



ECOLOGICAL REGIONS OF THE
NORTHWEST TERRITORIES

Taiga Plains

Ecosystem
Classification Group

Government of
Northwest Territories

**Department of Environment and Natural Resources
Government of the Northwest Territories**

Revised 2009

ECOLOGICAL REGIONS OF THE NORTHWEST TERRITORIES

TAIGA PLAINS

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About the cover:

The small photographs in the inset boxes are enlarged with captions on pages 22 (*Taiga Plains High Subarctic (HS) Ecoregion*), 52 (*Taiga Plains Low Subarctic (LS) Ecoregion*), 82 (*Taiga Plains High Boreal (HB) Ecoregion*), and 96 (*Taiga Plains Mid-Boreal (MB) Ecoregion*). Aerial photographs: Dave Downing (Timberline Natural Resource Group). Ground photographs and photograph of cloudberry: Bob Decker (Government of the Northwest Territories). Other plant photographs: Christian Bucher.

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Preface

The vast landscapes of the Northwest Territories include a remarkable array of terrain and climate conditions interacting to produce an abundance of ecosystems ranging in size from a few square meters to thousands of square kilometers. Productive and diverse forests and wetlands on the rich terraces of the Liard River in the southwest, an intricate complex of alpine and subalpine communities in the western mountains, open and stunted black spruce forests on permanently frozen soils in the northern interior plains, low-growing tundra communities in dry arctic areas north of tree line, and huge expanses of treeless or sparsely forested Canadian Shield rock are but a few of the ecosystems that define the land north of 60.

These broad-scale vegetation cover and terrain features provide, in part, the basis for defining and understanding the climatic and physiographic patterns that control vegetation and soil distribution. Both plant communities and soils develop in response to *abiotic factors* (those which affect temperature, moisture, light, and nutrient conditions, such as latitude, elevation, and parent materials), and *biotic factors* (for example, competition between species, or individual species tolerances to climatic conditions). The relative influence of each factor at any place in the landscape is determined by the interaction of atmospheric and landscape attributes – climate, topography, parent materials, and biotic elements – all acting over time, as described by Major (1951) and Jenny (1941) for vegetation and soils, respectively. These attributes can be delineated and represented as abstract ecological map units, and may be described at various scales.

At the global scale, the *Biome* or *Vegetation Zone* is recognized (Walter 1979, Scott 1995, Commission for Environmental Cooperation 1997). At the national scale in Canada, *Ecozones*, *Ecoregions* and *Ecodistricts* are described (Ecological Stratification Working Group 1995). The Northwest Territories has modified the Canadian national scale and classification framework to match the multi-level continental ecosystem classification framework – *Ecological Regions of North America* – developed by the Commission for Environmental Cooperation in 1997. The Canadian and continental systems are outlined in Section 1 of this report.

The value of regional ecosystem classification systems as a foundation for sustainable resource management has been recognized for at least four decades in Canada; they provide a means of presenting and understanding biophysical patterns in a geographic context, and a common basis for communication. The Government of the Northwest Territories has used the national ecosystem classification framework since 1996 as the basis for identifying candidate protected areas, forest management planning, wildlife habitat management and environmental impact assessment and mitigation. Increasing pressures from non-renewable resource development in the southern portion of the Taiga Plains, and the planned Mackenzie Gas Project along the Mackenzie River corridor prompted an evaluation of the national framework within the Taiga Plains and Boreal Plains Ecozones that together comprised most of the south-central Northwest Territories south of tree line and lying between the mountains on the west and the Canadian Shield to the east. This evaluation, undertaken in 2004, concluded that the national framework was appropriate for these purposes and suggested changes to improve its usability. Recommended changes included the re-assignment of ecosystem units that were part of the 1995 Taiga Plains to adjacent geographic areas, the re-assignment of Boreal Plains ecosystem units within the Northwest Territories to the Taiga Plains, and the creation of new ecosystem units to better reflect regional climatic, physiographic and biotic variations (Downing 2004).

Proposed revisions to the classification system were modeled and assessed through a series of workshops in 2004, 2005 and 2006 at which experts from the Government of the Northwest Territories, Agriculture and Agri-Food Canada, and consulting firms participated. A variety of spatial data sources including Landsat imagery, digital elevation models, hydrology, permafrost, bedrock and surficial geology, soils, and interpolated climate models were brought together

within a geographic information system. This information allowed participants to view landscapes and existing mapped ecosystem units from a number of different perspectives.

Air and ground verification of the proposed changes was an integral part of the revision process. In the summer of 2005, an intensive float plane and helicopter survey was undertaken throughout the entire Taiga Plains, including the eastern border of the Taiga Cordillera, the western border of the Taiga Shield, and the southern boundary of the Southern Arctic. Over 35,000 km of transects were flown, and a detailed and large-scale record of landscape features was captured in over 16,000 geographically located digital images accompanied by text commentaries; site, vegetation and soil information was also collected from 57 ground plots. Both the photographs and thematic maps derived from the commentaries proved to be indispensable for the revision process.

This report and the accompanying map (map pocket inside back cover and Appendix 3) provide a summary of ecoregions within the Taiga Plains. Better spatial information and an improved understanding of climate and landscape patterns and processes through intensive aerial surveys have resulted in the delineation of 45 Level IV¹ ecoregions within the Taiga Plains, compared with 16 ecoregions described by the Ecological Stratification Working Group in 1995. Some significant re-assignments of regional mapped ecosystem units have also been made. Higher-elevation ecoregions that were once assigned to the Taiga Plains, such as the mountainous Nahanni Plateau and the Franklin Mountains, are now part of the Taiga Cordillera. The Boreal Plains once extended north as far as the Slave River Delta, but now terminates south of the Alberta border, reflecting the current view that better forest growth on the Slave River floodplain is a consequence of better site conditions and not of a warmer climate regime.

The report integrates currently available information about climatic, physiographic, vegetation and soil attributes to characterize each of the ecoregions within the Taiga Plains in a format that is suited to both technical and non-technical users. For this purpose, it has been organized into three sections.

- Section 1 defines the continental ecosystem classification framework as applied to the Taiga Plains, and its relationship to the national classification system that is applied across much of Canada. The climatic and physiographic factors that exert major influences on landscapes are also discussed.
- Section 2 provides further details on the methods employed in the review and refinement of the 1995 Canadian Ecological Framework towards the present 2006 continental model.
- Section 3 describes the Level II Taiga Plains Ecoregion and the four Level III ecoregions and 45 Level IV ecoregions occurring within it.
- Section 4 describes the mammals and birds of the Taiga Plains.

The report concludes with a list of cited references, common and scientific names of plants mentioned in the text (Appendix 1), a summary of changes from the 1996 mapped version of Ecozones and Ecoregions to the current version (Appendix 2), a page-size map and legend for the Taiga Plains (Appendix 3) and a glossary of useful terms (Appendix 4).

This report is a revision of the 2007 *Ecological Regions of the Northwest Territories – Taiga Plains* document. The major change to the document is the inclusion of wildlife descriptions in Section 4.

