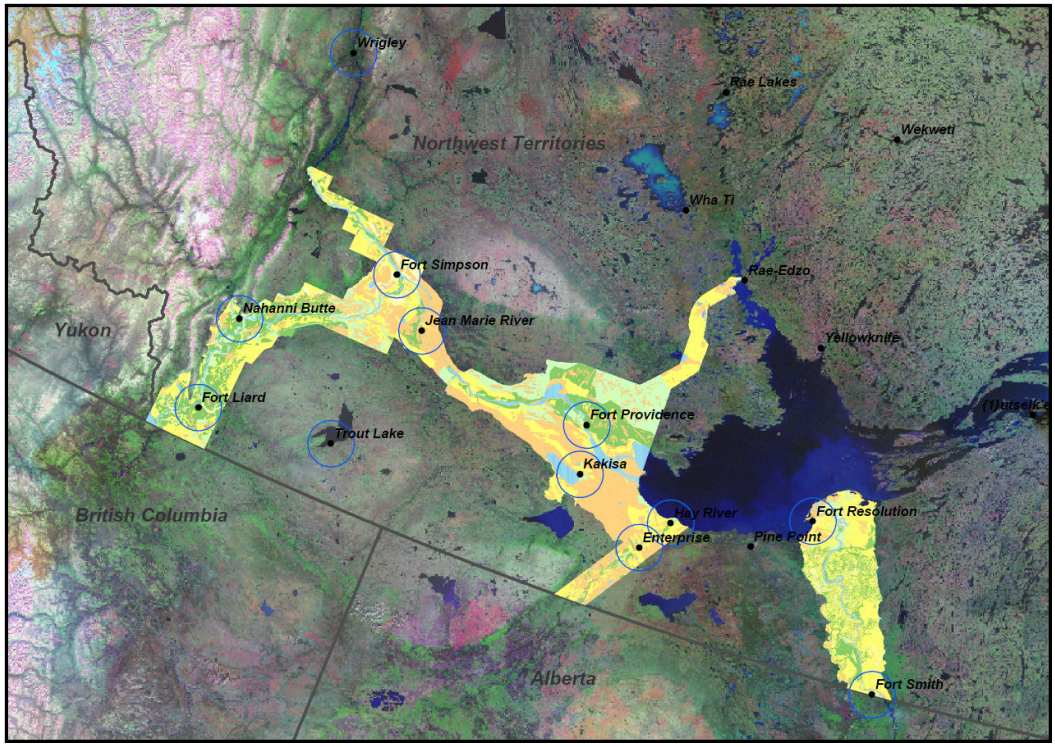
NORTHWEST TERRITORIES
SOIL SURVEY ENHANCEMENT PROJECT

Final Report



Prepared For:

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Table of Contents

"The greatest enemy of progress is ignorance and I think I am safe in calling maps the most used and least understood documents of modern civilization. The tendency may be to believe everything that appears on a map without understanding the limitations of maps and knowing how to use them."

Lloyd A. Brown, 1953, Author of "The Story of Maps"

Upper left photo: agricultural land along the Hay River
Lower left photo: Fort Liard, with abandoned Class 3 agricultural land in foreground
Photo to right: a Gleyed Cumulic Regosol soil in the Fort Resolution area.

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EXECUTIVE SUMMARY

In the fall of 2005, the Northwest Territories Department of Industry, Tourism and Investment (ITI), retained EcoDynamics Consulting to compile, digitize, and where possible, enhance the existing soil survey information covering over 4.3M ha of land in the southern Northwest Territories (Figure 1). The overall purpose of the project was to ensure that this existing map coverage is available in a digital form to support agricultural planning and management in the NWT. Funding for the project was from the *Canada - NWT Agricultural Policy Framework Program* (Agriculture and Agri-foods Canada) and the Government of the Northwest Territories (GNWT).

The resulting digital map set provides soil and agricultural land capability information for over 4M ha of the southern Northwest Territories based on compilation of a variety of soil surveys conducted during the 1960s and 1970s. Digital versions of these historical paper maps were produced using various computer-based techniques including raster scanning, raster-to-vector conversion, georeferencing and conflation. Various soil and soil capability for agriculture attributes were then attached to each digital map polygon using the built-in database structure of ArcMap. Revised map legends and soil descriptions were also prepared based on current Canadian soil taxonomy and terminology. A reconnaissance level field program was also undertaken to gain familiarity with the soils of the study area and to assess the general reliability of the existing information.

Digital files representing digital versions of the original hard copy soil and land capability for agriculture maps, and other key project files are contained on an accompanying DVD. This digital dataset represents the 'best available' soil and soil capability for agriculture information for the defined study area.

GIS-derived summary data prepared from these digital files indicates the following soil capability totals for agriculture in the 4.3M ha study area:

Class 3 - 826,336 ha

Class 4 - 491,119 ha

Class 5 - 1,310,082 ha

Class 6 - 138,486 ha

Class 7 - 1,196,085 ha

Bases on this summary, over 1.3M ha of arable land occur in the mapped area. This represents more than a quarter of the total mapped land base.

1.0 INTRODUCTION

1.1 Project Background and Purpose

With the rapid rise in fuel prices of the past year, and the attendant rise in the cost of producing and transporting food, food prices have suffered significant inflationary pressure. Should this trend continue and food and fuel prices continue to increase, it is likely that more attention will be paid to local food production potential, particularly in more remote regions, such as the Northwest Territories. If this anticipated shift to increased local food production does occur, land resource managers and policy makers across the globe will require comprehensive soil resource information at both regional and local scales, with accompanying agricultural capability interpretations.

In the fall of 2005, the Northwest Territories Department of Industry, Tourism and Investment (ITI), retained EcoDynamics Consulting to compile, digitize, and where possible, enhance the existing soil survey information covering approximately 4.3M ha of land in the southern Northwest Territories (Figure 1). The overall purpose of the project was to ensure that this existing map coverage is available in a digital form to support agricultural planning and management in the NWT. Funding for the project was from the *Canada - NWT Agricultural Policy Framework Program* (Agriculture and Agri-foods Canada) and the Government of the Northwest Territories (GNWT).

Of particular interest those lands within a 20 to 30 km radius of twelve (12) NWT communities with known or anticipated agricultural capability, namely: Ft. Resolution, Ft. Smith, Hay River, Enterprise, Ft. Providence, Kakisa, Jean-Marie River, Trout Lake, Ft. Simpson, Ft. Liard, Nahanni Butte, and Wrigley (Figure 1). Given the large study area and limited resources, project effort was focused on the compilation, digitization and enhancement of the existing soil inventories, and not remapping. However, a limited field program was undertaken to gain familiarity with soil and agricultural capabilities in the study area and to provide preliminary reconnaissance data in selected areas with no existing map coverage.

This report outlines the methodology used to prepare the digital soil map compilation, discusses the soils and agricultural capability of the study area, and presents project conclusions and recommendations. Much of the report consists of compiled and summarized material from the original soil and agricultural capability reports (Day, 1968; Day, 1972; Rostad et al, 1976; Kozak and Rostad, 1977; Rostad and Kozak, 1977). The accompanying DVD includes: an electronic version of this report (MS Word and PDF formats), ESRI shapefiles and attribute files representing digital versions of the original hard copy soil and land capability for agriculture maps; a community map series indicating soil capability for agriculture within a 20 km radius of targeted communities covered by the mapping; and copies of the original map and report scans (PDF format). This digital dataset represents the 'best available' soil and soil capability for agriculture information for the defined study area.

1.2 Description of Study Area

1.2.1 Location and Extent

The study area is located in the southern Northwest Territories and consists mainly of those examined in previous soil surveys (Day, 1968; Day, 1972; Rostad et al., 1976; and Kozak and Rostad, 1977) (Figure 1). The total existing mapped area is approximately 4.3M hectares in size.

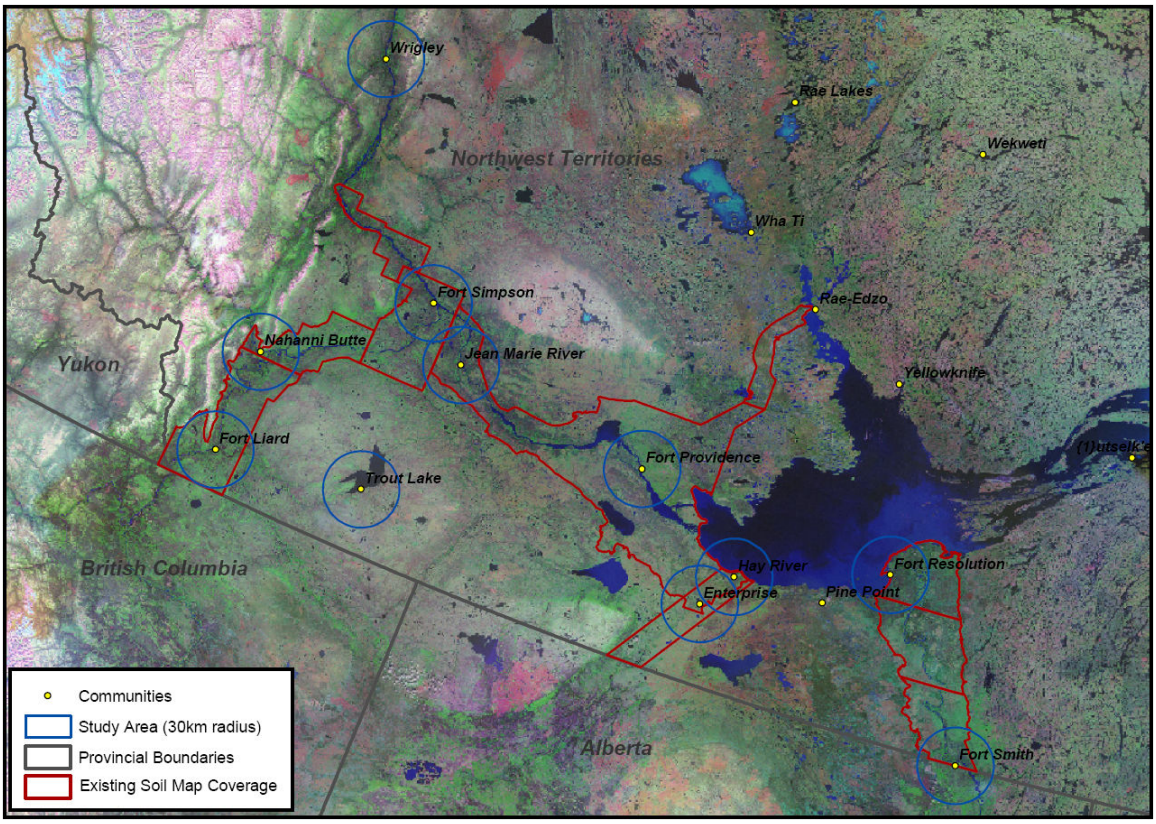


Figure 1. Extent of existing soil survey coverage and community study areas.

The Slave River Lowland map area (Day, 1972) is centered on the river valley itself, extending from the Alberta - NWT border northwards to its exit via a large delta into Great Slave Lake. The area is bounded on the south by the Northwest Territories - Alberta border, to the east by the Precambrian Shield, on the west by a wave-cut escarpment associated with Glacial Lake McConnell, and on the north by Great Slave Lake. The total area included in the survey is approximately 830,000 hectares.

The Hay River valley survey area was (Kozak and Rostad, 1977 consists of a swath of land approximately 22 km wide and 112 km long extending northeastward along the Hay River from the Alberta - Northwest Territory border, to its mouth at Great Slave Lake. The area included in this survey is approximately 300,000 hectares.

The Upper Mackenzie survey area (Day, 1968) includes the lower half of the Hay River Valley (from Enterprise to Great Slave Lake), and extends southwest and west of Great Slave Lake, along both sides of the upper Mackenzie River to Fort Simpson. A small narrow band follows the Mackenzie Highway north of Fort Providence to the community of Rae. The area covered by this survey is approximately 1.84M hectares.

The Liard and Mackenzie River survey (Rostad, et al., 1976) forms a swath along the Liard River from the British Columbia – NWT border to its confluence with the Mackenzie River at Ft Simpson. A smaller portion extends along the Mackenzie River to Camsel Bend. The area included in this survey is approximately 1.34M hectares.

1.2.2 Climate

Up to date climate data is critical for determining important parameters such as the length of the growing season, the amount of heat energy available and the length of the frost-free period, which determine the range of crops that may be grown in a given area. Variations in climate also form the first tier in mapping the agricultural capability of the various soils. Unfortunately, climate data for the study area varies in consistency over time, with some past reporting stations no longer in service. Also, most climate data contained in the various soil reports covering the study area are of 1950's to 1970's vintage. The best available data from this period is that of Eley (1977), who conducted an agrometeorological study during 1975 and 1976, in support of the agricultural capability assessment work of Rostad et al (1976), Kozak and Rostad (1977) and Rostad and Kozak (1977). The results of this study are were used to create climate limitation maps, which were used as a key input during agricultural capability assessment in the Hay River and Liard-Mackenzie map areas.

In the absence of updated agrometeorological data, the climatic portion of the agricultural capability assessment methodology remains a reflection of pre-1976 climate data. The following climate overview is compiled largely from Rostad and Kozak (1977) and Kozak and Rostad (1977), with selected climate information from other soil reports by Day (1968; 1972) and Rostad et al. (1976).

Table 1. Climatic parameters of selected stations in the southern NWT, northern Alberta and northern British Columbia (from Rostad and Kozak, 1977).

Climate Parameter	Fort Smith	Fort Resolution	Hay River	Fort Providence	Fort Simpson	Fort Nelson	Fort Vermillion
Annual Precipitation	337	293	348	264	333	434	353
May-Sept. Precipitation	180	149	160	124	201	254	208
Moisture Deficit (mm)*+	185	213	192	242	180		
Mean Annual Temp (^{o}C)	-3.3	-3.9	-3.9	-3.9	-3.9	1.1	-1.6
Mean July Temp (^{o}C)	16.6	15.5	15.5	16.1	16.6	16.6	16.6
Growing Degree Days+	1074	987	978	1108	1156		1193
Frost Free Period+	64	95	97	77	89	102	81
Elevation (m)	202	158	161	159	128	375	289

*Moisture deficit assumes 75 mm of moisture storage in soil; + frost-free period, growing degree days, and moisture deficit for the NWT locations taken from Eley (1977). Other data, including mean annual temperature, annual precipitation, and May-September precipitation, was obtained from "Temperature and Precipitation, 1941-1970, Environment Canada" and Day (1968).

The study area has a continental climate, with long and cold winters, and warm, but short, summers. As Table 1 indicates, the temperature regimes at the various stations in the NWT are remarkably similar. Fort Simpson is the warmest with a Growing Degree Day above 5°C accumulation of 1156. Al1 stations are within or very near the criteria for a class 3 climate (1000 -1145 GDD, 60-75 frost free days). Areas near Great Slave Lake have longer frost-free periods (Fort Resolution, 95 days, Hay River, 97 days), due to the warming effect of the lake, which delays frost in the fall. However, cool winds from ice-covered waters may also delay the start of the- growing season in the spring. Locations in the Hay River Valley further south of Great Slave Lake have more favourable summer temperatures (Eley, 1977). The total annual precipitation is relatively low at all stations. Most of the annual precipitation occurs during the May - September period, and is highly variable, ranging from 124 mm at Fort Providence to 200 mm at Fort Simpson. The low amount of rainfall and higher moisture deficit at Fort Providence suggests that this area is nearly marginal for cereal grains, especially on the coarser textured soils.

On a regional basis, it is the cool climate and attendant cool soil temperatures, rather than inherent soil characteristics, which restricts agricultural development north of the 60th parallel. In addition to regional climate limitations, evidence from the climate study by Eley (1977) also suggests that low, wet areas have cooler summer temperatures and a shorter frost-free period than nearby well drained areas. As a result, while most well drained soils in the Upper Mackenzie and Slave Lowland areas the have a Class 3 climate, the cooler low wet areas (Gleysolic and Organic soils) have a more restrictive Class 5 climate. In the Fort Simpson - Fort Liard area, elevation exerts an additional influence on the climatic rating. Near Fort Simpson, land above 180 meters above sea level (ASL) is given a climate class rating of 5, while near Fort Liard the break between class 3 and 5 is at approximately 365 meters (ASL).

One factor which is not often considered in historical agricultural climate assessment is the longer summer day length of northern latitudes, which may impart a compensating effect for the shorter growing season. Agriculture Canada is currently conducting new agricultural climate analysis across Canada, incorporating both a day length compensation factor, as well as newer climate data (W. Fraser, per. Comm.) This data was not yet available as of the date of this report. When it is available, this updated agricultural climate data will hopefully allow a thorough reassessment of agro-climate capability across the study area, which may in turn affect overall agricultural capability ratings.

Over the period 1960 and 1990, the mean annual temperature in many areas of the Mackenzie Valley, warmed as much a 0.5 to 1 degree Celsius. This raises an important question. If this warming trend continues, would agricultural land capability increase over the coming decades, due to reduction in climate limitations? And if so, by how much? Conceivably, such a warming trend could lead to an overall increase in both the amount and capability of agricultural lands.

1.2.3 Bedrock Geology

The study area is largely underlain by sedimentary formations of the Cretaceous and Devonian Periods, flanked by metamorphic Precambrian-aged bedrock immediately west of the Slave River and to the north of Great Slave Lake. Given the mostly flat-lying nature of the bedrock, much of the area is low-lying and nearly level, with extensive peatlands, numerous small lakes, ponds and abandoned stream channels.

The area south of Fort Liard is underlain by Upper Cretaceous sandstone, shale, and siltstone, while the main part of the Liard Valley is underlain by Lower Cretaceous limestone, sandstone, siltstone, and shale. Exposures of bedrock are rare, except along the banks major tributaries of the Liard River, particularly the Petitot, Kotaneelee, and Muskeg Rivers, and along the lower Liard itself. Some streams, including the Blackstone and Birch Rivers, flow directly over bedrock in their upper reaches. A striking, steep-sided bedrock ridge known locally as Sphinx Rock, rises above the floodplain near Nahanni Butte townsite (Figure 2). North from Jean Marie Creek (61° 25'), Upper Devonian shale predominates. This shale is soft, fissile, and highly erodable, in contrast to the more resistant limestone and sandstone further south. This shale formation has contributed significant silt and clay to the matrix of local glacial till.

Figure 2. Sphinx Rock, in the Liard River valley near Nahanni Butte.

Much of the area immediately north of the Upper Mackenzie River is underlain by Upper Devonian shale with thin inclusions sandstone and siltstone. However, in the northeast corner, near Rae, a mixture of Middle Devonian gypsum, salt, limestone, dolomite and breccia predominates. In the south, a band of Upper Devonian limestone and dolomite, with minor sandstone and siltstone, separates the shale areas to the north from prominent upland areas such as the Cameron Hills, which lie along the Alberta-Northwest Territories. These uplands and the Horn Plateau to the north of the Mackenzie River are underlain by rusty, gypsiferous shales of Cretaceous Age. Fragments of these rusty shales are frequently observed in the shale-rich glacial tills common throughout the area. Bedrock south and west of Trout Lake is composed mainly of Cretaceous sandstone and shale.

Much of the Slave River Lowland and the area to the west of the Slave River Lowland, is underlain by Middle Devonian dolomite, limestone, gypsum, salt, and breccia. This bedrock outcrops in several places and also forms a wave-cut escarpment extending from the NWT-Alberta border to the vicinity of Nyarling River. Northward from this point the escarpment diminishes into a series of stony beach (strand) lines. The escarpment and beaches both the product of water erosion by Glacial Lake McConnell. Precambrian granites and granodiorites forms a natural boundary along the eastern flank of the Slave River valley.

1.2.4 Surficial Geology

Surficial Geology

The entire study area was once covered by the Laurentide ice sheet during the last glaciation, which left its imprint on the landscape in the form various glacial materials and related landforms. To the west of the Liard River, the ice sheet even penetrated into the Franklin Mountains.

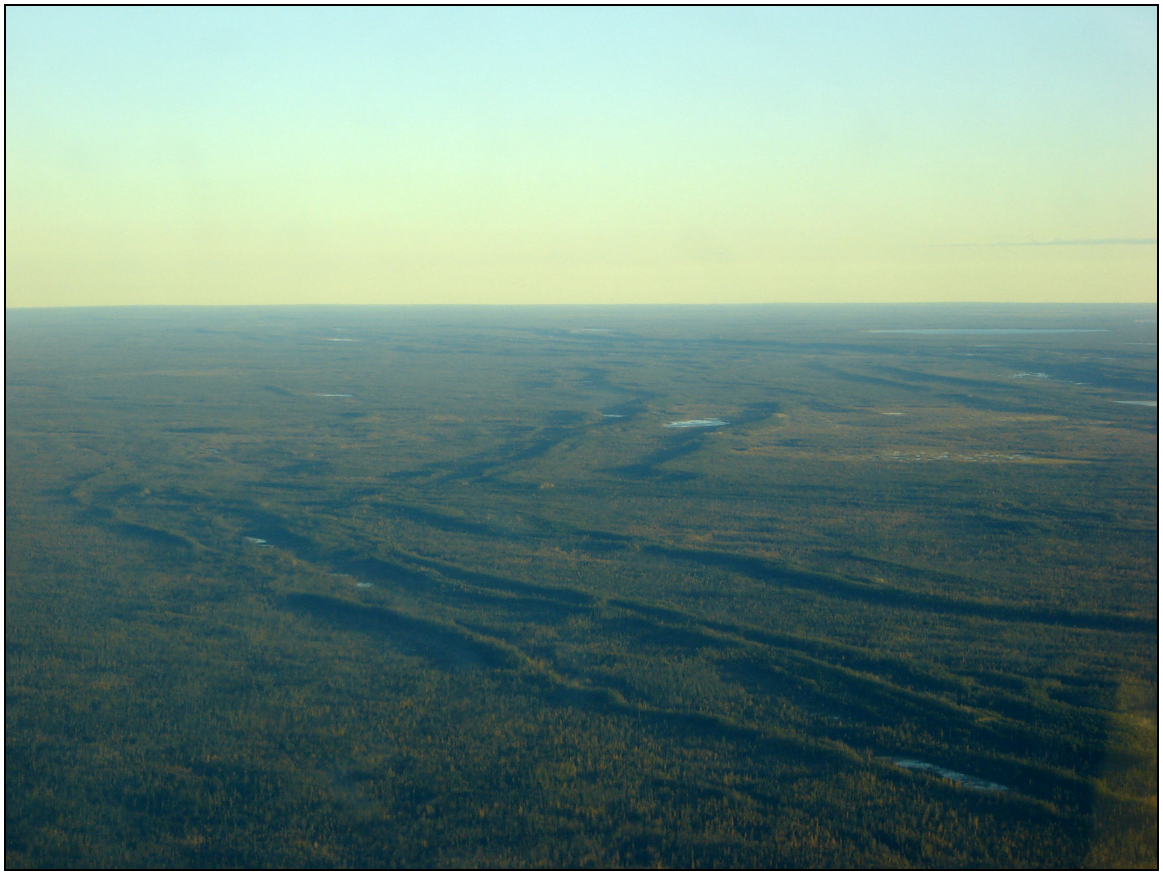
During the early stages of deglaciation, as the Laurentide ice retreated eastward, but remained close to the Liard and Nahanni Ranges, the confluence of the Liard and Mackenzie rivers was blocked by ice. As a result, it is believed that a glacial lake was formed in the Liard Valley at this time, giving rise to glaciolacustrine deposits at elevations as high as 530 m. The lake level likely fluctuated due to repeated damming at different elevations, at different stages of ice retreat.

As the margin of the Laurentide ice sheet continued its retreat eastward and upstream along the Mackenzie River system, other glacial lakes formed from the massive amounts of meltwater. Once the ice margin reached the edge of the Precambrian Shield, several smaller glacial lakes coalesced to form Glacial Lake McConnell, one of the largest glacial lakes in western Canada. This lake extended from Great Bear Lake through Great Slave Lake to the region of Lake Athabasca. During this time that the ancestral Liard River emptied into this glacial lake, and deposited extensive sandy deposits across a broad deltaic area southwest of Fort Simpson. Further east, the Hay and Slave Rivers also

deposited sands and gravel along their channels, as well as in deltas extending into Glacial Lake McConnell. Once Glacial Lake McConnell receded these rivers began established their present drainage channel. Glacial Lake McConnell later separated into three lake basins (Great Bear Lake, Great Slave Lake and Lake Athabasca) as water levels dropped due to the recession of the ice front northeastward and isostatic rebound.

The most widespread evidence of the former level and extent of Glacial Lake McConnell are the numerous series of sub-parallel beach ridges (Figure 3), most prominent along the regional east-west bedrock escarpment south of the Upper Mackenzie, which extends east of Jean Marie, past the Enterprise area and into the western Slave River Valley. The highest distinct beach found along the Mackenzie Highway occurs at an elevation of approximately 265 m. Two other small glacial lakes existed in this general area, but were not linked with Glacial Lake McConnell. One was in the south half of the Trout Lake basin and the other was east of the Cameron Hills in the southern Hay River valley. The latter glacial lake was confined between the Cameron Hills on the west and the high ground southwest of Buffalo Lake.

Figure 3. Beach ridges associated with Glacial Lake McConnell.



As Glacial Lake McConnell receded, many of the sandy fluvial and deltaic deposits at the mouth of the Liard were left exposed to wind action, which reworked these materials into distinct dune fields near Fort Simpson.

As vegetation returned to the barren landscape, thick peat deposits accumulated in low-lying, poorly drained flood plains and depressional areas. These areas also saw a slow, cyclical degradation and aggradation of permafrost insulated by the thick organic layers.

Many of the major rivers across the study area exhibit a numerous series of level or gently undulating terraces along their valleys, which are found at various elevations above the current river level. While the lowest terraces are most likely the result of Recent (post-Pleistocene) processes, the oldest and highest floodplain terraces are likely remnant from the period of deglaciation, particularly those along the Mackenzie River, as isostatic rebound lowered the base level and permitted down-cutting. Many of the terraces along the meandering Liard River, are marked by distinct channels scars formed as the river migrates across the valley over time (Figure 4).

Figure 4. Channel scars in the Liard River valley near Nahanni Butte.

The geomorphic processes associated with glaciation and deglaciation across the study area, as well as more recent processes, have produced a variety of surficial deposits, forming the *parent materials* in which the various soils have developed.

Glacial Till (Morainal) Deposits: A mantle of glacial till is present throughout most of the survey area, and even where the surface material is of some other origin, till is often found at the base of many sections or overlying the bedrock. Till deposits consist of a heterogeneous mixture of gravel, sand, silt, and clay. Most tills in the study area are medium to moderately fine textured, but coarse and fine textured tills do occur. The texture is generally uniform within a region, but it can vary greatly from one region to another. In some areas the till has been eroded or modified by water (wave-washed or resorted), often resulting in varying concentrations of stones, cobbles and gravel at the surface (boulder pavements and stone or gravel lags). In the western side of the study area, most notably between the Fort Simpson and Trout Lake areas, the ice sheet left a thick mantle of ground moraine, with a distinct drumlinoid or fluted pattern.

Glaciolacustrine Beach Deposits: Evidence of wave action by the waters of glacial lakes is widespread, particularly along bedrock escarpments. Most of these beach deposits are associated with Glacial Lake McConnell and are complex in texture and drainage. These mostly coarse textured deposits (generally stratified sand and gravel) often form series of sinuous, sub-parallel beach ridges. Along the top of escarpments themselves, the beach deposits usually consist of angular fragments of limestone or dolomite.

Glaciolacustrine Deposits: These medium textured to fine textured glacial lake sediments are found across the study area, formed by annual deposition of fine sand, silt and clay in various glacial lakes that existed during deglaciation.

Glaciofluvial Deposits: These coarse textured (sandy and sometimes gravelly) deposits are the result of effects of fast flowing waters along streams carrying glacial meltwater to the various glacial lakes. As the rivers neared the glacial lakes, the rivers often slowed down, forming deltaic deposits, which often contain bands of fine sand, silt and clay. These deltaic materials are sometimes indistinguishable from the nearby sandy glaciolacustrine deposits and may be termed *fluvial-lacustrine*. Some areas of fine sandy materials have been reworked by wind forming *fluvio-eolian* or *eolian* deposits

Alluvial Deposits: These materials consist of variable mixtures of sands, silts and clay deposited on the floodplains and terraces of modern streams and rivers. Alluvial materials are mainly associated with slow-moving rivers and streams, which periodically overtop their banks carrying sediment-laden water into adjacent lands. Much of this sediment is deposited just beyond the riverbank forming low, parallel ridges of silt-rich materials termed *natural levees*. These natural levees are usually better drained than the lower-lying, often poorly drained areas termed *back swamps*, which lie beyond levees. Gravel deposits are less common, as these rivers are generally slow moving, low energy environments.

Organic Deposits: These peat-rich deposits have accumulated in former shallow lakes and other very poorly drained wet landscapes across the study area. These deposits consist of the slowly decomposing accumulations of plant detritus derived from sedges, mosses (mainly *Sphagnum spp.*) and woody materials. The near-constant water saturation imposes low oxygen (anoxic) conditions, which results in a very slow rate of

decomposition which is easily exceeded by the rate of organic accumulation. Many organic deposits exhibit evidence of current or past permafrost influence, such as peat plateaus, palsas and collapse scars (thermokarst). Many of the latter are filled with water (thermokarst ponds).

1.2.4 Vegetation

The vegetation of the study area is typical of the northern boreal forest, but varies in species composition depending on soil and moisture conditions.

