brown clay loam with many medium, distinct mottles.

Swan soils occur in close association with the well drained Onanole and the poorly drained Proven Lake soils by having the same textural range and parent material. Swan soils were previously included as the intermediately drained associate of the Onanole association in the reconnaissance survey of soils in the Rossburn and Virden map sheet areas.

Swan River Series (SWV)

The Swan River series consists of moderately well drained Orthic Black Chernozem soils developed on moderately to strongly, calcareous, stratified, coarse loamy to fine loamy (VFS, LVFS, VFSL, L, CL, SiCL) fluvial (alluvial) deposits. These soils occur on upper slopes of very gently sloping fluvial terrace deposits and have moderate permeability, moderate surface runoff and a low water table during the growing season. Swan River soils have medium available water holding capacity, high organic matter levels, and high natural fertility. The native vegetation often comprises mixed forest of aspen and white spruce associated with shrubs and a ground cover of mixed grass. The majority of these soils are currently used for crop production.

In a representative profile the solum is generally about 45 cm thick. The profile is characterized by a 32 cm thick, very dark gray, loam Ap and Ah horizon overlying a dark grayish brown clay loam Btj or Bm horizon, and a light brownish gray to yellowish brown moderately calcareous Ck horizon. The parent material is typically stratified, moderately to strongly calcareous and may contain dark coloured layers high in organic matter.

Swan River soils occur on upper terraces of the flood plain associated with the Swan River. They are similar to Dutton soils by having a similar profile and the same texture, but differ from the Dutton soils because of greater textural variability associated with the stratified fluvial materials. Swan River soils correlate with the well drained mature black soils associated with the Alluvial Complex previously published in the Swan River soil report.

Swanford Series (SWF)

The Swanford series consists of imperfectly drained, carbonated Gleyed Rego Black Chernozem soils developed on strongly to very strongly calcareous, deep uniform coarse loamy lacustrine sediments. These soils occur on level lacustrine deposits and have moderate permeability, slow surface runoff and a medium water table during the growing season. The native vegetation often comprises black poplar and aspen with an understory of tall shrubs and ground cover of meadow grasses. The majority of these soils are currently used for crop production.

In a representative profile the solum is generally 45 cm thick. The profile is characterized by about 30 cm of very dark gray, calcareous, very fine sandy loam, Ahk horizon overlying a transitional grayish brown, calcareous and mottled, loamy very fine sand AC horizon, and a very pale brown very, strongly calcareous, mottled, loamy very fine sand Ckgj horizon. The parent material is typically carbonated and mottled throughout.

Swanford soils occur in close association with Swanford loamy substrate variant and Foley soils. They are similar to Foley soils by having the same texture but differ from Foley soils because of better drainage. Swanford soils have medium available water holding capacity, high organic matter levels and high natural fertility.

The Swanford loamy substrate variant, SWF1, consists of imperfectly drained, carbonated Gleyed Rego Black Chernozem soils developed on strongly to very strongly calcareous, shallow, coarse loamy lacustrine sediments less than 1 m in thickness overlying loamy lacustrine sediments. These soils occur on level, lacustrine veneer deposits and have moderate surface soil permeability and slow subsoil permeability, slow surface runoff and a medium water table during the growing season. Swanford loamy substrate variant soils have medium available water holding capacity, high organic matter levels, and high natural fertility. The native vegetation often comprises of mixed black poplar and aspen with an understory of tall shrubs and ground cover of meadow grasses. The majority of these soils are currently used for crop production.

In a representative profile of Swanford loamy substrate variant soil, SWF1, the solum is generally about 50 cm thick. The profile is characterized by a thick very dark gray, calcareous very fine sand, loam Ahk horizon overlying a grayish brown, calcareous and mottled, loamy very fine sand transitional AC horizon, and very pale brown, very strongly calcareous, mottled, loamy very fine sand Ckgj horizon. The parent material of the loamy substrate is compact, stratified, yellow, very strongly calcareous and mottled silt loam to clay loam. Swanford loamy substrate, SWF1, soils occur in close association with Swanford soils.

Switzer Series (SWZ)

The Switzer series is the imperfectly drained, carbonated Gleyed Rego Black Chernozem member of the Lyleton Association, developed on deep, moderately calcareous, coarse loamy (LVFS, FSL, VFSL) lacustrine deposits. This soil has a very fine sandy loam surface texture, complex gently undulating topography, imperfect drainage, moderate permeability, and no surface runoff. The depth to groundwater during the growing season is estimated at less than 2 m. Switzer soils are closely associated with Hartney soils.

The soil profile consists of black Apk horizons, 12 to 15 cm thick, dark gray AC horizons, 12 to 15 cm thick, gleyed gray Cca horizons, 12 to 15 cm thick, and stratified gleyed Ckgj horizons.

Tadpole Series (TDP)

The Tadpole series is a Rego Humic Gleysol, developed on poorly drained, strongly to very strongly calcareous, fine loamy (CL, SiCL), lacustrine sediments. These soils occur in level to depressional positions of gently sloping to undulating topography in association with Carroll, Firdale, Charman and Danlin soils. Surface runoff is very slow and permeability is restricted. Free water occurs at or near the surface for a considerable part of the year. In areas where seepage water contains appreciable soluble salt; a sufficient salt accumulation can occur to inhibit or retard the growth of normal hydrophytic vegetation.

The Tadpole soil profile has a moderately decomposed organic layer, 2 to 6 cm thick; a very dark gray Ah horizon, 10 to 18 cm thick; a dark gray AC horizon, 4 to 6 cm thick; a Cca horizon, 10 to 15 cm thick, and an olive to olive gray Ckg horizon with distinct yellowish brown mottles. In areas affected by salts, white pseudomycelia are common in the surface horizons. Tadpole soils are finer textured and less permeable than the very similar and coarser textured Vordas, Poolex and sandy Mockry and Sewell soils. The similar Carvey soils have coarser textured sandy to gravelly subsurface layers that are much more rapidly permeable than the Tadpole soils.

Taggart Series (TGR)

The Taggart series consists of imperfectly drained Gleyed Rego Black Chernozem soils developed on strongly to very strongly calcareous, deep, uniform, loamy (VFSL, L, SiL), lacustrine deposits. These soils occur in middle positions of undulating landscapes and have moderate permeability, slow surface runoff, and a high water table during the growing season. Taggart soils are non-eroded, non-stony, and often slightly saline. They have medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation includes aspen, oak, willow and prairie grasses. The majority of these soils are currently cultivated for crop production.

In a representative profile the solum is approximately 20 cm thick. The profile is characterized by a very dark gray Ah horizon, 15 to 24 cm thick, a dark gray AC horizon, 5 to 15 cm thick, moderately calcareous, a Cca horizon, 8 to 12 cm thick with a carbonate accumulation and an olive brown Ckgj horizon, with yellowish brown mottles. A typical profile also contains gypsum crystals below the Cca horizon.

Taggart soils occur in close association with Fairland, Durnan and Vordas soils. They are similar to Torcan soils by having imperfect drainage and loamy deposits but differ from them by having no prominent Bm horizon. Taggart soils were previously mapped as associates of the Holland Association in the Carberry (1957) soil report.

Tamarisk series (TAM) (Tk)

The Tamarisk series is the imperfectly drained Gleyed Cumulic Regosol developed on deep, moderately calcareous, coarse to moderately coarse textured alluvial deposits. This soil occurs on the lower slope position of undulating topography; it has moderately rapid permeability and very little surface runoff.

This soil is moderately to severely affected by trampling because it is usually moist and it becomes slippery and loses bearing strength when wet.

The soil was mapped in a study area around Deep Lake located near the southern edge of the Riding Mountain National Park.

Tarno Series (TRO)

The Tarno series consists of poorly drained Rego Humic Gleysol soils developed on a thin mantle of lacustrine clay (15 to 75 cm) over extremely calcareous, medium textured (VFSL, L, SiL), lacustrine sediments. The surface texture is clay. Runoff is very slow and permeability is moderately slow to slow. A peaty layer of variable thickness (usually 15 to 40 cm) is often present; where this occurs, the soil is mapped as the peaty phase. Some areas are variably saline. The vegetation is dominantly meadow grasses, sedges and herbs with clumps of willow and black poplar.

The soil is characterized by a variable thickness of mesic fen peat, a thin, very dark gray to black Ah horizon 8 to 20 cm thick; the depth of the A horizon varies with the thickness of the clay layer over the extremely calcareous medium textured substrate and may grade through a transitional AC horizon or tongue irregularly into the underlying Ckg horizon.

Tee Lake Series (TEK)

The Tee Lake series consists of imperfectly drained Gleyed Gray Luvisol soils developed on deep (>100 cm), moderately to strongly calcareous, fine loamy (CL, SiCL), slightly to moderately stony till deposits. These soils occur on lower slope and slight depressional positions of undulating to hummocky landscapes and have moderate permeability, moderately rapid surface runoff and a low water table during the growing season. Tee Lake soils are non-eroded, slightly to moderately stony and non-saline. They have medium to high available water holding capacity, and medium organic matter content. Native vegetation often includes white spruce, balsam fir, dogwood, and herbaceous plants. The majority of these soils are currently used for natural habitat and improved pasture.

In a representative profile the solum is approximately 31 cm thick. The profile is characterized by a leaf mat (L-F-H) horizon, 3 to 6 cm thick, a light gray weak fine platy, loamy Ae-Aegj horizon, 8 to 15 cm thick, a gleyed clay loam Btgj horizon, 8 to 35 cm thick; a

gleyed clay loam transitional BC horizon, 5 to 15 cm thick overlying a gleyed, strongly mottled, strongly calcareous, loamy Ckg horizon. The parent material is derived from glacial till consisting of shale, limestone, and granite rocks.

Tee Lake soils occur in close association with the well-drained Waitville soils, and the poorly drained Roblin and Sinnott soils which are developed in similar parent materials. Sinnott soils are not leached and are poorly drained. Tee Lake and Roblin soils are quite similar in that they are both strongly leached but Roblin soils are poorly drained. Tee Lake soils were included in areas previously mapped as the intermediately drained associate of the Waitville association in the reconnaissance survey of soils in the Rossburn and Virden map sheet areas.

Tellier Series (TLI)

The Tellier series consists of imperfectly drained Gleyed Dark Gray Chernozem soils developed on a mantle (25 to 100 cm) of moderately to strongly calcareous, uniform, fine loamy (L, CL, SiCL), lacustrine deposits over moderately to strongly calcareous, deep, uniform fine loamy (L, CL, SiCL) mixed till deposits. These soils occur in lower slope positions of undulating landscapes and have moderate permeability, moderate surface runoff and a medium water table during the growing season. Tellier soils have medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes tall prairie and meadow grasses. The majority of these soils are currently used for crop production.

In a representative profile solum is approximately 45 cm thick. The profile is characterized by dark gray Ap or Ah horizon, 10 to 20 cm thick, a very dark brown Bt or Btj horizon, 20 to 30 cm thick with a few fine faint iron mottles, a grayish brown, calcareous, transitional II BC horizon, 10 to 15 cm thick, and a dark yellowish brown IICk horizon with common, distinct, fine iron mottles. Tellier soils occur in close association with Altamont and Narish soils. Tellier soils were mapped as minor imperfectly drained associates of the Altamont association in the reconnaissance soil survey of South-Central Manitoba (1943).

Terence Series (TRC)

The Terence series is the imperfectly drained, carbonated, Gleyed Rego Black Chernozem member of the Terence Association, developed on thin (25 to 100 cm), weakly to moderately calcareous, coarse textured lacustrine sediments overlying strongly calcareous, medium to moderately fine textured glacial till. A very thin (less than 5 cm) gravelly pebble line may occur at the contact. This soil has a fine sandy loam surface texture, gently undulating to depressional topography, moderately slow permeability, and very slow surface runoff.

The Terence series resembles the Souris series of the Souris Association. The only difference is the Terence series is underlain by glacial till.

Thalberg Series (THG)

The Thalberg series consists of imperfectly drained Gleyed Solonetzic Dark Gray Chernozem soils developed on weakly calcareous lacustrine clay. They occur in level topographic positions; runoff is slow and permeability is slow to very slow. The native vegetation is dominantly trembling aspen with some balsam poplar and willow.

The soil is characterized by a thin dark gray to gray Ahe horizon 4 to 7 cm thick and a tough columnar structured B horizon grading into massive lower Bnjgj horizon. The upper part of the columns are usually bleached and degraded. The C horizon is carbonated.

Thickwood Series, peaty phase (TWO)

The Thickwood, peaty phase soils are poorly drained Rego Humic Gleysols developed on 20 to 100 cm of weakly to strongly calcareous, clayey lacustrine sediments overlying limestone bedrock. Becasue these soils are developed from a thin veneer of lacustrine clay, they are mapped as shallow and very shallow lithic phases. These poorly drained soils occur in depressional to level topography and are characterized by a thin (15 to 40 cm) surface layer of peat. Runoff is very slow, and internal drainage is impeded by a high water table and the relatively impermeable bedrock substrate.

Thickwood soils have a thin, dark gray Ahg horizon, which is underlain by a Ckg horizon of gleyed, grayish brown to light gray clay containing numerous mottles and iron stains. The Thickwood series, peaty phase soils occur in numerous soil map units throughout the Grindstone Point map area.

Thompson Lake Series (TOP)

The Thompson Lake series consists of Gleyed Gray Luvisol soils developed on deep (> 100 cm), moderately to strongly calcareous, fine textured lacustrine sediments. Surface textures are clay and the clayey textured subsoil is varved with very thin silt lenses. The Thompson soils are imperfectly drained as surface runoff is slow to moderate and the ground water level is high within the profile during spring runoff and early summer. The climax vegetation on these soils is black spruce with a ground cover of feathermoss. However, disturbance by fire results in mixed forest stands in which jack pine, aspen and birch replace much of the spruce. The Thompson Lake soils are moderately well developed, the depth of leaching ranges from 30 to 60 cm. A thin LFH horizon (8 to 10 cm thick) comprised mainly of feathermoss and forest litter is underlain by a light coloured, clayey textured Ae horizon with weak platy

structure. A grayish brown, clay AB transitional horizon separates the Ae from a brownish gray, heavy clay Bt horizon characterized by weak to moderate, fine to medium subangular blocky structure. The Bt horizon grades through a BC horizon into a moderately calcareous, brown and yellowish brown, massive clay C horizon. The C horizon is gleyed and mottled; both of these features increase in intensity at lower depths.

L-F - 10 to 3 cm, non-decomposed to partially decomposed feathermoss with jack pine and spruce needles and the remains of ericaceous and herbaceous shrubs; fibrous and loose; plentiful, fine horizontal roots; extremely acid; abrupt, smooth boundary.