¹ Ecoregion definitions are provided in Section 1.

Table of Contents

Members of the Ecosystem Classification Group	i
Acknowledgements	ii
Preface	iii

Section 1: Concepts, Climates, and Landscapes 1

1.1 Introduction	1
1.2 Classification Framework	1
1.2.1 Level I Ecoregions	1
1.2.2 Level II Ecoregions	1
1.2.3 Level III Ecoregions	2
1.2.4 Level IV Ecoregions	2
1.2.5 Further Divisions of Level IV Ecoregions	4
1.2.6 Long-term Value of the Taiga Plains Ecosystem Classification	4
1.3 Mapping Concepts and Landscape Descriptions	4
1.4 How Level III Ecoregions are Defined	5
1.4.1 Climatic Factors	5
1.4.2 Landscape Features	7
1.5 How Level IV Ecoregions are Defined	11

Section 2: Methods 13

2.1 Introduction	13
2.2 GIS Processes	13
2.2.1 Information Assembly	13
2.2.2 Map Production and Database Update	13
2.3 Field Data Collection	14
2.4 Post-field Data Review and Mapping	14
2.4.1 General Procedures	14
2.4.2 Information Sources Used to Describe Ecoregions	15

Section 3: Level III and Level IV Ecoregions of the Taiga Plains17

3.1 Introduction	17
3.2 The Taiga Plains	17
3.2.1 Biophysical Summary of the Taiga Plains	17
3.2.2 Relationship to Other Level II Ecoregions	19
3.3. Ecoregion Descriptions	19
3.3.1 Taiga Plains High Subarctic (HS) Ecoregion	22
3.3.1.1 Mackenzie Delta HS Ecoregion	24
3.3.1.2 Arctic Red Plain HS Ecoregion	26
3.3.1.3 Campbell Hills HS Ecoregion	28
3.3.1.4 Sitidgi Plain HS Ecoregion	30
3.3.1.5 Travaillant Upland HS Ecoregion	32
3.3.1.6 Anderson Plain HS Ecoregion	34

Table of Contents (continued)

3.3.1.7	Colville Upland HS Ecoregion	36
3.3.1.8	Colville Plain HS Ecoregion	38
3.3.1.9	Colville Hills HS Ecoregion	40
3.3.1.10	Great Bear Upland HS Ecoregion	42
3.3.1.11	Great Bear Plain HS Ecoregion	44
3.3.1.12	Grandin Plain HS Ecoregion	46
3.3.1.13	Grandin Upland HS Ecoregion	48
3.3.1.14	Lac Grandin Upland HS Ecoregion	50
3.3.2	Taiga Plains Low Subarctic (LS) Ecoregion	52
3.3.2.1	Arctic Red Plain LS Ecoregion	54
3.3.2.2	North Mackenzie Plain LS Ecoregion	56
3.3.2.3	Norman Range LS Ecoregion	58
3.3.2.4	Great Bear Upland LS Ecoregion	60
3.3.2.5	Great Bear Plain LS Ecoregion	62
3.3.2.6	Blackwater Upland LS Ecoregion	64
3.3.2.7	Keller Plain LS Ecoregion	66
3.3.2.8	Lac Grandin Plain LS Ecoregion	68
3.3.2.9	Lac Grandin Upland LS Ecoregion	70
3.3.2.10	Bulmer Plain LS Ecoregion	72
3.3.2.11	Ebbutt Upland LS Ecoregion	74
3.3.2.12	Horn Slopes LS Ecoregion	76
3.3.2.13	Horn Plateau LS Ecoregion	78
3.3.2.14	Cameron Plateau LS Ecoregion	80
3.3.3	Taiga Plains High Boreal (HB) Ecoregion	82
3.3.3.1	Ebbutt Upland HB Ecoregion	84
3.3.3.2	Horn Plain HB Ecoregion	86
3.3.3.3	Sibbeston Upland HB Ecoregion	88
3.3.3.4	Trout Upland HB Ecoregion	90
3.3.3.5	Cameron Upland HB Ecoregion	92
3.3.3.6	Great Slave Plain HB Ecoregion	94
3.3.4	Taiga Plains Mid-Boreal (MB) Ecoregion	96
3.3.4.1	South Mackenzie Plain MB Ecoregion	98
3.3.4.2	Liard Plain MB Ecoregion	100
3.3.4.3	Liard Upland MB Ecoregion	102
3.3.4.4	Trout Upland MB Ecoregion	104
3.3.4.5	Horn Slopes MB Ecoregion	106
3.3.4.6	Great Slave Lowland MB Ecoregion	108
3.3.4.7	Tathlina Plain MB Ecoregion	110
3.3.4.8	Cameron Slopes MB Ecoregion	112
3.3.4.9	Slave Upland MB Ecoregion	114
3.3.4.10	Slave Delta MB Ecoregion	116
3.3.4.11	Slave Lowland MB Ecoregion	118

Table of Contents (concluded)

Section 4: Mammals and Birds of the Taiga Plains	121
4.1 Introduction	121
4.2 Mammals of the Taiga Plains	122
4.2.1 Ungulates	122
4.2.2 Large Carnivores	123
4.2.3 Mustelids and Skunks	124
4.2.4 Large Rodents	125
4.2.5 Mice, Voles and Lemmings	125
4.2.6 Lagomorphs	126
4.2.7 Insectivores	126
4.2.8 Bats	126
4.3 Birds of the Taiga Plains	126
4.3.1 Birds of Prey	126
4.3.2 Loons and Grebes	127
4.3.3 Waterfowl	127
4.3.4 Wading Birds	127
4.3.5 Other Fish-eaters	127
4.3.6 Shorebirds	128
4.3.7 Gulls, Terns, and Jaegers	128
4.3.8 Grouse	128
4.3.9 Corvids and Blackbirds	128
4.3.10 Woodpeckers	128
4.3.11 Aerial Insect-eaters	129
4.3.12 Warblers	129
4.3.13 Other Insectivores	129
4.3.14 Thrushes	129
4.3.15 Sparrows and Related Species	130
4.3.16 Finches and Other Tree Seed-eaters	130
4.3.17 Hummingbirds	130
4.3.18 Doves	130
References	131
Appendix 1. Plant Species List	135
Appendix 2. Changes to 1996 Ecozones and Ecoregions	139
Appendix 3. Level III and Level IV Ecoregions of the Taiga Plains	148
Appendix 4. Glossary of Terms	151