The rich, moist soils of the recent floodplains of the major rivers, as well as smaller tributary streams which have similar soil conditions, support tall, dense mixtures of white spruce, balsam poplar, and white birch, with a dense and diverse understory of shrubs, including willow, red-osier dogwood, high-bush cranberry and Saskatoon berry, as well as a wide variety of herbs and grasses.

Well drained areas of higher elevation abandoned floodplains, as well as medium to fine textured morainal and glaciolacustrine deposits support mixtures of trembling aspen, white spruce, and white birch, with a shrub layer that commonly includes willow, rose, buffalo berry, and bunchberry.

Well to rapidly drained areas underlain by sandy and gravelly beach and glaciofluvial deposits, support nearly pure stands of jack pine, with scattered white spruce, aspen and birch. Jack pine may also be found mixed with aspen, white spruce, and black spruce in well drained morainal area. Lodgepole pine also extends into the Northwest Territories in the southwestern corner of the study area, overlapping and sometimes hybridizing with jack pine. Bedrock areas are also often covered by open stands of stunted jack pine, with a sparse understory. These pine dominated forests tend to have a sparser understory consisting mainly of alder, juniper, bearberry, crowberry, reindeer lichen, feathermosses and sedges.

Black spruce and tamarack dominate poorly drained mineral soils and very poorly drained peatlands. Non-forested wetland areas are dominated by sedges and mosses, with varying amounts of ericaceous shrubs and willow.

1.2.5 Soils

Soils are a product of the environment, and also in turn have an influence on other components of natural ecosystems. Soils result from the complex interplay over time between climate, plants and animals, topography (or landform), geological (or parent) materials. Climate factors such as temperature and precipitation influence what types of plants may be found in a given area or region, as well as their growth rates and susceptibility to disease. Organisms such as plants add organic matter through their roots and litter fall. Burrowing insects and worms both add and help recycle these and other organic waste products along with a host of microscopic bacteria, fungae and actinomycetes. Rainfall and runoff are redistributed by gravity from higher elevations and

down slopes, tending to accumulate in low lying or depressional areas, leading to periodic or permanent saturation. The underlying geological materials may consist of weathered bedrock or materials derived from the erosive forces of water, wind or glaciers. All of these environmental forces or factors interact in different ways and to different degrees, giving rise to the seemingly infinite soil variations we see across the landscape at local, regional and global scales.

In the project study area, the soils of the well to rapidly drained uplands consist of various sub-groups and great groups of the Brunisolic, Luvisolic and Regosolic Orders, developed in alluvial, glaciofluvial, glaciolacustrine and glacial till deposits. Poorly and very poorly drained lowland areas consist of various types of Gleysolic, Organic and Crysolic (permafrost) soils underlain at depth by various types of glacial and recent deposits.

The Slave Lowlands map area has extensive areas of fine textured alluvial and glaciolacustrine parent materials, with approximately half of the soils consisting of poorly drained Gleysols and Humic Gleysols. Well drained Orthic and Cumulic Regosols cover approximately a third of the map area. The remainder of the area consists of Eutric Brunisols, Fibrosols, Cryosols, other land types and water.

The soils in the Upper Mackenzie and Hay River map areas consist of various combinations of Eutric Brunisols, Gray Luvisols and Rego Gleysols developed on moderately fine to fine textured glaciolacustrine, and coarse textured, stony, beach deposits. The Gleysols south of the Mackenzie River tend to be much wetter than the Gleysols north of the river. A small, but significant area of Orthic and Cumulic Regosols are developed on alluvial deposits occurring along major rivers and streams. Very poorly drained Organic and Cryosolic soils also form a significant portion of the landscape.

The dominant soils in the Liard - Mackenzie map area are Eutric Brunisols, Gray Luvisols and Rego Gleysols developed on medium to fine textured glaciolacustrine materials, with Eutric Brunisols and Rego Gleysols predominant on course textured glaciofluvial deposits. Various combinations of Orthic and Cumulic Regosols, Eutric Brunisols, Gray Luvisols and Rego Gleysols are found on the largely medium to fine textured alluvial floodplain deposits. Very poorly drained Organic and Cryosolic soils also occur across the map area.

More detailed information about each map area is available in the original soil reports, accompanying each map series. Appendix A contains descriptions of the soil series and associations found in each map area.

2.0 METHODOLOGY

2.1 Map Compilation

The compilation process began with locating the existing soil maps and reports covering the study area (Table 2).

The first known soil survey in the Northwest Territories was a preliminary reconnaissance soil survey of the Hay River Valley carried out in July 1952 by Leahey (Leahey, 1953). Examination of the soils at that time was restricted mostly to the land adjacent the Mackenzie Highway on the west side of the Hay River. Due to the limited amount of time available only a preliminary 'sketch map' was prepared, not a detailed soils map. This work was incorporated into Day's (Day, 1968) reconnaissance soil survey of the Upper Mackenzie River Area, which was published at a scale of 1:250,000 covering approximately 1.94M hectares. The survey area covers the lower half of the Hay River Valley (from Enterprise to Great Slave Lake), and extends southwest and west of Great Slave Lake, along both sides of the upper Mackenzie River to Fort Simpson. A small narrow band follows the Mackenzie Highway north of Fort Providence to the community of Rae. However, this survey left a large part of the Hay River Valley unmapped. However, this situation was remedied by a more detailed 1:125,000 scale survey of the Hay River Valley survey conducted by Kozak and Rostad (1977), which covers an approximately 297,000 hectare swath of land covering both sides of the Hay River from the Alberta - Northwest Territory border, to its mouth at Great Slave Lake.

Table 2. Summary characteristics of 'best available' soil map series.

Soil Map Series	Communities Covered by Map	Published Scale	Approximate Area (ha)
Slave River Lowland (Day, 1972) 3 map sheets	Ft. Resolution Ft. Smith	1:63,360	832,000
Hay River Valley (Kozak and Rostad, 1977b) 1 map sheet	Hay River Enterprise	1:125,000	297,000
Liard and Mackenzie (Rostad et al, 1976) 4 maps sheets	Ft. Simpson Nahanni Butte Ft. Liard	1:125,000	1,330,000
Upper Mackenzie River (Day, 1968) 1 large map sheet	Jean Marie R. Ft. Providence Kakisa	1:250,000	1,940,000
Soil Landscapes of NWT (v3.1)	Trout Lake Wrigley	1:1,000,000	-

Day also conducted a 1:250,000 scale reconnaissance survey along the Liard River Valley from the Northwest Territories-British Columbia border to Fort Simpson (Day, 1966). This latter reconnaissance survey was superceded by a more detailed 1:125,000 scale soil survey of the Liard River Valley conducted by Rostad et al. (1976) of the Saskatchewan Institute of Pedology. This newer survey covers approximately 1.33M hectares, including the entire floodplain of the Liard River and a portion of the adjacent

uplands, from the British Columbia-Northwest Territories border to its confluence with the Mackenzie River at Fort Simpson. A smaller portion extends along the north side of the Mackenzie River to Camsel Bend. Only the more detailed survey of Rostad et al. (1976) was digitized, as this represented the 'best available' information for the Liard River area.

In 1972, a detailed 1:63,360 scale soil survey of the Slave River Lowland was published by Day (1972) The survey covers the entire river valley, extending from the Alberta – Northwest Territories border northwards to the river's exit via a large delta into Great Slave Lake. The area is bounded on the south by the Northwest Territories - Alberta border, to the east by the Precambrian Shield, on the west by a wave-cut escarpment associated with Glacial Lake McConnell, and on the north by Great Slave Lake. The total area covered by this survey is approximately 832,000 hectares. This soil survey superceded an earlier reconnaissance survey of the Slave River Lowland by Day and Leahey (1957). Only the 1972 survey was digitized, as it represents the most recent and detailed information for the area.

All of these existing soil surveys were conducted by federal agencies. The more recent soil surveys by Rostad et al. (1976) and Kozak and Rostad (1977) were conducted as part of a project to inventory and assess the soi1 and climatic resources for agriculture in the Northwest Territories and Yukon on behalf of the Territorial Governments and the Department of Indian Affairs and Northern Development. The study areas for these surveys were selected on the basis of a preliminary evaluation of the climate, native vegetation, current land use, and those areas where agricultural leases were held or being applied for. In addition to the soil surveys themselves, a series of interpretive maps were prepared as well, including capability for agriculture. Eley (1977) of Environment Canada, also conducted an agrometerological study in the southern Northwest and Yukon Territories in support of agricultural capability assessment conducted by Rostad et al., (1976) and Kozak and Rostad (1977). A summary report of agricultural potential in the Northwest Territories, based on the surveys of Day (1968; 1972), Rostad et al. (1976) and Kozak and Rostad (1977), was also prepared (Rostad and Kozak, 1977).

While these surveys and reports were known or thought to exist early on in the project, the process of locating some of the hardcopy maps, presented a significant challenge. While all of Day's surveys were official publications and readily available, in the case of the 1976 and 1977 surveys, the maps remained unpublished or were of limited distribution. While the CANSIS (Canadian Soil Information System) website of Agriculture and Agri-food Canada (AAFC) hosted scanned copies (in PDF format) of the maps and reports authored by Day (1966, 1968, and 1972), only scans of the reports were available at the time for the other 1970's surveys (Rostad et al., 1976; Kozak and Rostad, 1977). Having reached such a critical juncture made compilation of the various surveys a difficult task indeed, since these latter map series covered a significant portion of the study area; obtaining them was critical to overall project success. Fortunately hardcopies of the Liard and Mackenzie River Area soil map series (Rostad et al., 1976) were eventually located in May, 2006 at an Indian and Northern Affairs Canada (INAC) office in Hull, Quebec, where they had been kept in an unofficial office archive. Coincidentally,

INAC was in the process of digitizing all maps in this archive, and kindly forwarded scanned copies (geotiff format) of the missing soil maps to the project team. While the process of locating and compiling the soil maps and reports was largely completed in 2006, scans of the agricultural capability map series from Rostad et al. (1976) and Kozak and Rostad, (1977), which are key derivatives of the soil maps, remained unavailable until March, 2008.

While the existing soil surveys, conducted during the 1960's and 1970's, contain a wealth of information about the soils within the mapped areas, they are products of the pre-digital era. With the subsequent rise of desktop and institutional Geographic Information Systems, these analog, non-digital surveys became less accessible to users in land use decision-making, leading to increasingly infrequent use. Additionally, some of these surveys (e.g., Liard Mackenzie and Hay River) remained relatively obscure internal government reports, and largely inaccessible to the public; this further contributed to their diminishing use, and in one case, nearly lost to history due to lack of official archiving.

Ancillary information, including: surficial geology maps, DEMs, and satellite imagery, were also compiled and reviewed to better understand the study area, and to aid in map enhancement (e.g., conflation of digitized map to ortho-corrected satellite imagery base) and for presentations and posters.

2.2 Digital Conversion Process and Map Enhancements

As stated in the introduction, the primary objective and purpose of the project was to compile and convert the hardcopy paper maps into digital files to allow their use in a GIS environment; this represents the most important enhancement conducted during the project. Digitizing of soil surveys is a necessity in the digital age, allowing the user to prepare custom map products, as well as conduct a wide range of sophisticated spatial analysis for various land use planning, environmental assessment and resource management purposes. Digitization of soil information also improves availability, ease of access and distribution, and is a sound method of archiving this important land resource data.

Once hardcopy or scanned soil maps were obtained, the lengthy and challenging process of digital conversion to GIS-ready files was initiated. The general digital conversion process consisted of the following general steps:

1. Maps scanned to .jpg and/or .tiff formats (if not already scanned);
2. 'Cleaning' of raster images using Adobe PhotoShop;
3. Georeferencing of the raster image using ESRI ArcGIS 8.3;
4. Raster to vector conversion process into using WinTopo™ Professional software;
5. Cleaning of 'raw' vector files, including sliver and dangle removal in ESRI ArcGIS/ArcMap 8.3;

6. Conflation (realignment) of linework to LandSat TM ortho-corrected imagery, using a variety of techniques in ESRI ArcGIS/ArcMap 8.3; and
7. Attribute coding of each polygon and error checking.

The various maps used as key inputs in the digital soil map compilation, first needed to be scanned into image formats (.jpeg or .tiff) readable by computer software used in the digitization process. Of the various soil maps covering the study area, only the Hay River soil map (Kozak and Rostad, 1977) was available from in a GIS-ready format (ARC/INFO .e00 format). However this map file still needed to be conflated to a more accurate, ortho-corrected base map. The scans (.jpeg format) of the soil maps by Day (1968;1972) were available for download from the CANSIS website of Agriculture and Agrifood Canada, but unfortunately they had been scanned from previously folded maps and thus had fold marks, and were also warped in places, all of which introduced spatial errors that were very difficult to correct.

Given the limited budget and time available, hand-digitizing (either 'on-screen' or with a digitizing tablet) was ruled out due to time and cost constraints. Therefore, a search was made for effective and affordable 'raster to vector' conversion software. The software package WinTopo™ was selected for its ease of use, versatility and excellent results.

Prior to raster to vector conversion, polygon linework was filtered, sharpened and all colour was removed from the .jpg map scans using Adobe PhotoShop (Figures 5 and 6). Extra lines beyond the actual soil polygon lines (e.g., roads and railways), any word or number (i.e. labels), as well as polygon colour coding, had to be removed prior to raster to vector conversion, as would have interfered with the conversion process. This cleaning was done using Adobe Photoshop CS2 software and did remove much of the clutter and noise. Figure 6 shows an example of shows the clean version of the Slave River portion.

During the cleaning process corner 'tic marks' with known geographic coordinates, were preserved as reference points for georeferencing the map to real world coordinates. The resulting clean images or scans were georeferenced using ESRI ArcGIS/ArcMap 8.3 software (Figure 7). Once the map images were cleaned and georeferenced, WinTopo Professional was used for raster to vector conversion. WinTopo preserved the georeferencing during the conversion process, producing 'raw' polylines, which were exported as ESRI shapefiles. These raw shapefiles were then edited in ArcMap to remove slivers, dangles and other artifacts of the digitization process, creating polylines that are consistent with those found on the original map. These polylines were then converted or 'built' into a polygon shapefile coverage in ArcGIS/ArcMap 8.3 (Figure 8).

Since these hardcopy paper maps were prepared using non-rectified aerial photographs and topographic base maps of 1940' to 1960's vintage with poor ground control or rectification, the maps contained significant spatial errors. In order to remove these spatial errors and maximize their utility in a GIS mapping environment, these digital map files needed to conflated (or aligned) to a modern base map. In some cases, when the raw digitized line work was overlain onto the modern ortho-base, some spatial errors were in excess of several hundred metres. Additionally, these spatial errors occurred with random

degrees of directional and amplitudinal variance (i.e., not always in one direction or with the same degree of magnitude). With such random errors in the original soil map base, one typically cannot merely 'rubbersheet' in one direction. Often one area will be corrected, while another area of the map ends up with even more misalignment.

After careful consideration, it was determined that the best publicly available map base as a suitable base was ortho-corrected LandSat TM satellite imagery, which was readily available from both the Government of the Northwest Territories and the Government of Canada. Several methods of conflation were attempted. After much trial and error, the vector polygon coverage was converted to a raster grid file using ArcToolbox and then geo-referencing the resulting grid to the satellite image using ArcMap 8.3. In order to ensure the lowest possible RMS (Root Mean Square) error, at least 250 control points were used on each map. Once the grid lined up satisfactorily, it was converted back to a polygon coverage. The coverage was then ready to have the attributes attached prior to final checking. Figure 9 illustrates the *conflation* or alignment issues in a portion of the Hay River corridor near Enterprise, NWT. This adjustment of line work to a more accurate base map represented an additional important enhancement to the map data.

Once digital conversion of soil polygons was completed, the equally tedious and time-consuming task of attribute coding began. Attribute coding consisted of attaching polygon-specific soil and agricultural capability information to each digitized polygon using ESRI ArcMap 8.3.

The last major mapping task was to edge-match the boundaries between adjacent map sheets, in areas with multiple map sheets in a series (i.e., four sheets covering the Liard-Mackenzie map area and three sheets covering the Slave River Lowland map area). It was during this process that numerous errors in the original hardcopy line work and attributes became apparent. While some of these errors, particularly the line work, has been corrected, correction of the many of the classification or attribute errors can only be made in consultation with AAFC soil correlation experts. However, these errors are largely outside the 20 to 30 km radius of the target communities, currently of most interest to the GNWT.

Since the various soil surveys were conducted greatly different scales (i.e., 1:63,360, 1:125,000 and 1:250,000) and using different soil classification and mapping standards (e.g., series versus soil association), and, it was not possible to recompile the maps to one single scale, without an expensive remapping effort. The digital versions of the soil maps remain true to the originals, including the mapped attributes. However, the various map legends, which utilized different soil classification systems and substantially different mapping concepts (e.g., soil series vs. soil association), were substantially updated to be consistent with current soil taxonomy and terminology. The various soils and map units used in the various map areas are described in Appendix A.

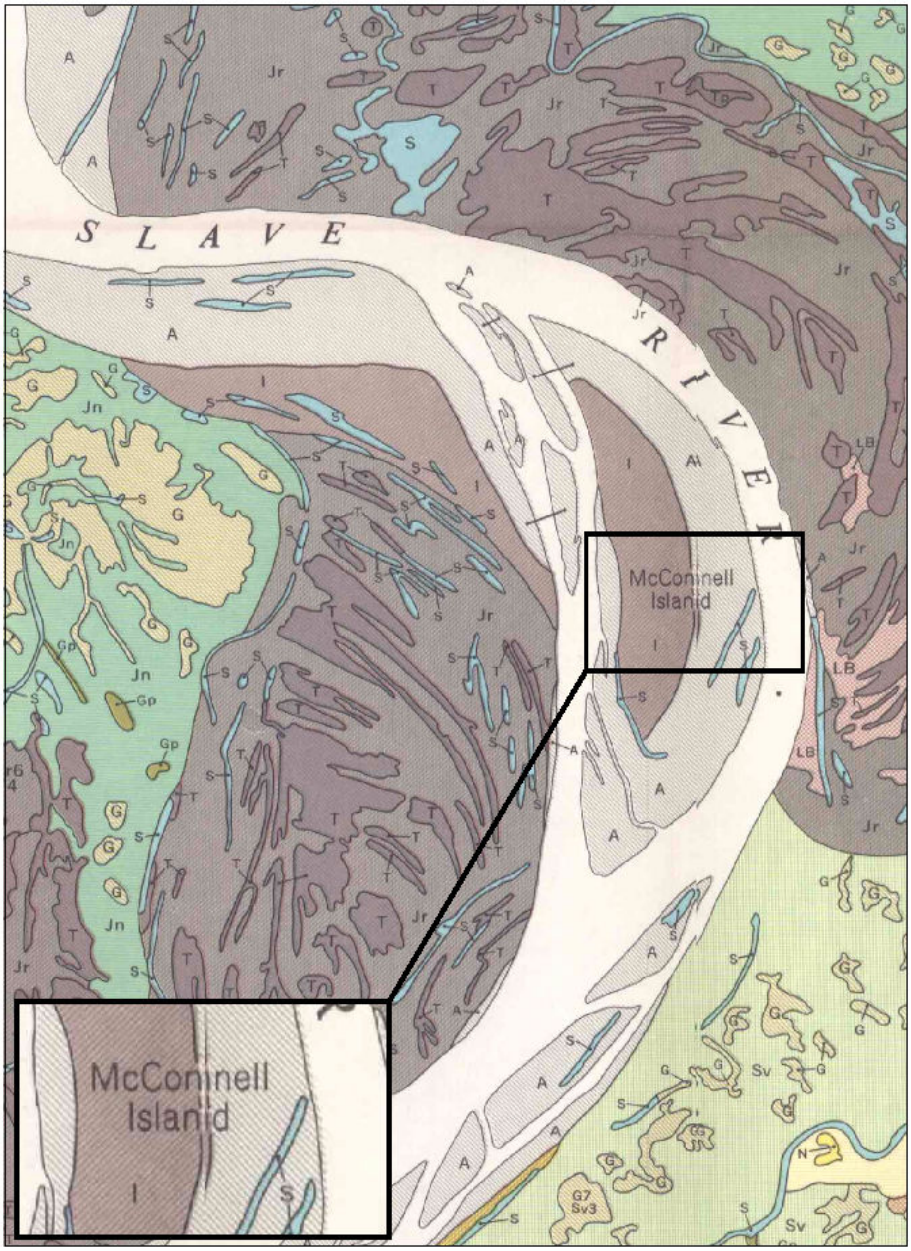


Figure 5. Original colored scanned map of a portion of the Slave River.

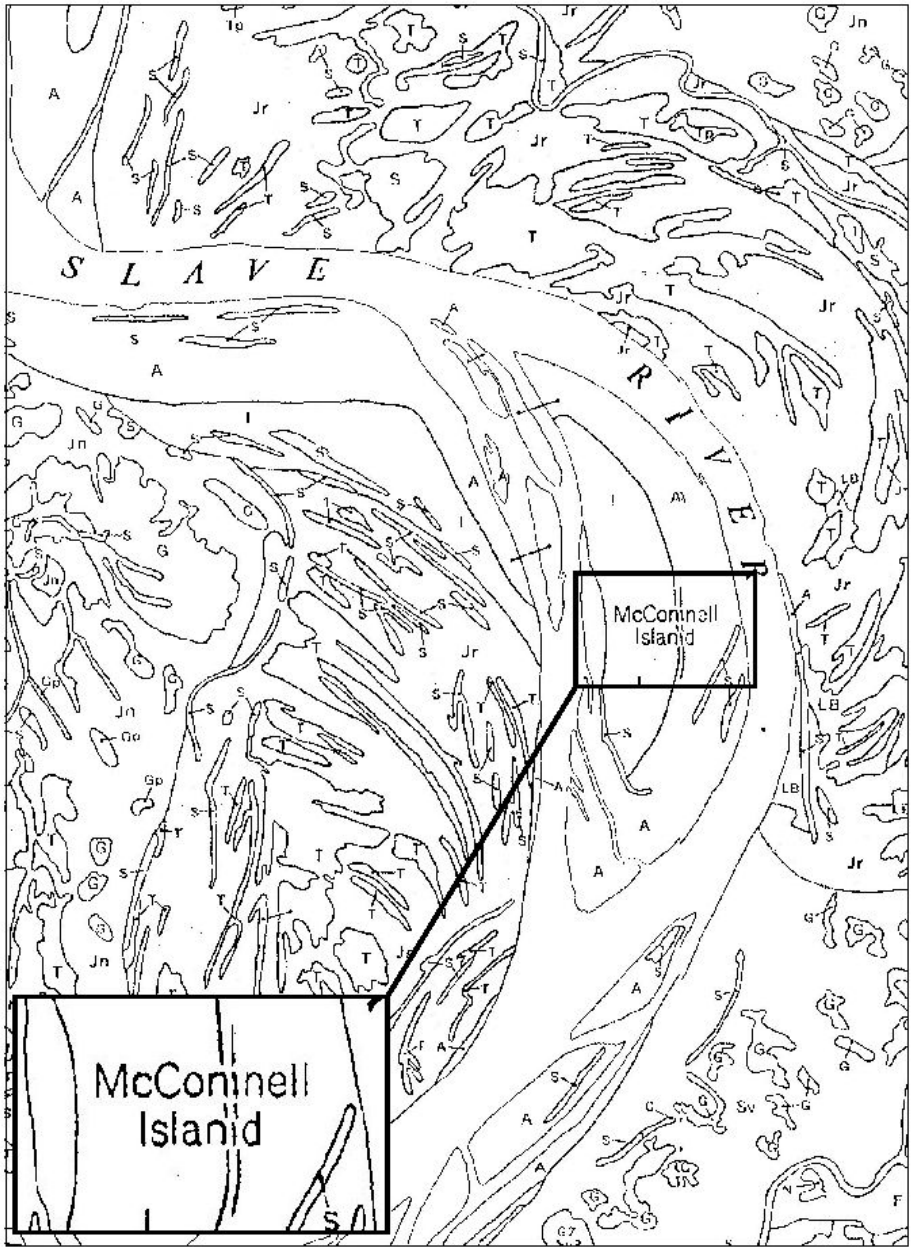


Figure 6. Portion of the Slave River with colour removed using Adobe Photoshop CS2.

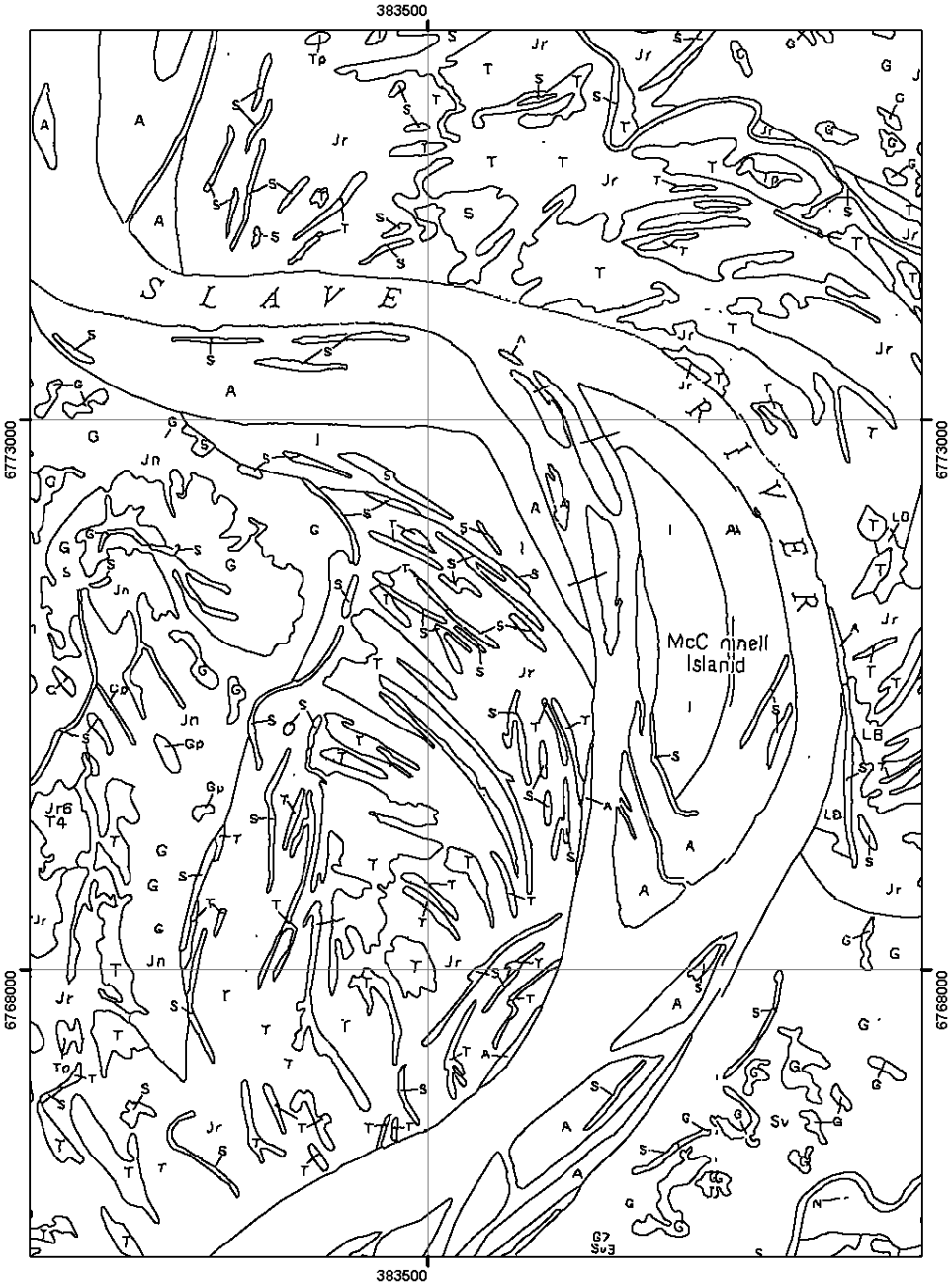


Figure 7: Raw georeferenced image of a portion of the Slave River map.