H - 3 to 0 cm, well decomposed forest litter; amorphous and weak, fine fibered; plentiful, fine horizontal roots; extremely acid; abrupt, smooth boundary.

Ae - 0 to 5 cm, brown (10YR 5/3 moist) clay; medium platy breaking to weak to moderate coarse granular; sticky and plastic when wet; friable when moist and slightly hard when dry; few, fine horizontal exped roots; strongly acid; diffuse, smooth boundary.

AB - 5 to 18 cm, grayish brown (10YR 5/2 moist) heavy clay; structureless, massive breaking to weak, medium to coarse angular blocky; sticky and plastic when wet; firm when moist and hard when dry; very few, very fine random exped roots; slightly acid; abrupt, smooth boundary.

Bt - 18 to 38 cm, dark brown (10YR 3/3 moist) heavy clay; weak to moderate fine to medium subangular blocky, breaking to moderate medium granular; very sticky and very plastic when wet; friable when moist and hard when dry; very few, very fine random exped roots; neutral; abrupt, smooth boundary.

BC - 38 to 55 cm, dark yellowish brown (10YR 4/4 moist) heavy clay; structureless, massive breaking to weak, fine granular; very sticky and very plastic when wet; friable when moist and hard when dry; very few, very fine horizontal exped roots; neutral; abrupt, smooth boundary.

Ckg - 55 to 100 cm, brown (10YR 5/3 moist) heavy clay; structureless, massive breaking to weak, fine granular; very sticky and very plastic when wet; friable when moist and hard when dry; mildly alkaline; moderately calcareous.

Tiger Hills Series (TGL)

The Tiger Hills series consists of well drained Orthic Dark Gray Chernozem soils developed on very strongly to extremely calcareous, thin, uniform, fine loamy (L, CL, SiCL), boulder till of limestone and granite origin. These soils occur in upper slope and crest positions of moderate slopes on hummocky landscapes and have moderate permeability, rapid surface runoff and a low water table during the growing season. Tiger Hills soils are moderately eroded, moderately stony and non-saline. They have medium available water holding capacity, low organic matter content, and medium natural fertility. Native vegetation often includes forest of bur oak and aspen poplar. The majority of these soils are currently used for improved grazing and forage crop production.

In a representative profile the solum is approximately 50 cm thick. The profile is characterized by a dark gray Ah or Ap horizon, 10 to 15 cm thick, a light gray Ahe or Aej horizon, 5 to 10 cm thick, a dark brown Bt or Btj horizon, 15 to 20 cm thick,and a brown transition BC horizon 5 to 10 cm thick. The parent material is typically yellowish brown calcareous till.

Tiger Hills soils occur in close association with Hilton and Barwood soils. They are similar to Dezwood soils by having an Orthic Dark Gray Chernozem profile developed in fine loamy till deposits. However they differ from Dezwood soils because the till deposits of Dezwood soils are moderately to strongly calcareous while Tiger Hills deposits are very strongly to extremely calcareous. Tiger Hills soils were previously mapped as the gray-black associate of the Hilton association in the reconnaissance soil survey of South-Central Manitoba (1943). The Tiger Hills series, coarse-loamy (L, SiL, VFSL) substrate variant, TGL1, occurs in close association with Tiger Hills soils and differs from them in having light yellowish brown, relatively stone-free, coarse loamy (VFSL, L) substrate material within a metre of the mineral surface.

Tilson Lake Series (TLN)

The Tilson Lake series is the well drained Orthic Gray Luvisol profile developed on thin (25 to 100cm) moderately calcareous, coarse textured sediments overlying moderately calcareous, medium to moderately fine glacial till deposits composed of shale, limestone, and granitic material. These soils have moderate to rapid permeability and moderate surface runoff. The topography is moderately rolling consisting of complex slopes.

The Tilson soil occurs in association with the Orthic Dark Gray Chernozem Ozerna series and the imperfectly drained Gleyed Dark Gray Chernozem Dickson series.

The soil was mapped in a study area around Deep Lake located near the southern edge of the Riding Mountain National Park.

Tilston Series (TLT)

The Tilston series is the poorly drained, Humic Luvic Gleysol member of the Ryerson Association, developed on strongly calcareous, medium to moderately fine textured (L, SiL, CL, SiCL) glacial till. The till is composed of silts and clays with coarse fragments of shale, limestone and granitic rock. These soils occur in depressional positions which occupy higher positions in the landscape and are usually developed in stone-free clay loam sediments that have been washed into small circular depressions. The

thickness of these local deposits depends largely on the surrounding topography. The permeability is moderately slow and there is no surface runoff from Tilston soils. The water table occurs at or very near the surface most of the year.

The thickness of the eluvial horizon decreases towards the center of these depressions. Tilston soils are submerged for moderately short periods of time during the year; however, during this time, they transmit a large portion of the surface water directly to the groundwater zone. As a result, the water table occurs very near the surface most of the year. The native vegetation characteristic of these soils consists of Lady's thumb, Polygonum persicaria and to a lesser extent slough grass, Beckmannia syzigachne.

Timberton Series (TBN)

The Timberton series consists of well drained Orthic Black Chernozem soils developed on moderately to strongly calcareous, shallow, fine loamy (CL, SiCL) lacustrine sediments less than 1 m in thickness overlying loamy (L, SCL) morainal deposits. These soils occur on level, lacustrine veneer deposits and have moderate permeability, slow surface runoff and a low water table during the growing season. Timberton soils have high available water holding capacity, high organic matter levels, and high natural fertility. Timberton soils are slightly stony. The native vegetation often comprises aspen with an understory of low shrubs and mixed grass. The majority of these soils are currently used for crop production.

In a representative profile the solum is approximately 34 cm thick. The profile is characterized by a very dark gray, loam Ap and Ah horizon about 23 cm thick overlying a dark brown clay to clay loam Btj horizon, and a pale brown calcareous loam textured Ck horizon. The parent material of the till substrate is typically compact, very strongly calcareous, light brownish gray loam.

Timberton soils occur in association with Dutton and Minitonas soils. They are similar to Dutton soils by having the same texture and drainage and to the Minitonas soils by having an underlying till substrate. Timberton soils differ from Minitonas soils because of better drainage. Timberton soils correlate with Dutton till substrate phase soils previously published in the Swan River soil report.

Tolstoi Association (TOT)

Dominant soil profile of the Tolstoi Association is a Gleyed Dark Gray Chernozem developed in sandy and gravely deposits (< 75cm thick) over extremely calcareous till. The surface deposits are more or less stony throughout, and a cobble lens usually occurs at the contact of the till and the sandy deposits.

Torcan Series (TOC)

The Torcan series consists of imperfectly drained Gleyed Black Chernozem soils developed on strongly to very strongly calcareous, deep, uniform, loamy (VFSL, L, SiL), lacustrine deposits. These soils occur in middle to lower positions of undulating to rolling landscapes and have moderate permeability, moderately slow surface runoff, and a medium water table during the growing season. Torcan soils are non-eroded, non-stony, and occasionally slightly saline. They have medium available water holding capacity, medium organic matter content, and high natural fertility. Native vegetation includes aspen, willow, shrubs and meadow grasses. The majority of these soils are cultivated for crop production.

In a representative profile the solum is approximately 45 cm thick. The profile is characterized by a very dark gray Ah horizon 18 to 25 cm thick, a light brown Bm horizon, 10 to 18 cm thick with yellowish brown mottles, a Cca horizon, 8 to 12 cm thick, and a light olive brown Ck horizon, with yellowish brown mottles. Torcan soils occur in close association with Fairland, Taggart and Vordas soils. They are similar to Taggart soils by having imperfect drainage and loamy deposits but differ from them by having a prominent Bm horizon. Torcan soils were previously mapped as associates of the Holland Association in the Carberry (1957) soil report.

Traverse Series (TAV)

The Traverse series consists of well to moderately well drained Calcareous Black Chernozem soils developed on strongly to very strongly calcareous, deep, uniform, loamy (VFSL, L, SiL), lacustrine deposits. These soils occur in middle and upper positions of very gentle slopes on undulating landscapes and have moderate permeability, moderate to rapid surface runoff, and a low water table during the growing season. Traverse soils are often slightly eroded, non-stony, and non-saline. They have medium available water holding capacity, medium organic matter content, and high natural fertility. Native vegetation includes oak, aspen, shrubs and prairie grasses. The majority of these soils are currently cultivated for crop production.

In a representative profile the solum is approximately 25 cm thick. The profile is characterized by a very dark gray Ah horizon, 10 to 18 cm thick, a dark grayish brown Bmk horizon, 8 to 15 cm thick, moderately calcareous, a brown to pale brown BC horizon, 10 to 15 cm thick, moderately calcareous and a white Cca horizon, 8 to 12 cm thick with carbonate accumulation. The parent material is typically dark yellowish brown.

Traverse soils occur in close association with Fairland, Taggart and Vordas soils. They are similar to Rempel soils by having a Calcareous Black Chernozem profile but differ from them by having loamy rather than fine loamy deposits. Traverse soils were mapped as Calcareous Black associates of the Holland Association in the Carberry (1957) soil report.

Tredwell Series (TDW)

The Tredwell series consists of a Rego Humic Gleysol solum developed in the flood plain of the incised channels commonly mapped as Eroded Slopes Complex. The soil materials are derived from colluvial and fluvial process along the channel and vary in composition depending on the adjacent upland material and underlying bedrock.

Tremauden Complex (TUX) or (TMU)

The Tremauden complex consists of imperfectly drained Gleyed Eluviated Eutric Brunisol (Tremauden series) and Gleyed Gray Luvisol (Sirko series) soils developed on strongly calcareous sandy to gravelly outwash and beach deposits. The Tremauden series is the dominant member of the complex. Generally a thin sandy surface mantle overlies the gravelly subsurface materials. These soils, common to the beach ridges associated with moraines and topographic highs have little surface runoff as the soils are quite permeable. Internal drainage is impeded by a high groundwater table. Some stones may appear at the surface. The native vegetation includes mainly spruce, white birch and jack pine with some balsam poplar. A typical Sirko series (Gleyed Gray Luvisol) profile is described below.

L-H - 3-0 cm, dark reddish brown (5YR 2.5/2 moist) moderately decomposed herbaceous material; very strongly acid; clear wavy boundary.

Aegj - 0-5 cm, gray to dark gray (7.5YR 4.5/0 moist) loamy sand; structureless; moist loose; non-plastic; very strongly acid; clear wavy boundary.

Btgj - 5-16 cm, dark reddish brown (5YR 3/4 moist) very gravelly sandy loam; structureless; moist very friable; neutral; moderately calcareous; gradual irregular boundary.

Ckg1 - 16-70 cm, strong brown to reddish yellow (7.5YR 5.5/6 moist) very gravelly sand; structureless; moist loose; non-plastic; mildly alkaline; extremely calcareous; clear smooth boundary.

Ckg2 - 70 + cm, light yellowish brown (10YR 6/4 moist) fine sand; structureless; moist loose; non-plastic; mildly alkaline; strongly calcareous.

The Tremauden series is similar, but lacks sufficient movement of clay to produce a Luvisolic Bt horizon. Soils of the Tremauden complex occur throughout the map area, often in association with better drained soils of the Freshford complex and with the poorly drained Norris series, peaty phase.

Trinton Series (TNT)

The Trinton series consists of well drained Dark Gray Luvisol soils developed on a mantle (25 to 100 cm) of moderately to strongly calcareous, stratified, coarse loamy (VFSL, L, SIL), lacustrine deposits over moderately to strongly calcareous, deep, stratified sandy-skeletal (GrS, GrLS), glaciofluvial deposits. These soils occur in upper slope positions of very gentle slopes on hummocky landscapes and have moderate permeability moderate surface runoff and a low water table during the growing season. Trinton soils have medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes tall prairie grasses interspersed with aspen-oak groves. The majority of these soils are currently used for crop production.

In a representative profile the solum is approximately 50 cm thick. The profile is characterized by a dark gray Ap or Ah horizon, 15 to 20 cm thick, a light gray Ae or Ahe horizon, 5 to 15 cm thick with thin platy structure, a dark brown Bt horizon 10 to 20 cm thick, a dark brown transitional II BC, 5 to 10 cm thick and a light brown IICk horizon. The parent material is typically stratified with thin layers of SiL, L and VFSL in the gravelly deposits.

Trinton soils occur in close association with Vandal, Vartel and Carvey soils. They are similar to Vandal soils by having well drained profiles developed in sandy-skeletal glacio-fluvial deposits but differ from Vandal soils by having an Ae horizon at least 5 cm thick. Trinton soils were previously mapped as an associate of the Leary association and as minor inclusions in the Pembina association, in the reconnaissance soil survey of South-Central Manitoba (1943). The Trinton series, shale gravel substrate variant, TNT1, occurs in close association with normal Trinton soils and differs from them by having dominantly shale derived coarse fragments in the sandy-skeletal substrate.

Turtle Mountain Series (TUM)

The Turtle Mountain series is the well, drained Orthic Gray Luvisol member of the Turtle Mountain Association, developed on strongly calcareous, moderately fine textured (SCL, CL, SiCL) glacial till composed of silts and clays with fragment inclusions of granitic rock limestone and shale. This soil has a clay loam surface texture, irregular, moderately rolling topography and usually occurs at elevations above 2,000 feet (a.s.l.) in the Turtle Mountains. Permeability is moderate and surface runoff is rapid. A few Turtle Mountain soils are cultivated but most exist in the undisturbed state supporting native vegetation consisting of aspen, oak, hazel, birch, numerous shrubs, grasses and flowers.

This soil consists of moderately decomposed L-H horizons, 2 to 5 cm thick, light gray Ae horizons, 5 to 10 cm thick, dark brown Bt horizons, 20 to 30 cm thick, yellowish brown BC horizons, 18 to 25 cm thick and light brownish gray weakly calcareous Ck horizons.

Turtle River Series (TUV)

The Turtle River Series consists of imperfectly drained Gleyed Cumulic Regosol soils developed on weakly to moderately calcareous, medium textured, recent alluvial deposits. Surface textures are usually very fine sandy loam to loam. These soils are stratified with layers ranging from sand to clay in texture and dark coloured layers high in organic matter are found throughout the profile. The Turtle River soils occur in the Dauphin Lake Plain and are associated mainly with the near level to very gently undulating flood plain and levee deposits of the Ochre River. Runoff is moderate and internal soil permeability is moderate. Native vegetation is dominantly hardwood forest composed of elm, ash, Manitoba maple, willow and associated low shrubs and herbs. Most of the Turtle River soils are cultivated except for narrow, wooded bands adjacent to the river channel.