List of Figures

Figure 1.	Relative sun angles at different locations at the winter and summer solstice.	5
Figure 2.	Decreasing average annual solar radiation with increasing latitude in the Taiga Plains.	6
Figure 3.	Decreasing average annual temperature with increasing latitude in the Taiga Plains	6
Figure 4.	Decreasing mean annual precipitation with increasing latitude in the Taiga Plains	7
Figure 5.	Polygonal peat plateaus, characteristic of wet areas throughout the Taiga Plains HS Ecoregion.	9
Figure 6.	Earth hummocks occur in the northern parts of the Northern Great Bear Plains HS Ecoregion and are common features of the Level II Southern Arctic Ecoregion.	9
Figure 7.	Runnels typical of the Taiga Plains HS Ecoregion and Taiga Plains LS Ecoregion.	9
Figure 8.	Peat plateau in the Taiga Plains HS Ecoregion.	10
Figure 9.	Peat plateau in the Taiga Plains MB Ecoregion.	10
Figure 10.	Closeup view of a peat plateau.	10
Figure 11.	Thermokarst lakes and peat plateaus, Mackenzie and Slave Lowland MB Ecoregion.	10
Figure 12.	Transects flown during July and August 2005 in the Taiga Plains.	16
Figure 13.	Taiga Plains and Neighbouring Level II Ecoregions (2007).	21
Figure 14.	1996 Ecozones, Ecoregions and Major Physiographic Elements of the Taiga Plains.	146
Figure 15.	2007 Level II Ecoregions, Level IV Ecoregions, and Major Physiographic Elements of the Taiga Plains.	147
Figure 16.	2007 Level III and Level IV Ecoregions of the Taiga Plains.	148-149

List of Tables

Table 1.	Classification Framework in the Northwest Territories and Comparison to Canada's National Classification Framework (the latter modified from Marshall <i>et al.</i> (1996)).	3
Table 2.	Climatic Characteristics of Four Level III Ecoregions within the Taiga Plains, Northwest Territories.	8
Table 3.	Summary of Changes Between 1996 Ecozones and Ecoregions and 2007 Level II and Level IV Ecoregions, western Northwest Territories.	141

Section 1: Concepts, Climates, and Landscapes

1.1 Introduction

Section 1 explains the system that classifies the Northwest Territories into ecologically meaningful units based on climate, physiography and vegetation patterns. Section 1.2 provides an overview of the North American continental ecosystem classification system, a comparison to the related Canadian framework, and its application to the Northwest Territories. Section 1.3 reviews mapping concepts, including the practical aspects of applying the ecosystem classification scheme to the Northwest Territories. Section 1.4 explains how climatically distinct regional land areas are delineated (Level III ecoregions, defined in Section 1.2.3). Section 1.5 explains how these regional areas are divided into units characterized by vegetation and physiography (Level IV ecoregions, defined in Section 1.2.4), how units are named, and how they are described.

1.2 Classification Framework

The recognition that climate and landforms influence biotic processes differently from place to place and at all scales encouraged the development of an integrated climate and landform-based ecosystem classification approach in Canada; this system has been under development for about four decades. The Subcommittee on Biophysical Land Classification (Lacate 1969) developed the first nationally applied multi-level definition of landscapes using these criteria. The Canada Committee on Ecological Land Classification (CCELC) was formed in 1976 and the Ecoregions Working Group was established shortly afterwards. The mandate of this working group was to develop the concept and hierarchy for the *Ecoclimatic Regions of Canada* (Ecoregions Working Group, 1989). The CCELC further defined classification elements and the methods for mapping them (Wiken and Ironside 1977); CCELC developed a multi-level classification framework, shown in Table 1 (Marshall *et al.* 1996; CEC 1997).

From 1996 to early 2006, this national scheme was employed to delineate and describe ecosystem units within the Northwest Territories (Ecological Stratification Working Group 1995; Downing *et al.* 2006). Subsequent discussions with other experts in Canada and the United States in May 2006 led to the conclusion that a re-assessment of the hierarchical system was timely; an opportunity existed for the Northwest Territories to integrate the revised Taiga Plains Ecozone with the existing Ecological Regions of North America². The mapped spatial units and their ecological attributes, as described in the 2006 technical report (Downing *et al.* 2006), remain unchanged.

Like the Canadian system, the North American continental framework is a multilevel, nested system for delineating and describing ecosystems; the Government of the Northwest Territories uses this information for planning and reporting purposes. Currently, the top four levels of the continental framework as applied to the Taiga Plains of the Northwest Territories are Level I ecoregions, Level II ecoregions, Level III ecoregions, and Level IV ecoregions.

1.2.1 Level I Ecoregions

North America includes 15 broad, Level I ecological regions (ecoregions) that provide the backdrop to the ecological mosaic of the continent, and provide context at global or intercontinental scales (Committee for Environmental Cooperation 1997). These ecoregions are similar in scale and scope to the global ‘*biomes*’ (e.g. Walter 1979) and are mapped at a scale of about 1: 50,000,000. There are three Level I ecoregions within the Northwest Territories. The Tundra Ecoregion occurs north of tree line. The Taiga Ecoregion and Northwestern Forested Mountains Ecoregion occupy the area between the 60th parallel and tree line. The Level II Taiga Plains Ecoregion lies entirely within the Level I Taiga Ecoregion.

1.2.2 Level II Ecoregions

Level II ecoregions are useful for national and sub-continental overviews of physiography, wildlife,

² Further information available at:

http://www.cec.org/files/pdf/BIODIVERSITY/eco-eng_EN.pdf
and <http://www.epa.gov/wed/pages/ecoregions/ecoregions.htm>

and land use (Committee for Environmental Cooperation 1997). They are more or less equivalent to the Canadian *ecozone*, defined as “areas of the earth’s surface representative of large and very generalized ecological units characterized by interactive and adjusting abiotic and biotic factors ... the ecozone defines, on a sub-continental scale, the broad mosaics formed by the interaction of macroscale climate, human activity, vegetation, soils, geological, and physiographic features of the country.” (Ecological Stratification Working Group 1995). They are nested within Level I ecoregions and are represented at a scale of between 1:5,000,000 and 1:10,000,000³. There are 18 Level II ecoregions within Canada and eight Level II ecoregions within the Northwest Territories.

Level II ecoregions in the Northwest Territories span a broad range of climatic and physiographic conditions. Boundaries are recognized by major changes in physiography (e.g., the well-defined bedrock boundary between the Taiga Plains and the Taiga Shield Ecoregions) and/or climate (e.g. the change from cold continental climates in the Taiga Plains Ecoregion to very cold polar climates in the Southern Arctic Ecoregion).

1.2.3 Level III Ecoregions

In the Taiga Plains Ecoregion, there are four Level III ecoregions that show regionally significant differences. These are approximately equivalent to the Canadian *ecoprovince* (Ecological Stratification Working Group 1995) or *ecoclimatic region* (Ecoregions Working Group 1989). In this document, Level III ecoregions are characterized by regional climatic differences as defined at the ecoclimatic region level in *Ecoclimatic Regions of Canada* (Ecoregions Working Group 1989). The Level III ecoregion recognizes several major climatic belts within the Level II Taiga Plains Ecoregion, and provides an organizing framework within which Level IV ecoregions having similar climatic regimes can be logically discussed. Level III ecoregions are mapped at a scale of 1:2,000,000 to 1:5,000,000; there are 62 Level III ecoregions in

Canada and 17 Level III ecoregions in the Northwest Territories. In Section 1.4, the four Level III ecoregions within the Taiga Plains are named and their climatic attributes are briefly discussed; more details are provided in Section 3.