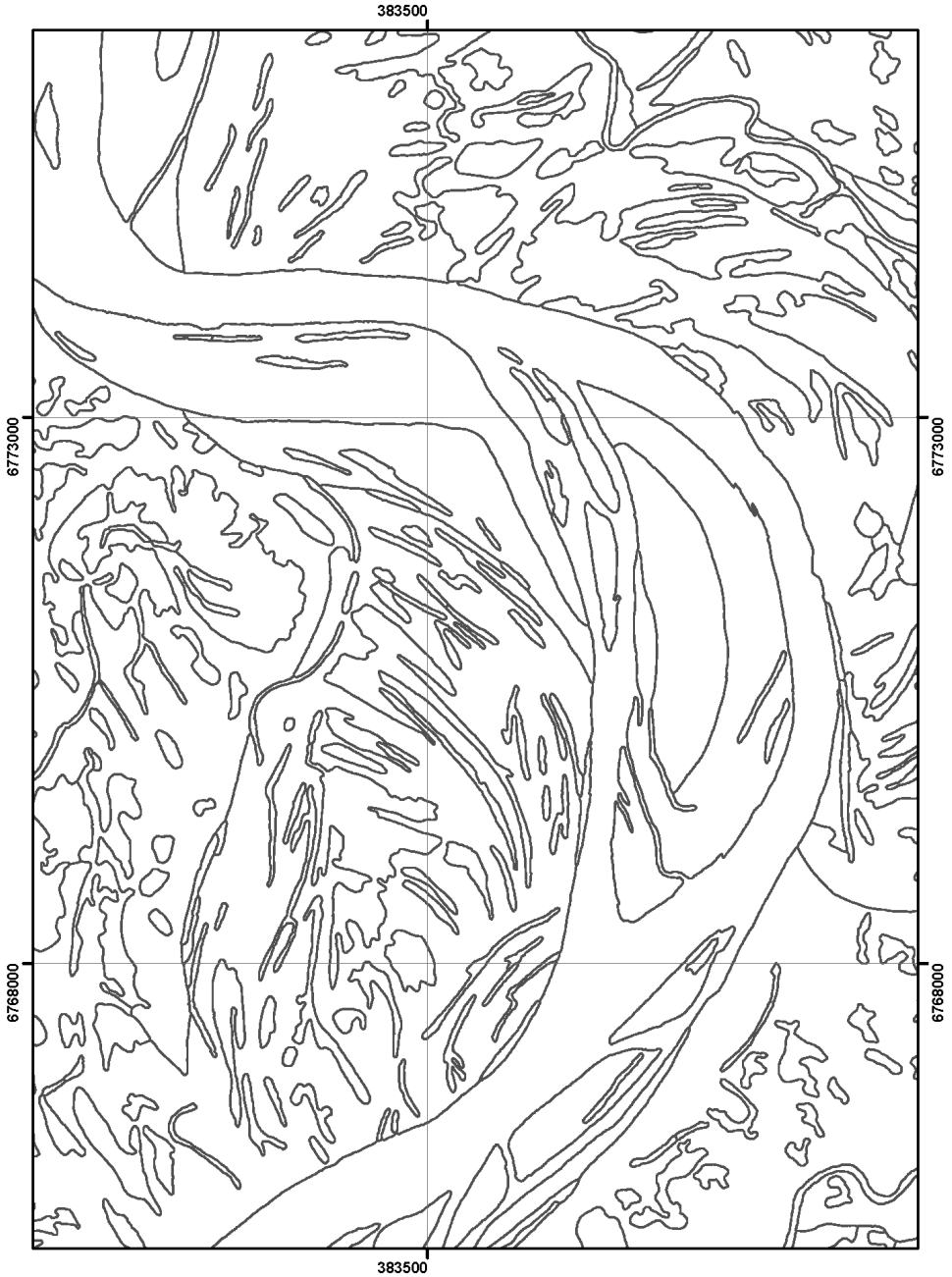


Figure 8. Polygon coverage cleaned and edited using ArcMap 8.3.

Figure 9. Example of from the Enterpries area illustrating final conflation to achieve "best fit" with ortho-corrected satellite image (black line - original; red line – adjusted).

2.3 Field Program

Given the large study area (approximately 4.3M ha) and limited resources, project objectives were focused on compilation and digitization of the existing soil inventories; resurveying or remapping was not feasible. However, a limited field program was undertaken to gain familiarity with soil and agricultural capabilities within the existing map coverage, to assess the general adequacy of this mapping, and to provide preliminary reconnaissance data in selected areas with no existing map coverage. This fieldwork was largely focused on lands within 20 to 30 km of twelve (12) NWT communities with known or anticipated agricultural capability, namely: Ft. Resolution, Ft. Smith, Hay River, Enterprise, Ft. Providence, Kakisa, Jean-Marie River, Trout Lake, Ft. Simpson, Ft. Liard, Nahanni Butte, and Wrigley. Table 3 provides a summary of field effort by community area. In each area, fieldwork emphasis was on areas mapped as Class 3 and Class 4 agricultural capability (i.e., highest agricultural potential). Also level of effort varied depending on the scale of mapping available for a given area, with areas of larger scale (e.g., 1:63,360) receiving less emphasis. Given the large project area, considerable time was expended on travel between observation points.

Table 3. Approximate number of days of fieldwork by community and year.

Community	Soil Map Scale	2005 (days)	2006 (days)	2007 (days)	Total (days)
Ft. Resolution	1:63,360	0.5	0	0	0.5
Ft. Smith	1:63,360	0.5	0	0	0.5
Hay River	1:125,000	0.5	2.5	2.5	5.5
Enterprise	1:125,000	0.5	1.5	0	2
Ft. Providence	1:250,000	0.5	3.5	1.5	5.5
Kakisa	1:250,000	0.5	0.5	0.5	1.5
Jean-Marie River	1:250,000	0.5	6.5	1	8
Trout Lake	1:1,000,000	0	1	2.5	3.5
Ft. Simpson	1:125,000	0.5	3.5	2.5	6.5
Ft. Liard	1:125,000	0	0.5	1	1.5
Nahanni Butte	1:125,000	0	1	1.5	2.5
Wrigley	1:1,000,000	0	0	1	1
TOTALS	**-**	**4**	**18.5**	**14**	**36.5**

Note: Time indicated does not include mobilization/demobilization or meetings and other office time.

Year 1 included a brief fall reconnaissance program to gain familiarity with the soil and terrain variations across the project area, and to assess the general reliability of the existing map coverage. This fieldwork continued in Years 2 and 3 using preliminary georeferenced soil map images overlaid on pan-sharpened (15 m resolution) LandSat satellite imagery to act as temporary field maps and to help select target areas to investigate.

Two types of field inspections were made: semi-detailed and visual. The semi-detailed inspections consisted of stops of approximately 0.5 to 1 hour duration at predetermined and incidental locations. At each stop a hand-dug soil pit was excavated to examine and

describe the soil profile and a short standardized field form was filled out. Visual ground calls consisted mainly of a visual assessment of selected soil, landform and vegetation characteristics at incidental roadside exposures while driving or walking. Locations of both types of inspections were recorded using a handheld GPS (Garmin Map 60CX).

During the course of fieldwork, a total of 249 detailed and 212 visual observations were made. Approximately 5 to 10 detailed inspections were made per day, depending on access and distance traveled between observations. More rapid visual observations were made at road cuts, gravel pits and rock outcrops.

Appendix D contains a summary of the soil inspection results. A project-specific Microsoft ACCESS database was also constructed for storage of the soil inspection data deriving from the project's field program for long-term storage and to facilitate use in future projects.

2.4 Communications and Collaboration

During the course of the project a number of communication activities were undertaken to raise awareness and seek in-kind support and collaboration. These communication activities included:

- A Powerpoint presentation describing the project at the *NWT Geomatics Workshop* in Yellowknife in December 2005;
- Attendance at the AAFC-hosted Canadian Land Resource Network (CLRN) meeting in Winnipeg (March, 2006);
- Project planning and collaboration meetings in Yellowknife with GNWT, INAC and AAFC representatives (March, 2006);
- A Powerpoint presentation at the AAFC-hosted Canadian Land Resource Network (CLRN) meeting in Calgary in April, 2007; and
- A project poster for the Circumpolar Agriculture Conference in Goose Bay, Newfoundland and Labrador in October, 2007.

As a result of these efforts, project exposure was increased, additional in-kind support was obtained from AAFC and the Geological Survey of Canada, and important existing datasets were located. Among the most crucial outcomes of this networking, was the discovery of the 'missing Liard maps' (Rostad et al., 1976), which were crucial to project success.

3.0 SOIL CAPABILITY FOR AGRICULTURE

3.1 Overview of Agricultural Capability Classification

This section mainly consists of information compiled from the various soil surveys and related reports (Day, 1968; Day, 1972; Rostad et al., 1976; Kozak and Rostad, 1977; Rostad and Kozak, 1977), together with area calculations tallied from the new digital map series. More detailed discussion of the various soils and their capability for agriculture is contained original soil reports, which are also included on the DVD accompanying this report.

In each survey area, once the original soil mapping was completed, each soil series (Day, 1968; 1972) or soil association (Rostad et al., 1976; Kozak and Rostad, 1977) was placed into standardized capability classes on the basis of soil, landscape, and climatic characteristics that affect their capability for agricultural use. While each of the surveys utilized slightly different variations of the capability classification, these differences are minor. All of the surveys factor rely on permanent soil and landscape factors including: permeability, erosion, fertility, flooding hazard, low moisture holding capacity, wetness, degree of slope, stoniness, and the limitation imposed by the regional climate. The capability classes, the limitations, and the symbols used to rate the soil polygons in the various map areas are summarized in Appendix B.

Each soil series or association is first given a basic climatic agricultural capability rating depending upon the climatic parameters of the region. Then the soil and landscape factors are considered. The climate limitation represents the highest class rating that any given soil in a particular climate zone can achieve. Should a given soil have no significant soil profile or landscape limitations (e.g., many well drained, stone-free, medium textured alluvial soils), the soil would remain at the same class designated by the climate rating.

In the soil capability for agriculture classification there are seven capability classes. The first three capability classes are suitable for sustained agriculture (but only Class 3 occurs in study area due to climate limitations); Class 4 is marginal for arable agriculture; Class 5 is suitable only for improved (seeded) hay or grazing; Class 6 for unimproved (native) grazing; and Class 7 is considered non-agricultural and incapable of agriculture. The soils within a capability class are similar only with respect to degree, but not necessarily specific kind of limitation. Each class contains many different kinds of soils, which may require different types of management. Any of the limitation may be applied at different class levels. It should also be noted, that the classification does not take into account economic factors such as distance from markets, cost of clearing or the suitability of specific crops.

Detailed descriptions of the various soils, mapping units and their agricultural capability ratings used in the various map areas are described in Appendix A. Detailed discussion of agricultural potential of the entire mapped region is available in the report by Rostad and Kozak (1977), portions of which are included in the following soil capability summaries.

3.2 Liard-Mackenzie River Map Area

Many of the alluvial soils along the Liard and Mackenzie River and some of the glaciolacustrine soils were assigned a climate rating of class 3 (Eley, 1977). Other soils at higher elevations can be rated no better than class 5 due to the accompanying cooling effect of elevation.

The well drained medium to fine textured soils on slopes less than 9% were generally given an agricultural capability rating of class 3. These soils occur on the well drained areas of the Arrowhead, Bovie, Bluebill, Bluefish, Celibeta, Coty Mountain, Liard, Netla, Petitot, Pointed Mountain, and Trout Lake Associations. The well drained areas with low moisture-holding capacity due to slightly coarser textures (e.g., Andersen Mill, Sibbeston Winter Road soils), and well drained, medium to fine textured soils on slightly steeper slopes (10 to 15%) were rated class 4. Gleysolic soils, which occur in the poorly drained areas of most soil associations are rated Class 5W due to excessive wetness. Coarse textured soils, including most Martin River soils are rated class 5M, due to low moisture holding capacity. All Organic and Organci Cryosolic soils are rated Class 7 due to high water table and occurrence of permafrost.

The extensive class 3 alluvial (Figure 11) and glaciolacustrine soils of the Liard River valley are considered to have the highest overall capability for agriculture all the areas studied in the Northwest and Yukon Territories (Rostad and Kozak, 1977). Much of the valley receives warmer summer temperatures and higher rainfall than most other areas of the Northwest Territories. Rostad and Kozak (1977) conclude that market gardening to supply local markets, may be feasible on the well drained alluvial soils, particularly near Fort Simpson and Fort Liard. However, flood hazard along the Liard River must be considered during agricultural planning and development, as the low level floodplains (Liard soils) still experience flooding due to ice jams. However, the higher level (abandoned) floodplains do not appear to be routinely subject to flooding (Rostad and Kozak, 1977).

Table 4 summarizes capability class area distribution within the Liard-Mackenzie River map area, including summaries within a 20 km radius of the communities of Fort Simpson, Nahanni Butte, and Fort Liard. It should be noted that these are generalized summaries based on dominant class in each polygon. As such each class area indicates the dominant (> 40%) class in each polygon, and may include other classes in a less than dominant but still significant (15 to 40%) amounts.

Table 4. Agricultural capability summary for the Liard-Mackezie River map area.

MAP AREA	Class 3	Class 4	Class 5	Class 6	Class 7
Entire Liard-Mackenzie River Map Area (ha)	351,510	139,237	421,863	101,127	247,648
Fort Simpson (20 km radius)	6,689	3,466	24,673	41,660	36,390
Nahanni Butte (20 km radius)	39,690	18,278	14,745	2,078	12,383
Fort Liard (20 km radius)	69,497	8,343	19,934	8,159	9,659

Figure 10. A Class 3 soil (Liard Association) at the site of abandoned agricultural land within the Ft. Liard town site (note the Ap horizon with past evidence of plowing).

3.3 Upper Mackenzie River Map Area

The well drained, medium to fine textured, stone-free soils in the Upper Mackenzie area haven been given a climate rating of class 3 with cool summer temperatures and low summer the main limitations (Eley, 1977). The poorly drained, stone-free soils are rated class 5 due to the coolness associated with these low, excessively wet areas.

The soils with the most potential for agriculture (class 3 and 4) in this map area are: the Hay and Vale soils found on medium to fine textured alluvial floodplain soils in the Hay River area covered in more detail by the Hay River map of Kozak and Rostad, 1977); the soils of the Liard soils developed on medium textured alluvium in the Jean Marie River area (Figure 11); the Providence and Mills Lake soils developed on moderately-fine to fine textured glaciolacustrine material in the Fort Providence area; and some of the Meridian and Mackenzie soil developed on medium to moderately fine textured alluvial materials along the Mackenzie River (Rostad and Kozak, 1977). These well drained, stone-free, medium and fine textured soils are typically given an overall agricultural capability rating of Class 3CH, with cool summer temperatures as their only main limitation (i.e., no significant soil limitations). However, soils developed on the coarse to medium textured glaciolacustrine beach deposits have variable gravel and stone contents in the solum, resulting in highly variable capability ratings from class 4 to class 7 (non-agricultural). The coarse textured glaciofluvial (Martin River Series) and coarse textured beach deposits (Twin Falls Series) are typically rated as Class 5M due to their low moisture holding capacity. The morainal (till) Tathlina and Laferte soils are mostly rated

Class 3, but some have been wave-washed and or eroded and thus may be subject to a downgrade to 4P or 5P, at least on a local scale.

Figure 11. A Class 3 (Liard Series) soil from the Jean Marie River area. Note the buried humus layers and a buried tephra (ash) layer.

Overall, the lands with the highest agricultural capability in the Upper Mackenzie region are the medium to fine textured glaciolacustrine and alluvial soils in the Fort Providence area, particularly in the area extending from Mills Lake to Deep Bay on Great Slave Lake (Rostad and Kozak, 1977). However, the presence of a bison herd in the nearby bison sanctuary would likely affect or restrict agricultural activities in some areas (Rostad and Kozak, 1977).

Table 5 summarizes capability class area distribution within the Upper Mackenzie River map area, including summaries within a 20 km radius of the communities of Jean Marie River, Fort Providence and Kakisa.

Table 5. Agricultural capability summary for the Upper Mackezie River map area.

MAP AREA	Class 3	Class 4	Class 5	Class 6	Class 7
Entire Upper Mackenzie River Map Area (ha)	256,170	312,123	362,237	none	749,036
Fort Providence (20 km radius)	54,043	9,024	20,216	none	31,976
Jean Marie (20 km radius)	17,829	**	20,719	none	74,642
Kakisa (20 km radius)	**	4,018	21,758	none	74,805

* Present only in combination with other classes.

3.4 Hay River Valley Map Area

While the majority of the survey area was given a climate rating of class 3 area, some soils located near the Alberta border (higher elevation) and near Great Slave Lake (lake cooling effect), were given a class 5 climate rating due to cool summer temperatures) (Eley, 1977).

Most class 3 soils are found along the moderately-fine textured alluvial floodplains of the Hay River (Hay River Association), and on some of the well drained, medium to moderately fine textured, morainal (till) soils (Tathlina Association) south of Enterprise. Some of the alluvial soils have been successfully cultivated for market gardening and forage production at Paradise Gardens south of the town of Hay River, for several decades (Figure 12). Field observations indicate that some areas of Tathlina soils are wave-washed or eroded, with varying stoniness, and may be subject to a downgrade to 4P or 5P. The majority of the area is class 5 and 7 due to excessive wetness and stoniness of the extensive beach deposits (Swede and Enterprise Associations) between Enterprise and Great Slave Lake. Significant Organic and Organic Cryosolic soils (Grainger and Trail River Associations) also occur and are given a class 7 rating.

Unmapped (due to scale limitations) Gleyed and Orthic Cumulic Regosols were observed at several locations along the floodplain of Sandy Creek, southeast of Hay River. Natural levees approximately 10 to 50 m wide flank the stream along a significant portion of the creek's extent. Theses soils are class 3 or 4, depending on the local climate rating. The stream has been dammed by beavers at various points and is thus no longer free-flowing, perhaps diminishing the risk of stream flooding and inundation. Unmapped moderately fine to fine-textured glaciolacustrine materials also occur in this same area currently mapped as sandy beach deposits, but both parent material types are largely poorly drained and would still receive a 5W rating due to excessive wetness.

Table 6 summarizes capability class area distribution within the Hay River Valley map area, including summaries within a 20 km radius of the communities of Hay River and Enterprise.

Table 6. Agricultural capability summary for the Hay River Valley map area.

MAP AREA	Class 3	Class 4	Class 5	Class 6	Class 7
Entire Hay River Valley Map Area (ha)	19,724	4,784	109,125	none	123,561
Hay River (20 km radius)	2,772	897	38,676	none	9,749
Enterprise (20 km radius)	7,003	1,969	41,109	none	36,030

Figure 12. Saskatoon berry plantation at Paradise Valley south of the town of Hay River.

3.5 Slave River Lowland Map Area

This area has been assigned a climate rating of mixed class 3 and class 5 (Eley, 1977). The well drained areas are generally class 3, while the poorly drained mineral soils in low areas (Gleysols) are thought to be cooler and are thus given a climatic class 5 rating. However, in spite of the climate factor, the excessive moisture of the poorly drained soils places them in class 5 capability class (Rostad and Kozak, 1977).

The well drained medium and fine textured Regosols (Slave, Rocher, Brule, and Little Buffalo Series) and Brunisols (Clewi Series) were given an overall agricultural capability rating of Class 3CH, with cool summer temperatures as the main limitation (i.e., no significant soil limitations). However, many of the Regosols are intermixed with poorly drained soils in such a fashion that they would be difficult to bring under cultivation (Rostad and Kozak, 1977). The well to imperfectly drained Iche, Jerome, and Jean soils are rated as Class 4 or 5 due to the presence of permafrost at depth. However, should the permafrost significantly recede upon cultivation, the productivity of these soils may be similar to the corresponding non-frozen soils in the southern part of the area (Rostad and Kozak, 1977).

The Class 3 soils are considered suitable for growing oats or barley and for market gardens (Rostad and Kozak, 1977). The coarse textured Fort Smith, Oracha and Resolution soils are rated as 5M due to a low moisture holding capacity, and are most suited for forage production. All of the poorly drained Lobstick, Grand Detour, Taltson, and Norberta soils are rated as 5W due to excess water, and are suited only for growing forages or for grazing (Rostad and Kozak, 1977).

Table 7 summarizes capability class area distribution within the Slave River Lowland map area, including summaries within a 20 km radius of the communities of Fort Resolution and Fort Smith.

Table 7. Agricultural capability summary for the Slave River Lowland map area.*

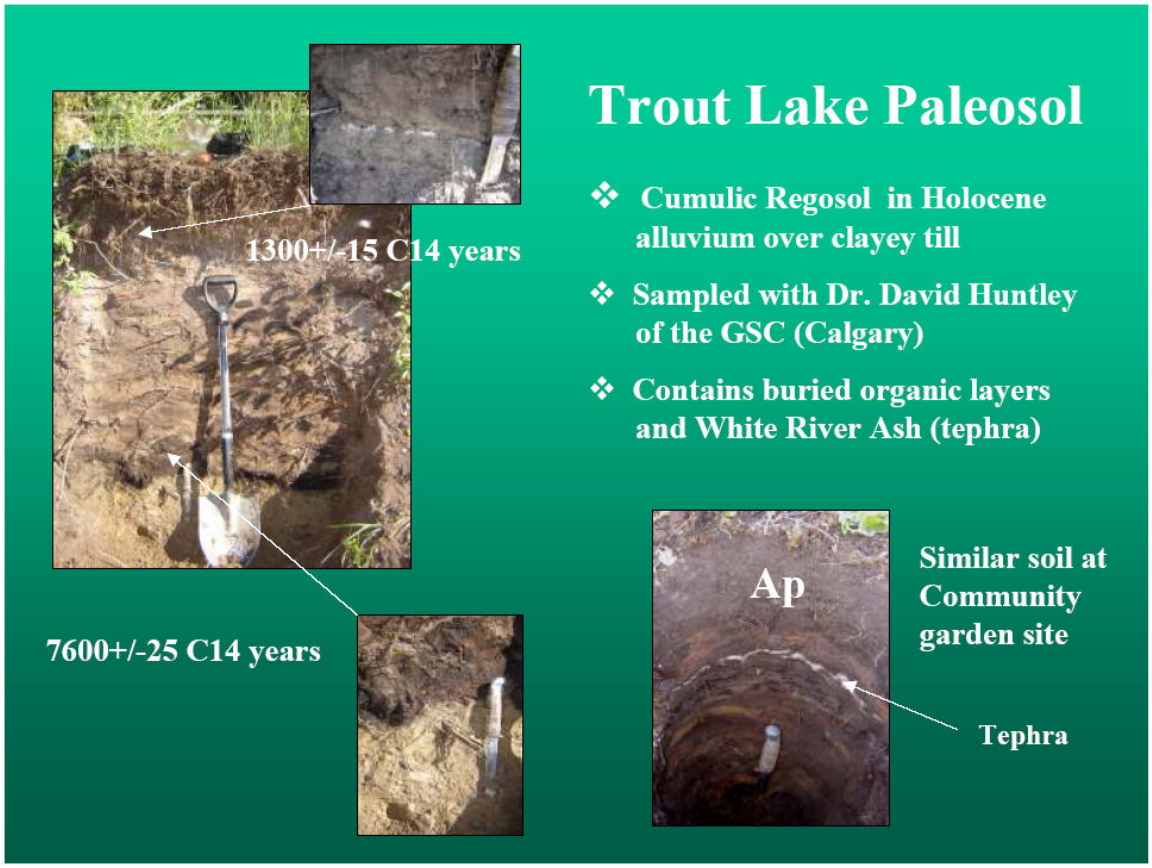
MAP AREA	Class 3	Class 4	Class 5	Class 6	Class 7
Entire Slave River Map Area (ha)	198,932	34,975	416,857	37,359	75,840
Fort Resolution (20 km radius)	none	5,430	32,891	4,598	24,835
Fort Smith (20 km radius)	2,816	1,106	40,451	102	2,403

3.6 Other Areas

Trout Lake

The alluvial floodplain soils of the Trout Lake area are Gleyed and Orthic Cumulic Regosols, with silt loam textures and high organic matter contents within the upper 75cm. These soils are similar in most respects to Cumulic Regosols found in other areas of the NWT, where they are often rated as Class 3 and 4. While the climate rating to the Trout Lake area has been given a climate rating of Class 5 and 6 (Eley, 1977), current and past success with a wide variety of fruits and vegetable in the community garden indicate that a milder climate may be found along the lake and river (Class 4?). The glacial till in the area is clay loam textured with a high shale, siltstone and mudstone content. Gypsum crystals were also observed in the till. The till near the river has an alluvial or glaciolacustrine veneer. Permafrost was observed at 35 cm, in black spruce bogs located within 1 km of the lakeshore and riverbanks, possibly indicating that the climate moderating influence of the nearby waterbodies does not extend inland very far, and the regional climate rating of class of 5 may still apply. However, the actual agricultural capability of these soils at Trout Lake remains in question until revised climate data is available.

Figure 13. Stratified alluvium with buried organic layers and White River tephra.



Interestingly, soils at both the garden site and boat launch contained numerous buried organic layers and a thin band of tephra (ash) near the surface (Figure 13). Carbon dating of selected organic layers at the boat launch site was conducted by Dr. David Huntley of the Geological Survey of Canada (Calgary). The deepest organic band, just above the underlying glacial till, indicated a date of 7,600 C^{14}-years, while the organic layer just under the tephra yielded a date of 1,300 C^{14}-years. The latter date supports the intepretation that the tephra derives from the historic eruption of Mount Churchill in Alaska, which distributed ash across the southern Yukon and into the southwestern Northwest Territories. A similar tephra layer was also frequently observed (though not sampled) in alluvial soils of the Jean Marie River area.

Wrigley

Due to budget and time limitations, only a short day trip was undertaken to Wrigley. The townsite itself is situated on sandy and gravelly parent materials, which would likely be given a capability rating of no better than class 5. However, some well to poorly drained, medium to fine textured glaciolacustrine materials were observed a few kilometers north of the town site. The well drained portions could be given a rating of Class 4, if climate limitations were not so severe. Unfortunately, there was not an opportunity to visit nearby

alluvial floodplains across the Mackenzie River. It is expected that the soils developed on these flooplains would be similar to those found further upstream on the Mackenzie River. If present, these alluvial soils would likely be the most capable of supporting local gardening efforts.

3.7 Total Agricultural Land Base

GIS-derived summary data prepared from these digital files indicates the following soil capability totals for agriculture in the 4.3M ha study area:

Class 3 - 826,336 ha
Class 4 - 491,119 ha
Class 5 - 1,310,082 ha
Class 6 - 138,486 ha
Class 7 - 1,196,085 ha

Bases on this summary, over 1.3M ha of arable land occur in the mapped area. This represents more than a quarter of the total land base.

3.8 Overview of Map Reliability

Map reliability is concerned with how what is indicated on the map, correlates with what is observed on the ground. One important factor in map reliability is the amount of fieldwork that was conducted in a given area during mapping. Unfortunately, the original soil inspection data that was used in the creation of the various soil maps is no longer available and no explicit quality or reliability statements are offered in the reports. This situation is unfortunate, since one is left to 'guesstimate' the level of inspection density (i.e., inspections per ha) of previous surveys, which is an important method for estimating soil map reliability. In the absence of such information, the scale of mapping has been used as a general indicator of map reliability, despite the limitation that maps at the same nominal scale are not necessarily of comparable reliability. Therefore, those areas covered by larger scale maps, specifically the Liard-Mackenzie River Area (1:125,000) and the Slave River Lowland Area (1:63,360) would be expected to have a higher level of detail and reliability. Additional inferences concerning reliability may also be made based on the soil inspections used to gain first-hand familiarity with the soils of the project area.

While only brief visits were made to the Slave River Lowland, the fact that the most current soil mapping was conducted by an experienced mapper using 1:10,000 colour photography (Day, 1972) would suggest a high degree of reliability. In fact, the majority of map polygons are small and very detailed due to being mapped at such a large scale, while being published at a significantly smaller scale of 1:63,360. As a result, a significant number are under the minimum polygon size of 0.5cm^2 usually recommended for most soil surveys. Now that the map is digital, a republication scale of 1:30,000 is recommended for ease of legibility in presentation.

Overall, these field observations indicated that the original soil surveys were reasonably accurate within the limitations of information available at the time of survey, the scale of mapping and the methodologies used. The field program confirmed the relatively high agricultural capability (Class 3 and 4) of most alluvial (river floodplain) soils across the map areas.

While checking in some areas covered by the 1:250,000 scale Upper Mackenzie soil map (Day, 1968), revealed some apparent errors in parent material mapping (e.g., confusion between wave-washed tills and glaciolacustrine deposits), in most cases they do seriously affect the agricultural capability, particularly when viewed on a regional level. Such errors may be expected given that it was a reconnaissance level survey (1:250,000) and the surveyor did not have the benefit of existing surficial geology mapping. Knowledge of surficial geology provides critical understanding of the nature and distribution of surface geological materials in which various soils develop.

Some glacial till and glaciolacustrine soils mapped as Class 3 and 4 in the Hay River valley and Ft Providence areas could be downgraded one capability class, should the observed surface stoniness prove to extend over wide areas. Unfortunately, the extent of such problem soil conditions can only be answered with a substantial remapping program, which was outside the scope and budget of the current project.

In the Liard-Mackenzie map area (Rostad et al., 1976), north of Ft. Simpson, glacial till was observed in an area mapped as fluvial, but again did not seriously affect the agricultural capability rating, as the till had a slight stone lag at the surface, which would have placed it into class 5 anyway.

During the course of reviewing the various named soil series and soil associations used in naming the various soils found in each map area, significant naming difficulties presented themselves (see APPENDIX D). Given the very large map area concerned (>4M ha), and number of naming difficulties encountered, a significant effort would be required to correct these inconsistencies, including substantially more field inspection effort to correlate similar soils with different names in different map areas. The scale of this challenge is highlighted by the fact that this task was not undertaken during the 1970's remapping efforts by Rostad et al. (1976) and Kozak and Rostad (1977), nor during the integration of this new map information with that of Day (1968;1972) for a synthesis report on the agricultural potential of the NWT (Rostad and Kozak, 1977). However, this issue should be resolved prior to any substantial remapping efforts.

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions

Area calculations based on the new digital soil map dataset indicates over 1.3M ha of arable land within the area covered by existing soil surveys covering the Slave, Hay, Upper Mackenzie and Liard River regions. This represents more than a quarter of the total land base. The historical soil surveys that underly this digital datset have long indicated an abundance of soil resources that appear capable of sustained agriculture, in spite of the negative perceptions associated with being located 'North of 60'. Recognition of such agricultural land capability may prove critical to future land use policy and decision-making.

In the intervening years since the original surveys, two important trends have developed which may have an impact on the agricultural land base of the Northwest Territories. Between 1961 and 1990, the climate of the Mackenzie Valley, has warmed as much a 0.5 to 1 degree Celsius. With this apparent warming trend over the coming decades, the question arises: would overall agricultural land capability also increase due to reduction in climate limitations? And if so, by how much? Conceivably, such a warming trend could lead to an overall increase in both the amount and capability of agricultural lands. Additionally, the recent rapid rise in food, fuel and transportation costs, will undoubtedly result in increased interest in local food production, both in Canada and abroad. Together, these apparent short- and long-term trends will likely necessitate careful review of agricultural land resources by territorial and national agencies, and decision-makers. It is imperative that all land resources be protected from indiscriminate disturbance and unsuitable land uses, including those lands that have the greatest potential for local food production.