Soil profile development on these immature alluvial sediments is restricted to a thin weakly expressed A horizon that grades sharply into the stratified parent material. The A horizon is characterized by fine granular structure, dark grayish brown colour, neutral reaction and moderate amounts of free carbonate. The stratified C horizon is weakly to strongly calcareous, mottled with weak iron staining and banded with dark coloured layers representing former surface horizons subsequently covered by fresh alluvium. A representative profile of the Turtle River series is described below:

Apk - 0 to 18 cm, very dark brown (10YR 2/2 moist, 10YR 4.5/1 dry) clay loam; strong fine granular; very friable when moist, hard when dry; neutral, very strongly calcareous; abrupt smooth boundary.

Ckgj1 - 18 to 45 cm, dark brown (10YR 3/3 moist) loam; moderate fine granular; very friable when moist, hard when dry; mildly alkaline, strongly calcareous; abrupt smooth boundary.

Ckgj2 - 45 to 60 cm, yellowish brown (10YR 5/4 moist) loam; weak fine granular; very friable when moist, soft when dry; mildly alkaline, very strongly calcareous, abrupt smooth boundary.

Ckg3 - 60 to 100 cm, dark brown to brown (10YR 4/3 moist) loam; moderate fine granular; very friable when moist, hard when dry; mildly alkaline, strongly calcareous.

Minor inclusions of poorly drained Mossey River and heavier textured Edwards soils may occur in some units.

Turtlehead Series (TUA)

The Turtlehead series is the Gleyed Black Chernozem member of the Bernice Association, developed on thin (25 to 100 cm), moderately to strongly calcareous, very coarse textured (VCoS, CoS, S) gravelly deltaic beach and outwash deposits overlying strongly calcareous, medium to moderately fine textured (VFSL, L, SiL to SCL, CL, SiCL) glacial till. This soil is imperfectly drained and occurs in areas adjacent to outwash deposits and stream channels mainly. The surface material has rapid permeability but the less permeable till restricts downward drainage. Surface runoff is slow; most of the water infiltrates the profile where the flow of water is horizontal lateral across the top of the underlying till. These soils are used mainly for pasture.

The Turtlehead series resembles the Cartwright series of the Bede Association. The only difference is the Turtlehoad series is underlain by glacial till.

Two Creeks (TWC)

The Two Creeks series is the imperfectly drained, Gleyed Black Chernozem member of the Waskada Association. It is developed on thin (25 to 100 cm), strongly calcareous, medium to moderately fine textured discontinuous eolian and lacustrine sediments overlying strongly calcareous, medium to moderately fine textured glacial till. A very thin (less than 5 cm), gravelly pebble line may occur at the contact. This soil has complex, very gently sloping topography, a fine sandy loam to loam surface texture, moderately slow permeability and slow surface runoff. The estimated depth to water table is 2 to 3 metres during the growing season. These soils are usually cultivated.

A typical profile has a very dark gray Ap horizon, 8 to 15 cm thick, a dark grayish brown Bmgj horizon, 13 to 18 cm thick, a gleyed light gray Cca horizon, 8 to 15 cm thick and light olive brown II Ckgj horizon.

Ullrich Series (ULH)

The Ullrich series consists of imperfectly drained Gleyed Black Chernozem soils developed on a mantle (25 to 100cm) of moderately to a strongly calcareous, uniform, fine loamy (L, CL, SiCL), lacustrine deposits over moderately to strongly calcareous, deep, uniform, fine loamy (L, CL), mixed till deposits. These soils occur in middle to lower slope positions of undulating landscapes and have moderate permeability, moderately slow surface runoff and a medium water table during the growing season. Ullrich soils have medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes tall prairie grasses interspersed by aspen-oak groves. The majority of these soils are currently used for crop production.

In a representative profile the solum is approximately 35 cm thick. The profile is characterized by black to very dark gray Ap or Ah horizon, 10 to 20 cm thick, a very dark brown Bm horizon, 10 to 20 cm thick with fine, faint iron mottles, a transitional dark brown II BC horizon, 5 to 10 cm thick and a grayish brown II Ck horizon with distinct, iron mottles.

Ullrich soils occur in close association with Knudson, Joyale and Guerra soils. They are similar to Nikkel soils by having an imperfectly drained Gleyed Black Chernozem profile and a fine loamy till substrate. However, they differ from Nikkel soils by having

a loamy textured lacustrine mantle overlying glacial till. Ullrich soils were previously mapped as imperfectly drained associates of the Altamont association in the reconnaissance soil survey of South-Central Manitoba (1943).

Underhill Series (UHL)

The Underhill series is the imperfectly drained, Gleyed Black Chernozem member of the Cameron Association, developed on deep, strongly calcareous, medium textured stratified lacustrine sediments. This soil has smooth, very gently sloping topography, a loam to fine sandy loam surface texture, moderate permeability and moderately slow surface runoff. The estimated depth to water table during the growing season is 1.5 metres. The surface soil is cultivated and non-stony although small pebbles may be present.

A typical profile has a black Ap horizon, 5 to 13 cm thick, a black Ah horizon, 10 to 18 cm thick, sometimes a very thin, very dark brown AB horizon, 2 to 5 cm thick, a very dark grayish brown Bmgj horizon, 10 to 18 cm thick which may have weak lime carbonates present in the lower portion. The parent material is usually stratified light yellowish brown to light brownish gray in color. Analytical and morphological data are presented below.

Ap - 0 to 13 cm, black (10YR 2/1 moist), very dark gray (10YR 3/1 dry), loam; weak, fine granular; friable when moist; soft when dry; abrupt, smooth boundary; pH 6.1.

Ah - 13 to 30 cm, black (10YR 2/1 moist), very dark gray (10YR 3/1 dry), loam; moderate, fine to medium granular; friable when moist; soft when dry; clear, smooth boundary; pH 6.5.

AB - 30 to 36 cm, very dark brown (10YR 2/2 moist), very dark grayish brown (10YR 3/2 dry), loam; moderate, fine to medium granular; friable when moist; soft when dry; clear, smooth boundary.

Bmkgj - 36 to 51 cm, very dark grayish brown (10YR3/2 moist), brown (10YR 4/3 dry), loam; few, fine, faint dark reddish brown (5Y 3/4) iron mottles; weak, medium prismatic to moderate, medium subangular blocky; friable when moist; slightly hard when dry; clear, smooth boundary; pH 7.3.

BC - 51 to 56 cm, very dark grayish brown (10YR 3/2 moist), brown (10YR 4/3 dry) few, fine, faint dark yellowish brown to yellowish brown (10YR 4/4 to 5/6) iron mottles; loam; weak, fine granular; friable when moist; soft when dry; clear, smooth boundary; moderately calcareous; pH 7.5.

Ckgj1- 56 to 69 cm, dark grayish brown to grayish brown (10YR 4/2 to 5/2 moist), light brownish gray loam; few, fine, faint yellowish brown (10YR 5/6) iron mottles; weak, fine granular; friable when moist; slightly hard when dry; smooth, clear boundary; moderately calcareous; pH 7.6.

Ckgj2 - 69 to 100 cm, yellowish brown (10YR 5/4 to 5/6 moist), light yellowish brown (10YR 6/4 dry), loam; common, fine, faint yellowish brown (10YR 5/6); weak, fine granular; friable when moist; soft when dry; clear, smooth boundary; moderately calcareous; pH 7.5.

Valley Series (VLY)

The Valley series consists of imperfectly drained Gleyed Rego Black Chernozem soils developed on moderately to strongly calcareous, uniform, fine loamy (CL, SiCL) lacustrine sediments. These soils occur on level lacustrine deposits and have moderate permeability, slow surface runoff and a medium water table during the growing season. Valley soils have high available water holding capacity, high organic matter levels, and high natural fertility. The native vegetation is comprised of black poplar and aspen with tall shrubs and a ground cover of meadow grass. The majority of these soils are currently used for crop production.

In a representative profile the solum is generally about 45 cm thick. The profile is characterized by a very dark gray clay loam Ap and Ah horizon about 32 cm thick overlying a grayish brown, calcareous and mottled clay loam AC transition horizon, and a yellowish brown, calcareous and mottled clay loam to silty clay loam Ckgj horizon. The parent material is typically strongly calcareous and mottled thoughout.

Valley soils occur in close association with Dutton and Swanford soils. They are similar to Dutton soils by having the same texture, similar to Swanford soils by having the same drainage but differ from Dutton soils in not having a B horizon because of imperfect drainage. They differ from the Swanford soils because of the finer texture.

Valley River Series (VLV)

The Valley River series consists of imperfectly drained Gleyed Rego Black Chernozem soils developed on thin (25 to 100 cm) weakly to moderately calcareous, moderately fine textured, alluvial deposits overlying sand deposits. Surface textures range from clay loam to light clay and the soils are stratified with layers ranging from sand to clay in texture. Dark colored organic rich layers indicating various periods of flooding and deposition occur throughout the soil profile. The Valley River soils are found mainly in areas of shallow alluvial deposition along the east side of the Ochre River flood plain and as narrow strips bordering the Vermillion River. All of the Valley River soils occur in the Dauphin Lake Plain, covering 454 ha. These soil areas are characterized by level to slightly irregular, very gently undulating topography. Surface runoff is moderate on these soils; and internal soil permeability is moderately slow in the upper alluvial materials and moderately rapid through the underlying sand substrate. Although most of the Valley River sods are presently cultivated, native vegetation was dominantly hardwood forest comprised of elm, ash, Manitoba maple, willow, dogwood and a ground cover of grasses and meadow grasses.

The Valley River soils are similar to the Ochre River soils, differing from them mainly in the presence of the coarse textured subsoil within 1 m of the surface. Profile development on the Valley River soils is restricted to a dark coloured Ah horizon, high in organic matter content and ranging in thickness from 25 to 30 cm. This Ah horizon has a fine granular structure, is usually quite friable, neutral in reaction and may be weakly calcareous. It grades into the stratified, moderated calcareous Ckgj horizon which is usually mottled with iron staining and banded with dark coloured layers of former surface horizons. The underlying sand substrate is gleyed and iron stained.

Valpoy Series (VPY)

The Valpoy series consists of poorly drained, carbonated Rego Humic Gleysol soils developed on moderately to strongly calcareous, coarse to moderately-coarse textured, lacustrine and outwash deposits. The surface texture varies from sand to fine sandy loam. Scattered areas of Valpoy soils occur in the southern portion of the Ste. Rose map area. The topography is depressional to level. Runoff is very slow and the permeability is impeded by a high water table. Areas of normal Valpoy soils are stone-free. Mapping units of Valpoy soils may contain minor inclusions of Melnice and Almasippi Series. Valpoy peaty phase mapping units may have minor inclusions of Melnice peaty phase and Meleb peaty phase soils. Other areas of Valpoy soils have a surface layer of peat (15 to 40 cm thick) and are mapped as peaty phases. The dominant vegetation is sedges, meadow grasses, swamp birch and willow.

Valpoy soils have a thin very dark gray to black A horizon (8 to 15 cm) which is usually calcareous. The A horizon grades into an iron stained calcareous Ckg horizon. A description of a representative Valpoy Series is as follows:

Om - 8 to 0 cm, black (10YR 2/1 dry) mesic material derived from sedges; mildly alkaline; clear, smooth boundary.

Ahkg - 0 to 10 cm, dark gray (10YR 4/1 dry) very fine sandy loam; single grain; loose; moderately alkaline; strongly calcareous; clear, smooth boundary.

Ckg1 - 10 to 30 cm, grayish brown (2.5Y 5/2 dry) loamy very fine sand; single grain; loose; moderately alkaline; strongly calcareous; clear, smooth boundary.

Ckg2 - 30 to 90 cm +, pale yellow (2.5Y 8/4 dry) very fine sand; single grain; loose; moderately alkaline; very strongly calcareous.

Vandal Series (VDL)

The Vandal series consists of well drained Orthic Dark Gray Chernozem soils developed on a mantle (30 to 100cm) of moderately to strongly calcareous, thin stratified, coarse-loamy (SL, L, SiL), lacustrine deposits over moderately to strongly calcareous, deep, stratified, sandy skeletal (GrS, GrLS) glaciofluvial deposits. These soils occur in middle and upper positions of very gentle to moderate slopes on hummocky landscapes and have moderate over rapid permeability, moderate surface runoff and a low water table during the growing season. Vandal soils have low available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes tall prairie grasses, aspen popular and bur oak. The majority of these soils are currently used for mixed farming but where gravel deposits are sufficiently deep they have been mined as a source for gravel.

In a representative profile the solum is approximately 45 cm thick. The profile is characterized by a very dark grayish brown Ap or Ah horizon, 10 to 18 cm thick, a grayish brown Bt or Btj horizon, 20 to 35 cm thick, a yellowish brown II Cca horizon, 10 to 20 cm thick with numerous coarse fragments and a brown to light brown II Ck horizon with mixed shale, limestone and granite gravel. The parent material is typically stratified with very gravelly and coarse sand layers (8 to 10 cm). A typical profile also contains thin (<2 cm) lenses of silt loam to very fine sandy loam at depth.

Vandal soils occur in close association with Firdale, Vartel and Carvey soils. They are similar to Altamont soils by having an Orthic Dark Gray Chernozem profile developed mostly in loamy and fine silty deposits but differ from them by having a sandy and gravelly substrate rather than a fine loamy glacial till substrate. Vandal soils were previously mapped as a minor associate of the Heaslip complex in the reconnaissance soil survey of South-Central Manitoba (1943).

The Vandal series shale gravel substrate variant, VDL1, occurs in close association with the normal Vandal soils and differs from them by having dominantly shale derived coarse fragments in the sandy-skeletal substrate. The Vandal series sandy substrate (LS, LFS) variant, VDL2, occurs in close association with the normal Vandal soils and differs from them by having a sandy substrate rather than a sandy skeletal substrate found in normal Vandal soils.

Varcoe Series (VRC)

The Varcoe series is characterized by a Gleyed Rego Black Chernozem (carbonated) solum on moderately to strongly calcareous, loamy (L, CL) morainal till of limestone, granite and shale origin. These soils are imperfectly drained and occur in the lower slope positions of undulating to hummocky landscapes in close association with Angusville soils. They receive runoff from the upper slopes, and in some landscapes, may be influenced by seepage. Permeability is slow and may be restricted during periods of subsoil saturation. In areas where upward groundwater or seepage waters contain appreciable salts, accumulation of salts may occur within the soil.