1.2.4 Level IV Ecoregions

Level IV ecoregions are subdivisions of the Level III ecoregions. They are characterized by distinctive regional ecological factors, including climate, physiography, vegetation, soil, water and fauna (Marshall *et al.* 1996). Level IV ecoregions have been variously defined, depending on the landscape and the classification objectives, as “total landscape ecoregions” (physiography – vegetation), “habitat ecoregions” (wildlife habitat – vegetation – physiography), “soil ecoregions” (soil – vegetation) or “ecoclimatic ecoregions” (ecologically effective macroclimate as expressed by vegetation) (Ecoregions Working Group 1989).

The degree to which climate, physiography, vegetation and soils can be used to define a particular ecoregion depends on its geographic location and the information available. In the Northwest Territories, detailed vegetation, soil and surficial geology information is generally limited to areas within the Mackenzie Valley and its major tributaries, and climate data have only been collected at a few stations within the Taiga Plains for a long enough period to be useful. There is, however, enough information to delineate and describe Level IV ecoregions. Information sources include: existing ecological, soils and surficial geology maps; good-quality satellite imagery; terrain models; geo-referenced digital photographs; and observed relationships between permafrost forms, forest cover, tree species distribution and climatic conditions. Level IV ecoregions are usually represented at a scale of 1:250,000 to 1:1,500,000. There are 45 Level IV ecoregions within the Taiga Plains.

³ At the scales of mapping *at each level* of the ecoregion hierarchy, the smallest mapping unit is about two square centimeters; this is usually the smallest area that reasonably represents a significant difference between adjacent map units.

Table 1. Northwest Territories Classification Framework and Comparison to Canada's National Classification Framework (the latter modified from Marshall *et al.* (1996).

Northwest Territories/Continental Ecosystem Classification	Canadian Ecosystem Classification Equivalent	Description
Level I Ecoregion (<i>Taiga</i>)	Ecoclimatic Province (Ecoregions Working Group 1989) – parts of the Boreal and Subarctic Climatic Ecoprovinces	<i>Global-Continental</i> : Scale 1:50,000,000. Equivalent to global biomes. Used as the first level of stratification for international planning and management initiatives.
Level II Ecoregion (<i>Taiga Plains</i>)	Ecozone	<i>Territorial-National</i> : Scale 1:30,000,000. Subdivision of global biomes. Used for national state-of-environment tracking.
Level III Ecoregion (<i>Taiga Plains HS, Taiga Plains LS, Taiga Plains HB, Taiga Plains MB</i>)	Ecoprovince (Canada Committee on Ecological Land Classification) or Ecoclimatic Region (Ecoregions Working Group 1989)	<i>Regional</i> : In the Northwest Territories (Taiga Plains), Level III ecoregions are defined by regional climatic differences within Level II ecoregions. Equivalent to Ecoclimatic Regions defined in <i>Ecoclimatic Regions of Canada</i> (Ecoregions Working Group 1989). Scale 1:5,000,000-1:10,000,000.
Level IV Ecoregion (45 in Taiga Plains, nested within each of four Level III ecoregions above)	Ecoregion	<i>Regional</i> : Broad recurring vegetation and landform patterns within a regional climatic framework. In the Northwest Territories, physiographic characteristics (e.g., plains, hill systems) and geographic features (e.g., major rivers or lakes) are combined to subdivide Level III ecoregions into Level IV ecoregions. Scale 1:500,000-1:1,000,000.
No current equivalent in continental system	Ecodistrict	<i>Subregional</i> : Subdivisions of an ecoregion based on distinctive landform differences. Ecodistricts, ecoregions, and ecozones are defined for all provinces and territories in Canada in the national system. In the Northwest Territories, the ecodistrict might be equivalent to one Soil Landscape (SLC) polygon (refer to Section 1.2.5 for discussion), or might include two or more SLC polygons. Scale 1:50,000-1:250,000.
	Ecosection	<i>Subregional</i> : More specific delineation of recurring landform and vegetation patterns, usually with reference to major community type groups or soil subgroups. Typically represented as complexes. Used for regional and subregional integrated resource planning. An SLC polygon with vegetation attributes linked to physical characteristics could be regarded as an ecosection. Scale 1:20,000-1:50,000.
	Ecoelement	<i>Local</i> : Scale 1:20,000 –1:50,000. May be employed as mappable units at the operational level ("ecosites", "site series") for example, forest resources inventory.
	Ecosite	<i>Local</i> : Scale <1:10,000. Usually a single vegetation type on a single soil type and site, but could be complexed in boreal landscapes. Employed where very detailed information is required (e.g. detailed pre-harvest assessments, special features delineation).

1.2.5 Further Divisions of Level IV Ecoregions

Two more classification levels also form part of the ecosystem classification framework in the Northwest Territories. The *ecodistrict* is a finer physiographic subdivision of the Level IV ecoregion, and provides the framework within which climatic models were developed (Agriculture and Agri-Food Canada 1997); these models are further discussed in Section 1.4. Ecodistricts and Level IV ecoregions may also include one or more smaller units. ‘*Soil Landscapes of Canada (SLC) polygons*’ are described by a standard set of attributes such as surface form, slope class, general texture and soil type, water table depth, permafrost and lake area. SLC polygons may contain one or more distinct soil landscape components and may also contain small but highly contrasting inclusion components. The location of these components within the polygon is not defined.

Neither the ecodistrict nor the SLC level of classification are presented in this report or on the map. Ecodistrict units do, however, provide general climatic information, and SLC map units provide information that is used to describe the parent geologic materials, soils, and wetland/upland proportions within each Level IV ecoregion. SLC polygons are an element of the digital coverage from which the Taiga Plains ecosystem classification was generated. The ecodistrict and SLC levels of classification are generally represented at scales of about 1:50,000 to 1:250,000.

1.2.6 Long-term Value of the Taiga Plains Ecosystem Classification

The 2007 ecosystem classification is a reasonable approximation of Northwest Territories biophysical patterns given the climatic and biophysical information available at the time of publication. It is based partly on past climatic trends that are not necessarily representative of future trends (refer to Section 1.4.1). It is likely that current ecological classification concepts will change in response to new information, climate change, improved analytical techniques, and revised viewpoints on how national and global classifications ought to be presented. This document and the accompanying map will serve both as a framework for current resource management and as a benchmark against which future ecosystem changes can be assessed.

1.3 Mapping Concepts and Landscape Descriptions

The classification scheme adopted for the Northwest Territories and presented in Section 1.2 (Table 1) illustrates how landscapes are logically divided into nested units that reflect the ecological relationships between climate, topography, parent materials, and biota. The approach starts with the largest landscape complex (Level I global to continental scale). Level II, III, and IV ecoregions are nested within these, and are recognized as discrete units by vegetation and landform patterns at increasingly large scales. Level III and Level IV ecoregions cover areas of hundreds to thousands of square kilometers and encompass considerable complexity, particularly at higher levels of the ecosystem classification. The spatial delineation and description of any of these units depends on the mapper’s concept of what constitutes an ecologically meaningful pattern and the information available to support this conclusion.