It is hoped that the digital soil compilation resulting from this project will be a useful data tool for planners and policy makers in their attempt to ensure the best use of Northwest Territories land and soil resources. It is also hoped that the dataset will contribute to national soil data archives.

4.2 Recommendations

Past agricultural capability assessment was based on pre-1975 climate data. As such, there is a need to utilize more current climate data, particularly in light of recent and anticipated climate change. New agrometeorlogical maps are currently under development by Agriculture Canada. When this new data is available, existing climate limitations used for the historical surveys, should be reviewed to assess whether climate warming in the intervening 30 years has substantially improved or otherwise modified these limitations, Should the past climate limitations be reduced, some soils may have their capabilities increased, thereby potentially changing the agricultural capability proportions of the land base.

While the existing soil information compiled on the accompanying map sets allow a regional to sub-regional assessment of agricultural land capability, more detailed soil assessments may be required should more site specific planning and development at a community level. Regionally, a substantial remapping effort would be required to fully integrate the small scale (1:250,000) map of the Upper Mackenzie River map area with the larger scale maps of the Liard-Mackenzie (1:125,000), Hay River (1:125,000) and Slave River (1:63,360) areas.

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APPENDIX A – Descriptions of Soils and Soil Map Units by Map Area

Compiled and revised from the original soil reports (Day, 1968; Day, 1972; Rostad et al., 1976; Kozak and Rostad, 1977).

Liard and Mackenzie River Area - Description of Soils and Soil Map Units

Alluvium Land Type

Series Present: very weakly developed Regosolic or Gleysolic soils

Surface Texture: variable, usually sand and gravel

Parent Material: variable textured alluvium, usually sandy and gravelly

Landform: sand bars and islands on active river channels

Drainage: imperfectly to poorly drained

Vegetation: sparse vegetation cover (horsetails, grasses, sedges and willows) or absent, due to scouring action of ice and water.

Agricultural Capability: 7I

Map Units:

Av - Dominantly Regosolic soils

Anderson Mill Association (Ad)

Series Present: Eluviated Eutric Brunisol, Orthic Gray Luvisol

Solum Texture: fine sandy loam

Parent Material: moderately calcareous, stratified mixture of sandy glaciofluvial and silty glaciolacustrine veneer (<1m) overlying till. The veneer material consists of loamy sand sandy loam textured glaciofluvial material with thin (1 to 5cm) silt loam and silty clay loam textured bands of glaciolacustrine material.

Landform: highly variable, from level to moderately inclined

Drainage: well drained

Vegetation: white spruce-aspen and tall mixed deciduous forests.

Agricultural Capability: 4M

Map Units:

Ad1 - Dominantly Eluviated Eutric Brunisol.

Ad2 - Dominantly Eluviated Eutric Brunisol, with significant Orthic Gray Luvisol.

Antoine Association (An)

Series Present: Rego Gleysol - peaty phase, Eluviated Eutric Brunisol, and Organics

Solum Texture: loamy sand and sand

Parent Material: moderately to strongly calcareous, sandy glaciofluvial and fluvial-lacustrine (deltaic) deposits, usually wind-modified (eolian).

Landform: level to gently undulating or hummocky

Drainage: poorly drained; well drained and very poorly drained

Vegetation: black spruce forest with an understory of ericaceous shrubs and mosses.

Agricultural Capability: 5W

Map Units:

An1 - Dominantly Rego Gleysol - peaty phase.

An2 - Dominantly Rego Gleysol - peaty phase, with significant Eluviated Eutric Brunisol.

An3 - Dominantly Rego Gleysol - peaty phase, with significant Eluviated Eutric Brunisol and Organics.

An4 - Dominantly Rego Gleysol – peaty phase, with significant Organics.

Arrowhead Association (Ar)

Series Present: Eluviated Eutric Brunisol, Orthic Eutric Brunisol, Gleyed Eutric Brunisol, Rego Gleysol - peaty phase, and Organics

Solum Texture: silt loam to very fine sandy loam

Parent Material: moderately calcareous, coarse silty glaciolacustrine material

Landform: level to moderately undulating

Drainage: well drained; imperfectly to poorly drained

Vegetation: mixedwood or mixed deciduous forest with an understory of alder, low bush cranberry, and rose and a variety of herbs, especially bunchberry. Feathermosses occur under spruce.

Agricultural Capability: 3M; gleyed soils are 4W

Map Units:

Ar1- Dominantly Eluviated Eutric Brunisol, with significant Orthic Eutric Brunisol.

Ar2 - Dominantly Orthic Eutric Brunisol, with significant Eluviated Eutric Brunisol.

Ar3 - Dominantly Eluviated Eutric Brunisol, with significant Gleyed Eutric Brunisol.

Ar4 - Dominantly Eluviated Eutric Brunisol, with significant Rego Gleysol - peaty phase.

Ar5 - Dominantly Orthic Eutric Brunisol, with significant Rego Gleysol - peaty phase.

Ar6 - Dominantly Gleyed Eutric Brunisol, with significant Rego Gleysol - peaty phase.

Ar7 - Dominantly Eluviated Eutric Brunisol, with significant Rego Gleysol - peaty phase and Organics.

Ar8 - Dominantly Eluviated Eutric Brunisol, with significant Gleyed Eutric Brunisol and Rego Gleysol - peaty phase.

Babiche Association (Bc)

Series Present: Rego Gleysol - peaty phase, Eluviated Eutric Brunisol

Solum Texture: silt loam

Parent Material: coarse silty glaciolacustrine veneer overlying glaciofluvial sand.

Landform: level to gently undulating

Drainage: poorly drained; well drained

Vegetation: short, dense black spruce, with an ericaceous shrub and feathermoss understory.

Agricultural Capability: 5W

Map Units:

Bc1- Dominantly Rego Gleysol - peaty phase, with significant Eluviated Eutric Brunisol.

Big Island Association (Bg)

Series Present: Rego Gleysol - peaty phase, Eluviated Eutric Brunisol, and Organics.

Solum Texture: silty clay loam to silty clay.

Parent Material: moderately calcareous, fine silty glaciolacustrine material

Landform: level to gently sloping and depressional

Drainage: poorly drained; well drained and very poorly drained

Vegetation: mostly short, dense stands of black spruce, with an understory of ericaceous shrubs, and mosses, interspersed with open meadow areas, covered with sedges, grasses and scattered shrubs, tamarack and black spruce.

Agricultural Capability: 5W

Map Units:

Bg1 - Dominantly Rego Gleysol - peaty phase.

Bg2 - Dominantly Rego Gleysol - peaty phase, with significant Eluviated Eutric Brunisol and Organics.

Bg3 - Dominantly Rego Gleysol - peaty phase, with significant Organics.

Blackstone River Association (Br)

Series Present: Rego Gleysol - peaty phase

Solum Texture: fine sandy to silty

Parent Material: fine sandy to silty alluvium, with occasional buried organic layers.

Landform: abandoned river channels on the meander floodplain

Drainage: poorly drained

Vegetation: black spruce forest with an understory of ericaceous shrubs and mosses and channel shrub consisting of willow, alder, bog birch, horsetail and sedges.

Agricultural Capability: 5W

Map Units:

Br1 - Dominantly Rego Gleysols, peaty phase.

Bluebill Association (Bb)

Series Present: Orthic Gray Luvisol, Eluviated Eutric Brunisol, Brunisolic Gray Luvisol, and Rego Gleysol - peaty phase

Solum Texture: very fine sandy loam and silt loam

Parent Material: coarse silty glaciolacustrine material

Landform: gently undulating

Drainage: well drained; poorly drained

Vegetation: mostly tall spruce-aspen mixedwood forest, with some areas containing jack pine, particularly at higher eleveations.

Agricultural Capability: 3D

Map Units:

Bb1 - Dominantly Orthic Gray Luvisol, with significant Eluviated Eutric Brunisol.

Bb2 - Dominantly Brunisolic Gray Luvisol, with significant Eluviated Eutric Brunisol and Rego Gleysol - peaty phase.

Bluefish Association (Bf)

Series Present: Eluviated Eutric Brunisol, Rego Gleysol - peaty phase

Solum Texture: very fine sandy loam and silt loam (occasional silty clay loam)

Parent Material: course silty lacustrine veneer (<1m) over sandy glaciofluvial material.

Landform: gently undulating

Drainage: well drained; poorly drained

Vegetation: mixedwood and mixed deciduous, including localized mixtures of white birch and aspen with a mountain ash understory. Dense willow and alder occur along poorly drained seepage slopes.

Agricultural Capability: 3M

Map Units:

Bf1 - Dominantly Eluviated Eutric Brunisol.

Bf2 - Dominantly Eluviated Eutric Brunisol, with significant Rego Gleysol - peaty phase.

Bovie Lake Association (Bv)

Series Present: Eluviated Eutric Brunisol, Orthic Eutric Brunisol, Brunisolic Gray Luvisol, Orthic Gleysol, Rego Gleysol - peaty phase, and Organics

Solum Texture: very fine sandy loam to silt loam

Parent Material: moderately calcareous, coarse silty glaciolacustrine material veneer (<1m) over calcareous till. The glaciolacustrine veneer has a silt loam to very fine sandy loam texture.

Landform: gently undulating to moderately sloping fluted and drumlinoid ridges

Drainage: well drained; poorly drained

Vegetation: mixed deciduous or mixedwood forests, with an understorey of alder, rose and bunchberry. Black spruce forest predominate in poorly drained areas.

Agricultural Capability: 3M

Map Units:

Bv1 – Dominantly Eluviated Eutric Brunisol.

Bv2 – Dominantly Eluviated Eutric Brunisol, with significant Orthic Eutric Brunisol.

Bv3 - Dominantly Eluviated Eutric Brunisol, with significant Brunisolic Gray Luvisol.

Bv4 - Dominantly Eluviated Eutric Brunisol, with significant Orthic Gleysol.

Bv5 - Dominantly Eluviated Eutric Brunisol, with significant Rego Gleysol - peaty phase.

Bv6 - Dominantly Eluviated Eutric Brunisol with significant Rego Gleysol - peaty phase and Organics.

Bv7 - Dominantly Eluviated Eutric Brunisol, with significant Brunisolic Gray Luvisol and Rego Gleysol - peaty phase.

Bulmer Association (Bu)

Series Present: Rego Gleysol - peaty phase, Orthic Eutric Brunisol, Gleyed Eutric Brunisol, and Organics.

Solum Texture: very fine sandy loam and silt loam

Parent Material: course silty glaciolacustrine veneer (<1m) over glacial till.

Landform: gently undulating

Drainage: poorly drained; well to imperfectly drained

Vegetation: mainly black spruce with occasional larch, dense ericaceous shrubs, and mosses.

Agricultural Capability: 5W

Map Units:

Bu1 - Dominantly Rego Gleysol - peaty phase.

Bu2 - Dominantly Rego Gleysol - peaty phase, with significant Orthic Eutric Brunisol.

Bu3 - Dominantly Rego Gleysol - peaty phase, with significant Gleyed Eutric Brunisol.

Bu4 - Dominantly Rego Gleysol - peaty phase, with significant Organics.

Bu5 - Dominantly Rego Gleysol - peaty phase, with significant OrthicEutric Brunisol and Organics.

Celibeta Association (Cb)

Series Present: Orthic Gray Luvisol, Brunisolic Gray Luvisol, Gleyed Eutric Brunisol, and Rego Gleysol - peaty phase.

Solum Texture: silty clay loam

Parent Material: fine silty glaciolacustrine veneer (<1m) over glacial till

Landform: gently sloping to undulating

Drainage: well drained; imperfectly to poorly drained

Vegetation: tall, dense stands of aspen or aspen-white spruce, with an understory of alder, rose, bunchberry, and twinflower.

Agricultural Capability: 3D

Map Units:

Cb1 - Dominantly Orthic Gray Luvisol, with significant Brunisolic Gray Luvisol and Gleyed Eutric Brunisol.

Cb2 - Dominantly Orthic Gray Luvisol, with significant Rego Gleysol - peaty phase.

Colluvium Land Type (Cv)

Series Present: Regosolic and non-soil

Solum Texture: variable, and in some cases may consist only of larger rock fragments

Parent Material: loose, heterogeneous and incoherent mass of material deposited by mass wasting and other gravity-controlled slope processes at the base of steep slopes or cliffs.

Landform: talus slopes

Drainage: rapidly drained

Vegetation: mainly non-vegetated

Agricultural Capability: 5T

Map Units:

Cv - Dominantly Regosolic soils

Coty Mountain Association (Ct)

Series Present: Orthic Eutric Brunisol, Gleyed Orthic Eutric Brunisol.

Solum Texture: silty clay loam

Parent Material: moderately calcareous, fine silty glaciolacustrine veneer (<1m) over glacial till

Landform: gently sloping to undulating

Drainage: well drained; imperfectly drained

Vegetation: tall stands of aspen or aspen-white spruce.

Agricultural Capability: 3CH

Map Units:

Ct1 - Dominantly Orthic.Eutric Brunisol.

Ct2 - Dominantly Orthic Eutric Brunisol, with significant Gleyed Orthic Eutric Brunisol.

Cormack Lake Association (Cm)

Series Present: Rego Gleysol - peaty phase, Orthic Gray Luvisol, and Organics.

Solum Texture: clay loam

Parent Material: moderately calcareous, fine loamy (clay loam) glacial till

Landform: level to gently sloping

Drainage: poorly drained; moderately-well drained and very poorly drained

Vegetation: dominantly stunted black spruce forest.

Agricultural Capability: 5W

Map Units:

Cm1 - Dominantly Rego Gleysol - peaty phase.

Cm2 - Dominantly Rego Gleysol - peaty phase, with significant Organics.

Cm5 - Dominantly Rego Gleysol - peaty phase, with significant Orthic Gray Luvisol and Organics.

Exposure Complex (Ex)

Series Present: non-soil or Regosolic

Solum Texture: N/A

Parent Material: bedrock

Landform: bedrock outcrops and escarpments occurring near the Franklin Mountains and along deep river valleys

Drainage: very rapidly drained

Vegetation: typically non-vegetated

Agricultural Capability: 7T

Map Units:

Ex – Complex of non-soil and Regosolic soils

Fisherman Lake (Fs)

Series Present: Rego Gleysol - peaty phase, Gleyed Eluviated Eutric Brunisol, and Organics.

Solum Texture: silty clay to clay

Parent Material: fine silty to clayey (clay to heavy clay) lacustro-till deposits with few stones

Landform: level to undulating or depressional

Drainage: poorly drained; imperfectly and very poorly drained

Vegetation: dense, medium-height black spruce forest

Agricultural Capability: 5W

Map Units:

Fs1 - Dominantly Rego Gleysol - peaty phase.

Fs2 - Dominantly Rego Gleysol - peaty phase, with significant Gleyed Eluviated Eutric Brunisol.

Fs3 - Dominantly Rego Gleysol - peaty phase, with significant Organics.

Flett Association (F)

Series Present: Rego Gleysol, Orthic Humic Gleysol, and Rego Humic Gleysol Rego Gleysol - peaty phase, and Organics

Solum Texture: silty clay loam

Parent Material: fine silty alluvium over sandy alluvium. The fine silty alluvium is usually <1 m thick, with a silty clay loam texture.

Landform: poorly drained abandoned channels, channel scars and backswamps associated with Netla and Swan Point Associations.

Drainage: poorly drained

Vegetation: tall, moderately dense mixedwood stands, similar to those occurring in the Netla Association, but spruce is more commonly dominant in this association in mature stands. Black spruce forest or meadow-shrub vegetation occurs in poorly drained abandoned channels.

Agricultural Capability: 5W

Map Units:

F1 - Dominantly Rego Gleysol - peaty phase.

F2 - Dominantly Rego Gleysol - peaty phase, with significant Orthic Gray Luvisol.

F3 - Dominantly Rego Gleysol - peaty phase, with significant Gleyed Eutric Brunisol. This unit is similar to F1, but differs in that there are a significant number of imperfectly drained ridges with Gleyed Eutric Brunisols.

F4 - Dominantly Rego Gleysol - peaty phase, with significant Organic soils (usually Fibric Organic Cryosols).

F5 - Dominant Rego Gleysol - peaty phase, with significant Orthic Eutric Brunisol. This unit is similar to F2, but has Orthic Eutric Brunisol rather than Orthic Gray Luvisol.

Grainger Association (G)

Series Present: Fibric Organic Cryosols, Mesic Organic Cryosol, Typic Mesisol

Solum Texture: N/A

Parent Material: fibric to mesic peat mostly derived from sphagnum mosses, with extensive permafrost

Landform: peat plateaus with collapse scars fens and small ponds resulting from permafrost degradation (thermokarst)

Drainage: very poorly drained

Vegetation: open stands of stunted black spruce, with a dense ground cover of labrador tea, cowberry, bog rosemary, bog cranberry, sphagnum mosses, and lichens in the more northern areas. Thermokarst areas are covered with small cotton grass, sphagnum, leather leaf, sedges, and aquatic sphagnum. Associated fen areas have willow, bog birch, scattered tamarack, mosses, and sedge.

Agricultural Capability: 7W

Map Units:

G1 - Dominantly Fibric Organic Cryosol, with significant Typic Mesisol. Peat plateau with extensive collapse scars and adjacent fen areas.

G2 - Fibric Organic Cryosol, with significant Mesic Organic Cryosol. Bog plateau with smaller, less extensive collapse scars. Permafrost is usually present, even under collapse scars, but at a deeper depth.

Gros Cap Association (Gc)

Series Present: Orthic Gray Luvisol

Solum Texture: silty clay loam

Parent Material: moderately calcareous, fine silty glaciolacustrine material

Landform: level to gently undulating

Drainage: well to moderately well drained

Vegetation: mixedwood forest of aspen and white spruce, with buffalo berry, alder, raspberry, bunchberry, and feathermosses in the understory.

Agricultural Capability: 3D

Map Units:

Gc1 - Dominantly Orthic Gray Luvisol.

Harris Association (Hr)

Series Present: Orthic Eutric Brunisol, Rego Gleysol - peaty phase

Solum Texture: variable (sandy to coarse loamy)

Parent Material: eroded, stony coarse loamy glacial till, often with a stone lag or boulder pavement at the surface

Landform: gently inclined

Drainage: well drained; poorly drained

Vegetation: variable mixtures of pine, aspen and white spruce.

Agricultural Capability: 6P

Map Units:

Hr1 - Dominantly Orthic Eutric Brunisol.

Hr2 - Dominantly Orthic Eutric Brunisol, with significant Rego Gleysol - peaty phase.

Hr3 - Dominantly Orthic Eutric Brunisol, with significant Rego Gleysol - peaty phase, and Organics.

Hr4 - Dominantly Rego Gleysol - peaty .phase, with significant Orthic Eutric Brunisol and Organics.

Hillwash Complex (Hw)

Series Present: complex of Brunisolic, Luvisolic, and Regosolic soils

Solum Texture: variable

Parent Material: a variety of glacial sediments, which have been eroded or reworked by slope wash. May include some colluvial materials moved by mass wasting and other gravity-controlled processes.

Landform: moderately to steeply sloping valleys and escarpments, actively eroding lands

Drainage: rapidly to well drained

Vegetation: variable, but commonly aspen and white spruce forest.

Agricultural Capability: 5T or 5E

Map Units:

Hw - complex of Brunisolic, Luvisolic, and Regosolic soils

Jean Marie Association (Jm)

Series Present: Eluviated Eutric Brunisol

Solum Texture: loamy fine sand

Parent Material: sandy glaciofluvial veneer (>1m) overlying strongly calcareous, gravelly and sandy glaciofluvial material.

Landform: gently undulating outwash plain and glacial spillways

Drainage: rapidly drained

Vegetation: jack pine with an understorey of alder, rose, buffalo berry and bog cranberry.

Agricultural Capability: 5MF

Map Units:

Jm1 - Dominantly Eluviated Eutric Brunisol.

Liard Association (L)

Series Present: Cumulic Regosol, Gleyed Cumulic Regosol and Rego Gleysol

Solum Texture: variable sandy to silty, with sandy loam most frequent

Parent Material: sandy to silty alluvium deposited by the Liard and Mackenzie Rivers, frequently with buried organic layers represent accumulations of surface organic litter that have been buried by periodic flooding; often there is a gradation from coarse textured, even gravelly deposits in the subsoil to finer textured sands and silts on the surface.

Landform: recent floodplains and islands, usually with a distinct channelled pattern; levelling occurs with recurrent flooding and subsequent deposition over time.

Drainage: moderately-well to well drained; imperfectly to poorly drained

Vegetation: The dominant vegetation type is white spruce-balsam poplar or white spruce-white birch forest, which is more likely of fire origin. In both types the shrub and herb layers are generally dense. The main understory species are alder, rose, dogwood, and low bush cranberry, horsetail, mitrewort, dewberry, and bunchberry, and feathermosses. The success of white spruce and balsam poplar on the flood-susceptible Liard soils is due to their ability to put out new roots when the base is buried by alluvium. Aspen does not have this ability and is rarely found on the Liard soils.

Agricultural Capability: 3CA; frequently 3I or 4I due to flooding hazard or 3IT due to presence of poorly drained channels

Map Units:

L1 - Dominantly Cumulic Regosol.

L2 - Dominantly Cumulic Regosol, with significant Gleyed Cumulic Regosols

L3 - Dominantly Cumulic Regosol, with significant Rego Gleysol.

Martin River Association (Mr)

Series Present: Eluviated Eutric Brunisol, Gleyed Eutric Brunisol, Rego Gleysol - peaty phase and Organics

Solum Texture: loamy sand and sand

Parent Material: moderately to strongly calcareous, sandy glaciofluvial and fluvial-lacustrine (deltaic) deposits, usually wind-modified (eolian).

Landform: gently undulating deltaic plains and gently to strongly sloping parabolic and longitudinal dunes.

Drainage: rapidly to well drained; imperfectly to poorly drained

Vegetation: dominantly jack pine forest with aspen commonly occurring on moister north and east-facing slopes and moderately well drained positions. The understorey includes rose, buffalo berry, twinflower, bunchberry, bearberry, and bog cranberry and moderate amounts of feathermosses. Lichens are sometimes present on drier sites. Shrub cover is often denser and taller under aspen cover. Poorly drained depressions usually contain black spruce forest with an understory of ericaceous shrubs and mosses. These often grade into fens with larch, willow and sedges in very poorly drained depressions.

Agricultural Capability: 5MF; 6SE if topography shows effects of past wind modifications (eolian dunes)

Map Units:

Mr1 - Dominantly Eluviated Eutric Brunisol.

Mr2 - Dominantly Eluviated Eutric Brunisol, with significant Rego Gleysol - peaty phase.

Mr3 - Dominantly Eluviated Eutric Brunisol, with significant Gleyed Eutric Brunisol.

Mr4 - Dominantly Eluviated Eutric Brunisol, with significant Rego Gleysol - peaty phase, and Organics.

Netla Association (Ne)

Series Present: Orthic Eutric Brunisol, Gleyed Eutric Brunisol, Eluviated Eutric Brunisol, Rego Gleysol - peaty phase, and Organics

Solum Texture: silty clay loam

Parent Material: fine silty alluvium (<1m) over sandy alluvium. The fine silty alluvium grades from silty clay loam to silt loam textures with depth, with very fine sandy loam to loamy sand textures in the underlying sandy alluvium.

Landform: older terraces of the abandoned floodplains, above the intermediate and lower terraces occupied by Poplar and Liard soils. Usually gently channelled with arcuate channel scars.

Drainage: well to moderately-well drained; imperfectly to poorly drained

Vegetation: the well drained sites support tall, moderately dense, even aged mixedwood stands typically dominated by tall straight trembling aspen, often with a layer of white spruce in the understorey. The understory also includes low bush cranberry, alder, rose, bunchberry and feathermoss. Black spruce forest or meadow-shrub vegetation occurs in poorly drained abandoned channels.

Agricultural Capability:

Map Units:

Ne1 - Dominantly Orthic Eutric Brunisol, with significant Gleyed Eutric Brunisol.

Ne2 - Dominantly Eluviated Eutric Brunisol, with significant Gleyed Eutric Brunisol.

Ne3 - Dominantly Orthic Eutric Brunisol, with significant Rego Gleysol - peaty phase.

Ne4 - Dominantly Orthic Eutric Brunisol, with significant Rego Gleysol - peaty phase and Organics. This unit is similar to Ne3, but the poorly drained abandoned channels and backswamps occupy a greater proportion of the area and many have thicker peat deposits.

Ne5 - Dominantly Eluviated Eutric Brunisol, with significant Gleyed Eluviated Eutric Brunisol and Organics. This unit is like Ne2, except that it has a significant proportion of small irregular abandoned channels, which have accumulated thick peat deposits and now support fen meadows.

Petitot Association (Pe)

Series Present: Eluviated Eutric Brunisol, Orthic Gray Luvisol, Rego Gleysol - peaty phase, and Organics. Occasional Orthic Eutric Brunisol.

Surface Texture: silty clay loam to silty clay

Parent Material: moderately calcareous, fine silty glaciolacustrine material.

Landform: level or gently undulating

Drainage: well to moderately-well drained; poorly to very poorly drained

Vegetation: mostly consists of even-aged stands of trembling aspen and white birch, with alder, buffalo berry, willow, and white spruce common in the understorey. Herbs and mosses are sparse. Some imperfectly drained to poorly drained lower slopes contain short, dense stand of birch, alder, and willow. Black spruce, alone, or in combination with tamarack and birch, usually occurs adjacent to wet depressions. The depressions themselves typically support sedge with scattered tamarack, willow, and birch.

Agricultural Capability: 3CH; similar to Netla, but at higher elevations

Map Units:

Pe1 - Dominantly Eluviated Eutric Brunisol, with significant Orthic Gray Luvisol.

Pe2 - Dominantly Eluviated Eutric Brunisol, with significant Orthic Gray Luvisol and Rego Gleysol - peaty phase.

Pe3 - Dominantly Eluviated Eutric Brunisol, and significant Rego Gleysol - peaty phase.

Pe4 - Dominantly Eluviated Eutric Brunisol, with significant Rego Gleysol - peaty phase, and Organics.

Pointed Mountain Association (Pd)

Series Present: Orthic Gray Luvisol, Brunisolic Gray Luvisol, Gleyed Eluviated Eutric Brunisol, and Rego Gleysol - peaty phase.

Solum Texture: silty clay to clay

Parent Material: fine silty to clayey (clay to heavy clay) lacustro-till deposits with few stones

Landform: moderately to steeply sloping large rolling hills, with very long slopes, and occasional high, steep-sided, bedrock controlled ridges.

Drainage: well to moderately-well drained; imperfectly to poorly drained

Vegetation: mainly mature and over-mature stands of large-diameter, tall white spruce and aspen. The main understorey species are alder, rose, lowbush cranberry, bunchberry, and feathermosses.

Agricultural Capability: 3D; 4T or 5T in areas of steep slopes

Map Units:

Pd1 - Dominantly Orthic Gray Luvisol.

Pd2 - Dominantly Orthic Gray Luvisol, with significant Brunisolic Gray Luvisol.

Pd3 – Dominantly Orthic Gray Luvisol, with significant Brunisolic Gray Luvisol and Gleyed Eluviated Eutric Brunisol.

Pd4 - Dominantly Orthic Gray Luvisol, with significant Rego Gleysol - peaty phase.

Poplar Association (Po)

Series Present: Orthic Eutric Brunisol, Orthic Regosol, Gleyed Eutric Brunisol, Gleysols and Organics; occasional Eluviated Eutric Brunisol

Solum Texture: very fine sandy loam to silt loam

Parent Material: moderately calcareous coarse silty alluvium (<1m) over sandy alluvium. The coarse silty alluvium ranges in texture from very fine sandy loam to silt loam. The parent material often contains buried organic layers (cumulic banding).

Landform: intermediate level terraces of abandoned floodplains, between the more recent terraces of the Liard Association and older terraces occupied by the Netla Association. Usually gently channelled with arcuate channel scars.

Drainage: well drained; imperfectly to poorly drained

Vegetation: mostly older mixedwood forest, with younger white birch and trembling aspen forest in recent burned areas.

Agricultural Capability: 3M

Map Units:

Po1 - Dominantly Orthic Eutric Brunisol.

Po2 - Dominantly Orthic Eutric Brunisol, with significant Orthic Regosol.

Po3 - Dominantly Orthic Eutric Brunisol, with significant Orthic Regosol and Rego Gleysol - peaty phase.

Po4 - Dominantly Orthic Eutric Brunisol, with significant Rego Gleysol - peaty phase.

Po5 - Dominantly Orthic Eutric Brunisol, with significant Rego Gleysol - peaty phase and Organics.

Rabbit Creek Association (Ra)

Series Present: Orthic Gray Luvisols, Eluviated Eutric Brunisol, and Rego Gleysol - peaty phase.

Solum Texture: sandy loam and loam

Parent Material: moderately calcareous, course loamy (sandy loam and loam), glacial till

Landform: gently undulating to strongly sloping

Drainage: well drained; poorly drained

Vegetation: dominantly mixed deciduous forest, with pine forest on drier, more fire-prone areas.

Agricultural Capability: 3D; frequently 4T due to steep slopes; occasional 5H

Map Units:

Ra1- Dominantly Orthic Gray Luvisol, with significant Eluviated Eutric Brunisol.

Ra2 - Dominantly Orthic Gray Luvisols, with significant Eluviated Eutric Brunisol and Rego Gleysol - peaty phase.