Varcoe profiles average 42 cm in thickness and range from 20 to 60 cm. The A horizon is usually 28 cm thick and ranges from 20 to 50 cm; very dark gray in color and is underlain by a dark gray transitional AC horizon, 4 to 8 cm thick. A carbonate accumulation horizon (Cca) is commonly present, but may be discontinuous. Gypsum crystals are usually present below and within the carbonate

accumulation layer. Varcoe soils containing significant soluble salts in the A horizon as well as gypsum, have been identified as the saline phase of the series.

Vartel Series (VTL)

The Vartel series consists of imperfectly drained Gleyed Dark Gray Chernozem soils developed on a mantle (25 to 100 cm) of moderately to strongly calcareous, stratified, loamy (SL, L, SiL), lacustrine deposits over moderately to strongly calcareous, stratified, deep sandy-skeletal (GrS, LGrS), glaciofluvial deposits. These soils occur in lower slope positions of very gentle to moderate slopes on hummocky landscapes and have moderate over rapid permeability, moderately slow surface runoff and a medium water table during the growing season. Vartel soils are non-eroded, non-stony and occasionally slightly saline. They have medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes tall prairie and meadow grasses. The majority of these soils are currently used for crop production.

In a representative profile the solum is approximately 50 cm thick. The profile is characterized by a dark gray Ap or Ah horizon, 10 to 20 cm thick, a brown to olive brown Bt or Btj horizon, 15 to 30 cm thick with many, fine, faint iron mottles, an olive brown II BC horizon, 5 to 15 cm thick with faint iron mottles and a dark yellowish brown II Ckgj horizon with large, distinct iron mottles. The parent material is typically mixed gravel of limestone, granite and shale origin. A typical profile also contains thin strata of VFSL, L and SiL interspersed with gravelly layers.

Vartel soils occur in association with Vandal and Carvey soils. They are similar to Tellier soils by having a Gleyed Dark Gray Chernozem profile developed in fine loamy lacustrine deposits but differ from them by having a sandy-skeletal glaciofluvial substrate rather than a fine loamy glacial till. Vartel soils were mapped as imperfectly drained associates of the Leary association and Heaslip complex in the reconnaissance soil survey of South-Central Manitoba (1943). The Vartel series shale gravel substrate variant, VTL1, occurs in close association with typical Vartel soils and differs by having dominantly shale derived coarse fragments in the sandy-skeletal substrate.

Vassar Series (VSS)

The Vassar series consists of rapidly to well drained Brunisolic Gray Luvisol soils developed on 15 to 76 cm of fine to medium sand underlain by moderately to strongly calcareous loam to clay textured lacustrine sediments over glacial till deposits. These soils occur in the Bedford Hills-Whitemouth Lake Plateau, mainly near the village of Vassar. The topography is irregular and gently sloping. Native vegetation consists of pure stands of jack pine, mixed jack pine and aspen or birch with some balsam fir, red pine and white pine (in the vicinity of Moose Lake) and a profusion of tall and short shrubs in association with a dense ground cover of herbs and grasses. A few scattered surface stones occur on areas with a substrate of stony glacial till.

In their native state, Vassar soils are characterized by a weakly developed sequence of horizons (Aej and Bfj) occurring in the thick leached, sandy Ae horizon originally of the Gray Luvisol profile overlying a thin, continuous, moderately to strong developed textural B horizon, usually occurring within 91 cm of the surface. The Bfj horizon of the Brunisolic solum usually extends 38 to 50 cm below the surface and seldom merges with the IIBt horizon. The IIC horizon is frequently stratified, stony, moderately alkaline and calcareous. Mapping units consist of small scattered areas dominantly of Vassar soils with minor occluded areas that are mainly Sandilands, Carrick, Arnes and St.Labre soils. A representative profile of Vassar fine sand is described below:

L-F - 2 to 0 cm, very dark brown (10YR 2/2 dry), partially to moderately decomposed pine needles, leaf, twig and grass litter; strongly acid; abrupt, smooth, lower boundary.

Aej - 0 to 10 cm, light gray (10YR 7/1 dry), loamy fine sand; loose; strongly acid; clear, smooth, lower boundary.

Bfj1 - 10 to 20 cm, brown (10YR 5/3 dry), loamy fine sand; weak, fine granular; very friable when moist; soft when dry; strongly acid; clear, smooth, lower boundary.

Bfj2 - 20 to 38 cm, yellowish brown (10YR 5/4 dry), fine sand; weak, fine granular; very friable when moist; soft when dry; medium acid; abrupt, wavy, lower boundary.

Ae - 38 to 42 cm, very pale brown (10YR 7/3 dry), loamy fine sand; weak, fine granular; very friable when moist and soft when dry; medium acid; abrupt, wavy, lower boundary.

IIBA - 42 to 46 cm, brown (10YR 5/3 dry), loam; moderate, fine subangular blocky; firm when moist; hard when dry; medium acid; clear, wavy, lower boundary.

IIBt - 46 to 61 cm, brown (10YR 4/3 dry), clay; strong fine to medium blocky; very firm when moist; very hard when dry; medium acid; gradual, wavy, lower boundary.

IIBC - 61 to 76 cm, brown to very pale brown (10YR 5/3 to 7/3 dry), clay; weak, fine blocky to coarse granular; firm when moist; hard when dry; mildly alkaline and calcareous; gradual, irregular, lower boundary.

IICk - 76 cm +, light olive brown to light yellowish brown (2.5Y 5/3 and 6/3 dry), stratified clay and silt loam; moderate, coarse platy and weak, fine granular; firm and friable when moist; very hard and slightly hard when dry; mildly alkaline and strongly calcareous; iron stained.

Venlaw Series (VLW)

The Venlaw series consists of well drained Dark Gray Luvisol soils developed on sandy to gravelly outwash, which is moderately to strongly calcareous. The surface textures vary from gravel to loamy sand. The topography is irregular, very gently to gently sloping, surface runoff is moderate and permeability is rapid to very rapid. Vegetation consists of bur oak, grasses, herbs, hazelnut, and some aspen.

The Venlaw series is characterized by a 8 to 12 cm, dark gray Ap horizon, with a 5 to 15 cm, pale brown Ae horizon, and a 8 to 15 cm, light brown Bt horizon which usually terminates at a layer which contains coarser fragments. A transitional BC may be present.

Vermillion River Series (VMV)

The Vermillion River series consists of imperfectly drained Gleyed Cumulic Regosol soils developed on thin (25 to 100 cm), weakly to moderately calcareous, moderately fine textured (CL, SiCL), recent alluvial deposits overlying sandy deposits. Surface textures are usually silty clay loam and the soil is stratified with layers ranging from sand to clay in texture. Dark coloured layers high in organic matter content occur throughout the profile. The Vermillion River soils are very similar to the Edwards series, differing from them mainly in the presence of coarse textured substrates within 1m of the surface. The topography is level to slightly irregular, very gently undulating. Surface runoff is moderate and internal permeability is moderately slow in the upper alluvium and moderately rapid through the underlying sand substrate. Although most of the Vermillion River soils are cultivated, native vegetation was mainly hardwood forest consisting of elm, ash, Manitoba maple, with shrubs such as willow and dogwood and a ground cover of grasses and meadow grasses.

Soil profile development on these thin alluvial sediments is restricted to a weakly expressed discontinuous Ah horizon that grades into the stratified parent material. The A horizon has fine granular structure, dark grayish brown to light brownish gray colour, neutral reaction and is usually weakly calcareous. The C horizon is moderately calcareous, mottled with weak iron staining and banded with dark coloured layers representing former soil surfaces which were covered by deposition of fresh alluvium. The Vermilion River mapping units may contain minor inclusions of the poorly drained Pine River soils. A representative profile of the Vermillion River series is described below:

Apk - 0 to 10 cm, very dark grayish brown (10YR 3/2 moist) silty clay loam; weak fine granular; friable when moist, slightly hard when dry; mildly alkaline, strongly calcareous, clear smooth boundary.

Ahk - 10 to 25 cm, very dark grayish brown (10YR 3/4 moist) silty clay; weak, fine granular; friable when moist, slightly hard when dry; mildly alkaline, strongly calcareous; abrupt wavy boundary.

Ckg1 - 25 to 43 cm, dark gray to gray (5Y 4.5/1 moist) silty clay loam; many fine to medium prominent yellowish red (5YR 5/8 m) mottles; structureless, massive breaking to weak fine granular, friable when moist, slightly hard when dry; moderately alkaline, very strongly calcareous; clear smooth boundary.

Ckg2 - 43 to 60 cm, dark gray to gray (5Y 4.5/1 moist) silt loam; many fine to medium, prominent yellowish red(5YR 4/6 m) mottles; massive, breaking to weak fine granular; friable when moist, slightly hard when dry; mildly alkaline, strongly calcareous, abrupt smooth boundary.

Ckg3 - 60 to 90 cm, stratified dark gray to gray and light gray (5Y 4.5/1 to 5Y 6.5/1 moist) very fine sand and loam; few, fine prominent dark red (2.5YR 3/6 moist) and many fine prominent reddish yellow (5YR 6/8 moist) mottles; structureless; very friable when moist, soft when dry; mildly alkaline, strongly calcareous.

II Ckg - 90 cm +, light yellowish brown (2.5Y 6/4 moist) fine and very fine sand; few; fine faint yellow (2.5Y 7/6 moist) mottles; structureless, single grain; mildly alkaline; strongly calcareous.

Verner Lake Series (VLK)

Verner Lake soils consist of Gleyed Regosols developed on gray, moderately to strongly calcareous, coarse textured (FS, LCoS, LFS) siliceous sands and gravels overlying moderately to strongly calcareous, medium to moderately fine textured (VFSL, L, SiL to SCL, CL, SiCL) stratified lacustrine deposits. These soils occur in the vicinity of Whitewater Lake. The coarse textured surface materials consist of deltaic and modified beach deposits surrounding the lake. The soil has nearly level topography, moderately slow permeability, very slow surface runoff and imperfect drainage caused by the high water levels and less permeable underlying materials. The sub-soils may be slightly to moderately saline. The native vegetation consists of such moisture and salt tolerant species as wild barley, gum weed, sow thistle sedges and slough grasses. Some of these soils are used for pasture and some are used for native hay production. Verner Lake soils are very susceptible to flooding from windblown lake water and snow melt water.

The profile consists of gleyed, gray, saline Ah horizons, 10 to 25 cm thick over very stratified parent materials consisting of white, coarse textured II Ck horizons over gray, moderately fine textured III Ck horizons. The depth of this profile is extremely variable, as are the textures of the various stratified layers of its parent material. Analytical and morphological data are presented below.

Ahksgj - 0 to 23 cm, very dark gray (10YR 3/1 moist), gray (10YR 5/1 dry) sandy clay loam; amorphous; friable when moist; abrupt, smooth boundary; moderately calcareous; moderately saline; pH 8.0.

II Cskgj - 23 to 28 cm, gray to light gray (10YR 6/1 moist), white (10YR 8/1 dry) fine sandy loam; amorphous; friable when moist; abrupt, smooth boundary; very strongly calcareous; weakly saline; pH 8.7.

III Cskgj - 28 to 46 cm, light gray (10YR 6.5/1 moist), white (10YR 8/1 dry) clay loam; strong, coarse columnar breaking to moderate, fine sub-angular blocky; friable when moist; clear, wavy boundary; moderately calcareous; weakly saline.

IV Cskgj - 46 to 91 cm, pale brown (10YR 6/3 moist), light gray (10YR 7/1 dry) loamy very fine sand; single grained; friable when moist; few, fine, faint iron mottles; abrupt, smooth boundary; moderately calcareous; strongly saline; pH 8. 1.

V Cskgj - 91 cm +, light gray (10YR 7/2 dry) gravelly coarse sand: single grained; friable when moist; very strongly calcareous; strongly saline; pH 8.4.

Verrall Lake Series (VRL)

The Verrall Lake series consists of imperfectly drained Gleyed Gray Luvisol soils developed on deep, fine textured (SC, SiC, C) glaciolacustrine sediments. These soils occur in areas of level to gently sloping topography often in close association with glaciolacustrine sediments of the Blackstone series in higher, well drained positions and the Brekon series in poorly drained depressions.

Verrall Lake soils generally have a 5 to 10 cm thick leaf mat (LFH) on the surface, a light gray Ae horizon of' similar thickness, and a gleyed, silty clay to clay textured Btgj horizon approximately 25 cm thick. These horizons are underlain by a thin transitional BC horizon and a gleyed, mottled, moderately to strongly calcareous, silty clay to clay textured Ckg horizon.

Vegetation consists mainly of white spruce and aspen, with an under story of alders, bunchberry, sarsaparilla and feathermosses. Verrall Lake soils occur primarily in the Childs Lake and Wellman Lake portions of the Duck Mountain study area.

Villette Series (VLT)

The Villette series, a poorly drained, Orthic Humic Gleysol member of the Waskada Association, is developed on thin (25 to 100 cm), strongly calcareous, medium textured (VFSL, L, SiL), discontinuous eolian and lacustrine sediments overlying strongly calcareous, medium to moderately fine (VFSL, L, SiL to SCL, CL, SiCL) textured glacial till. A very thin (less than 5 cm) gravelly stratum or pebble line may occur at the contact. This soil has a fine sandy loam to loam surface texture, nearly level to depressional topography, slow permeability and no surface runoff. These poorly drained soils occur in enclosed depressions in the south central part of the map area. They are very susceptible to flooding and ponding in the early spring and after heavy summer rains. The native vegetation usually consists of hydrophytic vegetation such as slough grasses. These soils are not cultivated.

Vista Series (VST)

The Vista series consists of poorly drained Rego Humic Gleysol soils developed on deep, stratified, moderately calcareous, coarse textured (FS, LS, LFS), lacustrine deposits. These soils occur in depressional positions of nearly level to gently undulating landscapes and have moderately high permeability, slow surface runoff and a high water table during the growing season. Vista soils are non-eroded, non-stony and non-saline. They have low available water holding capacity, and low organic matter content. Native vegetation often includes sedges, reeds, willows and meadow grasses. The majority of these soils are currently used for natural grazing and improved pasture.

In a representative profile the solum is approximately 34 cm thick. The profile is characterized by dark gray, fine sandy loam Apk or Ahk horizon, 10 to 28 cm thick, overlying a thin carbonated transitional sandy textured AC horizon, 10 to 15 cm thick, and a strongly mottled, strongly calcareous, gray to olive gray, loamy sand Ckg horizon. Many of the Vista soils may have a peaty surface layer 10 to 30 cm thick.