The mapping process is therefore inherently subjective, and mapped units and their descriptions are based on the best empirical information available at the time, a reasonable compromise between differing viewpoints, and the acknowledgement that map units are abstract representations of real-world landscapes. For example, boundaries between Level I, II and III ecoregions are shown as sharp lines on a map or in a GIS database, but are not always so well defined in nature. Clearly visible features such as the Taiga Shield – Taiga Plains bedrock interface are readily observed and mapped, but where climatic differences are the boundary criterion, boundaries between map units are more correctly viewed as broad transition zones perhaps tens of kilometers in width.

Despite the conceptual nature of ecosystem classification, an explicit and logical system can be developed through the application of consistent rules for mapping, naming and describing units. The criteria for mapping discrete units are provided in Sections 1.2, 1.4 and 1.5, and are further explained where appropriate in Section 3.

1.4 How Level III Ecoregions are Defined

The Taiga Plains includes four major Level III ecoregions, each influenced to different degrees by climatic factors discussed below in Section 1.4.1 and summarized in Table 2. Although climate patterns have been modeled at the ecodistrict level (Agriculture and Agri-Food Canada 1997), only a few long-term stations scattered across the Taiga Plains are available to calibrate the model. Level III ecoregions have therefore been defined with reference to certain landscape and vegetation features that are considered to be representative of climatic regimes (Section 1.4.2), and the Agriculture and Agri-Food Canada ecodistrict climate model was used as a general check on the validity of the conclusions.

The four Level III ecoregions occurring in the Taiga Plains are, from north to south, the *Taiga Plains High Subarctic (HS) Ecoregion*, the *Taiga Plains Low Subarctic (LS) Ecoregion*, the *Taiga Plains High Boreal (HB) Ecoregion*, and the *Mackenzie and Slave Mid-Boreal (MB) Ecoregion*. These Level III ecoregions are closely matched to the Ecoclimatic Regions defined by the Ecoregions Working Group (1989); more intensive field surveys have allowed refinement of the 1989 boundaries. Climate, soil and vegetation characteristics of these ecoregions are summarized above in Table 2. Representative examples of permafrost features that help to define each Level III ecoregion are shown in Figures 5 through 11.

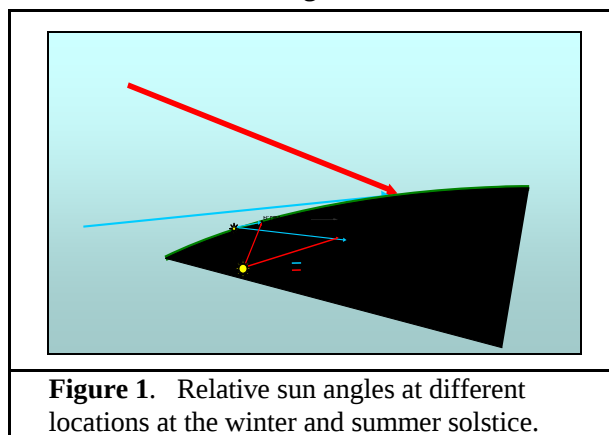
1.4.1 Climatic Factors

Climate can be generally defined as the cumulative long-term effects of weather, involving the processes of heat and moisture exchange between the earth and atmosphere. Succinctly put, “weather is what you see; climate is what you expect” (Anon., cited in Klock *et al.* 2000). In the Northwest Territories, climate is affected by several factors. The interaction of these factors produces climatic zones (Level III ecoregions) that are recognizable by certain landform and vegetation patterns.

Climates throughout the Northwest Territories are profoundly influenced by several factors.

Latitude

As latitude increases, the incident angle of the sun’s rays decrease. For example, at Fort Liard (latitude 60°13’N) at mid-day on December 21, the sun is 6.3 degrees above the horizon. On the same day at Norman Wells (latitude 66°11’N) the sun is only 0.4 degrees above the horizon and at Inuvik (latitude 68°21’ N) the sun does not rise at all. Figure 1 shows this relationship at these three locations on June 21 and December 21. A decrease in sun angle produces a corresponding decrease in the amount of solar energy, which is further reduced by the longer passage the sun’s rays must take through the atmosphere at higher latitudes. Figure 2 shows the decrease in average daily global solar radiation (the amount of radiation incident at the top of the atmosphere⁴) with increase in latitude, modeled from Ecodistrict Climate Normals provided by Agriculture and Agri-Food Canada (1997). The amount of incident solar radiation also influences the annual temperature regime of an area; Figure 3 shows how mean annual temperature also decreases with increasing latitude.



Albedo

Albedo is defined as the ratio of the amount of solar radiation reflected by a body to the amount incident on it, commonly expressed as a percentage (Klock *et al.* 2000). Coniferous forest cover has a low albedo, and reflects about nine percent of incident sunlight (Eugster *et al.* 2000) whereas snow and ice cover reflect considerably

⁴ This amount exceeds the solar radiation incident at the ground surface for various reasons, including particulate matter and clouds in the atmosphere, and the albedo of incident surfaces.

more incident sunlight. Extensive ice-covered areas (e.g., Great Slave and Great Bear Lakes which do not become ice-free until June) increase albedo, as does cloud cover. The interaction of low solar inputs and high albedo produce the array of permafrost and vegetation features distributed across the Taiga Plains.

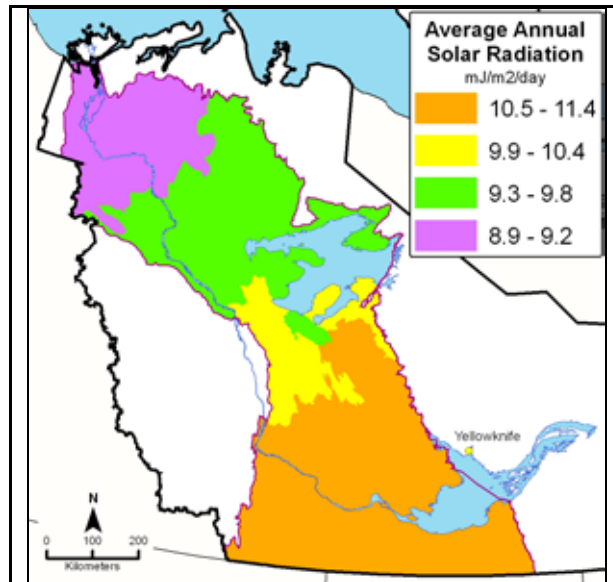


Figure 2. Decreasing average annual solar radiation with increasing latitude in the Taiga Plains (units are mJ/m²/day).