Scotty Creek Association (Sc)

Series Present: Rego Gleysol - peaty phase, Eluviated Eutric Brunisol, and Organics

Solum Texture: sandy loam to loamy sand

Parent Material: moderately to strongly calcareous, sandy glaciofluvial veneer (40 to 100 cm thick) overlying glacial till. May have a gravelly or stony lag along contact with till.

Landform: level to gently undulating, with some hummocky areas

Drainage: poorly drained; well drained and very poorly drained

Vegetation: black spruce forest with an understory of ericaceous shrubs and mosses.

Agricultural Capability: 5W

Map Units:

Sc1 - Dominantly Rego Gleysol - peaty phase.

Sc2 - Dominantly Rego Gleysol - peaty phase, with significant Eluviated Eutric Brunisol.

Sc3 - Dominantly Rego Gleysol - peaty phase, with significant Eluviated Eutric Brunisol and Organics.

Shale Creek Association (Sh)

Series Present: Rego Gleysol - peaty phase, Orthic Eutric Brunisol, and Organics

Solum Texture: silt loam to very fine sandy loam

Parent Material: moderately calcareous, coarse silty glaciolacustrine material

Landform: level to gently undulating

Drainage: poorly drained; well drained

Vegetation: mostly black spruce forest, with mixedwood or mixed deciduous forest in localized well drained areas.

Agricultural Capability: 5W

Map Units:

Sh1 - Dominantly Rego Gleysol - peaty phase.

Sh2 - Dominantly Rego Gleysol- peaty phase, with significant Orthic Eutric Brunisol.

Sh3 - Dominantly Rego Gleysol - peaty phase, with significant Orthic Eutric Brunisol and Organics.

Sh4 - Dominantly Rego Gleysol - peaty phase and significant Organics.

Sibbeston Association (Sb)

Series Present: Eluviated Eutric Brunisol, Rego Gleysol - peaty phase, and Organics

Solum Texture: sandy loam to loamy sand

Parent Material: moderately to strongly calcareous, sandy fluvial-lacustrine veneer (40 to 100 cm thick) overlying glacial till. May have a gravelly or stony lag along contact with till.

Landform: gently undulating to hummocky, often with long narrow morainal ridges (flutings) imposed by the underlying till.

Drainage: well to rapidly drained; poorly to very poorly drained

Vegetation: jack pine forest and mixed pine-aspen stands on rapidly drained to well drained sites, with aspen and spruce-aspen stands are frequently found on moister sites. The depth to the underlying till and its influence on the moisture regime as well as the frequency of fires seem to be the main influences on vegetation.

Agricultural Capability: 4M

Map Units:

Sb1 - Dominantly Eluviated Eutric Brunisol.

Sb2 - Dominantly Eluviated Eutric Brunisol, with significant Rego Gleysol - peaty phase.

Sb3 - Dominantly Eluviated Eutric Brunisol, with significant Rego Gleysol - peaty phase, and Organics.

Swan Point Association (Sw)

Series Present: Orthic Gray Luvisol, Eluviated Eutric Brunisol, Gleyed Gray Luvisol, Rego Gleysol - peaty phase, and Organics

Solum Texture: silty clay loam to silty clay

Parent Material: weakly to moderately calcareous, fine silty alluvium over sandy alluvium. The fine silty alluvium is usually <1 m thick, but is occasionally thicker, with silty clay loam to silty clay textures.

Landform: older terraces of the abandoned floodplains, on same terraces as Netla soils or slightly above and back from them. Usually gently channelled to level.

Drainage: moderately-well to well drained; imperfectly to poorly drained

Vegetation: tall, moderately dense mixedwood stands, similar to those occurring in the Netla Association, but spruce is more commonly dominant in this association in mature stands. Black spruce forest or meadow-shrub vegetation occurs in poorly drained channels.

Agricultural Capability: 3D; gleyed soils are 4W; Brunisols are 3A

Map Units:

Sw1 - Dominantly Orthic Gray Luvisol, with significant Eluviated Eutric Brunisol.

Sw2 - Dominantly Orthic Gray Luvisol, with significant Gleyed Gray Luvisol.

Sw3 - Dominantly Gray Luvisol, with significant Eluviated Eutric Brunisol and Gleyed Gray Luvisol.

Sw4 - Dominantly Orthic Gray Luvisol, with significant Gleyed Gray Luvisol and Rego Gleysol - peaty phase.

Sw5 - Dominantly Orthic Gray Luvisol, with significant Eluviated Eutric Brunisol and Rego Gleysol - peaty phase.

Trail River Association (Tr)

Series Present: Typic Mesisol, Fibric Organic Crysol, Hydric Fibrisols, and Terric Mesisol.

Solum Texture: N/A

Parent Material: mesic to fibric peat mostly derived from sedges, with variable degrees of permafrost occurrence.

Landform: horizontal, patterned and floating fens, with various degrees of palsa and peat plateau occurrence.

Drainage: very poorly drained

Vegetation: predominantly sedges, grasses, willow, dwarf birch, ericaceous shrubs, mosses, and occasionally with sparse tamarack and black spruce.

Agricultural Capability: 7W; 6W on drier sedge covered areas

Map Units:

Tr1 - Dominantly Typic Mesisol, with significant Fibric Organic Crysol. Patterned fens. In some areas of shallow deposits Terric Mesisols occur.

Tr2 - Dominantly Typic Mesisol, with significant Fibric Organic Crysol. Dominantly horizontal fen areas with significant permafrost build-up areas (palsas and small peat plateaus).

Tr3 - Dominantly Typic Mesisol, with significant Hydric Fibrisols and Fibric Organic Crysols. Very wet fen areas with ponds (open and infilling) and scattered ice-cored palsas or peat plateau areas, too small to be mapped out. These small, usually rounded treed domes often have collapse holes in the centre.

Tributary Floodplain Complex (Tp)

Series Present: complex of Regosolic and Gleysolic soils

Solum Texture: variable, but usually sandy loam

Parent Material: variable textured alluvium; usually sandy loam over gravel

Landform: steeply banked streams grading down gentle gradients into narrow floodplains, frequently with poorly drained backswamps and abandoned channels.

Drainage: variable

Vegetation: variable

Agricultural Capability: 4I or 5I

Map Units:

Tp - complex of Regosolic and Gleysolic soils

Trout Lake Association (Tk)

Series Present: Orthic Gray Luvisol, Brunisolic Gray Luvisol, Gleyed Eluviated Eutric Brunisol, and Rego Gleysol - peaty phase.

Solum Texture: clay loam

Parent Material: moderately calcareous, fine loamy (clay loam) textured glacial till

Landform: strongly-ridged and rolling

Drainage: well to moderately-well drained; imperfectly and poorly drained

Vegetation: mostly mixed deciduous forest, but white spruce occurs on some moister sites and jack pine on drier sites.

Agricultural Capability: 3D; frequently 4T due to steep slopes

Map Units:

Tk1 - Dominantly Orthic Gray Luvisol.

Tk2 - Dominantly Orthic Gray Luvisol, with significant Rego Gleysol - peaty phase.

Tk3 - Dominantly Orthic Gray Luvisol, with significant Brunisolic Gray Luvisol and Gleyed Eluviated Eutric Brunisol.

Winter Road Association (Wr)

Series Present: Eluviated Eutric Brunisol, Orthic Gray Luvisol, and Rego Gleysol - peaty phase.

Solum Texture: sandy loam to loamy fine sand

Parent Material: moderately calcareous, stratified sandy glaciofluvial and silty glaciolacustrine veneer overlying till. The veneer material consists of sandy loam to loamy fine sand textured glaciofluvial material with thin (1 to 5cm) silt loam and silty clay loam textured bands of glaciolacustrine material.

Landform: level to gently undulating

Drainage: well drained; poorly drained

Vegetation: well drained areas support moderately dense stands of mature mixedwood forest, with an understory of alder, rose, lowbush cranberry, bog cranberry, bunchberry, and feathermosses. Regenerating forest consists of mixtures of dense young pine and aspen, in which white spruce may later establish in the understorey. Black spruce forest. with an understory of ericaceous shrubs and mosses occupies poorly drained areas.

Agricultural Capability: 4M

Map Units:

Wr1 - Dominantly Eluviated Eutric Brunisol, with significant Orthic Gray Luvisol.

Wr2 - Dominantly Eluviated Eutric Brunisol, with significant Rego Gleysol - peaty phase.

Yohin Lake Complex (Yn)

Series Present: complex of Brunisolic, Gleysolic, and Regosolic soils

Solum Texture: variable, from gravel to silts and clays

Parent Material: recent alluvium emanating from higher mountain slopes, which have been deposited over older lacustrine deposits.

Landform: broad fans and aprons gently sloping away from the Franklin Mountains

Drainage: variable

Vegetation: variable

Agricultural Capability: 5I

Map Units:

Yn1 - complex of Brunisolic, Gleysolic, and Regosolic soils

Hay River Valley Area - Description of Soils and Soil Map Units

Alluvium Complex (Av)

Series Present: Regosols and Gleysols

Surface Texture: Variable

Parent Material: Alluvium, variable in both texture and composition

Landform: Level to channelled

Drainage: Well to poorly drained

Vegetation: The vegetation may be quite variable depending on the frequency of flooding and drainage. The alluvium areas are usually treed. Balsam poplar, aspen, and white spruce are the dominant trees. The understory vegetation varies from sparse to very dense. The vegetation usually consists of willow, alder, buffalo berry, rose, horsetail, and grass.

Agricultural Capability: The alluvium soils are usually subject to flooding and frequently contain some poorly drained phases. These soils have an Agricultural Capability rating of 5 due to inundation (I) or wetness (W).

Map Units:

Av - Dominantly Regosols, with significant Gleysols.

Enterprise Association (Et)

Series Present: Orthic Eutric Brunisol and Rego Gleysol - peaty phase.

Surface Texture: Sand, Loamy Sand, Sandy Loam and Loam (often gravelly).

Parent Material: Coarse textured (sand and loamy sand) to medium textured (sandy loam and loam) gravelly and cobbly beach deposits underlain by Paleozoic and Mesozoic bedrock (typically within 2m of the surface). Scattered bedrock exposures often have thin veneers of frost-shattered and wave-worked rubble.

Landform: Undulating to ridged beach deposits and bedrock escarpment.

Drainage: Rapid to poorly drained.

Vegetation: The dominant tree species are jack pine, white spruce, black spruce, and aspen. The understory usually consists of buffalo berry, willow, rose, Labrador tea, cinquefoil, juniper, bearberry, cranberry, fireweed, lichens, and mosses. The pine stands occur most frequently and are generally quite dense. The poorly drained Enterprise soils are treed with black spruce and tamarack. The understory in this case consists of willow, bog birch, Labrador tea, moss, lichens, sedges, and grass.

Agricultural Capability: The Enterprise soils tend to be rather coarse textured and are often quite shallow to bedrock. They may also be quite stony to the surface. The Agricultural Capability rating of these soils are a mixture of classes, 5M, 5W, and 7MP. The better soils could be seeded to forages whereas the shallow or excessively stony soils would be non-agricultural. There are a few grasses present but not enough to be of any grazing value.

Map Units:

Et1 - Dominantly Orthic Eutric Brunisol, with significant Rego Gleysol - peaty phase.

Et2 - Dominantly Rego Gleysol - peaty phase, with significant Orthic Eutric Brunisol.

Grumbler Rapids Association (Gr)

Series Present: Orthic Eutric Brunisol, Eluviated Eutric Brunisol, and Rego Gleysol - peaty phase

Surface Texture: Loamy Sand.

Parent Material: Coarse textured fluvial sands and gravels.

Landform: Level to undulating fluvial.

Drainage: Well to poorly drained.

Vegetation: The vegetation is mainly jack pine, with some aspen and white spruce. The ground cover is generally quite sparse; it consists of rose, lichen, grass, bearberry and some buffalo berry, cranberry, and juniper. Where aspen and white spruce are more prevalent the understory vegetation becomes denser. The poorly drained sites usually consist of black spruce, tamarack, willow, bogbirch, cinquefoil, Labrador tea, bearberry, mass, and sedge.

Agricultural Capability: The Grumbler Rapids soils are rated as 5M due to their low moisture holding capacity. The poorly drained sites would be rated as 5W due to wetness. These soils are only suited for forage production.

Map Units:

Gr1 - Dominantly a combination of Orthic Eutric Brunisol and Eluviated Eutric Brunisol.

Gr2 - Dominantly Orthic Eutric Brunisol, with significant Rego Gleysol - peaty phase.

Gr3 - Dominantly Rego Gleysol - peaty phase, with significant Orthic Eutric Brunisol.

Hay River Association (Hy)

Series Present: Orthic Eutric Brunisol, Cumulic Regosol, and Rego Gleysol - peaty phase.

Surface Texture: Fine sandy loam to silty clay loam.

Parent Material: Fine sandy loam to silty clay loam textured alluvial material deposited by the Hay River.

Landform: Level to undulating or channelled alluvial.

Drainage: Well to poorly drained.

Vegetation: White spruce, balsam poplar, and aspen are common on the river terraces; these trees occur in both pure are mixed stands. Occasionally some birch may also be found. The shrub growth is often dense, consisting of willow, alder, Labrador tea, rose, and buffalo berry. The ground cover is quite variable but usually consists of fireweed, horsetail, grass, and moss.

Agricultural Capability: The majority of the Hay River soils have an Agricultural Capability rating of Class 3CH. These soils are suitable for grain and market garden production. On the other hand, the Hay River soils near the Alberta border and near Great Slave Lake (cool summer temperatures), and those that are predominantly Gleysols (excessive wetness), have an Agricultural Capability rating of 5CH and 5W, respectively. These latter soils are suitable only for forage production.

Map Units:

Hy1 - Dominantly a combination of Orthic Eutric Brunisol and Cumulic Regosol, with significant Rego Gleysol – peaty phase.

Hy2 - Dominantly Cumulic Regosol.

Hy3 - Dominantly Rego Gleysol - peaty phase.

Hy4 - Dominantly Orthic Eutric Brunisol, with significant Rego Gleysol - peaty phase.

Hy5 - Dominantly Cumulic Regosol, with significant Rego Gleysol - peaty phase.

Hillwash Complex (Hw)

Series Present: Variable mixtures of Regosols and Brunisols.

Surface Texture: Variable.

Parent Material: Variable in texture and composition, including colluvial, fluvial, morainal and Paleozoic bedrock.

Landform: Steep slope and escarpments along major rivers and streams.

Drainage: Rapidly drained.

Vegetation: The vegetation may be quite variable. The slopes are usually treed. Aspen, jack pine and white spruce are the dominant trees. The understory is generally quite dense except on eroding slopes. Some of the common shrubs and herbs include willow, alder, Labrador tea, buffalo berry, rose, bearberry, cranberry, fireweed, moss and grass. Some areas are largely devoid of vegetation due to recent slope failures and severe erosion.

Agricultural Capability: These soils are generally in Agricultural Capability Class 7. They are generally to steep for agricultural use and are subject to severe erosion.

Map Units:

Hw - Dominantly a complex mixture of Regosols and Brunisols, with significant exposed bedrock (escarpments).

Swan Lake Association (Sk)

Series Present: Gleyed Eutric Brunisol and Rego Gleysol.

Surface Texture: Silty clay loam to silty clay.

Parent Material: Silty clay loam and silty clay textured, calcareous glaciolacustrine materials.

Landform: Undulating glaciolacustrine plain.

Drainage: Well to poorly drained.

Vegetation: Aspen groves are the most common vegetative type on the well drained soils. White spruce is usually found along with the aspen but seldom forms pure stands. These areas usually have a good ground cover of willow, buffalo berry, cranberry, Labrador tea, fireweed, rose, and moss. Poorly drained areas are usually treed with black spruce and have a good growth of willow, Labrador tea, bog birch, cranberry, shrubby cinquefoil, and moss.

Agricultural Capability: The majority of the Swan Lake soils have an Agricultural Capability rating of either 5CH or 5W. These soils are best suited for forage production. Some Swan Lake soils that occur near the Hay River or Swan Lake have an Agricultural Capability rating of 3CH. The well drained soils in this area could be used for grain or market gardens.

Map Units:

Sk1 - Dominantly Gleyed Eutric Brunisol.

Sk2 - Dominantly Gleyed Eutric Brunisol, with significant Rego Gleysol.

Sk3 - Dominantly Rego Gleysol, with significant Gleyed Eutric Brunisol.

Swede Association (Sw)

Series Present: Orthic Eutric Brunisol and Rego Gleysol - peaty phase.

Surface Texture: Loamy Sand.

Parent Material: Coarse textured sandy and gravelly beach deposits.

Landform: Level to gently undulating and ridged beach deposits.

Drainage: Well to poorly drained.

Vegetation: The well drained sites are usually dominantly jack pine, although white spruce and aspen are generally present. Occasionally aspen will be the dominant tree in some areas. The understory is composed of willow, rose, buffalo berry, bearberry, fireweed, cranberry, cinquefoil, lichen, moss, and grass. The poorly drained sites have black spruce and tamarack, The shrubs and herbs common to these wet sites are willow, bog birch, cinquefoil, Labrador tea, bearberry, juniper, moss, and sedge.

Agricultural Capability: The Swede soils have an Agricultural Capability rating of Class 5. The well drained soils are 5M due to a low moisture holding capacity while the poorly drained sites are 5W due to wetness. These soils are best suited to forage production.

Map Units:

Sw1 - Dominantly Rego Gleysol -.peaty phase, with significant Orthic Eutric Brunisol.

Sw2 - Dominantly Orthic Eutric Brunisol, with significant Rego Gleysol - peaty phase.

Tathlina Association (Ta)

Series Present: Orthic Eutric Brunisol, Orthic Gray Luvisol, and Rego Gleysol - peaty phase.

Surface Texture: Clay loam to silty clay.

Parent Material: Clay loam to silty clay textured, calcareous glacial till (morainal) deposits.

Landform: Undulating till (morainal) plain.

Drainage: Well to poorly drained.

Vegetation: The dominant tree species on the well drained sites is aspen, however, white spruce, black spruce, and jack pine are common. The ground cover usually consists of willow, bearberry, buffalo berry, rose, fireweed, cranberry. grass and masses, The poorly drained areas consist of black spruce and tamarack with willow, fireweed, twinflower, crowberry, sedges, and moss.

Agricultural Capability: Approximately half of the Tathlina soils have an Agricultural Capability rating of Class 3CH. These soils are suitable for grain or market gardens. The rest of the Tathlina soils are rated as Class 5 due to cool climate or excessive wetness (Gleysols). These soils should be restricted to forage production.

Map Units:

Ta1 - Dominantly Orthic Eutric Brunisol.

Ta2 - Dominantly Orthic Eutric Brunisol, with significant Rego Gleysol - peaty phase.

Ta3 - Dominantly Rego Gleysol - peaty phase, with significant Orthic Eutric Brunisol.

Ta4 - Dominantly Orthic Gray Luvisol and significant Rego Gleysol - peaty phase.

Tributary Floodplain Complex (Tp)

Series Present: Rego Gleysol - peaty phase (with inclusions of Gleyed Regosol, Gleyed Cumulic Regosol, and Orthic Regosol)

Surface Texture: Variable.

Parent Material: The parent material is variable in texture and composition.

Landform: Channelled alluvial deposits associated with small streams and adjacent valley slopes.

Drainage: Poorly drained; inclusions of moderately well to imperfectly drained

Vegetation: The vegetation consists of willow, bog birch, sedge, and grass along with a few small tamarack and black spruce. Some better-drained areas have white spruce.

Agricultural Capability: These are dominantly Class 7 soils, which are usually too wet or subject to frequent inundation due to flooding. However, some moderately-well to imperfectly drained Regosols and Cumulic Regosols do occur locally as inclusions (particularly east of Hay River) and may be assigned a Class 4 rating.

Map Units:

Tp - Dominantly Rego Gleysol - peaty phase (with inclusions of Gleyed Regosol, Gleyed Cumulic Regosol, and Orthic Regosol)

Grainger Association (G)

Series Present: Fibric Organic Cryosol.

Parent Material: Fibric organic (bog peat) deposits, commonly with permafrost (cryic).

Landform: Peat plateaus and flat bogs usually with frequent collapse scars and thermokarst ponds.

Drainage: Very poor.

Vegetation: The vegetation generally consists of black spruce, tamarack, willow, Labrador tea, bog birch, crowberry, bearberry, lichens, sphagnum, moss, some sedges and grass. The trees are usually small and widely spaced. There may be some pine or birch, in certain areas, usually as a result of forest fires.

Agricultural Capability: These soils are usually too wet and are considered non-arable. They are Class 7W or non-agricultural soils.

Map Units:

G - Dominantly Fibric Organic Crysol.

Trail River Association (Tr)

Series Present: Mesisol and Fibric Organic Cryosol.

Parent Material: Mesic and fibric organic (fen peat) deposits.

Landform: Patterned and horizontal or flat fens.

Drainage: Very poor.

Vegetation: The vegetation consists mainly of willow, bog birch, sedges, and grasses. Scattered, often stunted, tamarack and black spruce may be present but are seldom abundant.

Agricultural Capability: These soils are too wet for agricultural use. They are considered to be Class 7W.

Map Units:

Tr - Dominantly Mesisols, with significant Fibric Organic Cryosol.

Upper Mackenzie River Area - Description of Soils and Soil Map Units

Alluvium Land Type (A)

Soils Present: complex mixture of Regosols and Gleysols

Solum Texture: variable

Parent Material: recent exposed alluvium on river islands and active floodplains

Landform: level active floodplains

Drainage: moderately-well to poorly drained (depending on the height above the river).

Vegetation mainly a sparse cover of willow, horsetail, spruce seedlings, and grasses on the lowest sand bars, and balsam poplar, willow, alder, and rose on the old sand bars and terraces.

Agricultural Capability: These soils are rated 7SI because they are usually flooded during the spring breakup.

Antoine Series (An)

Soils Present: Rego Gleysol - carbonated phase

Solum Texture: sand to loamy sand

Parent Material: coarse textured, weakly to moderately calcareous glaciofluvial and fluvio-lacustrine deposits, frequently modified by wind.

Landform: level to gently sloping plains and low dunes

Drainage: poorly drained

Vegetation: undescribed

Agricultural Capability: rated 5W due to poor drainage.

Berens Series (Be)

Soils Present: Orthic Eutric Brunisol, Eluviated Eutric Brunisol

Solum Texture: silt loam, loam and silty clay loam

Parent Material: medium textured, moderately calcareous, stratified alluvial deposits, underlain by stony, gravelly moderately-fine textured, moderately calcareous glacial till at depths beyond 1m

Landform: level to very gently sloping river terraces and floodplains

Drainage: well drained

Vegetation: mainly aspen and white spruce, with an understory of willow, saskatoon, rose, buffalo berry, highbush cranberry, and other species.

Agricultural Capability rated as 3C, as the soils are well drained and permeable and have a good moisture-holding capacity. Furthermore, they are adjacent to the river and easily irrigated.

Boulogne Series (Bu)

Soils Present: Orthic Regosol

Solum Texture: sandy loam, very fine sandy loam, and loam

Parent Material: medium textured, moderately calcareous, stratified alluvial deposits.

Landform: level to very gently sloping river terraces and floodplains

Drainage: well to moderately-well drained

Vegetation: mainly a mixture of aspen, white and black spruce, jack pine, balsam poplar, and white birch, with an understory of alder, willow, dwarf birch, buffalo berry, cinquefoil, and red osier dogwood, alpine bearberry, fireweed, peavine, paintbrush, horsetail, strawberry, sedges, various grasses, and lichens.

Agricultural Capability: generally rated as 5W. In some places, particularly in the vicinity of Meridian Island, these soils may be flooded occasionally.

Bouvier Series (Bv)

Soils Present: Rego Gleysol - peaty phase

Solum Texture: gravelly sandy loam and sandy loam

Parent Material: gravelly, coarse to moderately-coarse textured, weakly calcareous glaciolacustrine beach deposits underlain by moderately-fine textured, moderately calcareous, amorphous glaciolacustrine deposits

Landform: very gently sloping plains with low, irregular beach ridges

Drainage: poorly drained

Vegetation: mainly a mixture of white spruce, black spruce, and tamarack, with an understory of dwarf birch, cinquefoil, willow, rose, horsetail, Labrador tea, bunchberry, lichens, and mosses.

Agricultural Capability: rated 5W since these soils are poorly drained and slow to warm up in the spring.

Cache Series (Ca)

Soils Present: Orthic Gray Luvisol

Solum Texture: gravelly loam, loam, and silty clay loam

Parent Material: thin veneer of stony, gravelly medium textured, moderately calcareous glaciolacustrine beach deposits, underlain by stony, moderately fine textured moderately calcareous glacial till.

Landform: gently sloping plains

Drainage: well drained

Vegetation: mainly a mixture of aspen, white spruce, and balsam poplar, with an understory of buffalo berry, roses, alpine bearberry and mosses.

Agricultural Capability: rated 7P, due to the exceedingly stony nature of the surface.

Caen Series (Cn)

Soils Present: Orthic Gray Luvisol

Solum Texture: loam, and sandy clay loam and clay

Parent Material: medium to fine textured, calcareous glaciolacustrine beach deposits underlain by fine textured, calcareous, stratified glaciolacustrine deposits.

Landform: very gently sloping plains, with low, irregular beach ridges

Drainage: well to moderately-well drained

Vegetation: mainly a mixture of aspen, white spruce, and jack pine, with an understory of rose, buffalo berry, highbush cranberry, willow, bunchberry, and strawberry.

Agricultural Capability: rated 4S, due to tight and relatively impermeable Bt horizon.

de Roche Series (dR)

Soils Present: Orthic Regosol

Solum Texture: gravelly loam, gravelly sandy loam and gravelly sand

Parent Material: thin veneer of gravelly medium to moderately-fine textured, weakly calcareous glaciolacustrine beach deposits underlain by moderately- fine textured, moderately calcareous, stratified glaciolacustrine deposits.

Landform: very gently sloping plains, with low, irregular beach ridges

Drainage: well to moderately-well drained

Vegetation: mixture of white and black spruce, tamarack, and balsam poplar, with an understory of alder, dwarf birch, willow, buffalo berry, cinquefoil, juniper, alpine bearberry, bunchberry, sedges, and mosses.

Agricultural Capability: rated 4S.

Desmarais Series (De)

Soils Present: Rego Gleysol - peaty phase

Solum Texture: gravelly loam

Parent Material: thin veneer of gravelly, stony, moderately-coarse to medium textured, strongly calcareous glaciolacustrine beach deposits underlain by angular gravel, flaggy stones and/or paleozoic bedrock (usually dolomitic).

Landform: level; bedrock controlled

Drainage: poorly drained

Vegetation: mainly black spruce and tamarack, with an understory of willow, dwarf birch, juniper, cinquefoil, alpine bearberry, sedges, mosses and lichens.

Agricultural Capability: rated 7PW, due to stoniness and poor drainage.

Dieppe Series (Dp)

Soils Present: Orthic Eutric Brunisol, Eluviated Eutric Brunisol

Solum Texture: gravelly loamy sand and gravelly sandy loam

Parent Material: thin veneer of gravelly, moderately-coarse textured glaciolacustrine beach deposits underlain by moderately-fine textured, moderately calcareous, stratified glaciolacustrine deposits

Landform: very gently sloping to level

Drainage: well to moderately-well drained

Vegetation: mixture of white spruce, jack pine, aspen, and white birch, with an understory of alder, willow, cinquefoil, buffalo berry, rose, alpine bearberry, bunchberry, fireweed, and peavine.

Agricultural Capability: rated 4M, due to poor moisture-holding capacity.

Dory Series (Do)

Soils Present: Rego Gleysol, occasional Rego Gleysol – peaty phase

Solum Texture: gravelly loam, gravelly clay loam, and gravelly silty clay loam

Parent Material: thin veneer of gravelly, stony, medium to moderately-fine textured, moderately calcareous glaciolacustrine beach deposits underlain by moderately- fine textured, moderately calcareous, amorphous glaciolacustrine deposits.

Landform: level to very gently sloping, with low, irregular beach ridges

Drainage: poorly drained

Vegetation: mainly black spruce and tamarack, with an understory of black spruce seedlings, willow, dwarf birch, cinquefoil, rose, alpine bearberry, bearberry, Labrador tea, sedges, and lichens.

Agricultural Capability: rated 7WP due to poor drainage and stoniness.

Enterprise Series (Et)

Soils Present: Orthic Eutric Brunisol, with occasional Eluviated Eutric Brunisol and Orthic Gray Luvisol

Solum Texture: gravelly sandy loam, gravelly loam, loam, and gravelly sandy clay loam

Parent Material: thin veneer of moderately-coarse to medium textured, strongly calcareous glaciolacustrine beach deposits, containing various amounts of angular gravel and flaggy stones, underlain by calcareous paleozoic bedrock (usually dolomitic); occasional bedrock outcrops.

Landform: level to gently sloping; minor areas of moderately to strongly sloping; occasional bedrock escarpments

Drainage: well drained

Vegetation: mixture of jack pine, white spruce, and aspen, with an understory of pine seedlings, buffalo berry, willow, rose, bearberry, Labrador tea, cinquefoil, lichens, mosses, and grasses.

Agricultural Capability: rated 7MP, due to low moisture-holding capacity and stoniness.

Eroded River Banks and Escarpments (Er)

Soils Present: complex mixture of Regosolic and Brunisolic soils.

Solum Texture: variable

Parent Material: variable textured materials which have been moved downslope by gravity (colluvium) and water erosion (slope wash), mixed with occasional bedrock outcrops.

Landform: steeply sloping; occasional bedrock escarpments

Drainage: rapidly to well drained

Vegetation: nearly devoid of vegetation, but the less steep areas are fully vegetated.