Vista soils occur in close association with Kircro, Lenswood and Bethany soils. They are similar in texture to Lenswood soils but are more poorly drained. Bethany soils are better-drained and slightly coarser in texture than Vista soils. Vista soils with peaty surface layers are similar to Kircro soils but the Kircro soils have a greater thickness of peat (>40 cm). Vista soils were previously mapped as the meadow associate of the Rackham association sandy phase, in the reconnaissance survey of soils in the Rossburn and Virden map sheet areas.

Vita Series (VIT)

The Vita series consists of imperfectly drained Gleyed Gray Luvisol soils developed on moderately calcareous, coarse sandy to gravelly outwash, beach and stratified drift deposits which are underlain by extremely calcareous loamy glacial till within 1 metre. There is commonly a thin sandy surface mantle over the gravelly material and surface textures range from loamy coarse sand to loam. The topography is level to irregular gently sloping. There is little or no surface runoff as the soils are very permeable, but internal drainage is impeded by a high groundwater table. Native forest consists mainly of aspen and some balsam poplar. Shrubs are mainly dogwood, rose, some alder willow and raspberry.

Vodroff Series (VFF)

The Vodroff series consists of poorly drained Rego Humic Gleysol soils developed on a thin mantle (<1 m) of loamy (L, CL, SiCL) lacustrine sediments over a strongly calcareous loam to clay loam glacial till of shale, limestone and granitic origin. These soils have free water at or near the surface for a considerable period of the year. The topography is level to depressional; runoff is negligible; permeability is restricted during periods of free water within a metre. In areas where the inflowing waters contain appreciable soluble salts, the salt may accumulate in the soil in sufficient amount to affect the growth of normal hydrophytic vegetation.

The soil is characterized by a moderately decomposed organic layer, 2 to 5 cm thick, a very dark gray Ah horizon, 10 to 18 cm thick, a mottled dark gray AC horizon, 4 to 8 cm thick and a carbonate accumulation horizon, 8 to 12 cm thick. The Ckg horizon is olive to pale olive and usually contains yellowish brown mottles.

Vordas Series (VDS)

The Vordas series consists of poorly drained Rego Humic Gleysol soils developed on strongly to very strongly calcareous, deep, uniform, loamy (VFSL, SiL, L), lacustrine deposits. These soils occur in level to depressional positions of undulating landscapes and have moderate permeability, very slow surface runoff, and a high to ponded water table during the growing season. Vordas soils are non-eroded, non-stony, and often slightly saline. They have medium available water holding capacity, high organic matter content, and low natural fertility. Native vegetation includes sedges, rushes, reeds and willows. The majority of these soils are currently in native vegetation.

In a representative profile the solum is approximately 15 cm thick. The profile is characterized by a moderately decomposed organic horizon, 2 to 5 cm thick, a very dark gray Ah horizon, 10 to 18 cm thick, a dark gray AC horizon, 4 to 6 cm thick with carbonates and mottles, and an olive to pale olive Ckg horizon, with yellowish brown iron mottles. A typical profile also contains white pseudomycelia of salt in the Ah and AC horizons in saline areas.

Vordas soils occur in close association with Fairland, Taggart and Torcan soils. They are similar to Tadpole soils by having poor drainage and loamy deposits but differ from them by having slightly coarser textures. Vordas soils were previously mapped as Meadow associates of the Holland Association in the Carberry (1957) soil report.

Wabowden Series (WBW)

The Wabowden series consists of well drained Solonetzic Gray Luvisol soils developed on weakly to moderately calcareous, deep, uniform clayey lacustrine deposits. These soils occur in midslope positions of undulating to hummocky landscapes and have slow permeability and moderate surface runoff. Wabowden soils are seldom eroded, non stony and non saline. They have high available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes white poplar, white and black spruce and alder. The majority of Wabowden soil areas exist as productive woodland.

In a representative profile the solum is approximately 70 cm thick. The profile is characterized by a very dark brown, acidic LH horizon, 8 to 15 cm thick, a dark grayish brown, platy structured loamy, acidic Ae horizon, 10 to 15 cm thick overlying a 10 to 20 cm thick transitional AB horizon, a dark grayish brown, acidic Bt horizon, 25 to 35 cm thick with well developed columnar structure, a BC horizon, 15 to 25 cm thick and a clayey Ck horizon. The parent material is typically dark gray in color and weakly calcareous with very thin lenses of very fine sand and silt. A typical profile also contains a few coarse fragments.

Wabowden soils occur in close association with clayey granular subangular blocky structured Sipiwesk soils. They are similar to Sipiwesk soils by having clayey parent material and good soil drainage, but differ from them in having strongly developed coarse round topped columns in their AB and B horizons. Wabowden soils were previously mapped as Wabowden soils as described in the Cormorant Lake interim soils report.

Waitville Series (WTV)

The Waitville series consists of moderately well to well drained Orthic Gray Luvisol soils developed on strongly calcareous, medium textured glacial till of mixed shale, limestone and granite rock origin. These soils are found at higher elevations (above 570 m a.s.l.) in the Riding Mountain area. The surface textures of the Waitville soils vary from loam to clay loam. They occur on irregular morainic topography ranging from gently rolling to hilly. Runoff is moderate to rapid and internal soil permeability is slow. The Waitville soils are moderately stony. Native vegetation consists of aspen, birch and white spruce with an understory of hazel, dogwood, cranberry and mixed mosses and grasses. Associated minor areas of imperfect drainage are characterized by black poplar and willow whereas in poorly drained areas both black spruce and tamarack are common.

Waitville soil profiles vary in thickness because of variable leaching due to differences in local soil moisture regimes in different topographic positions. The soils are generally thicker in the mid to lower slope position than on the crests. The Waitville soils are characterized by a moderately thick deciduous leaf and mixed moss leaf mat (10 to 20 cm) underlain by a light brownish gray, fine sandy loam to loam textured Ae horizon with fine to medium platy structure. The Ae ranges in thickness from 10 to 15 cm and may be separated from the L-H by a thin, darker coloured Ah or Ahe horizon. The underlying Bt horizon is characterized by dark brown clay loam to clay textures and medium sized subangular blocky aggregates. The B horizon contains significant clay accumulations and is 15 to 25 cm thick. The lower portion of the B horizon grades into a transitional BC horizon containing some residual carbonates. The underlying Ck horizon is moderately to very strongly calcareous and is usually light grayish brown in colour.

The Waitville soils were mapped as the well drained member of the Waitville soil association described in the Westlake and Grandview Map areas (Soil Reports No. 8 and No. 9).

Wakopa Series (WKP)

The Wakopa series is the poorly drained, Rego Humic Gleysol member of the Horton Association, developed on deep, strongly calcareous, medium to moderately fine textured glacial till deposits with coarse fragment inclusions of shale, limestone and granitic rock. Significant accumulations of erosional material occur in the depressions in which the profiles are commonly developed. This soil occurs above the 549 m (1800 ft a.s.l.) level in the Turtle Mountains in the southeastern portion of the map area. This soil has a clay loam surface texture, slow permeability and no surface runoff. Surface waters remain ponded in the surface most of the year. Aquatic and hydrophytic vegetation are common.

Wampum Series (WMP)

The Wampum series consists of imperfectly drained Gleyed Gray Luvisol soils developed on 15 to 75 cm of medium to fine sand underlain by slightly to moderately calcareous loam to clay textured lacustrine sediments. The sandy surface deposits usually range from 38 to 50 cm in thickness. The topography is irregular, very gently sloping and, as a result of low relief, surface drainage is slow. Internal drainage is impeded by high groundwater table perched on a slowly permeable fine textured substrate. The native vegetation consists of aspen, balsam poplar, and some birch; a fairly dense shrub layer of dogwood, rose, alder, willow, raspberry; and a profusion of herbs and grasses. The soils are stone-free.

The Wampum soils have a thin, partially to well decomposed leaf, forb and grass, surface organic layer; a thin dark gray Ah horizon; a weak deeply leached sandy iron stained slightly acid, light gray Ae horizon, and a weakly to moderately developed Bt horizon. The soils usually are developed partly in the sandy surface mantle and partly in the underlying stratified, loam to clay textured lacustrine sediments.

Wapus Series (WPU)

The Wapus series consists of Orthic Gray Luvisol soils developed on thin, medium textured, shaly till deposits over shale rock. The upper till deposits are weakly to moderately calcareous and grade into thinly bedded shale rock which breaks readily to flakes and flat chips. Surface textures are usually loam but vary from very fine sandy loam to clay loam. The Wapus soils occur on the northern slope of the Riding Mountain in the extreme south west corner of the Ste. Rose map area. The topography is irregular, strongly rolling to hilly and the area is characterized by eroded ravines and gullies; in addition, several areas have been affected by slumping bedrock. Runoff from the Wapus soils is rapid, particularly in areas of steep topography and internal soil permeability is rapid. Native vegetation is dominantly mixed forest of aspen, birch and white spruce with an understory of hazel, rose, saskatoon, chokecherry and mosses and grasses.

The Wapus soils are characterized by a moderately thin leaf mat (8 to 10 cm), underlain by a thin dark gray, fine sandy loam Ah or Ahe horizon. This in turn is underlain by 30 to 50 cm of light gray, weak granular, fine sandy loam Ae horizon containing many shale fragments. This Ae horizon grades into a very diffuse B horizon consisting of much dark grayish brown shale intermixed with clay loam materials. The lower boundary of the B horizon is likewise very diffuse and grades into mainly unaltered weakly calcareous shale bedrock which breaks readily into thin, highly fractured shale flakes and chips. A more detailed description of the Wapus soils is given in Soil Report No. 8 of the Westlake Map Sheet Area.

The Wapus soils in the Ste Rose Map area occur mainly in homogeneous mapping units and in lesser amounts in complex association with the Clarksville series. Wapus soil areas are restricted to the very steeply sloping portions of the Escarpment and are mapped in a narrow belt where the till deposits from the last glaciation are thin.

Warpath Series (WRP)

The Warpath series consists of imperfectly drained Gleyed Gray Luvisol soils developed on moderately to strongly calcareous clayey till. Topography is nearly level to gently undulating. Permeability and runoff are slow to very slow due, in part, to clay textured surfaces of these soils. The surface may be slightly stony to moderately stony. The native vegetation is dominantly spruce mixed with balsam poplar and aspen. Warpath soils have a light gray Ae horizon underlain by a gleyed, textural B horizon. Numerous isolated pockets of extremely calcareous loamy till occur within the clayey matrix of the parent material. Warpath soils of the Low Boreal climatic zone are similar in parent material and drainage to the less strongly degraded Davis Point soils of the High Boreal-temperate climatic zone also found in this map area. The Warpath series occurs often in association with soils of the Chitek, Askandigau, peaty phase, and Cedar Lake series. A description of this series is given below.

L-H - 5 to 0 cm, leaf and sod mat; medium acid; abrupt boundary.

Ae - 0 to 8 cm, gray (10YR 6/1 moist), loam; coarse platy; slightly plastic when wet; strongly acid; abrupt boundary.

AB - 8 to 13 cm, grayish brown (10YR 5/2 moist), clay loam; coarse blocky; plastic when wet; strongly acid; clear boundary.

Btgj - 13 to 30 cm, dark gray (10YR 4/1 moist), clay; medium blocky; plastic when wet; strongly acid; clear boundary.

BC - 30 to 41 cm, dark grayish brown (10YR 4/2 moist), clay; medium blocky; plastic when wet; medium acid; slightly effervescent; gradual boundary.

Ckg1 - 41 to 51 cm, dark gray to gray (10YR 4.5/1 moist) silty clay; massive, slightly plastic when wet; mildly alkaline; very strongly calcareous; diffuse boundary.

Ckg2 - 51 cm +, dark gray (10YR 4/1 moist) silty clay; coarse pseudogranular; plastic when wet; mildly alkaline, very strongly calcareous.

Warren Series (WRN) (replaced by Warner Series)

The Warren series consists of moderately well to well drained, Rego Black Chernozem soils developed on thin, strongly calcareous, dominantly moderately fine textured (SC, SiC, C), lacustrine deposits over extremely calcareous loamy till or clay till of mixed clay and loam materials. The surface textures range from loam to light clay. The topography is irregular, very gently to gently sloping; runoff is moderate; and permeability is moderate to moderately slow in the moderately fine sediments and variable from moderate to slow in underlying till. The native vegetation consists of tall prairie grasses, trembling aspen and bur oak.

The Warren soil is characterized by a very dark gray, granular A horizon 15 to 25 cm thick, a grayish brown to brown, granular AC horizon 8 to 12 cm thick and pale brown Ck horizon. The depth of moderately fine textured overlay is normally 40 to 80 cm. Some stones may be present at the surface. Associated with the Rego Black Chernozem soils are the Calcareous Black and some Orthic Black Chernozem soils depending on the depth of overlay. Soils with the underlying clay till, a mixture of loam and clay textured till deposits, are referred to as the Warren, clay till variant, WRN1.

Waskada Series (WKD)

The Waskada series is the well drained, Orthic Black Chernozem member of the Waskada Association and is developed on thin (<1 m), strongly calcareous, loamy (VFSL, L, SiL) lacustrine sediments overlying strongly calcareous, loamy glacial till. A very thin (< 5 cm), gravelly pebble line may occur at the contact. These soils have complex, gently sloping topography, moderately good drainage, loam to clay loam surface texture, moderate permeability and moderate surface runoff. The depth to water table is approximately 3 m during the growing season. Most of these soils are cultivated for crop production. Waskada soils usually occur in intermediate and upper slope positions. The knolls are sometimes slightly to moderately eroded. The Waskada series resembles the Cameron series of the Cameron Association. The only difference is the Waskada series is underlain by glacial till. The presence of few stones in the till makes it difficult to determine the depth of overlay.

A typical profile has very dark gray Ap horizons 10 to 15 cm thick, dark brown Bm horizons, 12 to 15 cm thick; sometimes a brown BC horizon occurs above the pale brown II Ck horizon. Analytical and morphological data are presented below.

Ap - 0 to 18 cm, very dark grayish brown (10YR2.5/2 moist), very dark gray (10YR 3/1 dry) loam; weak, fine to medium granular; friable when moist; slightly hard when dry; abrupt, smooth boundary; pH 7.1.

Bm - 18 to 33 cm, dark brown (7.5YR 3.5/2 moist), brown (7.5YR 4.5/2 dry) loam; weak, coarse prismatic breaking to moderate, medium sub-angular blocky; friable when moist; slightly hard when dry; clear, smooth boundary; pH 7.1.

BC - 33 to 43 cm, brown (10YR4.5/3 moist), brown (10YR5/3 dry), silt loam; moderate, medium subangular blocky; friable when moist; hard when dry; clear, smooth boundary; moderately calcareous; pH 7.5.