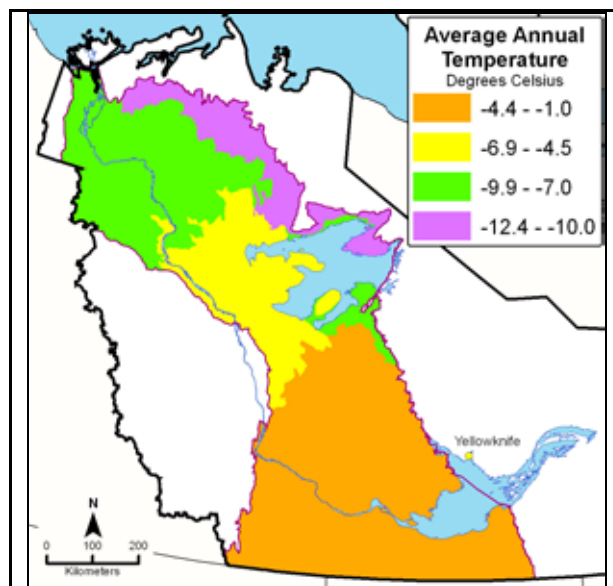


Figure 3. Decreasing average annual temperature with increasing latitude in the Taiga Plains (units are degrees Celsius).

Regional and global circulation patterns

General north to south circulation patterns in the atmosphere redistribute heat, without which arctic and subarctic regions would experience a net annual energy loss. They also redistribute moisture. The Mackenzie River Basin, within which the Taiga Plains lies, is characterized by prevailing westerly winds, and storms over the North Pacific Ocean have the greatest influence in the transport of water and energy into the Basin, especially during the cold season when the north – south temperature gradients are strong. The flow aloft is determined by two features: an upper low that is usually over the central Arctic Islands during the summer and that intensifies and moves to northern Foxe Basin during the winter; and the Aleutian Low/Pacific High. The Mackenzie River Basin is an important source region of cold continental polar air mass and anticyclones that have great impacts on the weather and climate of North America in the fall and winter (Klock *et al.* 2000).

Topography

Regional weather patterns and topography interact to produce a general decrease in mean annual precipitation with increasing latitude and decreasing elevation, shown below in Figure 4. Mountain ranges across Alaska, the Yukon and the Northwest Territories strip much of the moisture from frontal systems, and together with the lower water-holding capacity of cold air, results in lower mean annual precipitation at higher latitudes and lower elevations. Local topographic features such as the Horn Plateau and Cameron Hills can produce uplift effects resulting in convective storm events in summer (Klock *et al.* 2000); precipitation amounts are probably not evenly distributed within ecoregions.

In addition to these effects, decreases in temperature and increases in wind speed with elevation produces local vegetation and soil patterns, such as permafrost features on top of the Horn Plateau that are more typical of areas several hundred kilometers to the north.

Lake effects

The climatic effects of Great Bear Lake and Great Slave Lake, the largest and fifth largest freshwater lakes entirely within Canada, respectively, are currently under investigation. They likely affect regional climates, because they have a huge capacity to store heat. They melt slowly in spring, and the lake waters remain cold

during the summer; consequently, the lower atmosphere is stable, inhibiting cloud formation and allowing more solar radiation to strike the lake surface and heat the water. The cold lake waters also control air temperatures, limit the amount of daytime heating on lands adjacent to the larger lakes, and consequently affect vegetation and permafrost development (refer to Section 3.3.1.11 for further discussion). In the fall and winter, there is a slow release of stored heat compared to that experienced by thousands of smaller lakes; freeze-up often does not occur until late November, and atmospheric instability as a result of released heat leads to high evaporation and precipitation⁵. Non-forested lowlands are also found on the downwind side of large lakes, where cold winds off the ice create a tundra-like microclimate (Scott 1995).

Climate change

Northern environments are highly sensitive to climate change (Eugster *et al.* 2000). Zoltai (1995) presents evidence indicating that permafrost zones were considerably further north 6,000 years ago in the Holocene Warm Period than they are at the present time. Woo *et al.* (1992) suggest that mean annual surface temperatures may increase by 4°C in Northern Canada in future; Tarnocai *et al.* (2004) indicated that the depth of thaw penetration into permafrost is sensitive to past temperature change and has responded measurably to recent major climatic events. Northern ecosystems have historically been highly dynamic and will undoubtedly continue to be so. This ecosystem classification should be viewed as the present-day representation of a dynamic Arctic – Boreal system and a useful benchmark against which to compare future environmental states.

1.4.2. Landscape Features

Level III ecoregions are defined by permafrost and vegetation characteristics that indicate climatic influences (Table 2), along with basic GIS-derived information such as total land and water area and elevation ranges.

The landscape features most useful for differentiating Level III ecoregions are those visible on Landsat images, augmented by aerial digital photographs taken at known locations (refer to

Section 2 for a discussion of methods). These include permafrost features, forest cover characteristics, and tree distribution. Permafrost features include *peat plateaus*, *polygonal peat plateaus*, *earth hummocks*, *patterned ground*, *runnels*, and *thermokarst*. Forest cover features include *canopy composition* (e.g., trembling aspen – white spruce mixed-wood forest, black spruce – lichen forest) and *canopy closure* (open vs. closed canopy). Indicator tree species include trembling aspen, jack pine, and lodgepole pine⁶. The above-listed permafrost features are defined in the glossary of terms (Appendix 4); examples are shown in Figures 5 through 11.

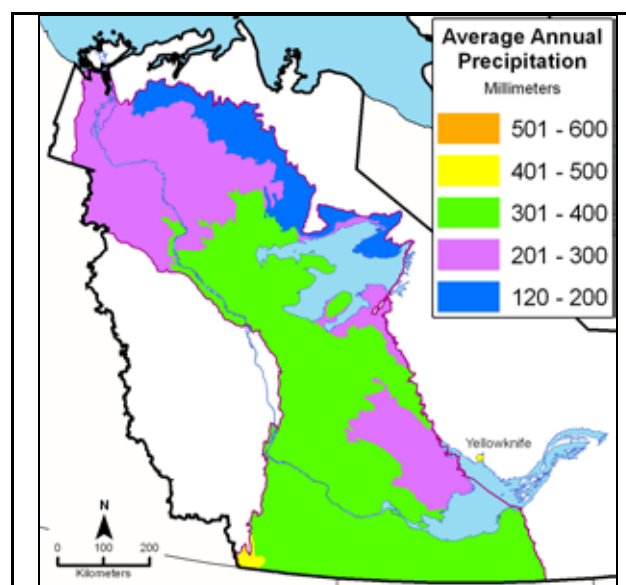


Figure 4. Decreasing average annual precipitation with increasing latitude in the Taiga Plains (units are mm).

⁵ Further information at http://www.usask.ca/geography/MAGS/Achievement_e.html.

⁶ Lodgepole pine occurs mainly at higher elevations on the Cameron Hills and the southwestern mountains, where it is associated with relatively warm microclimates. It is not known to occur north of Wrigley.

Table 2. Climate and Landscape Characteristics of Four Level III Ecoregions within the Taiga Plains, Northwest Territories.