Agricultural Capability: rated 7T due to the steep, unstable slope.

Escarpment Complex (Es)

Soils Present: Orthic Eutric Brunisol - lithic phase, Orthic Regosol – lithic phase

Solum Texture: gravelly sandy loam, gravelly loam

Parent Material: thin veneer of moderately-coarse to medium textured, strongly calcareous glaciolacustrine beach deposits, containing high volumes of angular gravel and flaggy stones, underlain by calcareous paleozoic bedrock (usually dolomitic); frequent bedrock outcrops.

Landform: level to gently sloping; minor areas of moderately to strongly sloping; occasional bedrock escarpments

Drainage: well to rapidly drained

Vegetation: mainly low density aspen and pine, with an understory of willow, buffalo berry, juniper, cranberry, rose, peavine, raspberry,grasses, fireweed, bearberry, and lichens.

Agricultural Capability: rated 7RP, due to rock outcrops and stoniness.

Grainger Series (G)

Soils Present: Fibric Organic Cryosol, Mesic Organic Cryosol

Solum Texture: N/A

Parent Material: fibric to mesic peat deposits with permafrost within 50 cm of the surface.

Landform: level, with rough, hummocky microtopography

Drainage: very poorly drained

Vegetation: mainly open with a ground cover of moss, Labrador tea, leatherleaf, bearberry, lichens, liverwort, cloudberry, and black crowberry, with scattered black spruce, tamarack, white birch, and jack pine.

Agricultural Capability: not suitable for agriculture, but are not rated in the soil capability classification. In the context of soil capability they would be placed in class 7.

Gros Cap Series (Gc)

Soils Present: Orthic Gray Luvisol

Solum Texture: loam, sandy loam, and silty clay loam

Parent Material: medium textured, moderately calcareous, stratified alluvial deposits.

Landform: level to gently sloping; occasional moderately sloping areas

Drainage: well drained

Vegetation: mainly aspen, with an understory of willow, buffalo berry, rose, current, highbush cranberry, bearberry, and fireweed.

Agricultural Capability: rated 3C in the level areas and 4T in the moderately sloping areas.

Hansen Series (Hn)

Soils Present: Rego Gleysol - peaty phase

Solum Texture: silty clay loam, clay loam and loam

Parent Material: thin veneer of stony, medium textured, glaciolacustrine beach deposits, underlain by stony, moderately fine textured moderately calcareous glacial till.

Landform: level to depressional

Drainage: poorly drained

Vegetation: mainly a mixture of balsam poplar, aspen, white and black spruce, with an understory of buffalo berry and mosses.

Agricultural Capability: rated 7WP, due to their stoniness and poor drainage.

Harris Series (Hr)

Soils Present: Orthic Eutric Brunisol

Solum Texture: loam and gravelly loam

Parent Material: thin veneer of stony, gravelly medium textured, glaciolacustrine beach deposits, underlain by stony, moderately fine textured, moderately calcareous glacial till.

Landform: gently sloping

Drainage: well drained

Vegetation: mainly aspen and white spruce, with an understory of alder, willow, bunchberry, rose, buffalo berry, lichens and mosses.

Agricultural Capability: rated 7P, due to stoniness.

Hay Complex (Hy)

Soils Present: Orthic Eutric Brunisol, Orthic Gray Luvisol and Eluviated Eutric Brunisol

Solum Texture: loam and silty clay loam

Parent Material: moderately-fine textured, moderately calcareous alluvial deposits, with frequent buried humus and woody layers (cumulic banding).

Landform: level to gently sloping river terraces and floodplains

Drainage: well drained

Vegetation: dense aspen and white spruce forests.

Agricultural Capability: rated 3C, and are suitable for the production of any crop that can be grown under the climatic conditions.

Horn Series (Ho)

Soils Present: Orthic Regosol

Solum Texture: silty clay loam, clay loam and silty clay loam

Parent Material: moderately-fine to fine textured, moderately calcareous glaciolacustrine deposits.

Landform: level to very gently sloping

Drainage: well to moderately-well drained

Vegetation: mainly a mixture of white spruce, black spruce, aspen, and balsam poplar, , with an understory of cranberry, buffalo berry, rose, willow, bearberry, horsetail, peavine, and mosses.

Agricultural Capability: rated 3C, with only climate limitations (too much or too little rain at planting or harvesting time; frost at harvest time)

Laferte Series (Lf)

Soils Present: Orthic Eutric Brunisol

Solum Texture: clay loam

Parent Material: stony, moderately-fine textured, strongly calcareous glacial till deposits.

Landform: gently sloping

Drainage: well drained

Vegetation: mainly pine, with occasional aspen and balsam poplar, and an understory of including alder, buffalo berry, rose, and bearberry.

Agricultural Capability: rated 4P, as they are moderately to very stony.

Liard Series (L)

Soils Present: Cumulic Regosol

Solum Texture: loam

Parent Material: medium textured, moderately calcareous, stratified alluvial deposits, with frequent buried humus and woody layers (cumulic banding).

Landform: very gently sloping river terraces and floodplains, with shallow abandoned drainage channels.

Drainage: well drained

Vegetation: mainly white spruce and aspen, with an understory of willow, alder, highbush cranberry, rose, red osier dogwood, horsetail, fireweed, and mosses.

Agricultural Capability: rated 3C, with only climate limitations.

Louise Series (Lo)

Soils Present: Rego Gleysol - peaty phase

Solum Texture: silty clay loam

Parent Material: moderately-fine textured, weakly to moderately calcareous, stratified alluvial deposits, with frequent buried humus and woody layers (cumulic banding).

Landform: level river terraces and floodplains

Drainage: poorly drained

Vegetation: mainly willow, black spruce, dwarf birch, sedges, and mosses.

Agricultural Capability: rated 5W, due to poor drainage.

Mackenzie Series (Mk)

Soils Present: Orthic Eutric Brunisol

Solum Texture: silty clay loam and clay loam

Parent Material: moderately-fine textured, weakly to moderately calcareous, stratified alluvial deposits along the Mackenzie River.

Landform: level to gently sloping river terraces and floodplains

Drainage: well drained

Vegetation: mixture of dense white spruce, aspen, and white birch, with an understory of highbush cranberry, buffalo berry, mosses, and lichens.

Agricultural Capability: rated 3C, with only climatic limitations.

Martin River Series (Mr)

Soils Present: Orthic Eutric Brunisol and Eluviated Eutric Brunisol

Solum Texture: sand to loamy sand

Parent Material: mesic to humic peat deposits, with occasional permafrost within 50 cm of the surface; usually underlain by mineral soil within 1 m of the surface; occasional thermokarst ponds or small lakes.

Landform: moderately to strongly sloping dunes, mixed with level to very gently sloping plains

Drainage: well to rapidly drained

Vegetation: mainly white spruce, with some jack pine and white birch, with an understory rose, bunchberry and mosses.

Agricultural Capability: rated 4M.

Matou Series (Ma)

Soils Present: Terric Mesisol and Terric Humic Mesisol; occasional Mesic Organic Cryosol

Solum Texture: N/A

Parent Material: mesic to humic peat deposits, with occasional permafrost within 50 cm of the surface; usually underlain by mineral soil within 60 to 100 cm of the surface; occasional thermokarst ponds or small lakes.

Landform: level to very gently sloping or depressional

Drainage: very poorly drained

Vegetation: mainly willow, black spruce, tamarack, juniper, dwarf birch, Labrador tea, mosses, lichens, sedges, and grasses.

Agricultural Capability: not suitable for agriculture, but are not rated in the soil capability classification. In the context of soil capability they would be placed in class 7.

Meridian Series (Me)

Soils Present: Orthic Regosol

Solum Texture: loam, silt loam and silty clay loam

Parent Material: medium to moderately-fine textured stratified alluvial deposits, underlain by weakly to moderately calcareous, stratified glaciolacustrine deposits.

Landform: very gently sloping river terraces and floodplains

Drainage: well to moderately-well drained

Vegetation: mainly a mixture of aspen, balsam poplar, and white spruce, with an understory of willow, white birch, alder, highbush cranberry, rose, buffalo berry, fireweed, horsetail, bunchberry and mosses.

Agricultural Capability: rated 3C, with only climatic limitations.

Mills Lake Series (Mi)

Soils Present: Rego Gleysol and Rego Gleysol - peaty phase

Solum Texture: clay loam and silty clay loam

Parent Material: moderately-fine to fine textured, moderately calcareous stratified glaciolacustrine deposits.

Landform: level

Drainage: poorly drained

Vegetation: mixture of aspen, balsam poplar, and white spruce, with an understory of tall alder, rose, horsetail, highbush cranberry, red current, Labrador tea, fireweed, and grasses. In some areas, however, the vegetation cover consists largely grasses and sedges, with some scattered clumps of willow and dwarf birch.

Agricultural Capability: rated 5W, as they are poorly drained and are cold and slow to warm up in the spring.

Morrisey Series (Mo)

Soils Present: Orthic Gray Luvisol

Solum Texture: silty clay loam, clay loam and silty clay

Parent Material: moderately-fine to fine textured, moderately calcareous stratified glaciolacustrine deposits.

Landform: level to very gently sloping

Drainage: well to moderately-well drained

Vegetation: mixture of white spruce, aspen, balsam poplar,with an understory of willow, buffalo berry, fireweed, rose, bearberry and grasses.

Agricultural Capability: rated 3C, with only climatic limitations.

Poplar Series (Po)

Soils Present: Orthic Eutric Brunisol

Solum Texture: silty clay loam, clay loam and loam

Parent Material: moderately-fine textured, moderately calcareous, stratified alluvial deposits.

Landform: level to gently sloping river terraces and floodplains

Drainage: well drained

Vegetation: mainly aspen, with an understory of willow, alder, buffalo berry, rose, highbush cranberry and mosses.

Agricultural Capability: rated 3C, with only climatic limitations.

Providence Series (Pr)

Soils Present: Orthic Eutric Brunisol

Solum Texture: silty clay loam

Parent Material: moderately-fine to fine textured, moderately to strongly calcareous stratified glaciolacustrine deposits; below 200m elevation.

Landform: level to very gently sloping

Drainage: well drained

Vegetation: in burned areas, mainly young aspen, with willow, buffalo berry, fireweed, rose, bearberry, and grass. In unburned areas, jack pine and tamarack are the main tree species.

Agricultural Capability: rated 3C, with only climatic limitations.

Redknife Complex (Rk)

Soils Present: Rego Humic Gleysol and Rego Gleysol (some may be peaty phase)

Solum Texture: silty clay loam

Parent Material: moderately-fine textured, weakly to moderately calcareous, amorphous alluvial deposits.

Landform: level river terraces and floodplains

Drainage: poorly drained

Vegetation: mainly willow, with occasional aspen, white birch, and alder, and a ground cover dominated by sedges, with some grass, peavine, fireweed, horsetail, and occasional buffalo berry.

Agricultural Capability: rated 5W, due to poor drainage.

Sarristo Series (Sa)

Soils Present: Orthic Eutric Brunisol

Solum Texture: gravelly loam, gravelly sandy clay loam and gravelly sandy loam

Parent Material: thin veneer of stony, gravelly, medium to moderately-fine textured, weakly calcareous glaciolacustrine beach deposits underlain by moderately- fine textured, moderately calcareous, amorphous glaciolacustrine deposits.

Landform: very gently sloping, with low, irregular beach ridges

Drainage: well to moderately-well drained

Vegetation: mixture of white spruce, tamarack, and white birch, with an understory of willow, spruce seedlings, rose, grasses, and bearberry. Some areas are covered by a mixture of jcak pine, white spruce, and black spruce. In burned areas, regenerating aspen is the dominant tree.

Agricultural Capability: are rated 4P (moderately stony areas) and 7P (exceedingly stony areas).

Sloughs and marshes (S)

Soils Present: N/A

Solum Texture: N/A

Parent Material: small ponds, lakes and marshes

Landform: N/A

Drainage: very poorly drained

Vegetation: open water, with some areas of aquatic sedges and rushes

Agricultural Capability: not rated.

Spence River Series (Sp)

Soils Present: Eluviated Eutric Brunisol

Solum Texture: loamy sand; occasional sandy loam

Parent Material: coarse textured, weakly to moderately calcareous, stratified glaciofluvial deposits.

Landform: level to gently sloping

Drainage: rapidly drained

Vegetation: mixture of jack pine, aspen, and white spruce, with an sparse understory of rose, bearberry, and mosses, with occasional clumps of juniper and buffalo berry.

Agricultural Capability: rated 5M, as they have low fertility and are droughty.

Strong Point Series (St)

Soils Present: Orthic Eutric Brunisol and Eluviated Eutric Brunisol

Solum Texture: sandy loam and loam

Parent Material: moderately-coarse to medium textured, moderately calcareous, stratified glaciofluvial deposits.

Landform: very gently to moderately sloping

Drainage: well to rapidly drained

Vegetation: mixture of white spruce, tamarack, and aspen, with an understory of buffalo berry, bearberry, alpine bearberry, mosses and reindeer lichen.

Agricultural Capability: rated 4M, with some of the sandy loam soils being somewhat droughty in dry years.

Swede Series (Sw)

Soils Present: Rego Gleysol and Rego Gleysol - peaty phase

Solum Texture: loamy sand and sand

Parent Material: coarse textured, weakly calcareous glaciolacustrine beach deposits.

Landform: level areas between low beach ridges

Drainage: poorly drained

Vegetation: mainly black spruce and tamarack, with an understory of dwarf birch, willow, cinquefoil, Labrador tea, alpine bearberry, reindeer lichen, sedges, and juniper.

Agricultural Capability: rated 5W, due to poor drainage.

Tathlina Series (Ta)

Soils Present: Orthic Gray Luvisol

Solum Texture: very fine sandy loam, sandy clay loam and clay

Parent Material: stony, moderately-fine to fine textured, strongly to extremely calcareous glacial till deposits; frequently eroded or wave-washed surface; above 300 m elevation.

Landform: gently to moderately sloping

Drainage: well to moderately-well drained

Vegetation: mostly aspen forest, with occasional jack pine.

Agricultural Capability: rated 5PT, due to undulating topography and stoniness.

Truesdell Series (Tr)

Soils Present: Gleyed Eutric Brunisol

Solum Texture: clay loam, loam and gravelly clay loam

Parent Material: thin veneer of stony and gravelly medium textured, glaciolacustrine beach deposits, underlain by stony, moderately fine textured moderately calcareous glacial till.

Landform: level to gently sloping

Drainage: imperfectly drained

Vegetation: mainly white spruce, with willow, aspen, rose, and bunchberry.

Agricultural Capability: rated 7P, as they are exceedingly stony.

Twin Falls Complex

Soils Present: Orthic Eutric Brunisol, Brunisolic Gray Luvisol and Eluviated Eutric Brunisol

Solum Texture: sand, loamy sand; occasional sandy loam

Parent Material: coarse textured (sometimes gravelly), weakly calcareous glaciolacustrine beach deposits, with occasional bands of medium textured material.

Landform: level to gently sloping, with low, irregular beach ridges; occasionally moderately and strongly sloping.

Drainage: rapidly to well drained

Vegetation: mainly jackpine, with scattered aspen and white spruce, with a sparse understory of rose, lichen, grasses, bearberry, and occasional clumps of buffalo berry, highbush cranberry, and juniper. Burned areas often have young aspen with fireweed and peavine.

Agricultural Capability: rated 5M, as they have low fertility and are droughty.

Vale Series

Soils Present: Cumulic Regosol

Solum Texture: silty clay loam

Parent Material: moderately-fine textured, weakly to moderately calcareous, stratified alluvial deposits, with frequent buried humus and woody layers (cumulic banding).

Landform: level to gently sloping river terraces and floodplains

Drainage: well to moderately-well drained

Vegetation: dense stands of mixed woods, dominantly white spruce with some aspen, and a considerable amount of undergrowth.

Agricultural Capability: rated 3C, with only climatic limitations.

Slave River Valley Area - Description of Soils and Soil Map Units

Alluvium Land Type (A)

Soils Present: complex mixture of Cumulic Regosols and Gleysols

Solum Texture: Variable, sand to silty clay loam

Parent Material: weakly to moderately calcareous, stratified alluvium, variable in both texture and composition.

Landform: Level to channelled areas along the banks of the Slave River and on the shoals, bars, and low terraces in the delta at the mouth of the river.

Drainage: Well to poorly drained (depending on the height above the river).

Vegetation: mainly willow, alder, and balsam poplar. On the lowest terraces and shoals willow occurs in pure stands, and on the middle terraces alder occurs in thick tangled stands. Balsam poplar occurs on the higher terraces, with an understory of shrubs and forbs including red-osier dogwood, rose, and horsetail.

Agricultural Capability: These soils are rated 7I because they are usually flooded during the spring breakup. However, there are many small areas that could be used for garden crops. The moisture-holding capacity is good on the loam soils and good quality water is available for irrigation.

Brûlé Series

Soils Present: Cumulic Regosol

Solum Texture: silty clay loam or clay

Parent Material: moderately fine textured, moderately calcareous, stratified alluvium with buried organic layers (cumulic banding).

Landform: gently undulating to level

Drainage: well to moderately-well drained

Vegetation: mainly trembling aspen, white spruce, and black spruce, with an understory of soapberry, fireweed, alpine bearberry, and grass.

Agricultural Capability: individually rated 3C for arable agriculture. They should be capable of producing feed grain and forage. When cultivated they will probably need applications of N and P fertilizers. However, they are usually associated with poorly drained Taltson soils and sloughs in a braided pattern and are therefore rated 4T.

Clewi Series (C)

Soils Present: Orthic Eutric Brunisol

Solum Texture: silty clay loam

Parent Material: moderately-fine textured, weakly to moderately calcareous lacustrine and alluvial deposits, often underlain by a weakly calcareous sandy material at an average depth of 70 cm.

Landform: level to gently undulating terraces along the Slave and the Salt Rivers

Drainage: well drained

Vegetation: trembling aspen, white spruce, balsam poplar, and willow, with an understory of soapberry, rose, high bush-cranberry, bunchberry, and hairy wild ryegrass.

Agricultural Capability: these soils are rated 3C, as they have fairly good moisture-holding capacity. However, the underlying sand tends to inhibit deep rooting, which may make the soils droughty in some years.

Desmarais Series (De)

Soils Present: Rego Gleysol – peaty phase

Solum Texture: stony, gravelly loam

Parent Material: slightly stony and gravelly, moderately-coarse to medium textured, moderately calcareous, glaciolacustrine beach deposits underlain by limestone, calcareous sandstone, or shattered angular cobbles and gravel derived from this underlying bedrock. Usually overlain by a thin peat layer 10 cm or more thick.

Landform: gently to moderately sloping, sub-parallel beach ridges.

Drainage: poorly drained

Vegetation: mainly black spruce and tamarack, with willow, dwarf birch, shrubby cinquefoil, and mosses.

Agricultural Capability: these soils are entirely unsuitable for arable agriculture and are rated 7PW

Ennuyeuse Series (En)

Soils Present: Orthic Regosol - lithic phase, Orthic Humic Regosol - lithic phase

Solum Texture: gravelly sandy loam

Parent Material: moderately calcareous, coarse-textured glaciolacustrine beach deposits underlain by ice-scoured and wave-washed limestone and gypsum bedrock.

Landform: isolated hills of Devonian bedrock rising above surrounding lowlands Lowland, which are gently sloping on the knolls and moderately to steeply sloping along the flanks.

Drainage: well to rapidly drained

Vegetation: sparse and patchy white spruce forest, with scattered tamarack. The understory consists of occasional clumps of juniper, interspersed with soapberry, saskatoon, bearberry, lichens, dwarf birch, and grasses.

Agricultural Capability: these soils are not suitable for agricultural development because they are shallow to bedrock. They are rated 7R.

Enterprise Complex (Et)

Soils Present: Orthic Eutric Brunisol (some are lithic phase), occasional Eluviated Eutric Brunisol

Solum Texture: stony, gravelly loam or sandy loam

Parent Material: moderately stony and gravelly, moderately-coarse to medium textured, moderately calcareous, glaciolacustrine beach deposits underlain by limestone, calcareous sandstone, or flat angular stones, cobbles and gravel derived from this underlying bedrock.

Landform: gently sloping, but adjacent to the bedrock escarpment it is moderately and strongly sloping. In some places there are sinkholes 5 to 10 m wide and 2 to 3 m deep.

Drainage: well to rapidly drained

Vegetation: mixtures of jack pine, white spruce, and trembling aspen, with an understory of pine seedlings, soapberry, willow, rose, bearberry, Labrador tea, shrubby cinquefoil, lichens, mosses and grasses.

Agricultural Capability: these soils are rated 7MP due to low moisture holding capacity and stoniness.

Eroded Slopes and Riverbanks Land Type (E)

Soils Present: Regosolic

Solum Texture: variable, sands to silts

Parent Material: variable, course to medium textured eroded slopes and riverbanks.

Landform: very steep to sheer (cliffs)

Drainage: rapidly drained

Vegetation: non-vegetated to vegetated

Agricultural Capability: unsuitable for agricultural use

Fort Smith Complex (F)

Soils Present: Orthic Eutric Brunisol, Eluviated Eutric Brunisol, with occasional Gleyed Eutric Brunisol

Solum Texture: variable, includes: loamy sand, sand, sandy loam, fine sandy loam, loam and sandy clay loam.

Parent Material: sandy calcareous deltaic and lacustrine materials, reworked by wind in some areas (eolian).

Landform: level to gently undulating, with narrow-ridged dunes in some areas

Drainage: well to rapidly drained; occasional imperfectly drained

Vegetation: mainly mixtures of trembling aspen, jack pine, and young white spruce with an understory of soapberry, American vetch, rose, and fireweed.

Agricultural Capability: the complex as a whole is rated 5M. Specific occurrences of sandy loam and fine sandy loams, and the soils adjacent to depressions, are rated 4M.

Grand Detour Complex (G, Gp)

Soils Present: Rego Humic Gleysol (G), Rego Gleysol - peaty phase (Gp); some Rego Humic Gleysols have carbonated Ah horizons (carbonated phase).

Solum Texture: silty clay loam, silty clay and clay

Parent Material: veneer of moderately fine and fine-textured, weakly to moderately calcareous lacustrine and alluvial sediments, often underlain by coarse to medium textured (fine sand, fine sandy loam and loam) moderately calcareous material. May be overlain by peat organic material 5 to 15 cm or more thick.

Landform: level or very gently undulating, interrupted in places by stream meanders, sloughs, or lakes.

Drainage: poorly drained

Vegetation: mainly sedges, grasses, and rushes, with scattered clumps of willow, dwarf birch and low herbs. In many areas, trembling aspen, dwarf birch, and willow are invading the grassy meadows.

Agricultural Capability: the non-peaty (G) soils are rated 5W because they are poorly drained and probably unsuitable for the production of feed grains. However, they are well suited to the production of hay. The peaty phase (Gp) soils are rated 6W due to a high seasonal water table.

Iche Series (I)

Soils Present: Regosolic Static Cryosol, possible areas of Cumulic Regosol

Solum Texture: clay loam or silty clay loam

Parent Material: moderately fine textured, weakly to moderately calcareous, stratified alluvium with frequent buried organic layers (cumulic banding), with permafrost at a depth of approximately 80 to 90 cm.

Landform: terraces of the Slave River at a level slightly above the average flood stage

Drainage: moderately-well to imperfectly drained

Vegetation: large white spruce and balsam poplar, with an understory of alder, rose, red-osier dogwood, horsetail, and wintergreen.

Agricultural Capability: individual basic rating of 4S, but are usually in association with Taltson soils and sloughs in a braided pattern and thus are rated 5ST on a landscape level. If cultivated the permafrost would thaw and recede, and may cause some

subsidence of the soil surface. However, they should be able to produce forage and cereal grains because they have a favorable available moisture capacity and organic matter content.

Jean Series (Jn)

Soils Present: Regosolic Static Cryosol, possible areas of Gleyed Orthic Regosol

Solum Texture: clay loam and silty clay loam

Parent Material: moderately-fine textured, weakly calcareous lacustrine sediments, with occasional sand lenses, with permafrost at a depth of approximately 20 to 60 cm.

Landform: level or very gently sloping, with irregular low ridges

Drainage: imperfectly drained

Vegetation: mainly white spruce, tamarack, and balsam poplar, with an understory that includes soapberry, horsetail, alpine bearberry, mosses and lichens.

Agricultural Capability: basic rating of 5S due to poor soil structure, somewhat restricted drainage, and presence of permafrost. However, they are probably capable of producing forage.

Jerome Series (Jr)

Soils Present: Regosolic Static Cryosol, possible areas of Cumulic Regosol

Solum Texture: loam, fine sandy loam and silt loam

Parent Material: medium textured, weakly calcareous stratified alluvium with frequent buried organic layers (cumulic banding), with permafrost at a depth of approximately 20 to 80 cm.

Landform: gently undulating to level terraces of the Little Buffalo and Slave rivers in the permafrost-rich northern third of the lowland.

Drainage: well to moderately-well drained

Vegetation: mainly white spruce, balsam poplar, and white birch, with an understory that includes soapberry, rose, high bush-cranberry, fireweed, horsetail, bearberry, red-osier dogwood, and mosses.

Agricultural Capability: basic rating of 4S, with more severe climate restrictions than in southern areas.

Little Buffalo Series (LB)

Soils Present: Cumulic Regosol

Solum Texture: loam to silt loam

Parent Material: medium textured, weakly calcareous stratified alluvium with frequent buried organic layers (cumulic banding), with permafrost at a depth of approximately 20 to 80 cm. May be underlain by stratified sandy (loamy sand) material at depth.

Landform: gently undulating to level terraces of the Little Buffalo and Slave rivers

Drainage: well to moderately well drained

Vegetation: mainly white spruce, balsam poplar, trembling aspen, with some birch and rarely, tamarack. The shrub layer consists of red-osier dogwood, prickly rose, soapberry, and high bush-cranberry, and the ground cover includes horsetail, strawberry, bearberry, wintergreeen, and mosses.

Agricultural Capability: these are the most fertile soils of the area, and are rated 3C. In many areas, however, they are associated with linear wet meadows (Taltson soils) and sloughs, which slightly diminish their capability on a landscape level.

Lobstick Complex (L, Lp)

Soils Present: Rego or Rego Humic Gleysol (L), Rego Gleysol - peaty phase (Lp)

Solum Texture: silt loam, fine sandy loam, and loam

Parent Material: medium textured, weakly calcareous lacustrine material, located between low ridges of sandier material; sandy materials may occur at depths as shallow as 20 cm. May be overlain by 5 to 30 cm of peat organic material.

Landform: level

Drainage: poorly drained

Vegetation: mainly dwarf birch and willow, with an understory of shrubby cinquefoil, meadowrue, bedstraw, colt's-foot, grasses, yarrow, and other plants. Black spruce, tamarack, and balsam poplar are dominant in some locations.

Agricultural Capability: basic rating of 5W. Areas having peaty surfaces and high water tables are rated 6W. Most of thes soils should be well suited to the production of forage, but are too wet for cereals.

Matou Complex (Ma)

Soils Present: Terric Mesic Fibrisol, Fibric Organic Cryosol

Solum Texture: N/A

Parent Material: fibric to mesic peat developed from sedges, mosses, and wood, underlain by medium to moderately-fine (loam to silty clay loam) textured materials

Landform: level

Drainage: very poorly drained

Vegetation: mainly sedges, rushes, willow, dwarf birch and mosses.

Agricultural Capability: not rated; unsuitable for agriculture. Would be rated class 7.

Norberta Complex (N, Np)

Soils Present: Rego Gleysol – peaty phase, Rego Humic Gleysol; occasional saline phases near the Salt River.

Solum Texture: loamy sand, sand, and sandy loam; occasional silt loam

Parent Material: coarse-textured (sandy), moderately calcareous alluvium, often overlain by 10 to 25 cm of peat organic material.

Landform: level to depressional

Drainage: poorly drained

Vegetation: mainly a mixture of dwarf birch, willow, tamarack, black spruce, Labrador tea, shrubby cinquefoil, colt's-foot, sedges, grasses, and mosses, and but white spruce, balsam poplar, and soapberry also occur.

Agricultural Capability: generally rated 5 W due to wetness, but are well suited to forage production. The peaty phase soils are rated 6W due to high water tables during the growing season, and are thus too wet for the production of forage crops, but may provide native grazing.

Nyarling Complex (Ny)

Soils Present: Fibric Organic Cryosol, Terric Fibrisol

Solum Texture: N/A

Parent Material: fibric peat developed mainly from sphagnum mosses and woody material, usually frozen at depths of 20 to 60 cm. Medium to moderately-fine textured materials may occur within 1m of the surface (terric layer).

Landform: level, with frequent peat plateaus, which rise 1 to 2 m above the surrounding landscape.

Drainage: very poorly drained

Vegetation: mainly a mixture of Labrador tea, mosses, black spruce, tamarack, dwarf birch, willow, and an occasional white birch.

Agricultural Capability: not rated; unsuitable for agriculture. Would be rated class 7.

Oracha Series (O)

Soils Present: Orthic Regosol, Cumulic Regosol

Solum Texture: medium to fine sand, loamy sand, silt loam and loam

Parent Material: veneer of coarse textured (sandy), moderately calcareous alluvium (approximately 30 cm thick) underlain by medium textured (loam to silt loam), moderately calcareous alluvium, which may have occasional organic streaks or buried organic layers (cumulic banding)

Landform: level, low terraces adjacent to the banks of the Slave River, with a few shallow drainage channels incised in the surface

Drainage: well drained

Vegetation: usually white spruce and balsam poplar, with an understory of alder, rose, red-osier dogwood, soapberry, bunchberry, cranberry, gooseberry, horsetail and grasses.