II Cca - 43 to 66 cm, pale brown (10YR 6/3 moist), light gray (10YR 7/2 dry), loam till; moderate, medium granular breaking to weak, fine granular; friable when moist; hard when dry; clear, smooth boundary; strongly calcareous; pH 8.1.

II Ck - 66 cm +, grayish brown to light brownish gray (10YR 5/2 to 6/2 moist), light brownish gray to light gray (10YR 6/2 to 7/2 dry), loam till; pseudo, weak fine granular; firm when moist; hard when dry; strongly calcareous; pH 8.0.

Waskik Lake Comlex (WSK)

The Waskik Lake complex consists of very poorly drained Terric Mesisol soils developed on shallow (40 to 160 cm), moderately decomposed fen peat deposits with little or no (< 15 cm) sphagnum surface peat. The Waskik Lake soils are underlain by non calcareous sandy lacustrine or glacio-fluvial deposits. These soils occur on fens which have developed on flat or depressional terrain. Surface runoff is ponded and subsurface drainage is moderate to slow due to moderate to poor permeability of the sedge peat. The water table is at or clost to the surface for most of the growing season. Native vegetation includes very stunted tamarack and black spruce trees and extensive swamp birch cover. Groundcover vegetation is dominated by sedges, various herbs like bog bean and threeleaf smilacina brown mosses and patches of sphagnum mosses. The majority of these soils are presently in their native state.

The Waskik Lake complex includes Terric Mesisol and Terric Fibric Mesisol soils. In a representative profile the peat is 100 to 140 cm thick. The profile is characterized by a thin, broken, non-decomposed, strongly acid, pinkish white, sphagnum peat Of horizon, 0 to 20 cn thick; a slightly decomposed, strongly acidic, dark reddish gray, mixed moss, sedge, herb and leaf Om horizon, 20 to 30 cm thick; a moderately decomposed, strongly acidic, dark reddish brown, non-woody sedge and brown peat Om horizon, 40 to 100 cm thick; and a weakly acidic, light brownish gray, sandy II Cg horizon. The peat material is typically stratified with thin fibric layers.

These soils occur in close association with Gormley Lake soils, which may occur along the edge of Waskik Lake peatlands. Reed Lake soils occur in deeper sections of the Waskik Lake peatlands.

Waskwei Complex (WKW)

The Waskwei series consists of poorly to very poorly drained deep (>160 cm) organic soils developed on mesic forest peat capped with a thin layer (0 to 65 cm) of fibric Sphagnum moss peat. The underlying mineral sediments are undifferentiated, but usually consist of strongly gleyed, moderately to strongly calcareous, loamy to clayey lacustrine sediments. These soils generally exhibit a flat bog or blanket bog landform, with depressional to level topography. Vegetation is mainly black spruce, with an understory of Sphagnum moss and ericaceous shrubs.

The Waskwei series, a Typic Mesisol, sphagnic phase, is the dominant member of the complex. This series has a 15 to 65 cm surface layer of strongly acid, fibric Sphagnum moss. The Baynham series, a Typic Mesisol with less than 15 cm of Sphagnum peat at the surface, is the subdominant member of the complex. Soils of the Baynham complex are similar, but have little or no fibric Sphagnum peat overlying the mesic forest peat. Waskwei soils occur in relatively few map units, most notably on The Pas Moraine, where they often occur in association with other deep organic soils of the Baynham complex and the Stead series. A representative profile of the Waskwei complex is given below.

Of1 - 0 to 55 cm, strong brown (7.5YR 5/6 wet) dominantly fibric Sphagnum; medium to fine fibered; low wood; strongly acid; unrubbed fiber content approximately 92%; rubbing to 80%; clear wavy boundary.

Om1 - 55 to 110 cm, very dark gray (5YR 3/1 wet moderately decomposed herbaceous forest peat; medium to fine fibered; low wood; neutral; unrubbed fiber content approximately 74%; rubbing to 44%.

Om2 - 110 to 165 cm, black (5YR 2/1 wet) moderately decomposed herbaceous forest peat, medium to fine fibered, low wood; slightly acid; unrubbed fiber content approximately 72%; rubbing to 32%; clear smooth boundary.

II Ckg - 165 + cm, greenish gray (5GY 6/1 moist) silt loam; massive; sticky wet; mildly alkaline; extremely calcareous.

Wassewa Series (WSW)

The Wassewa series is the poorly drained, carbonated Rego Humic Gleysol member of the Croll Association, developed on thin (24 to 100 cm), strongly calcareous, moderately fine textured (SCL, CL, SiCL), discontinuous lacustrine sediments overlying strongly calcareous, medium to moderately fine textured (VFSL, L, SiL to SCL, CL, SiCL) glacial till. A very thin (less than 5 cm), gravelly stratum may occur at the till contact. This soil has depressional topography, silty clay loam to clay loam surface texture; no surface runoff and very slow permeability. The depth to water table is estimated at less than 1 metre during the growing season. Under dry conditions these soils may be cultivated, but due to frequent flooding and surface ponding, they rarely produce a crop. In some instances, these soils may be weakly saline.

This soil has a black Ahk horizon, 10 to 25 cm thick, and a dark olive gray Ck horizon. A thin black Ap horizon may be present in some soils. A typical profile description is given below.

Apk - 0 to 15 cm, black (10YR 2/1 moist), very dark gray (10YR 3/1 dry) clay loam; weak, fine sub-angular blocky; slightly stick when wet; slightly hard when dry; abrupt smooth boundary; weakly calcareous.

Ahkg - 15 to 25 cm, black (10YR 2/1 moist), very dark gray (10YR 3/1 dry) clay loam; amorphous; slightly sticky when wet; slightly hard when dry; clear, irregular boundary; moderately calcareous.

Ckg - 25 cm +, dark olive gray (5Y 3/2 moist), olive gray (5Y4/2 dry), clay loam; amorphous; slightly sticky when wet; very hard when dry; strongly calcareous.

Watrine Series (WTI)

The Watrine series is characterized by a Humic Luvic Gleysol solum, poor soil drainage and materials of thin veneer (< 90 cm), moderately to strongly calcareous fine loamy (L to CL) lacustrine or fluvial lacustrine sediments overlying moderately to strongly calcareous glacial till of shale, limestone and granitic origin. The soils occur in depressional position of undulating landscapes in association with the Altamont and Kingsley soils. Some inwash (< 15 cm) material is usually present in the surface due to erosion from upper slopes, particularly in cultivated areas. Runoff is negligible except when the surface drainage has been improved. Permeability is moderately slow.

The solum has a dark gray loam Ah or Ahe horizon 8 to 12 cm thick, a gray to light gray loam, Aeg horizon 5 to 8 cm thick a clay loam to clay, Btg horizon 25 to 35 cm thick, and a variable BC horizon commonly extending to the till contact within a metre.

Wawanesa Series (WWS)

The Wawanesa series is the imperfectly drained, carbonated, Gleyed Rego Black Chernozem member of the Wawanesa Association and is developed on thin (25 to 100 cm), moderately to strongly calcareous, medium textured (VFSL, L, SiL) lacustrine sediments overlying strongly calcareous, coarse textured (FS, LCoS, LFS) lacustrine deposits. This soil has a silt loam to loam

surface texture, gently undulating topography, moderate permeability and slow surface runoff. The depth to water table is estimated at between 1 and 2 metres during the growing season. The proximity of the sandy subsoil causes the surface soil to remain saturated for longer periods, after rains than would normally be expected from this type of soil. The majority of these soils are cultivated.

Weiden Series (WDN)

The Weiden series consists of poorly drained, carbonated Rego Humic Gleysol soils developed, on thin, strongly calcareous, coarse loamy lacustrine deposits overlying extremely calcareous, stony loamy till. The topography is level to depressional, runoff is slow and permeability is moderate in the coarse loamy deposits and moderately slow in the underlying till. The surface textures range from loamy fine sand to loam. The native vegetation consists of meadow grasses, reeds, sedges, clumps of willow and black poplar may occur. The Weiden series is very similar to the Foley series except for the till substrate. The Weiden peaty phase has a 15 to 40 cm layer of mesic peat on the surface.

Wekusko Complex (WEK) or (WKX)

The Optic Lake Complex soils are dominantly Terric Mesic Fibrisols with inclusions of Terric Fibric Mesisols and Terric Fibrisols. These soils are developed in 60 to 160 cm of fibric sphagnum peat which may be underlain by significant amounts of forest or fen peat. The underlying mineral sediments are non-calcareous till. A profile description is provided:

Of - 0 to 60 cm, dark yellowish brown (10YR 4/4 moist), fibrous, spongy compacted Sphagnum mosses; extremely acid; fiber content approximately 79 percent.

Om1 - 60 to 99 cm, very dark grayish brown (10YR 3/2 moist), woody, moderately decomposed forest peat mixed with weakly decomposed Sphagnum moss peat; extremely acid; fiber content approximately 59 percent.

Om2 - 99 to 150 cm, very dark grayish brown (10YR 3/2 moist), woody, moderately decomposed forest peat mixed with weakly decomposed Sphagnum moss peat; extremely acid; fiber content approximately 65 percent.

Om3 - 150 to 301 cm, very dark grayish brown (10YR 3/2 moist), woody, moderately decomposed forest peat mixed with weakly decomposed Sphagnum moss peat; very strongly acid; fiber content approximately 51 percent.

Om4 - 301 to 351 cm, very dark gray (10YR 3/1 moist), moderately decomposed forest peat; strongly acid; fiber content approximately 38 percent.

IICg - 351 +, non-calcareous sandy loam till.

Wellman Series (WLM)

Wellman series consists of imperfectly drained Gleyed Dark Gray Luvisol soils developed on deep (>100 cm) moderately to strongly calcareous, clayey, stone free glaciolacustrine deposits derived predominantly from Cretaceous shales. These soils occur in lower slopes on nearly level to gently sloping hummocky landscapes. Wellman soils have slow to very slow permeability, moderate to slow surface runoff and a moderately low water table during the growing season. Wellman soils are non-eroded and non-saline. They have high available water holding capacities and moderately high organic matter content. Native vegetation typically includes grasses, shrubs and herbaceous plants. Some of these soils are used for crop production.

The average solum thickness is about 40 cm. A typical profile contains a dark gray, clayey Ap horizon, 20 cm thick and a medium to strong sub-angular blocky, dark grayish brown, clay textured Bt horizon 15 to 20 cm thick. The lower portion of the profile is weakly to strongly calcareous and grades through a thin BC horizon to the underlying clayey Ckgj horizon containing many prominent mottles. Coarse fragments of shale and occasional weathered limestone occur in the parent material.

Wellman soils are very similar to the well-drained Meadowbrook soils in profile characteristics with the exception that drainage is imperfect. In contrast to the poorly drained Breckon soils, surface ponding is only temporary on Wellman soils. Wellman soils were mapped in the Meadowbrook soil association in the reconnaissance survey of soils in the Rossburn and Virden map sheet areas.

Wells Harbour Series (WLH)

The Wells Harbour series consists of imperfectly drained, Gleyed Gray Luvisol, shallow lithic phase soils. They are developed on thin, weakly to moderately calcareous sandy deposits underlain by sandy to loamy-skeletal, moderately stony glacial till. Limestone bedrock occurs within one metre of the surface. These soils occur on level to gently ridged topography. Internal drainage is rapid in the upper portion of the solum and impeded in the lower portion. Vegetation is dominantly Balsam fir and birch, with an understory of mountain maple, sarsaparilla, bunchberry and feathermoss.

Wells Harbour soils are similar to those of the Caliento series, differing only in the presence of a lithic contact within one metre of the surface. These soils occur near well developed beach ridges of the Woodridge complex in the eastern portion of the map area, and also occur on the northern half of Janora Island.

Wellwood Series (WWD)

The Wellwood series consists of well to moderately well drained Orthic Black Chernozem soils developed on a thin mantle (25 to 75 cm) of strongly calcareous fine loamy (CL, SiCL) sediments grading to moderately calcareous sandy (FS, LS, LFS) deposits. Topography is nearly level to very gently sloping; runoff is moderate to moderately slow; permeability is moderate in the upper loamy strata and rapid in the sandy strata.

The soil is characterized by a deep black to very dark gray, loam to clay loam, Ah horizon, 18 to 30 cm thick; a dark brown to brown, prismatic to subangular blocky, clay loam to silty clay, Bm horizon, 16 to 24 cm thick, and a yellowish brown to pale brown, clay loam to silty clay loam, BC horizon, 8 to 14 cm thick. A Cca horizon may be present, underlain by a II Ck that ranges from fine sand to loamy fine sand. The Wellwood, clay variant, WWD1, differs from the modal Wellwood by having a clay to silty clay textured layer, 10 to 40 cm thick within the solum that often forms part of the Bm horizon. The underlying sandy sediments usually occur at a greater depth than in the modal Wellwood.

Wentland Series (WTD)

The Wentland series is a carbonated, Rego Humic Gleysol soil developed on poorly drained, very strongly to extremely calcareous, dominantly coarse loamy (VFS, FSL, LVFS) lacustrine sediments. These soils occur on level to depressional topography associated with Plum Ridge soils. Surface runoff is slow, and soil permeability is impeded by a high water table. In areas where the groundwater contains high salt concentrations, sufficient soluble salt can be present in the soil profile to reduce plant growth. Native vegetation consists of sedges, meadow grasses and willows.

The Wentland soil profile has a gray to dark gray Ap horizon, 15 to 20 cm thick; a light gray, calcareous transition AC horizon with prominent mottles, 10 to 20 cm thick and a very pale brown, calcareous Ckg horizon with many prominent mottles. This profile has a lighter matrix colour and is more calcareous than the similar Osterwick soils. It is coarser textured than either the dominantly fine loamy Glenfields soils or the coarse loamy to fine loamy Blumenfeld soils. Wentland soils are non arable unless surface drainage is improved. With adequate surface drainage, the soils have moderately severe seasonal wetness limitations that reduce the choice of crops or require special management.

Wesley Series (WEL)

The Wesley series consists of imperfectly drained, carbonated Gleyed Rego Black Chernozem soils developed on stony, very strongly to extremely calcareous loamy glacial till of limestone and granitic origin; some coarser material may occur at variable depths below the surface. The soils occur on the lower slopes of irregular, undulating to moderately rolling topography; they receive the run off from the upper slopes as well as seepage waters during the spring. Free water may occur within a metre for a considerable part of the year. Permeability is moderate, but is restricted during periods of free water in the soil.

The soil is characterized by a very dark gray Ah(k) horizon 15 to 20 cm thick, a very dark gray AC horizon, 6 to 10 cm thick, and a lime accumulation (Cca) horizon, 8 to 12 cm thick, that is often not adequately discernible from the extremely calcareous, pale yellow Ck horizon. This soil is similar to the Barwood series in physical and chemical properties.