Distinguishing Characteristic	Level III Ecoregion			
	<i>Taiga Plains High Subarctic (HS)</i>	<i>Taiga Plains Low Subarctic (LS)</i>	<i>Taiga Plains High Boreal (HB)</i>	<i>Taiga Plains Mid-Boreal (MB)</i>
<i>Temperature regime</i> ^{1,2}	Very short, cool summers; frost common except in July and August; very cold winters, mean annual temperature minus 8.5 °C to minus 13 °C.	Short, cool summers, very cold winters, mean annual temperature minus 4.5 °C to minus 8.5 °C.	Short, cool summers, very cold winters, with persistent snow cover; mean annual temperature minus 3 °C to minus 4.5 °C.	Warm, moist summers; very cold and snowy winters; mean annual temperature minus 1°C to minus 4.5 °C.
<i>Precipitation patterns</i> ^{1,2}	Average annual precipitation 250-320 mm, most falls in late summer, early fall.	Average annual precipitation 230-350 mm; most falls in late summer, early fall.	Average annual precipitation 300-500 mm; summer-high precipitation pattern.	Average annual precipitation 400-460 mm; summer-high precipitation pattern.
<i>Relative insolation</i> ¹	<9 mJ/m ² /day.	9-9.5 mJ/m ² /day.	9.5-10.5 mJ/m ² /day.	>10.5 mJ/m ² /day.
<i>Characteristic permafrost features, peatlands, and soils</i>	<u>Widespread and continuous permafrost.</u> Polygonal peat plateaus are the most common permafrost form. Earth hummocks are widespread and evident in open areas. Thermokarst is not common. Permafrost depth 30 cm. Polygonal peat plateaus are the common wetland type; Cryosols are the dominant soils, with some Brunisols on coarse-textured materials.	<u>Widespread permafrost</u> “Runnel” permafrost forms are common on slopes, with permafrost within 30 cm of the organic surface under lichen cover, and Gleysols in the shrubby channels between the spruce-lichen uplands. Polygonal peat plateaus locally common in the Keller Plain area. Large areas of peat plateaus and some polygonal peat plateaus; widespread occurrence of earth hummocks; soils are dominantly Cryosols and, on coarse-textured materials, Brunisols.	<u>Discontinuous permafrost.</u> Organic landforms not common because terrain is hummocky to rolling; where they do occur, peat plateaus are the most common permafrost form, with weakly developed polygonal peat plateaus in depressions where cold air collects. Other common peatland types are peat palsas, northern ribbed fens, and horizontal fens; some earth hummocks also occur. Brunisols, Organic soils and Organic and mineral Cryosols are common soils.	<u>Discontinuous permafrost.</u> Thermokarst lakes common; peat plateaus are localized, with permafrost at greater than 60 cm, and with large collapse scars. No polygonal peat plateaus, patterned ground, or runnels. Common types of peatlands are peat plateaus, palsas, northern ribbed fens, and horizontal fens. Brunisols, Luvisols, Organic soils and Organic Cryosols are common soils.
<i>Characteristic forest cover</i>	Very open, stunted forests of black and white spruce with lichen understory; white spruce occurs near the limit of tree growth as stunted individuals along creeks and on well-drained materials.	Open canopy white and black spruce forests with lichen and low shrub understory; tree growth tends to be better by streams.	Closed-canopy mixed-wood forests on southerly aspects, closed-canopy black or mixed black and white spruce forests elsewhere	Closed-canopy mixed-wood forests of aspen and white spruce, with jack pine on drier sites.
<i>Trembling aspen and jack pine occurrence</i>	Trembling aspen rare, only on south slopes, stunted. Jack pine absent.	Trembling aspen is restricted to warm aspects or well-drained sites; often stunted growth form. Alaska paper birch is a more common deciduous species. Jack pine is rare.	Pure trembling aspen stands favor south slopes; jack pine occurs to about 66° N latitude.	Trembling aspen and jack pine occur throughout the Ecoregion on all slopes and aspects.

¹ Data generalized from *Canadian Ecodistrict Climate Normals* (Agriculture and Agri-Food Canada 1997)

² Information obtained from *Ecoclimatic Regions of Canada* (Ecoregions Working Group 1989)



Figure 5. Polygonal peat plateaus are characteristic of wet areas throughout the Taiga Plains HS Ecoregion and of cold wet locales in the Taiga Plains LS Ecoregion. The gray and white areas are lichen-dominated, with limited tree growth. The darker polygonal cracks are outlined by common and northern Labrador tea and cloudberry; there are often clear ice wedges at the bottom. Permafrost is usually about 30 cm below the lichen surface in late summer.



Figure 6. Earth hummocks become increasingly visible in the northern parts of the Taiga Plains HS Ecoregion where tree cover is sparse, and are common features of the Level II Southern Arctic Ecoregion. The lighter-colored tops are exposed mineral soil that has been pushed to the surface by frost action. Earth hummocks also occur further to the south, but are hidden by vegetation cover



Figure 7. These runnels, or channels, are typical of the Taiga Plains HS Ecoregion and Taiga Plains LS Ecoregion and clearly indicate the slope direction (the slope runs down toward the bottom of this image). The whitish areas are open black or white spruce forests with a lichen understory on organic soils, with permafrost at 30-40 cm in late summer. The darker stripes are drainage channels forested by black spruce with a shrub understory; they are usually associated with mineral soil that thaws to a depth of 70 cm or more in late summer.



Figure 8. In this wet peat plateau in the cold Taiga Plains HS Ecoregion, note the small size of the light brown collapse scar bogs compared to those in Figure 9 to the right, and the abundance of white-colored reindeer lichen under an open, stunted black spruce canopy. Permafrost is only 30-40 cm below the surface in the raised areas even in late summer, and more than a meter below the collapse scars.



Figure 9. In this wet peat plateau in the warmer Taiga Plains MB Ecoregion, note the comparatively large size of the brownish-green collapse scar bogs and the relatively dense black spruce cover on the grayish-white raised areas. Permafrost is about 50-90 cm below the surface in the raised areas in late summer, and more than a meter below the surface of collapse scars.



Figure 10. This ground view of a peat plateau in the Taiga Plains MB Ecoregion shows a collapse scar bog vegetated by sedges, cottongrass and mosses in the foreground. The raised area (usually 1-3 m higher than the collapse scar) is underlain by permafrost and vegetated by black spruce, common and northern Labrador tea, cloudberry, and reindeer lichen.

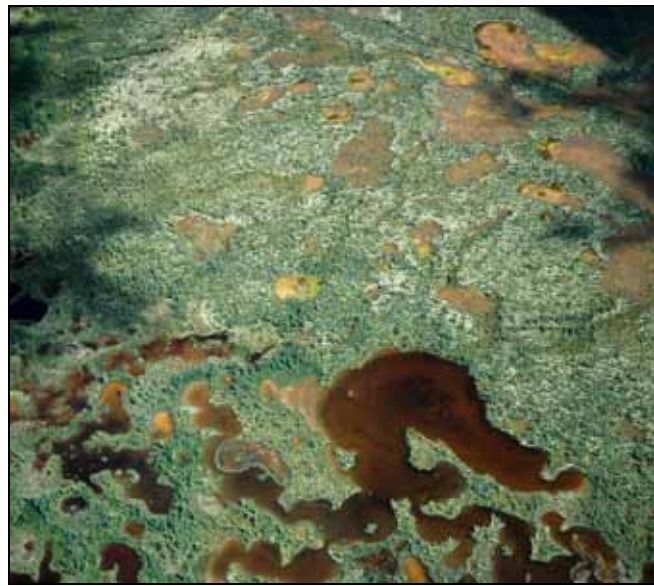


Figure 11. This image from the Taiga Plains MB Ecoregion includes shallow dark brown thermokarst lakes in the lower half and peat plateaus in the upper half. Thermokarst forms in areas previously dominated by permafrost that has since melted, leaving a network of ponds, fens and bogs, the latter often with residual permafrost lenses.