Agricultural Capability: usually rated 4M because of its coarse surface texture. Areas where sand or loamy sand is very shallow and underlain by loam are rated 3C.

Resolution Series (R)

Soils Present: Regosolic Static Cryosol, Regosolic Static Cryosol - peaty phase

Solum Texture: loamy sand, sand; occasional sandy loam layers and bands of silty clay loam and clay loam

Parent Material: course textured (sandy), weakly to moderately calcareous alluvium, with occasional thin streaks of organic matter and buried organic layers (cumulic banding) and silty clay loam and clay loam bands; extensive permafrost at depths of 25 to >100 cm below the surface; may be covered by thin peat organic layers (peaty phase).

Landform: gently undulating

Drainage: imperfectly to poorly drained (due to permafrost)

Vegetation: mainly a mixture of white and black spruce, balsam poplar, and trembling aspen, with an understory of alder, willow, soapberry, bearberry, gooseberry, rose, grasses, and mosses.

Agricultural Capability: generally are rated 7MS because of their coarse texture and the presence of permafrost. The soils that have a fine-textured horizon are rated 5M, but such soils were not separately designated on the soil maps.

Rocher Series (Ro)

Soils Present: Orthic Regosol

Solum Texture: loam, silt loam and fine sandy loam

Parent Material: medium textured, moderately calcareous stratified lacustrine material

Landform: knolls and ridges of a very gently to gently undulating plain

Drainage: well to moderately-well drained

Vegetation: mainly white spruce with some balsam poplar, and tamarack, with an understory of willow, soapberry, rose, mosses and lichens.

Agricultural Capability: are rated 3C, and should be well suited to the production of cereals and of forage.

Rock Outcrop

Soils Present: non-soil

Solum Texture: N/A

Parent Material: Paleozoic and Precambrian bedrock

Landform: level to steeply sloped bedrock outcrop

Drainage: very rapidly drained

Vegetation: non-vegetated or with scattered grass, moss and lichen cover.

Agricultural Capability: rated class 7R

Slave Series (Sv)

Soils Present: Orthic Regosol

Solum Texture: silty clay loam, silty clay and clay

Parent Material: veneer of moderately-fine and fine textured, moderately calcareous lacustrine sediments (approximately 45 to 150 cm thick), underlain by fine sandy material. A loam textured layer may lie between the two materials.

Landform: very gently sloping plain

Drainage: well drained

Vegetation: mainly trembling aspen, white spruce, balsam poplar, and white birch, with an understory of willow, soapberry, rose, fireweed, grasses, and some moss.

Agricultural Capability: generally rated 3C for arable agriculture, and should be capable of producing cereals and forage.

Taltson Complex (T, Tp, Tv)

Soils Present: Rego Humic Gleysol (T), Rego Gleysol - peaty phase (Tp), Rego Humic Gleysol - saline phase (Tv)

Solum Texture: silty clay loam, clay loam and silty clay

Parent Material: moderately fine and fine-textured, moderately calcareous, stratified alluvium, with frequent buried organic layers (cumulic banding) and underlain by fine sandy material; may be overlain by 5 to 30 cm of peat organic material.

Landform: level or very gently sloping

Drainage: poorly drained

Vegetation: dominantly sedges and grasses, with a discontinuous canopy of willow and dwarf birch. Occasional black spruce and tamarack, with an understory of mosses and lichens.

Agricultural Capability: basic rating of 5W due to poor drainage, and are probably slow to warm up in the spring. The peaty-phase soils (Tp) are rated 6W, and are suitable only for grazing in dry years. The saline-phase soils (Tv) are rated 7NW because they are usually always poorly drained, are excessively saline in some parts, and support stands of the poisonous arrow-grass.

APPENDIX B – Soil Capability for Agriculture Classification System

In this classification soils are grouped into seven classes on the basis of soil survey information. Soils in classes 1, 2, 3, and 4 are considered capable of sustained use for cultivated field crops, those in classes 5 and 6 only for perennial forage crops and those in class 7 for neither. Class 1 and 2 are not used in the Northwest Territories. The classes are based on intensity, rather than kind, of their limitations for agriculture. Each class includes many kinds of soil, and many of the soils in any class require unlike management and treatment.

Some of the important factors which classification is based are:

- the soils will be well managed and cropped, under a largely mechanized system;
- land requiring improvements, including clearing, that can be made economically by the farmer, is classed according to its limitations or hazards in use after the improvements have been made. Land requiring improvements beyond the means of the farmer are classed according to its present condition;
- the following are not considered: distance to market, kind of roads, location, size of farms, type of ownership, cultural patterns, skill or resources of individual operators and hazard of crop damage by storms; and
- the classification does not include the capability of soils for trees, tree fruits, small fruits, ornamental plants, recreation or wildlife.

Capability Classes

CLASS 1 – capable of sustained agriculture. The soils are deep, are well to imperfectly drained, hold moisture well and in the virgin state were well supplied with plant nutrients. They can be managed and cropped without difficulty. Under good management they are moderately-high to high in productivity for a wide range of field crops.

CLASS 2 – capable of sustained agriculture. The soils are deep and hold moisture well. The limitations are moderate and the soils can be managed and cropped with little difficulty. Under good management they are moderately-high to high in productivity for a fairly wide range of crops.

CLASS 3 – capable of sustained agriculture. The limitations are more severe than for Class 2 soils. They affect one or more of the following practices: timing and ease of tillage, planting and harvesting, choice of crops and methods of conservation. Under good management they area fair to moderately-high in productivity for a fair range of crops.

CLASS 4 – marginal capability for arable agriculture. The limitations seriously affect one or more of the following practices: timing and ease of tillage, planting and harvesting, choice of crops and methods of conservation. The soils are low to fair in productivity for a fair range of crops but may have high productivity for a specially adapted crop.

CLASS 5 – capability only for permanent pasture, seeded forages and hay. The limitations are so severe that the soils are not capable of use for sustained production of annual field crops. The soils are capable of producing native or tame species of perennial forage plants, and may be improved by use of farm machinery. The improvement practices may include clearing of bush, cultivation, seeding, fertilizing or water control.

CLASS 6 – capability only for unimproved (native) pasture. The soils provide some sustained grazing for farm animals, but the limitations are so severe that improvement by use of farm machinery is impractical. The terrain may be unsuitable for use of farm machinery, or the souls may not respond to improvement or the grazing season may be very short.

CLASS 7 – non-agricultural. This class includes very stony soils, rockland, other non-soil areas and bodies of water too small to show on the maps. Organic soils may also be placed in this category or are left unclassified.

Subclass Limitations

SUBCLASS C: adverse climate – The main limitation is low temperature or low or poor distribution of rainfall during the cropping season, or a combination of these.

SUBCLASS D: undesirable soil structure and/or low permeability – The soils are difficult to till, absorb water slowly or the depth of the rooting zone is restricted.

SUBCLASS E: erosion – Past damage from erosion limits agricultural use of the land or erosion hazard if cultivated.

SUBCLASS F: fertility – Low natural fertility due to lack of available nutrients, high acidity or alkalinity, low exchange capacity, high levels of calcium carbonate or presence of toxic compounds.

SUBCLASS I: inundation – Flooding by streams or lakes limits agricultural use.

SUBCLASS M: moisture – A low moisture holding capacity, caused by adverse inherent soil characteristics, limits crop growth. (Not to be confused with climatic drought).

SUBCLASS N: salinity – The soils are adversely affected by soluble salts (excessive salinity). This limitation is used when the salt concentration is high enough to restrict the growth of most cereal crops (5N or 6N).

SUBCLASS P: stoniness – Excess stones on the surface will hinder cultivation. This limitation is used primarily where the stones are too numerous to pick, in which case the soil is rated 6P or 7P. Some soils are rated 4P in moderately stony areas, where stones are not too numerous to pick

SUBCLASS R: bedrock - Shallowness to solid bedrock. This limitation is used when bedrock outcrops are present at near to the surface (within 1m). These areas are usually devoid of vegetation (7R).

SUBCLASS S: soil limitations – Adverse soil characteristics. A combination of two or more subclasses D, F, M and N. It is used in a collective sense in place of subclasses M and F where these two occur in addition to some other limitations. For example, 6SE has limitations M, F coupled with erosion hazard E.

SUBCLASS T: adverse topography – Either steepness or the pattern of slopes limits agricultural use.

SUBCLASS W: excess water – Excess water other than from flooding limits use for agriculture. The excess water may be due to poor drainage, a high water table, seepage or runoff from surrounding areas.

<u>Subclass Limitations as Applied in the Liard-Mackenzie and Hay River Map Areas</u>
(Rostad et al, 1976; Kozak and Rostad, 1977)

C- Adverse Climate

CA - Climatic limitation due to aridity or low seasonal precipitation.

CH - Climatic limitation due to short growing season and cool temperatures.

- 3CA - The highest class level over the whole area.
- 3CH - The class and limitation present on areas above the floodplains.
- 5CH - Applies to areas at higher elevations, too short a growing season for grain crops.

D: undesirable soil structure

- 3D - Soils with a highly leached surface (Ae) horizon (well developed Luvisols)

E: erosion

- 3E - Soils with few shallow gullies.
- 4E - Soils with many shallow or few deep gullies.
- 5E - Steeply sloping areas.
- 6E, 7E - Creek and river banks or very sandy soils subject to wind erosion.

F: fertility

- 5F - Loamy sand and sand textured soils. .

I: inundation

3I - Flooding more than 2 years in 10, but for short periods.
4I - Annual flooding, but for short periods.
5I - Flooding in spring runoff and under storm conditions.
7I - Sandbars where flooding is so regular that vegetation does not occur.

M: moisture

3M - Soils with a silt loam or loam texture.
4M - Soils with a sandy loam texture or loamy fine sand soil with a finer textured substrata.
5M - Soils with a loamy sand texture.
6M or 7M - gravelly soils

T: adverse topography

<u>Liard - Mackenzie Area</u>

3T - Slopes of 6 to 9% and areas of irregular pattern of bogs and ridges as might occur floodplains.
4T - Slopes of 10 to 15% and floodplains with rough topographic pattern.
5T - Slopes of 16 to 30%

<u>Hay River Area</u>

4T - Slopes of 6 to 9%
5T - Slopes of 16 to 30%
6T/7T - Slopes >15%

W: excess water

4W - Imperfectly drained soils
5W – All poorly drained Gleysols.
6W - Sedge covered organic soils suitable for grazing.
7W - Most organic soils.

APPENDIX C – Soil Inspection Data Summary

SOIL CLASSIFICATION ABBREVIATIONS AND SYMBOLS

The following is a summary of the soil classification system and related symbols for describing soil profiles. Note that this listing reflects soils observed or expected in the NWT, and is not a complete representation of the Canadian System of Soil Classification. Additionally, not every soil classification abbreviation listed is necessarily used.

BRUNISOLIC ORDER			
Order	**Great Group**	**Subgroup**	**Abbreviation**
Brunisolic	Eutric Brunisol	Orthic Eutric Brunisol	O.EB
		Eluviated Eutric Brunisol	E.EB
		Gleyed Eutric Brunisol	GL.EB
		Gleyed Eluviated Eutric Brunisol	GLE.EB
LUVISOLIC ORDER			
Order	**Great Group**	**Subgroup**	**Abbreviation**
Luvisolic	Gray Luvisol	Orthic Gray Luvisol	O.GL
		Brunisolic Gray Luvisol	BR.GL
		Gleyed Gray Luvisol	GL.GL
		Gleyed Brunisolic Gray Luvisol	GLBR.GL
GLEYSOLIC ORDER			
Order	**Great Group**	**Subgroup**	**Abbreviation**
Gleysolic	Luvic Gleysol	Humic Luvic Gleysol	HU.LG
		Fera Luvic Gleysol	FE.LG
		Orthic Luvic Gleysol	O.LG
	Humic Gleysol	Fera Humic Gleysol	FE.HG
		Orthic Humic Gleysol	O.HG
		Rego Humic Gleysol	R.HG
	Gleysol	Fera Gleysol	FE.G
		Orthic Gleysol	O.G
		Rego Gleysol	R.G
REGOSOLIC ORDER			
Order	**Great Group**	**Subgroup**	**Abbreviation**
Regosolic	Regosol	Orthic Regosol	O.R
		Cumulic Regosol	CU.R
		Gleyed Regosol	GL.R
		Gleyed Cumulic Regosol	GLCU.R
	Humic Regosol	Orthic Humic Regosol	O.HR
		Cumulic Humic Regosol	CU.HR
		Gleyed Humic Regosol	GL.HR
		Gleyed Cumulic Humic Regosol	GLCU.HR

ORGANIC ORDER			
Order	**Great Group**	**Subgroup**	**Abbreviation**
Organic	Fibrisol	Typic Fibrisol	TY.F
		Mesic Fibrisol	ME.F
		Humic Fibrisol	HU.F
		Terric Fibrisol	T.F
		Terric Mesic Fibrisol	TME.F
		Terric Humic Fibrisol	THU.F
	Mesisol	Typic Mesisol	TY.M
		Mesic Mesisol	ME.M
		Humic Mesisol	HU.M
		Terric Mesisol	T.M
		Terric Fibric Mesisol	TFI.M
		Terric Humic Mesisol	THU.M
CRYOSOLIC ORDER			
Order	**Great Group**	**Subgroup**	**Abbreviation**
Cryosolic	Turbic Cryosol	Orthic Eutric Turbic Cryosol	OE.TC
		Orthic Dystric Turbic Cryosol	OD.TC
		Brunisolic Eutric Turbic Cryosol	BRE.TC
		Brunisolic Dystric Turbic Cryosol	BRD.TC
		Gleysolic Turbic Cryosol	GL.TC
		Regosolic Turbic Cryosol	R.TC
		Histic Eutric Turbic Cryosol	HE.TC
		Histic Dystric Turbic Cryosol	HD.TC
		Histic Regosolic Turbic Cryosol	HR.TC
	Static Cryosol	Orthic Eutric Static Cryosol	OE.SC
		Orthic Dystric Static Cryosol	OD.SC
		Brunisolic Eutric Static Cryosol	BRE.SC
		Brunisolic Dystric Static Cryosol	BRD.SC
		Gleysolic Static Cryosol	GL.SC
		Regosolic Static Cryosol	R.SC
		Histic Eutric Static Cryosol	HE.SC
		Histic Dystric Static Cryosol	HD.SC
		Histic Regosolic Static Cryosol	HR.SC
	Organic Cryosol	Fibric Organic Cryosol	FI.OC
		Mesic Organic Cryosol	ME.OC
		Humic Organic Cryosol	HU.OC
		Terric Fibric Organic Cryosol	TFI.OC
		Terric Mesic Organic Cryosol	TME.OC
		Terric Humic Organic Cryosol	THU.OC

SOIL PHASES

Symbol	Description
L	lithic phase (shallow to bedrock)
P	peaty phase (shallow surface peat layer <40 cm if fibric peat; or <60 cm if mesic/humic peat)

PARENT MATERIAL DESCRIPTION

Symbol	Parent Material
Me	eroded till
Mw	washed or resorted till
M	undifferentiated till
GL	glaciolacustrine
GLx	glaciolacustrine beach deposits
FL	fluvial-lacustrine
GF	glaciofluvial
Av	Alluvium
O	organic
R	bedrock
LT	lacustrotill
Cv	colluvium

SOIL DRAINAGE CLASS

Symbol	Drainage Class
R	rapid
W	well
MW	moderately well
I	imperfect
P	poor
VP	very poorly

TEXTURE GROUP

Symbol	Group	Textured Classes Included
C	Coarse	sand, loamy sand
MC	Moderately-coarse	sandy loam (except very fine sandy loam)
M	Medium	very fine sandy loam, loam, silt loam, silt
MF	Moderately-fine	sandy clay loam, clay loam, silty clay loam
F	Fine	clay, silty clay and heavy clay

OTHER SYMBOLS

-	indicates range of texture groups
/	unconformity (or change) in parent material (in consecutive order from surface)

2005 Detailed Inspection Sites

SITE	***SOIL***	***Drainage***	***Solum Texture***	***PM Texture***	***PM***
FS01	O.R	MW	MF	MF	Av
FS02	GLE.EB	I	M	MF	Av/GL
FS03	O.R	W	C-M	C-M	Av/M
JM01	GL.GL	I	MF-F	MF	Av/GL
FM01	O.EB	MW	C	C	Av or FE
FM02	O.HR	MW	C	C-M	Av or FE
FM03	E.EB	MW	C	C	Av or FE
FR01	GLCU.R	MW	M	C	Av
FR02	R.SC	P	C	C	O/Av
FR03	R.G-P	P	C	C	O/Av
FR04	GLCU.R	I	C	C	Av
BR01	O.MB	R	C	C	E
EN01	E.EB	W	MC-M	MF/MC	GLx/M
EN02	GLE.EB	I	M	MC	GLx/M
EN03	E.EB	R-W	C-MC	F-M	Me/R
EN04	E.EB	R	C	C	GLx
EN05	O.EB	R	MF	MC-C	GL or GF
KA01	R.G-P	P	C	F	O/GF/M
KA02	E.EB	W	C-MC	MF-F	GF/M
KA03		W		MF	M/R
KA04	T.F	VP	MF	MF	O/M
KA05	O.G-P	P	MC-M	M-MF	O/GL
KA06				MF	M/R
KA07		R		C	GF
FP01	O.R	W	MF	C-MC/MF	GL/M or Av/M

2006 Detailed Inspection Sites

SITE	***SOIL***	***Drainage***	***Solum Texture***	***PM Texture***	***PM***
FS01	E.EB	R	C	C	E/GF
FS02	E.EB	R-W	C	C	E/GF
FS03	E.EB	R-W	C	C	E/GF
FS04	CU.R	MW	MC-M	M	Av
FS05	O.EB	W	C	C	Cv
FS06	O.EB	MW	C	C/F	E/Av or E/GL
FS07	GLCU.R	I	MC-M	M	Av
FS08	GLCU.R	I	MC-M	M-MF	Av
FS09	O.EB	MW	C	C/M	E/Av or E/GL
FS10	GLE.EB	I	C	C	E
FS11	GLE.EB	I	C	C	E
FS12	O.EB/GLE.EB	MW-I	MC-M	M/C	GL/FL
FS13	E.EB	MW	C	C	E
FS14	GLE.EB	I	C	C	E
FS15	O.GL	W	MC-MF	MC-MF	GL
FS16	GLBR.GL/GL.GL	MW-I	MC-M	MC-M	GL or Av
FS17	O.GL	W	MC-MF	MC-M	GL
FS18	E.EB/GLE.EB	MW-I	C	C	E/FL
FS19	BR.GL	W	MC-M	M	GL
FS20	BRE.TC	I	M-MF	MF-F	GL
FS21	E.EB	R-W	C	M/C	FL/GF
*FS22	BR.GL	R-W	C	MF/C	FL/Me
*FS23	BR.GL	R-W	C	MF/C	FL/Me
FS24	GL.CU.R	I	C	C-M	Av
*FS25	BR.GL	W	C	MF-F	Me
FS26	BR.GL	W	C	MF-F	FL/Me
TR01	CU.R/O.EB	W-MW	M	M/MF	Av/M
TR02	O.R	R-W	C	C	Lx
TR03	O.R	R	C	C	Lx
TR04	R.HG	P	M	M-MF	Av
TR05	GLCU.R	I	M	M-MF	Av
TR06	CU.R	W	M	M-C	Av
FL01	GLE.EB/O.EB	I-MW	M-MF	M-MF/M	Av/M
FL02	GL.GL	I	MF-F	M-MF/MF	GL/M
FL03	R.G-P	P-Org	MF-F	M-MF/MF	GL/M
NB01	CU.R	W	M	M-MF-F	Av
NB02	BR.GL	W-MW	C-M	MC-M	GL
NB03	R.HG-P	P-I	M	M	Av
JM01	O.GL	R	MC-MF	C	GL/GF
JM02	O.EB	MW	C-MC	MF-F	GL
JM03	GL.GL	MW-I	M-MF	M	Av/M
JM04	O.GL	W	M-MF-F	MF	GL
JM05	GL.GL	I	MF-F	F	GL/M
JM06	O.R	MW	MC-M	C	GL/GF or GL/M

JM07	R.G-P	I-P	MC	C	GL/GF or GL/M
JM08	O.R	W-MW	M	MC-M	GL
JM09	E.EB	W	MC-M	MC-M	GL/M?
JM10	O.EB	R	C-MC	C-MC	GL/R
JM11	O.GL	W	MC-MF	M	GL/M/R
JM12	O.GL	W	M-F	MF	M
JM13	O.GL	W	MC-F	F	M
JM15	O.R	MW-I	M	C-MC	Av
JM16		VP			Org
JM17	E.EB	W-MW	C	C	FL
JM18	GL.SC	P	C	C	O/GL
JM19	O.GL	W	M-MF	M-MF	GL
JM20	CU.R	W	M	M	Av
JM21	O.R	MW	M	F-MF	Av
JM22	O.EB	W	M	MF	GL
JM23	O.EB	MW	MC	F	Cv/GL
JM24	E.EB	R	C	C	GL (sandy)
JM25	E.EB	R	C	C	GL (sandy)
JM26	GLE.EB	I	C	C	GL (sandy)
JM27	Org.Crysol	VP			Org
JM28	O.GL	MW	M-F	F	GL
JM29	BR.GL	W	C-F	MF	Me
JM30	O.GL	MW	M-F	MF-F	GL/M
JM31	BR.GL	W-MW	C-M-F	MF	Me
JM32	O.GL	W	M-MF-F	M-MF	Mw
JM33	GL.SC	P-VP	M-MF	M-MF	O/GL
JM34	E.EB	W	C-M	MC-MF	Mw
JM35	GL.GL	I-P	M-MF-F	MF-F	GL/M
JM36	GLE.EB	I	M	M	Av ?
JM37	GL.HR	I	M-MF	M	Av
JM38	O.EB	MW	M	M-MC	Av
JM39	O.GL	MW	C-M-MF-F	F-MF	GL
JM40	E.EB/O.GL	I-MW	M-MF	MF	Av/GL/M
JM41	O.GL	MW	MF-F	MF	GL/M
JM42	O.EB	MW	M	M/MF/MF	Av/GL/M
JM43	E.EB	MW	M-MF	M/MF-F	Av/GL/M
JM44	GLO.R	I	M-MF	M	Av
JM45	E.EB	MW	M-MF	M-MF	Av
JM46	GLE.EB	I	MF-C	C	GLx
JM47	O.LG	P	MF-F	M-MF-C	GL(x)?
JM48	GL.EB	I	M	M-C/F	Av/GL or GLx/GL
FP01	E.EB	MW	M	MF-F	Av/Mw or GL/Mw
FP02	O.GL	W-MW	C-M-MF	MF-F	Me
FP03	O.GL	MW	C-M-MF	MF-M/MF	Av/Mw
FP04	O.GL	MW	M-MF-F	MF	Av/Me
FP05	GL.GL	MW-I	M-MF-F	M-MF/F	Av/GL
FP06	GL.GL	I	M-MF-F	M/C-MF	Av/Me

FP07	O.EB	W	MF	M-C/C-MF	Av/Mw
FP08	O.GL	W-MW	MC-M-MF	C-MF	Me/GL/M
FP09	O.GL	MW	M-MF-F	MF-F	Av/Mw or GL/Mw
FP10	O.GL	MW	M-MF-F	F	GL
FP11	GL.GL	I-MW	M-MF-F	F-MF	GL
FP12	R.G	P	MF-F	MF-F	O/GL
FP13	E.EB	MW	C-M	F	Me?
EN01	E.EB	R-W	C	C/MF	GF/M
EN02	O.GL	W-MW	C-M-F	MF-F	M
EN03	O.GL	MW-W	C-M-F	MF-M	Me/M
EN04	BR.GL	W	C-M	MF	Me/M
EN05	R.G	P	MF-M	MF-M	Av
EN06	E.EB	R-W	C-F	C-MC	Me
EN07	O.GL	W	C-F	MF	Me/M
EN08	O.GL	W-R	C-MF	C-MF	Me/M
HR01	GL.EB	MW-I	C	MF-F	GLx/M
HR02	O.EB	R	C	C	GLx
HR03	Eutric Brunisol	R	C	C	GLx
HR04	O.EB	R	C	C	GLx
HR05	O.EB	W-MW	C	C	Glx
HR06	TF.M	VP	C	C	O/GLx
HR07	R.G	P	C	C-F	O/GLx
HR08	E.EB	W	C-M-F	F	Av/GL
HR09	GL.EB	I	C	C/F	GLx/GL
HR10	GLCU.R	I	C-M	M-MF	Av
HR11	O.GL	MW	M-F	MF/M	Av/M
HR12	R.G	P	C-MF	C-MF-F	Av or GL
CO1	GLCU.R	I	M	M-MF	Av
CO2	O.GL	W	MC-F	MF	M
CO3	O.GL	R	MC-MF	M/MF	Me/Mw/M
271	O.GL	MW	MC-MF-F	MF	Mw
187	O.R	R	M	M	Me/R
214	E.EB	R	M	C	GLx
287	GLE.EB	I	C	C/M	GLx/M
288	O.G	W	M-MF	MF-F	M
289		W	MF	MF-C/MF	Av/M
291	O.GL	MW	M-MF	F-MF/MF	LT/M
295	E.EB	W	C	M	Me
316	R.G	P	M/MF	M/MF	Mw/M or Me/M
362(FS)	O.HR	W	M	M	Av
363(JM)	GL.GL	I-MW	MF-F	MF	Av

2007 Detailed Inspection Sites

SITE	***SOIL***	***Drainage***	***Solum Texture***	***PM Texture***	***PM***
FL05	GLE.EB	I	M-MF	MF-F/F	GL/M
FL06	R.G-P	P	F	F	O/M
NB	GLE.EB	I	M	M	GL
FS(airport01)	O.GL	W	MC-MF	C-M	GL
HR0711	R.GL-P	P-VP	C-M	C-M/F	O/GLx/GL
HR0712	GLE.EB	I-P	C	C	GLx
HR0713	R.GL-P	P	C	C	O/GL
HR0714	GLO.R/R.G	I-P	C	C	GLx
HR0715	GL.EB	I	C-M	C/F	GL/Me/M
HR0716	R.G-P	P	C/F	C/F	O/GL
HR0717	GLCU.R	MW-I	M-MF	MF	Av
FS(colin's house)	R.G-P	P	C	C	FE
TL10	GLCU.R	I	C	C	Lx
TL11	GLE.EB	I	C	C	FL
TL12	CU.R	MW	M	M	Av
TL13	BR.GL	W-MW	M-MF-F	MF/F	Av/Me/M
TL14	GLCU.R	I-P	C	C	Lx
TL15	FIO.C	VP			
TL16	T.M	VP	C	C	O/Lx
HR0718	GLCU.R	I	MF	MF-F/F	Av
HR0719	GLCU.R	I	M-MF	M-MF	Av
HR0720	R.G.P	P	M	M	Av
HR0721	GLCU.R	I	M-MF	MF-F	Av
JMR2807	GLO.R	I	M	M-C	GL
JMR2807-2	BR.GL	W	C-M	M-C/MF	GL/M
HR0701	GLE.EB	MW-I	M-MF	MF/F	Av/GL
HR0702	O.GL	MW	MF-F	F-MF	Av
HR0703	GL.GL	I	M-MF-F	MF-F	Av
HR0704	O.G	P	M-F	MF-F	GL?
HR0705	O.G-P	P	M	MF-F	Av/GL
HR0706	GL.GL	I	C-MF-F	MF-F/MF	GL/M
HR0707	O.G	P	M	M-MF/F	Av/GL
HR0708	GLE.EB	I	C-M-MF	F-MF/MF	GL/M
HR0709	O.G-P	P	M-MF	F/F	GL/M
HR0710	O.G-P	P	MF-F	F/F-MF	Av/M
JM(st05-01)	BR.GL	W	C-M	C-MF	GL
JM(st05-02)	Fibrosol	VP			O
JM(st06-01)	BR.GL	W-R	C-MF	C-M-MF	GL
JM(st06-02)	O.EB	W	MC-M	MC-M-MF	GL
JM(st06-03)	GLE.EB	I	M-MF	M-F	GL
JM(st07-01)	GLE.EB	I	C	C	FL
JM(st08-01)	GLE.EB/O.G	P	C-MC	MC-MF-F	GL or FL/GL
JM(st09-01)	GLE.EB	I	C-MC-F	M-MF-F	GL or FL/GL
JM(st10-01A)	O.GL	W	C-M-MF	F	Mw or Me