Westray Series (WRY)

The Westray series consists of well to moderately well drained, Orthic Gray Luvisol soils developed on extremely calcareous glacial till. Surface textures range from sandy loam to clay. This wide range of texture is due to the inclusion in the series of soils developed on a very thin (< 15 cm) lacustrine mantle over the glacial till. These soils occupy the higher till ridges. The topography is gently undulating to undulating, commonly in the form of broad low ridges. Surface runoff is moderate, permeability is medium. These soils are very to exceedingly stony. The native vegetation is mainly aspen and white spruce with minor occurrences of jack pine, balsam poplar and willow. The Westray soils have the typical Orthic Gray Luvisol profile characteristics, but the horizons are very thin. The entire solum is normally less than 25 cm thick from the surface. On virgin sites a thin, neutral to slightly acid L-H horizon overlies a 2.5 to 5 cm thick light gray Ae horizon that is medium acid in reaction. The thin Bt horizon is fairly well developed and it consists of 5 to 10 cm of brown to dark brown, subangular blocky structured aggregates. The C horizon is extremely calcareous and highly dolomitic. Westray soils of the Low Boreal climatic zone are similar in parent material and drainage to the Garson soils of the High Boreal-temperate climatic zone. A representative profile of the Westray series is described below.

L-H - 4 to 0 cm, very dark gray (10YR 3/1 moist), leaf and grass mat, slightly acid, abrupt smooth boundary.

Ae - 0 to 5 cm, light gray (10YR 7/1 moist), loam; moderate, fine platy; friable when moist; slightly acid; abrupt smooth boundary.

Bt - 5 to 18 cm, brown to dark brown (10YR 4/3 moist), clay; moderate, fine subangular blocky; firm when moist; medium acid; clear wavy boundary.

Ck1 - 18 to 64 cm, very pale brown (10YR 7/3 moist), loam; weak fine to medium platy; very friable moist; moderately alkaline; extremely calcareous.

Ck2 - 64 cm +, very pale brown (10YR 7/3 moist), silt loam; weak fine to medium platy; very friable moist; moderately alkaline; extremely calcareous.

Wheatland Series (WHL)

The Wheatland series consists of well to moderately well drained Orthic Black Chernozem soils developed on a mantle (60 to 95 cm) of moderately to strongly calcareous, shallow sandy (FS, LS), fluvial deposits over moderately to strongly calcareous, deep, stratified, sandy-ske letal (CoS, MS), fluvial deposits. These soils occur in upper positions of gentle to very gentle slopes on undulating landscapes and have rapid over very rapid permeability, moderately slow surface runoff, and a low water table during the growing season. Wheatland soils are occasionally slightly eroded, non-stony, and non-saline. They have low available water holding capacity, medium organic matter content, and low natural fertility. Native vegetation includes oak, aspen, shrubs and prairie grasses. The majority of these soils are currently used for grazing and for some crop production.

In a representative profile the solum is approximately 40 cm thick. The profile is characterized by very dark gray to very dark grayish brown Ah horizon, 18 to 25 cm thick, a brown to yellowish brown Bm horizon, 12 to 24 cm thick, a light yellowish brown BC horizon, 10 to 15 cm thick with carbonates and a Cca horizon, 5 to 8 cm thick at the sand/gravel contact. They are similar to Dorset soils by having a Orthic Black Chernozem profile and sandy-skeletal substrate but differ from them in having a sandy surface mantle. Wheatland soils were previously mapped as associates of the Agassiz Association in the Carberry (1957) soil report.

Whitefish Series (WFS)

The Whitefish series consists of Rego Humic Gleysol soils developed on a thin veneer of clayey, stone-free glaciolacustrine sediments overlying loamy glacial till. These soils occur in small depressional areas with poor to very poor drainage and a high seasonal water table.

Whitefish soils are characterized by a dark colored, humus rich Ahg horizon of silty clay to silty clay loam texture. This Ahg is underlain by a gleyed, calcareous Ckg horizon of similar texture. A II Ckg horizon, consisting of stony, loam textured, moderately to strongly calcareous glacial till occurs within 1 metre. These soils also possess a thin leaf mat (LFH) at the surface. Whitefish, peaty phase soils (WFSp) are similar, but possess a thicker, 15 to 40 cm layer of organic material on the surface.

Native vegetation of Whitefish soils is commonly balsam poplar, willow, and grasses. Whitefish soils occur as map units in small depressional areas, mainly in the Childs Lake area.

Whitemouth Series (WHU)

The Whitemouth series are well to moderately well drained Dark Gray Luvisol soils developed on strongly calcareous, moderately fine textured alluvial sediments. The sediments range in texture from very fine sandy loam to silty clay and sometimes are underlain by a weakly to moderately calcareous lacustrine clay. These soils occur on well drained levees along the Whitemouth River, its numerous small tributaries and the Winnipeg River. Topography is usually level to irregular, moderately sloping. Surface runoff is rapid and internal drainage is moderate. The Whitemouth, clay substrate phase, (WHUc), soils have a weakly to moderately calcareous lacustrine clay substrate within 75 cm of the surface which impedes internal drainage.

The Whitemouth series has thin organic layers that may be absent due to earthworm activity. The underlying distinct Ah horizon grades abruptly into a platy Ae horizon that is often mottled just above a strong textural B horizon. The B horizon grades into a stratified, very pale brown Ck horizon. A description of a representative Whitemouth soil profile follows:

Ap - 0 to 15 cm, gray to dark gray (10YR 5/1 to 4/1, dry), clay loam; massive breaking to coarse platy; friable when moist, soft when dry; slightly acid; abrupt, smooth lower boundary; pH 6.2.

Ae - 15 to 20 cm, light gray to light brownish gray (10YR 6/1 to 6/2, dry), clay loam; moderate, medium platy; friable when moist, soft when dry; slightly acid; clear, wavy, lower boundary; pH 6.6.

Bt - 20 to 36 cm, brown to grayish brown (10YR 5/3 to 5/2, dry), clay; strong subangular blocky to blocky; firm when moist; hard when dry; slightly acid; clear, wavy, lower boundary; pH 6.3.

BC - 36 to 46 cm, dark grayish brown (10YR 5/2, dry), silty clay; moderate, coarse granular; firm when moist; hard when dry; neutral to mildly alkaline; clear, wavy, lower boundary; pH 7.4.

Ck - 46 to 76 cm, light gray to very pale brown (2.5Y 7/2 to 10YR 7/3, dry), silty clay; moderate, fine subangular blocky; firm when moist; hard when dry; mildly alkaline and strongly calcareous; pH 7.6.

Whitewater Series (WIW)

The Whitewater series is the imperfectly drained, saline, Gleyed Rego Black Chernozem member of the Whitewater Association. It is developed on deep (> 100 cm), strongly calcareous, moderately fine to fine textured, stratified, moderately saline lacustrine sediments. Whitewater soils have a clay loam to clay surface texture, nearly level topography, slow permeability and slow surface runoff. The depth to water table ranges from 1 to 2.2 metres. These soils are moderately saline as is evident by the abundance of white salt crystals in the form of pseudo-mycelia in the profile. Some of these soils are cultivated but crop growth and yield are severely reduced. Analytical and morphological data for a representative profile is presented below.

Apkgj - 0 to 15 cm, black (10YR 2/1 moist), silty clay; massive, firm when moist; abrupt, smooth boundary; weakly calcareous; pH 8.1.

Ahksgj - 15 to 35 cm, black (10YR 2/1 moist), silty clay; amorphous; slightly sticky when wet; gradual, irregular boundary; weakly calcareous; pH 8.0.

II AC - 35 to 64 cm, very dark gray (10YR 3/1 moist), silty loam; amorphous; slightly sticky when wet; gradual, irregular boundary; moderately calcareous; weakly saline; pH 8.2.

II Cskg - 64 +, light brownish gray to light gray (2.5Y 6.5/2 moist), silty clay loam; amorphous; slightly sticky when wet; moderately calcareous; moderately saline; pH 8.7.

Whithorn Complex (WHI)

The Whithorn complex consists of deep (>160 cm) organic soils composed of strongly acidic, fibric Sphagnum peat more than 65 cm thick overlying mesic forest or fen peat. The underlying mineral sediments are undifferentiated, but are usually strongly gleyed, moderately to strongly calcareous, loamy to clayey lacustrine sediments. These soils exhibit a raised landform due to the rapid growth of Sphagnum mosses. The topography of these soils is level to gently sloping, and drainage is poor to very poor. Water samples from these areas are very ombotrophic (nutrient deficient) as the site is above the regional water table and moisture is provided mainly by precipitation. Native vegetation on Whithorn soils is stunted black spruce, Labrador tea, leather leaf, and Sphagnum moss.

The dominant member of the complex is the Whithorn series, a Mesic Fibrisol with a surface layer of 80 to 135 cm of fibric Sphagnum moss peat. The Julius series, a Typic Fibrisol with greater than 125 cm of fibric Sphagnum peat, and the Santon series, a Fibric Mesisol with 65 to 80 cm of fibric Sphagnum surface peat, are the subdominant members of the complex. Soils of the Whithorn complex are similar to those of the Julius series, differing only in that Whithorn soils have a slightly thinner layer of fibric Sphagnum peat at the surface. A representative profile of the Whithorn series is given below.

Of1 - 0 to 50 cm, dark reddish brown (5YR 3/3 broken) pinkish gray (7.5YR 7/2 pressed) pink (7.5YR 7/4 rubbed) fibric Sphagnum moss; medium to fine fibered; non-woody; extremely acid; unrubbed fiber approximately 86%; rubbing to 64%.

Of2 - 50 to 110 cm, very dark brown (10YR 2/2 broken) light gray (10YR 7/2 pressed) pale brown (10YR 6/3 rubbed) fibric Sphagnum moss; medium to fine fibered; non-woody; extremely acid; unrubbed fiber approximately 84%; rubbing to 66%; clear wavy boundary.

Om1 - 110 to 175 cm, black (10YR 2/1 broken) dark grayish brown (10YR 4/2 pressed) dark brown (10YR 3/3 rubbed) moderately decomposed forest peat, dominantly fine fibered with odd coarse wood fragments; low wood; extremely acid; unrubbed fiber approximately 60%; rubbing to 32%; clear smooth boundary.

II Ckg - 175 + cm, gray (5Y 5/1 moist) clay; massive; very sticky wet; mildly alkaline; moderately calcareous.

William Series (WIL)

The William series is the poorly drained, carbonated Rego Humic Gleysol member of the Dromore Association, developed on thin (25 to 100 cm), strongly calcareous, medium textured (VFSL, L, SiL) lacustrine sediments overlying coarse textured (FS, LCoS, LFS) gravelly deltaic beach and outwash deposits. This soil has nearly level to depressional topography, a fine sandy loam surface texture and commonly occurs in depressions and stream channels in the south-west corner of the Boissevain-Melita map area. Permeability is moderate and surface runoff is moderate. The ground water level usually occurs within 1 metre of the surface. These soils are used mainly for pasture.

Willowbend Series (WWB)

The Willowbend series consists of poorly drained Rego Humic Gleysol soils developed on moderately to strongly calcareous, stratified, deep, loamy (SL, FSL, L, SiL, CL, SiCL), recent alluvial deposits. Strata can very in texture from FS to CL depending on source area and position relative to stream channels. These soils occur in level to depressional positions of very gentle slopes on flood prone terraces and meander landscapes and have moderately slow permeability, very slow surface runoff, and a high to ponded water table during the growing season. Willowbend soils are non-eroded, non-stony, and often moderately saline. They have a medium available water holding capacity, medium organic matter content, and low natural fertility. Native vegetation includes sedges, rushes, reeds and willows. The majority of these soils are currently in native vegetation.

In a representative profile the solum is not developed. The profile is characterized by a moderately decomposed LH horizon, 5 to 10 cm thick, a very dark gray Ah horizon, 15 to 20 cm thick with moderate calcareousness, and a light brownish gray to very pale brown Ckg horizon with many prominent mottles. Buried Ah horizons often occur throughout the soil profile.

Willowbend soils occur in close association with La Salle and Gervais soils. They are similar to Basker soils by having stratified loamy alluvium and poor drainage but differ from them by occurring in a warmer soil climate. Willowbend soils were previously mapped as inclusions of the Assiniboine Complex in the Carberry (1957) soil report.

Willowcrest Series (WWC)

The Willowcrest series consists of imperfectly drained Gleyed Black Chernozem soils developed on weakly to moderately calcareous, deep, uniform, sandy (FS, LFS), lacustrine deposits. Finer textured deposits underlie the sands at depths of 1.5 to 3.5 metres. These soils occur in middle positions of undulating landscapes and have moderately rapid to rapid permeability, moderate surface runoff, and a high water table during the growing season. Willowcrest soils are occasionally slightly eroded, non-stony, and very occasionally slightly saline. They have a low available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation includes aspen, willow, shrubs and prairie grasses. The majority of these soils are currently cultivated for forage or crop production.

In a representative profile the solum is approximately 55 cm thick. The profile is characterized by a very dark gray to very dark brown Ah horizon, 18 to 25 cm thick, a dark brown to yellowish brown Bmgj horizon, 25 to 40 cm thick with distinct iron mottles, a Cca horizon, 13 to 20 cm thick and a pale brown Ckgj horizon, with many prominent mottles. The WWC1 variant differs from the normal Willowcrest series by having coarse sand subsoil.

Willowcrest soils occur in close association with Skelding, Long Plain and Lelant soils. They are similar to Almasippi soils by having imperfect drainage and sandy deposits but differ from them in having a prominent Bmgj horizon. Willowcrest soils were previously mapped as Black Meadow associates of the Almasippi in the Carberry (1957) soil report.

Winkler Series (WIK)

The Winkler series consists of moderately well drained Orthic Black Chernozem soils developed on moderately calcareous, deep, stratified, clayey (SiC, C), lacustrine deposits. These soils occur in middle positions of nearly level to undulating landscapes and have moderately slow permeability, moderately slow surface runoff, and a medium water table during the growing season. Winkler soils are non-eroded, non-stony, and non-saline. They have high available water holding capacity, high organic matter content, and medium natural fertility. Native vegetation includes tall prairie grasses, shrubs and aspen-oak groves. The majority of these soils are currently used for crop production.

In a representative profile the solum is approximately 45 cm thick. The profile is characterized by a very dark gray Ah horizon, 13 to 25 cm thick, a dark brown Bm horizon, 20 to 35 cm thick with moderate medium granular to prismatic structure, and a Ck horizon, with dominantly SiC to C textures. The parent material is typically stratified with lighter (SiL, SiCL) textures at depth.