WR01	O.R	R	C	C	GF
WR02	GL.EB	I	MC	MC-MF	GL
WR03	GLE.EB	I	C-M	C/M-MF	GF/GL
NB05	T.F/R.G-P	VP	F	F	O/GL
NB06	O.R	MW	MF-F	F	GL or Av/GL
NB07A	E.EB	MW	MF-F	MF-F	GL or Av/GL
NB07B	O.EB	W	M	MC-C	Av or GL
NB08	E.EB	MW	MF-F	F	Av
NB09	O.EB	MW	M	MF-F	Av
FS(st1-01)	R.G-P	VP	MF-F	MF-F	O/GL
FS(st1-02)	O.GL	W	M-MF	M-MF/MF-F	Me/M
FS(st1-03)	FIO.C	VP			O
FS(st1-04)	TYF.M	VP			O
FS(st2-01)	E.EB	W	C-MC	C-MC-M	GL or FL
FS(st2-02)	TF.M	VP	C	C	O/FL or O/GL
FS(st3-01)	O.GL	W	M-MF-F	MF	Me/M
FS(st3-02)	GLE.EB	I	MF	F	GL or Av/GL
FS(st4-01)	E.EB	R	C	C	GF?
FS(st4-02)	GLCU.R	I	M	M-MF	Av
C007 01(FP)	O.GL	MW	MC-F	MF-M	Av/M
C007 02(FP)	R.G-P	I	F	F/F	O/Av/M
C007 03(FP)	O.GL	MW	F	F/F	GL/M
C007 04(FP)	O.GL	MW	M-MF-F	F	GL
C007 05(FP)		W-MW		MF	M
C007 06(FP)	O.GL	W-MW	M-MF-F	MF/C/MF	GL/Mw/M
C007 07(FP)	O.GL	MW	M-F	MF-F	GL/M
C007 08(FP)	O.GL	MW	M-F	F	GL/Mw
C007 09(FP)	GLCU.R	I	MF	MF/M-MF	Av/Mw/m
C007 10(FP)	TY.M	VP			O
C007 11(TL)	CU.R/GLCU.R	MW-I	M	M-C	Av
C007 12(TL)	CU.R	W-MW	M	M-MF	Av
C007 13(TL)	CU.R/GLCU.R	MW-I	M	M	Av
C007 14(FS)	GLO.R	MW	M	M-MF/C-MC	Av/M
C007 15(FS)	GLCU.R	I	M-MF	MF-C-M	Av
C007 16(FS)	GLCU.R	I	M	M-C-MC-MF-F	Av
C007 17(FS)	E.EB	R	C	C	E/FL
C007 18(FS)	GLCU.R	I	M	M-F	Av/GL
C007 19(FS)	GLCU.R	I-P	C	MC-M	Av
C007 20(FS)	O.GL	W	M-F	MF-F-MC	GL
C007 21(FS)	GLE.EB	I-P	C	C	FL
C007 22(KA)	E.EB	R	M-MF	MC-C	GL/R or Mw/R
C007 23(KA)	O.GL	R	MC-M-MF	MC	GLx
C007 24(KA)	O.G	P	C	C	O/GL/M
C007 25(HR)	R.G-P	I-P	MF	MF-F-M	O/Av
C007 26(HR)	R.G-P	P	C-F	C-F	O/GL
C007 27(HR)	O.GL	W	MF-F	M-MF	Av/M
C007 28(HR)	E.EB	MW	MC-MF	C-MC-MF/MF	Av/GL/M

APPENDIX D – Soil Correlation Table

Symbol	Soil Name	Map Area	Mapping Concept	PM Type	Solum Texture	Soils	Drainage	Comments
A	Alluvium	LR	Land Type	Av	variable	Regosolic	Variable	
		UM	Land Type	Av	variable	Regosolic	Variable	
Av	Alluvium	LM	Complex	Av	sandy & gravelly	Regosolic	Variable	
		HR	Complex	Av	variable	Regosolic & Gleysolic	W-P	
An	Antoine	LR	Series	Av (GF?)	LS	RG	P	carbonated
		UM	Series	Av (GF?)	LS	RG	P	carbonated
		LM	Association	GF,FE	LS	RG-Peaty, E.EB, Organic	P, R-W, VP	
Ad	Anderson Mill	LM	Association	FL	fSL	E.EB, O.GL	W	thin silt & clay bands
Ar	Arrowhead	LM	Association	GL	vfSL,SiL	O.EB, E.EB, GL.EB, RG-Peaty, RG, Organic	W, I, P, VP	
Bc	Babiche	LM	Association	GL/GF	SiL	E.EB, RG-Peaty	W, P	
Be	Berens	LR	Series	Av	SiCL	O.EB	W	
		UM	Series	Av	L	O.EB	W	
Bt	Betalamea	LR	Series	Av	L	RHG-Peaty	P	
Bg	Big Island	LM	Association	GL	SiCL	RG-Peaty, E.EB, Organic	P, W, VP	
Bi	Birch	LR	Series	Av	L	GL.CUR	I	
Br	Blackstone River	LR	Series	Av	L	RG-Peaty	P	
		LM	Association	Av	sandy & silty	RG-Peaty	P	
Bb	Bluebill	LM	Association	GL/M	vfSL,SiL	O.GL, BR.GL, E.EB, RG-Peaty	W, P	
Bf	Bluefish	LM	Association	GL/GF	vfSL,Si	E.EB, RG-Peaty	W, P	
Bu	Boulogne	UM	Series	Av	SL, L	OR	W	
Bv	Bouvier	UM	Series	GLx/GL	gLS, SL	RG-Peaty	P	
Bv	Bovie Lake	LM	Association	GL/M	vfSL,SiL	E.EB, O.EB, BR.GL, RG-Peaty, RG, Organic	W, P, VP	

Bu	Bulmer	LM	Association	GL/M	vfSL,SiL	RG-Peaty, O.EB, GL.EB, Organic	P, W, I, VP	
Ca	Cache	UM	Series	GLx/M	gL	O.GL	W	stony
Cn	Caen	UM	Series	GLx/M	L	O.GL	W	
Cb	Celibeta	LM	Association	GL/M	SiCL	O.GL, BR.GL, GL.EB, RG-Peaty	W, P	
Cv	Colluvium	LM	Association	Cv	variable	Regosolic	R-I	
Cm	Cormack Lake	LM	Association	M	SiCL	RG-Peaty, Organic, O.GL	P, VP, W	
Ct	Coty Mountain	LM	Association	GL/M	SiCL	O.EB, GL.EB	W, I	
dR	de Roche	UM	Series	GLx/GL	gL, gSL	OR	W	
De	Desmarais	UM	Series	GLx/R	gL	RG	P	stony/flaggy
Do	Dory	UM	Series	GLx/GL	gL, gCL, gSiCL	RG	P	stony
Dp	Dieppe	UM	Series	GLx/GL	gLS, SL	O.EB	W	
Et	Enterprise	UM	Series	GLx/R	gSL, L	O.EB	W	stony/flaggy
		HR	Association	GLx/R	LS, L (gravelly?)	O.EB, RG-Peaty	W, P	gravelly/stony/flaggy
Er	Eroded Riverbanks	LR	Land Type	Cv				
	Eroded Riverbanks & Escarpments	UM	Land Type	Cv, M, R			R-W	mostly minor to no vegetation
Es	Escarpment	UM	Complex	GLx/R	gSL, gL	O.EB, OR	W	stony/flaggy
Ex	Exposure	LM	Complex	Bedrock	variable	Regosolic	R	
Fs	Fisherman Lake	LM	Association	M	SiC, C	RG-Peaty, GL.EB, Organic	P, I, VP	lacustrotill
F	Flett	LR	Series	Av	CL, SiCL	RHG	P	
		LM	Association	Av	SiCL	RG-Peaty, O.GL, GL.EB, Organic, O.EB	P, W, I, VP	silty over sandy
G	Grainger	LR	Series	Organic			VP	extensive permafrost
		UM	Series	Organic			VP	extensive permafrost
		LM	Association	Organic		Organic Crysols, Typic Mesisols	VP	extensive permafrost
		HR	Association	Organic		Fibric Organic Cryosol	VP	extensive permafrost
Gc	Gros Cap	LR	Series	Av	L, SiC, SiCL	O.GL	W	
		UM	Series	Av	L	O.GL	W	

		LM	Association	GL	SiCL	O.GL	W	
Gr	Grumbler Rapids	HR	Association	GF	LS	O.EB, E.EB, RG-Peaty	W-P	
Hn	Hansen	LR	Series	GF/M	L, CL	RHG-Peaty	P	stony, carbonated, mucky
		UM	Series	GLx/M	CL	RG-Peaty	P	stony
Hr	Harris	LR	Series	Av/M	L	O.EB	W	stony
		UM	Series	GLx/M	gL	O.EB	W	stony
		LM	Association	M	Variable	O.EB, RG-Peaty, Organic	W, P, VP	eroded till
Hy	Hay	UM	Series	Av	SiCL	O.EB, O.GL	W	
		HR	Association	Av	fSL, SiCL	O.EB, CU.R, RG-Peaty	W-P	
Hw	Hillwash	LM	Complex	Various	Variable	Regosolic	Variable	actively eroding
		HR	Complex	GF & M	Variable	Regosolic & Brunisolic	W	
Ho	Horn	UM	Series	GL	SiCL, CL, SiC	OR	W	
Jm	Jean-Marie	LM	Association	GF	LS	E.EB	R, W	sandy GF veneer over gravelly GF
K	Kotaneelee	LR	Series	Av	SiCL	RG	P	
Lf	Laferte	UM	Series	M	clay loam	O.EB	W	stony
L	Liard	LR	Series	Av	fSL, L	CU.R	W	
		UM	Series	Av	L	OR	W	
		LM	Association	Av	vfSL, SiL	CU.R, GL.CUR, RG-Peaty	W, I, P	organic banding throughout
Lo	Louise	UM	Series	Av	SiCL	RG-Peaty	P	
Mk	Mackenzie	UM	Series	Av	SiCL, CL	O.EB	W	
Mn	Manners	LR	Series	Av	L	Cryosolic CU.R	I	permafrost within 75 cm
Mr	Martin River	LR	Series	Av (GF?)	LS	O.EB	W	
		UM	Series	Av (GF?)	LS	O.EB	W	
		LM	Association	GF,FE	LS	E.EB, RG-Peaty, GL.EB, Organic	R-W, P, I, VP	
Ma	Matou	LR	Series	Organic			VP	

		UM	Series	Organic			VP	
Me	Meridian	UM	Series	Av	L, SIiL, SiC	OR	W	
Mi	Mills Lake	UM	Series	GL	CL, SIC	RG	P	
Mo	Morrisey	UM	Series	GL	SiCL, CL	O.GL	W	
Nh	Nahanni	LR	Series	Av	L	OR	W	
Na	Naylors	LR	Series	Av (GF?)	LS	GL.EB	I	
Ne	Netla	LR	Series	Av	CL, SiCL	O.EB	W	
		LM	Association	Av	SiCL	O.EB, E.EB, GL.EB, RG-Peaty, RG, Organic	W, I, P, VP	silty over sandy
Pe	Petitot	LR	Series	Av	L	O.EB	W	
		LM	Association	GL	SiCL	E.EB, O.GL, RG-Peaty, Organic	W, P, VP	
Pd	Pointed Mountain	LM	Association	M	SiC, C	O.GL, BR.GL, GL.EB, RG-Peaty	W, I, P	lacustrotill
Po	Poplar	LR	Series	Av	L, SiCL	O.EB	W	
		UM	Series	Av	SiCL, CL	O.EB	W	
		LM	Association	Av	SiL, vfSL	O.EB, O.R, RG-Peaty, Organic	W, P, VP	silty over sandy; no organic banding
Pr	Providence	UM	Series	GL	SiCL	O.EB	W	
Ra	Rabbit Creek	LR	Series	M	L	O.GL	W	stony
		LM	Association	M	SL, L	O.GL, E.EB, RG-Peaty	W, P	
Rk	Redknife	UM	Series	Av	SiCL	RHG, RG	P	
RM	Rough Mountainous	LR	Land Type					
Sa	Sarristo	UM	Series	GLx/GL	gL, gCL	O.EB	W	stony
Sc	Scotty Creek	LM	Association	GF/M	SL, LS	RG-Peaty, E.EB, Organic	P, W, VP	
Sh	Shale Creek	LM	Association	GL	SiL, vfSL	RG-Peaty, O.EB, Organic	P, W, VP	
S	Sloughs	LR	Land Type				VP	
	Slough & Marshes	UM	Land Type				VP	
Sb	Sibbeston	LM	Association	GF/M	SL, LS	E.EB, RG-Peaty	R-W, P	
Sp	Spence River	UM	Series	Av (GF?)	LS, SL	E.EB	W	

St	Strong Point	UM	Series	Av (GF?)	SL, L	O.EB	W	
Sk	Swan Lake	HR	Association	GL	SiCl, SiC	GL.EB, RG-Peaty	I, P	
Sw	Swan Point	LR	Series	Av	CL	O.GL	W	
		LM	Association	Av	SiCL	O.GL, E.EB, GL.EB, RG-Peaty	W, I, P	silty over sandy
Sw	Swede	UM	Series	GLx	LS, S	RG	P	
		HR	Association	GLx	LS	O.EB, RG-Peaty	W, P	course sandy and gravelly
Ta	Tathlina	UM	Series	M	vfSL, C	O.GL	W	moderately stony; veneer of bouldery sandy till common
		HR	Association	M	CL, SiCL	O.EB, O.GL, RG-Peaty	W, P	
Tr	Trail River	LM	Association	Organic		Typ. Mesisols, Org. Cryosols, Hyd. Fibrisols	VP	sedge-derived peat with significant permafrost
		HR	Association	Organic		Mesisols, Fibric Organic Cryosols	VP	
Tp	Tributary Floodplain	LM	Complex	Av	Variable	Regosolic, Gleysolic	W, P	
		HR	Complex	Av	Variable	RG-Peaty	P	
Tk	Trout Lake	LM	Association	M	SiCL	O.GL, RG-Peaty, BR.GL, GL.EB	W, P, I	
Tr	Truesdell	LR	Series	GF/M	CL, L	GL.EB	I	stony
		UM	Series	GLx/M	CL, L	GL.EB	I	stony
Tf	Twin Falls	UM	Series	GLx	S, LS	O.EB, BR.GL, E.EB	W	
V	Vale	UM	Series	Av	SiCL	OR	W	
Wr	Winter Road	LM	Association	FL/M	SL	E.EB, O.GL, RG-Peaty	W, P	thin silt & clay bands in FL
Yn	Yohin Lake	LM	Complex	Av	Variable	Brunisolic, Regosolic, Gleysolic	W, P	Av in streams exiting mountains

Code	Map Area		Year
LM	Liard & Mack		1976
HR	Hay River		1977
UM	Upper Mack		1968
LR	Liard River		1966
SR	Slave River		1972

	Indicates symbol conflict

APPENDIX E – Glossary of Terms

[Compiled from Rostad et al (1976).]

acid soil - Any soil having a pH of less than 7.0.

alkaline soil- Any soil that has a pH greater than 7.0.

alluvial fan - A fan-shaped deposit of alluvium laid down by a stream where it emerges from an upland into less steeply sloping terrain.

alluvium - Material such as clay, silt, sand, and gravel deposited by modern rivers and streams.

arable soil - Soil suitable for piowing and cultivation.

association, soil - A natural grouping of soil based on similarities in climatic or physiographic factors and soil parent materials.

available nutrient - The portion of any element or compound in the soil that can be readily absorbed and assimilated by growing plants. ("Available" should not be confused with "exchangeable".)

available water - The portion of water in a soil that can be readily absorbed by plant roots. Most workers consider it to be the water held in the soil against a pressure of up to approximately 15 bars. See also field capacity and moisture tension, soil.

beach deposits - Sediments that are modified in their degree of sorting, surface relief, or both, by the action of waves in forming beaches.

bedrock - The solid rock that underlies soil and the regolith or that is exposed at the surface.

bog - Permanently wet land having low bearing strength.

Brunisolic - An order of soils whose horizons are developed sufficiently to exclude the soil from the Regosolic order, but that lack the degrees or kinds of horizon development specified for soils of the other orders. These soils, which occur under a wide variety of climatic and vegetative conditions, and have Bm or Btj horizons. The great groups are Melanic Brunisol, Eutric Brunisol, Sombric Brunisol, and Dystric Brunisol belong to this order.

calcareous soil - Soil containing sufficient calcium carbonate, often with magnesium carbonate, to effervesce visibly when treated with cold 0.1 N hydrochloric acid.

capability class - A rating that indicates the capability of land for some use such as agriculture, forestry, recreation, or wildlife. In the Canadian system, it is a grouping of lands that have the same relative degree of limitation or hazard. The degree of limitation or hazard is nil in Class 1 and becomes progressively greater to Glass 7.

capability subclass - A grouping of lands that have similar kinds of limitations and hazards. It provides information on the kind of conservation problem or limitation. The class and subclass together provide information about the degree and kind of limitation, for broad land-use planning and for the assessment of conservation needs.

catena - A non-taxonomic grouping of a sequence of soils of about the same age, derived from similar parent materials, and occurring under similar climatic conditions, but having unlike characteristics because of' variations in relief and in drainage.

classification, soil - The systematic arrangement of soils into categories on the basis of their characteristics. Broad groupings are made on the basis of general characteristics, and subdivisions on the basis of more detailed differences in specific properties,

clay - (i) As a particle-size term: a size fraction less than 0.002 mm in equivalent diameter, or some other limit (geologists and engineers). (ii) As a geological term: a natural, earthy, fine grained material that develops plasticity with a small amount of water. (iii) As a soil term: a textural class. See also texture, soil. (iv) As a soil separate: a material usually consisting of clay minerals, but commonly also of amorphous free oxides and primary minerals.

clay loam - Soil material that contains 27% to 40% clay and 20% to 45% sand. See also texture, soil.

clayey - Containing large amounts of clay, or having properties similar to those of clay.

coarse texture - The texture exhibited by sands, and loamy sands, and sandy loams except very fine sandy loam. Sometimes divided into coarse (sands and loam sands) and moderately-course (sandy loams, except very fine sandy loam) textures.

colluvium - A heterogeneous mixture of material that as a result of gravitational action has moved down a slope and settled at its base. See also creep.

complex, soil - A mapping unit used in detailed and reconnaissance soil surveys where two or more defined soil units are so intimately intermixed geographically that it is impractical, because of the scale used, to separate them.

cryic layer - A perennially frozen layer.

Cryosolic - An order of soils in Canadian soil taxonomy. Cryosolic soils are mineral or organic soils that have perennially frozen material within 1 m (3 ft) of the surface in some part of the soil body, or pedon. They mean annual soil temperature is less than O^{o}C. They

are the dominant soils of the zone of continuous permafrost and become less widespread to the south in the zone of discontinuous permafrost; their maximum development occurs in organic and poorly drained, fine textured materials. The vegetation associated with Cryosolic soiis varies from sparse plant cover in the high arctic, through tundra, to subarctic and northern boreal forests. The active layer of these soils i.s frequently saturated with water, especially near the frozen layers, and colors associated with gleying are therefore common in mineral soils, even those that occur on well drained portions of the landscape. They may or may not be markedly affected by cryoturbation. The order has three great groups: Turbic Cryosol, comprising mineral soils that display marked cryoturbation and generally occur on patterned ground; Static Cryosol, mineral soils without marked cryoturbation; and Organic Cryosol, frozen organic soils.

cryoturbation - Frost action, including frost heaving.

deposit - Material left in a new position by a natural transporting agent such as water, wind, ice, or gravity, or by the activity of man.

drumlin - An elongate or oval hill of glacial drift, commonly glacial till, deposited by glacier ice and having its long axis parallel to the direction of ice movement.

dunes - Wind-built ridges and hills of sand formed in the same manner as snowdrifts. They are started by some obstruction, such as a bush, boulder, or fence that causes an eddy or otherwise thwarts the sand-laden wind. Once begun, the dunes themselves offer further resistance and they grow to form various shapes.

Dystric Brunsiol - A great group of soils in the Brunisolic order. The soils may have mull Ah horizons less than 5 cm (2 inches) thick. They have Bm horizons in which the base saturation (NaCl) is usually 65% to 100% and the pH (CaCl2) is usually 5.5 or lower.

eolian deposit - Sand, or silt, or both, deposited by the wind. See also loess and dunes.

erosion - (i) The wearing away of the land surface by running water, wind, ice, or other geologcial agents, including such processes as gravitational creep. (ii) Detachment and movement of soil or rock by water, wind, ice, or gravity.

Eutric Brunisol - A great group of soils in the Brunisolic order. The soils may have mull Ah horizons less than 5 cm (2 inches) thick, and they have Bm horizons in which the,base saturation (NaCI) is 100%.

fertility, soil - The status of a soil in relation to the amount and availability to plants of elements necessary for plant growth.

Fibrisol - A great group of soils in the Organic order that are saturated for most of the year. The soils have a dominantly fibric middle tier, or midble and surface tiers if a terric, lithic, hydric, or cryic contact occurs in the middle tier.

field capacity - The percentage of water remaining in the soil 2 or 3 days after the soil has been saturated and free drainage has practically ceased.

fine texture - Consisting of or containing large quantities of the fine fractions, particularly silt and clay. It includes all the textural classes of clay loams and clays: clay loam, sandy clay loam, silty clay loam, sandy clay, silty clay, and clay. Sometimes it is subdivided into fine (clay, silty clay and heavy clay) and moderately-fine (clay loam, silty clay loam, sandy clay loam) textures.

floodplain - The land bordering a stream, built up of sediments from overflow of the stream and subject to inundation when the stream is at flood stage.

fluvial deposits - All sediments, past and present, deposited by flowing water, including glaciofluvial deposits. Wave-worked deposits and deposits resulting from sheet erosion and mass wasting are not included.

glacial drift - All rock material carried by glacier ice and glacial meltwater, or rafted by icebergs. This term includes till, stratified drift, and scattered rock fragments,

gleyed soil - Soil affected by gleization.

gleization - A soil forming process, operating under poor drainage conditions, which results in the reduction of iron and other elements and in gray colors, and mottles.

Gleysolic - An order of soils developed under wet conditions and permanent or periodic reduction. These soils have low chromas, or prominent mottling, or both, in some horizons. The order includes the great groups: Gleysol, Humic Gleysol, and Luvic Gleysol.

gravel - Rock fragments 2 mm to 7.5 cm in diameter.

Gray Luvisol - A great group of soils in the Luvisolic order occurring in moderately cool climates, where the mean annual temperature is usually lower than 5.5^{o}C . The soils have developed under deciduous and coniferous forest cover, and have an eluviated (leached) light-colored surface (Ae) horizon, a brownish illuvial B (Bt) horizon, and usually a calcareous C horizon. The solum is base saturated (NaCl extraction). The Ahe horizon, if present, is less than 5 cm thick. This group includes soils formerly called Gray Wooded.

great group - A category in the Canadian system of soil classification It is a taxonomic group of soils having certain morphological features in common and a similar pedogenic environment (Eg, Eutric Brunisol).

horizon, soil - A layer of soil or soil material approximately parallel to thelands surface; it differs from adjacent genetically related layers in properties such as color, structure, texture, consistence, and chemical, biological, and mineralogical composition.

humus - The fraction of the soil organic matter that remains after most of the added plant and animal residues have decomposed. It is usually dark colored.

irrigation - The artificial application of water to the soil for the benefit of growing crops:
lacustrine deposit - Material deposited in lake water and later exposed .either by lowering of the water level or by uplifting of the land. These sediments range in texture from sands to clays. Occasionally gravelly where lacustrine beach deposits have formed.

landforms - The various shapes of the land surface resulting from a variety of actions such as deposition or sedimentation (eskers, lacustrine plains), erosion (gullies, canyons), and earth trust movements (mountains).

leaching - The removal from the soil of materials in solution.

loess - Material transported and deposited by wind and consisting of predominantly silt-sized particles:

Luvisolic - An order of soils that have eluvial (Ae) horizons, and an illuvial (Bt) horizon in which silicate clay is the main accumulation product. The soils developed under forest or forest/grassland transition in a moderate to cool climate.

marl - A soft, unconsolidated earthy deposit consisting of calcium carbonate or magnesium carbonate, or both, and often shells, usually mixed with varying amounts of clay or other impurities.

marsh - Periodically flooded or continually wet areas having the surface not deeply submerged. It is covered dominantly with sedges, cattails, rushes, or other hydrophytic plants.

matrix, soil - The main soil constituent or material that encloses other soil features, for example, concretions embedded in a fine-grained matrix.

medium texture - Intemediate between fine-textured and coarse-textured soils. It includes the following textural classes: very fine sandy loam, loam, silt loam, and silt.

Mesisol - A great group of soils in the Organic order that are saturated for-most of the year. The soils have a dominantly mesic middle tier, or middle and surface tiers if a terric, lithic, hydric, or cryic contact occurs in the middle tier.

microclimate - (i) The climate of a small area resulting from the modification of the general climate by local differences in elevation or exposure. (ii) The sequence of atmospheric changes within a very small region.

mineral soil - A soil consisting predominantly of, and having its properties determined predominantly by, mineral matter. It contains less than 17% organic carbon except for an organic surface layer that may be up to 40 cm thick if formed of mesic or humic peat

or 60 cm if the layer consists mainly of fibric peat.

moderately coarse texture - Consisting predominantly of coarse particles. In soil textural classification, it includes all the sandy loams except the very fine sandy loam.
moderately-fine texture - Consisting predominantly of intermediate-size soil particles with or without small amounts of fine or coarse particles. In soil textural classification, it includes clay loam, sandy clay loam, and silty clay loam.

moisture, soil - Water contained in the soil.

moraine - An accumulation of earth (various mixtures of sand, silt and clay) generally with gravel, cobbles and stones, carried and finally deposited by a glacier during glacial advance or during its retreat (melting). Several kinds of moraines are distinguished, such as ground moraine and end moraine. Sometimes used in place of the term *glacial till*.

neutral soil - A soil in which the surface layer, to plow depth, is neither acid nor alkaline in reaction.

order, soil - A category in the Canadian system of soil classification. All the soils of Canada have been divided into nine orders: Chernozemic, Solonetzic, Luvisolic, Podzolic, Brunsiolic, Cryosolic, Regosolic, Gleysolic, and Organic. All the soils within an order have one or more characteristics in common.

Organic - An order of soils that have developed dominantly from organic materials. The majority of Organic soils are peat-derived and saturated for most of the year. They contain 17% or more organic carbon and must be at least 40 cm thick if formed of mesic or humic peat or at least 60 cm if the layer consists mainly of fibric peat.

organic matter - The organic fraction of the soil; includes plant and animal residues at various stages of decomposition, cells and tissues of soil organisms, and substances synthesized by the soil population.

outwash - Sediments washed out by flowing water beyond the glacier and laid down as stratified drift in thin foreset beds. The particle size may vary from boulders to silt.

parent material - The unconsolidated and more or less chemically weathered mineral or organic matter from which the solum of a soil has developed by pedogenic processes.

peat - Unconsolidated soil material consisting largely of undecomposed, or only slightly decomposed, organic matter deposited under largely water saturated conditions. Derived mainly from sedges, mosses and wood in wetland areas.

pedology - The aspcts of soil science dealing with the origin, morphology, genesis, distribution, mapping, and taxonomy of soils, and classification in terms of their use.

permafrost - (i) Perennially frozen material underlying the solum. (ii) A perennially frozen soil horizon.

pH, soil - The negative logarithm of the hydrogen-ion activity of a soil. The degree of acidity or alkalinity of a soil as determined by laboratory methods at a specified moisture content or soil-water ratio, and expressed in terms of the pH scale.

Regosolic - An order of soils having no horizon development or have development in the A and B horizons that is weakly expressed and insufficient to meet the requirements of the other orders. Regosol is the only great group in this order.

relief - Elevations or inequalities of a land surface, considered collectively. Land having no unevenness or differences of elevation are called level; gentler relief is termed undulating; strong relief is termed rolling, and very strong relief is termed hilly,

saline soil - A non-alkali soil that contains enough soluble salts to interfere with the growth of most trop plants. The conductivity of the saturation extract is greater than.4 mmhos/cm, the exchangeable-sodium percentage is less than 15, and the pH is usually less than 8.5.

salinity, soil - The amount of soluble salts in a soil, expressed in terms of percentage, parts per million, or other convenient ratios.

sand - (i) A soil particle between 0.05 and 2.0 mm in diameter. (ii) Any one of five soil separates: very coarse sand, coarse sand, medium sand, fine sand, or very fine sand. (iii) A soil textural class.

separates, soil - Mineral particles, less than 2.0 mm in equivalent diameter, ranging between specified size limits. The names and size limits of separates recognized by pedologists in Canada and the United States are: very coarse sand, 2.0 to 1.0 mm; coarse sand, 1.0 to 0.5 mm; medium sand, 0.5 to 0.25 mm; fine Sand, 0.25 to 0.10 mm; very fine sand 0.10 to 0.05 mm; silt, 0.05 to 0.002 mm; and clay, less than 0.002 mm.

series, soil - A category in the Canadian system of soil classification, and is a basic unit of soil classification and mapping, and consists of soils that are essentially alike in all major profile characteristics except the texture of the surface.

silt - (i) A soil separate consisting of particles between 0.05 mm and 0.002 mm in equivalent diameter. (ii) A soil textural class.

soil - The unconsolidated material on the immediate surface of the earth that serves as a natural medium for the, growth of land plants.

solum (plural sola) - The Upper horizons of a soil in which the parent material has been modified and in which most plant roots are contained. It usually consists of A and B horizons.

stones - Rock fragments greater than 25 cm (10 inches) in diameter if rounded and greater than 30 cm (15 inches) along the greater axis, if flat.
stony land - Areas containing sufficient stones to make the use of machinery impractical; usually 15% to 90% of the surface soil is covered with stones.

subgroup, soil - A category in the Canadian classification system. These soils are subdivisions of the great groups and therefore each soil is defined more specifically.

survey, soil - The systematic examination, description, classification, and mapping of soils in an area. Soil surveys are classified according to the kind and intensity of the field examination.

swamp - An area saturated with water throughout much of the year, but with the surface of the soil usually not deeply submerged. It is generally characterized by tree or shrub vegetation.

terrace - A nearly level usually narrow, plain bordering a river, lake, or sea. Rivers sometimes are bordered by a number of terraces at different levels. There are also man-made terraces.

texture, soil - The relative proportions of the various soil separates in a soil as described by the classes of soil texture.

till - Unstratified glacial drift deposited directly by the ice and consisting of clay, Sand, gravel, and boulders intermingled in any proportion.

topography - The physical features of a district or region, such as those represented on a map, taken collectively; especially, the relief and contours of the land.

topsoil - layer of soil moved in cultivation (typically includes the A horizon) or the presumably fertile soil material used to topdress disturbed areas for landscaping or garden development.