The Winkler, loam variant, WIK1, differs from the normal Winkler series by having a loam to clay loam texture in the surface horizon instead of a clay texture. The Winkler, heavy clay variant, WIK2, differs from the normal Winkler series because of increased clay content throughout the profile. The clay content varies from 55 to 85 % while the normal Winkler series has a clay content usually between 40 to 50 %, with some silty strata in the subsoil. Winkler soils occur in close association with Deadhorse and Plum Coulee soils. They are similar to Denham soils by having an Orthic Black Chernozem profile and clayey substrate but differ from them in having no loamy surface mantle. Winkler soils were mapped as Blackearth associates of the Horndean Complex in the Winnipeg-Morris (1953) soil report.

Wintergreen Series (WGE)

The Wintergreen series consists of imperfectly drained, Gleyed Gray Luvisol soils developed on moderately to strongly calcareous, sandy lacustrine and outwash deposits. Surface textures are fine sand to fine sandy loam. The topography is level to irregular, very gently sloping. Soil permeability is rapid, but internal drainage is impeded by a high ground water table. Native vegetation is comprised of pure stands of jack pine, mixed jack pine, aspen, balsam poplar, birch; a dense understory of tall and short shrubs like dogwood, rose, alder, raspberry, currant and saskatoon; and some herbs and grasses. The soils are stone-free.

The soil is characterized by a thin 2 to 5 cm leaf litter, and a 8-12 cm dark yellowish brown Btgj with clay coating on the peds and grades through a thin transition area to the Ckg horizon and then to the II Ckg.

Wolverton Series (WVT)

The Wolverton series consists of well drained Eluviated Dystric Brunisol soils developed on a mantle (10 to 100 cm) of very strongly acid sandy morainal deposits overlying Precambrian bedrock. These soils occur in upper slope and crest positions of moderately to strongly sloping bedrock landscapes. They have moderate permeability and slow to moderate surface runoff. Wolverton soils are moderately susceptible to erosion if unprotected and are very stony. They have low available water holding capacity, low organic matter content, and low natural fertility. Native vegetation often includes white spruce, jack pine, birch, aspen and alder. The majority of Wolverton soil areas are remain in native vegetation.

In a representative profile the solum is approximately 16 cm thick. The profile is characterized by a very strongly acidic dark brown LH or LFH horizon, 4 to 10 cm thick, a thin broken gray colored Ae horizon, 3 to 7 cm thick, a brown to dark yellowish brown, sandy Bm horizon, 10 to 20 cm thick and a pale brown acidic C horizon. The parent material is typically derived from acidic bedrock. A typical profile contains bedrock at about 20 to 50 cm and has coarse fragments throughout the profile. Wolverton soils occur in close association with Fay Lake soils and bedrock outcrops. They are similar to Fay Lake soils by having similar drainage and parent material but differ from Fay Lake soils because of their shallow depth to bedrock. Wolverton soils were previously mapped as Wolverton Series in the Cormorant Lake interim soil report.

Woodfield (WDF)

The Woodfield series consists of moderately well to well drained Calcareous Black Chernozem soils developed on stony, very strongly to extremely calcareous loamy glacial drift of limestone and granitic origin. Some coarser materials may occur at variable depths. These soils occur on the mid and upper slopes of irregular undulating to moderately rolling topography of the Brandon Hills. They are more common on the south and west facing slopes which receive greater amounts of radiation per area resulting in a greater moisture deficiency than Stanley soils on north and east slopes. Runoff is moderately rapid to rapid; permeability is moderate.

The soil is characterized by a very dark gray Ah horizon, 10 to 15 cm thick, and a calcareous dark grayish brown to brown Bm horizon, 8 to 12 cm thick. A white lime accumulation (Cca) horizon is common below the solum but is often difficult to differentiate from the very strongly calcareous till. The cultivated soils are susceptible to wind and water erosion and have had some of the Ah horizon removed.

Woodmore Series (WOM)

The Woodmore series consists of imperfectly drained Gleyed Dark Gray Chernozem soils developed on thin, strongly calcareous, medium to moderately coarse lacustrine deposits over extremely calcareous loamy till. The topography is level to irregular, very gently sloping; runoff is moderate; and permeability is moderate in the moderately coarse to medium deposits and variably moderate to moderately slow in the underlying till. The surface texture ranges from loamy fine sand to loam. The native vegetation consists of trembling aspen, balsam poplar, hazel, native grasses, and occasional willow.

The soil is characterized by a dark gray granular Ap or Ahe horizon 10 to 18 cm thick and a moderately developed dark grayish brown Btj horizon 7 to 10 cm thick with some thin discontinuous organic and clay coatings on the peds, and grades through a thin transition area to the Ckgj horizon or IICkgj. The WOM1 variant differs from the normal Woodmore series by having clay till substrate.

Woodridge Series (WOG)

The Woodridge series consists of rapidly drained Orthic Gray Luvisol soils developed on sandy and gravelly beach, and outwash deposits. A thin sandy to loamy mantle which ranges from 15 to 25 cm in thickness frequently overlies the coarser sediments. The areas are usually in the form of narrow elongate, gently sloping beach ridges. Native vegetation consists of a semi-open stand of jack pine and sparse ground cover of shrubs, herbs and mosses.

These soils are characterized by a very thin, patchy, partially to moderately decomposed organic layer; a pale brown, weakly but usually deeply leached strongly acid, Ae horizon; a dark yellowish brown, weakly developed, slightly acid Bt horizon which usually occurs partly in the sandy surface mantle and partly in the underlying stratified coarse sand and gravel where a large percentage of coarse gravel and cobbles prevail and the horizons are thinner and the textural B horizon appears to be prominent.

Worden Series (WOR)

The Worden series is characterized by rapid to well drained, Orthic Regosol soils developed in deep (>100 cm) moderately to strongly calcareous, clay loam textured glacial till of shale, limestone and granite origin. These soils occur on the knoll positions of moderate to very strongly sloping landscapes and are subject to wind and water erosion. Surface runoff is moderate to rapid; permeability is moderate to moderately slow. These soils are found in association with the well drained Darlingford and Hebbot series.

The solum is very shallow due to erosion. They may have an Ap horizon less than 10 cm, no A horizon, above the unaltered parent material. Productivity of these soils is limited and conservation practices are required for improvement.

Wytonville Series (WVI)

The Wytonville series consists of imperfectly drained Gleyed Black Chernozem soils developed on a thin mantle (<1 m) of moderately to strongly calcareous, coarse loamy (VFS, LVFS, SL, FSL) sediments, overlying moderately to strongly calcareous medium sand to gravelly textured deposits. Topography is gently sloping to irregular, undulating. Runoff is moderately slow; permeability is moderately rapid on the upper strata, and very rapid in the lower strata unless restricted by a water table within a metre of the surface during the spring or following heavy rains.

The soil is characterized by a very dark gray to very dark grayish brown Ah horizon, 18 to 25 cm thick, a brown to dark brown, weakly mottled Bmgj horizon, 14 to 22 cm thick and a light yellowish brown BC with strong brown mottles. A carbonate accumulation horizon (Cca) occurs at the upper boundary of the coarse strata. Wytonville profiles differ from Kilmury soil profiles in not having the presence of carbonates in their Ah and Bm horizons. They are also more permeable than the very similar Druxman soils. They occur in close association with the Kilmury soils, the well drained Miniota soils and the poorly drained Bornett series.

Xavier Series (XVI)

The Xavier series consists of very poorly drained, Typic Mesisol soils developed on deep (>160 cm), moderately decomposed, mesic fen peat deposits. These soils occur in depressional positions of undulating landscapes and have moderately slow permeability, very slow surface runoff, and a high to ponded water table during the growing season. Xavier soils are non-eroded, non-stony, and non-saline. They have a high available water holding capacity, high organic matter content, and medium natural fertility. Native vegetation includes sedges, rushes, reeds and willow. The majority of these soils are currently in native vegetation.

Xavier soil is characterized by a dark yellowish brown Of horizon, 10 to 30 cm thick, which is medium acid to neutral and a thick, very dark brown, medium acid to neutral Om horizon, grading into a black, weakly acid to weakly calcareous Oh horizon. Underlying mineral strata range in texture from loam to clay. Xavier soils are similar to Perillo soils by having very poor drainage and organic deposits but differ from them in having deep (>160 cm) rather than shallow (40-160 cm) organic deposits.

Yustak Series (YTK)

The Yustak series is characterized by a Rego Humic Gleysol solum, poor soil drainage, and materials with a thin veneer of moderately to strongly calcareous coarse loamy (VFS, LVFS, SL, FSL) sediments overlying moderately to strongly calcareous stratified sand and gravel deposits. These soils occur in level to depressional positions of undulating or hummocky morainic-like landscapes that were influenced by glacial fluvial processes and subsequent ponding. Runoff is restricted, but some lateral flow through the coarser material probably occurs. Permeability is moderate in the upper strata and rapid in the lower strata, but is restricted during periods of saturation and high water table conditions. Vegetation consists of dominantly sedge and reeds; commonly, willow occurs on the periphery as a "willow ring".

Zaparosa Series (ZAP)

The Zaparosa series consists of well to rapidly drained Orthic Gray Luvisol soils developed on deep (>100 cm), stratified, extremely calcareous, coarse sandy (CoS, MS, LCoS, LS) to gravelly deltaic, beach, or outwash deposits. These soils occur on upper slope and crest positions of undulating to hummocky landscapes and have rapid permeability, slow surface runoff and a very low water table during the growing season. Zaparosa soils are moderately eroded, slightly stony and non-saline. They have very low available water holding capacity and low organic matter content. Native vegetation often includes some aspen and white spruce, with shrubs and prairie grasses. The majority of these soils are currently used for improved pasture, some are used as a source of road aggregate, and others are cultivated for annual crops.

In a representative profile the solum is approximately 50 cm thick. The profile is characterized by a gray to light gray (10YR7/1 dry), granular, slightly acid, sandy loam Ap - Ae horizon, 10 to 20 cm thick. A brownish (10YR5/3 dry), weak medium sub-angular blocky, slightly acid, sandy loam Bt horizon, 20 to 60 cm thick, grading into a very strongly calcareous gravelly Ck horizon. A typical profile contains coarse fragments throughout.

Zaparosa soils occur in close association with Seech, Katherine, and Heron Creek soils. They are similar to Seech and Katherine soils by having similar texture, but Katherine soils are imperfectly drained. Heron Creek soils are poorly drained and usually have a sandy loam surface texture. Zaparosa soils were previously mapped as Zaparosa association in the reconnaissance survey of soils in the Rossburn and Virden map sheet areas.

Zaplin Series (ZPI)

The Zaplin series consists of imperfectly drained Gleyed Dark Gray Chernozem soils developed on moderately to strongly calcareous, deep, uniform, fine loamy (L, CL, SICL), till deposits of mixed limestone, granite and shale origin. These soils occur in lower slope positions of gentle slopes on hummocky landscapes; surface runoff is moderately slow. Permeability is moderate; water table is between 1 to 2 m during the growing season. Zaplin soils are non-eroded, slightly stony and non-saline. They have medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes tall prairie and aspen-oak groves. The majority of these soils are currently used for crop production.

The solum is approximately 45 cm thick with a dark gray Ap or Ah horizon, 10 to 20 cm thick; a very dark brown Bt or Btj horizon, 20 to 30 cm thick with a few, fine, faint mottles; and a grayish brown transitional BC horizon, 10 to 15 cm thick. The Ck horizon is dark with many fine, distinct mottles. Zaplin soils occur in close association with Dezwood and Horose soils. Zaplin soils were previously mapped as imperfectly drained minor associates of the Pembina association in the reconnaissance soil survey of South-Central Manitoba (1943).

Zarnet Series (ZRT)

The Zarnet series is a Rego Black Chernozem soil developed on moderately well to well drained, moderately to strongly calcareous, loamy (VFSL, L, SiL, CL, SiCL) lacustrine sediments less than one metre in depth, overlying moderately to strongly calcareous sandy (S, CoS) to sandy skeletal (GrS, GrCoS) fluvial deposits. The soils occur on gently sloping topography or in upper slope and knoll positions of irregular, undulating to gently rolling topography. Surface runoff is moderate to rapid dependent upon the gradient with moderate permeability in the upper sediments as opposed to rapid permeability in the lower deposits.

The Zarnet soil profile is characterized by a very dark gray Ah horizon, 12 to 18 cm thick, a dark gray to dark grayish brown AC horizon, 8 to 14 cm thick and a carbonate accumulation horizon (Cca) of 10 to 18 cm thickness. Zarnet soil profiles are shallower and lack Bm horizons that characterize Croyon soils, a closely related associate.

Zhoda Series (ZHD)

The Zhoda series consists of well to moderately well drained Dark Gray Luvisol soils developed on moderately to strongly calcareous, coarse textured (FS, LS, LFS) deltaic and lacustrine deposits. The surface texture is fine sand to loamy fine sand. Topography is very gently sloping to irregular gently sloping. Permeability is rapid. Native vegetation consists dominantly of aspen and jack pine.

The Zhoda soils are developed on sandy deposits with very low clay content and consequently the accumulation in the B horizon is usually very low. The Zhoda soil has a dark gray Ah, 10-15 cm thick, an pale brown Ae 10 to 20 cm thick, a yellowish brown Bt 5 to 10 cm thick, then grading into the calcareous C horizon.

Zinman Series (ZIM)

The Zinman series is characterized by a Gleyed Solonetzic Dark Gray Chernozem solum, imperfect soil drainage, and materials of moderately to strongly calcareous fine loamy to clayey lacustrine veneer over water modified, loamy glacial till deposits. They occur within the Manitou Plain at elevations from 457 to 465 m.a.s.l. and are associated with localized areas of salinity and seepage; they occupy the intermediate to lower slope positions of near level to gently sloping, undulating topography. Runoff is slow; permeability is slow to very slow particularly in the Bn horizon. Gypsum and other soluble salts (magnesium and sulfates) are usually present below the solum.

The solum has a dark gray Ah or Ap horizon 10 to 15 cm thick, a gray Ahe or Ae horizon 5 to 10 cm thick, a black to very dark gray columnar Bn1 horizon 10 to 18 cm and an amorphous very dark gray Bn2 horizon that is quite compact and breaks into subangular blocky peds. Some salts and gypsum are usually present in the lower part of the B horizon and in the transitional BC horizon. The depth of lacustrine veneer or water modification (inwash) vary from less than 30 cm to greater than 75 cm; the underlying till is dominantly of clay loam in texture, but can vary in composition in terms of shale, granite and limestone fragments.