1.5 How Level IV Ecoregions are Defined

Level IV ecoregions are the most detailed mapped units presented in this report. Each ecoregion is consistently named with reference to three descriptive components:

- **First component** – geographic location, usually defined by a feature of local or regional significance, such as a lake, river or landform;
- **Second component** – one of eight landform types (delta, hills, lowland, plain, range, slopes, upland, valley); and
- **Third component** – the ecoclimate, expressed as a two-letter code following the naming conventions outlined in *Ecoclimatic Regions of Canada* (Ecoregions Working Group 1989)⁷. This component also indicates its linkage with the Level III ecoregion within which it occurs.

For example, the Horn Slopes MB Ecoregion occurs on the southerly slopes of the Horn Plateau and is one of 11 Level IV ecoregions in the Level III Taiga Plains Mid-Boreal (MB) Ecoregion. The Horn Slopes LS Ecoregion occurs on the north slopes of the Horn Plateau and is one of 14 Level IV ecoregions in the Level III Taiga Plains Low Subarctic (LS) Ecoregion. The inclusion of slope in the names of both ecoregions infers that landform, aspect and process (i.e., downslope moisture and nutrient movement) are significant ecological influences.

Level IV ecoregions are defined by vegetation, soil and landform characteristics that, taken together, differentiate one ecoregion from another. The *reference site* is the vegetation – landform – soil combination that succinctly describes the central concept of a Level IV ecoregion. It is conventionally regarded as a site with “deep, well- to moderately well-drained, medium-textured soils, with neither a lack nor an excess of soil nutrients or moisture, and neither exposed nor protected from climatic extremes” (Strong and Leggat 1992; Ecoregions Working Group 1989). Sites meeting these criteria are considered to reflect the regional climate. For example, in the Slave Upland MB Ecoregion, a reference site would be associated with aspen and mixed aspen – white spruce

stands on deep, moderately fine-textured soils of average moisture and nutrient status.

Level IV ecoregions are characterized by different influences depending on geographic location, and this definition of reference site does not always fit well with the most commonly occurring vegetation – landform – soil combination. For example, in the bedrock-dominated Campbell Hills HS Ecoregion in the far northwest corner of the Taiga Plains, deep, medium-textured soils are uncommon. The most commonly occurring vegetation – landform – soil combination there is black spruce and lichen on thin soils over bedrock.

The eight landforms that constitute the second component of ecoregion names have definite associations with landscape position, topographic variability, parent materials and probable hydrologic processes, all of which modify the effects of regional climates. These landforms are described in alphabetical order below.

- A *delta* is an alluvial sediment deposit at the mouth of a river, often somewhat triangular in form, frequently flooded, and nearly level. High water tables, abandoned channels and oxbow lakes, and periodic nutrient-rich sediment deposition are important ecological factors.
- *Hills* are prominences rising generally no more than about 500 m above the surrounding areas. They may have gentle to abrupt slopes; slope steepness and aspect along with bedrock substrates near or at the mineral soil surface can strongly influence vegetation development. Drainage patterns are well developed relative to those of the surrounding lowlands. In the Taiga Plains within the Northwest Territories, this term is used to name ecoregions that are higher than the surrounding terrain and that often have distinctive bedrock features.
- *Lowlands* are lands of low relief at the lower levels of regional elevation; they receive water inputs from adjacent higher terrain. They are typically imperfectly- to poorly-drained, have a high proportion of wetlands, and are nearly level; slightly elevated areas that support upland forests are subject to flooding in wet years. Drainage patterns are poorly defined.
- *Plains* are extensive, typically level to gently undulating areas. They differ from lowlands because they are not necessarily at the lower

⁷ The “Subhumid” descriptor for High Boreal and Mid-Boreal ecoclimates as described in *Ecoclimatic Regions of Canada* was dropped for the sake of brevity, but is implied.

levels of regional elevation; in the Taiga Plains, they usually have extensive wet areas and are imperfectly- to poorly-drained, and drainage patterns are poorly defined.

- A *plateau* is an extensive upland region at high elevation with respect to its surroundings. Plateaus in the Northwest Territories also include incised areas, hummocky uplands and deeply fluted terrain. Drainage patterns on the plateau are poorly developed and often mostly internal.
- A *range* refers to mountains or hill systems that occur in a named group, such as the Norman Range.

- *Slopes* are inclined surfaces. Extensive slopes, such as those leading to the higher elevations of the Cameron Plateau or Horn Plateau, have a significant effect on groundwater and surface water flow; slope aspect and hydrology have a controlling effect on vegetation development. Parallel intermittent stream drainages are typical.
- *Upland* is a general term for an area that is higher than the surrounding area, sometimes several hundred meters higher, but that is not a plateau. Uplands usually have undulating to hummocky terrain, a higher proportion of moderately well- to well-drained sites than lowlands or plains, and a lower proportion of wetlands. Drainage patterns tend to be dendritic (resembling tree roots).

Section 2: Methods

2.1 Introduction

The 2007 Taiga Plains ecosystem classification was developed through a consultative process that involved representatives from the Government of the Northwest Territories, Environment and Natural Resources (ENR) and the Federal government (Agriculture and Agri-Food Canada). Revisions to the classification system were proposed and evaluated through a series of workshops in 2004, 2005 and 2006 at which experts from ENR, Agriculture and Agri-Food Canada, and consulting firms participated. The concepts generated during these workshops guided data acquisition and analyses required to develop the final 2007 ecosystem classification.

The revision process employed a variety of spatial data sources including Landsat imagery, digital elevation models, hydrology, permafrost, bedrock and surficial geology, soils, and interpolated climate models that were displayed on a common base within the ESRI ArcGIS 9.1® geographic information system platform. This provided an efficient way to view landscapes from various perspectives, a process that would have been much more challenging in 1996 when the Ecological Stratification Working Group developed the first iteration of ‘*ecozones*’ (Level II ecoregions) and ‘*ecoregions*’ (Level IV ecoregions). Air and ground verification of the proposed changes was an integral part of the revision process. Section 2 presents in general terms the GIS processes and data employed, the field data collection methods, and the process by which concepts, GIS-based data, and field information was integrated to produce the final map and report.

2.2 GIS Processes

2.2.1 Information Assembly

ESRI ArcGIS® 9.1 was the principal GIS software used to manage the spatial datasets. All datasets were transformed to a common projection (Lambert Conformal Conic, NAD 83 Datum) and maintained in an ArcGIS® 9.1 Geodatabase. Other software packages used to create and manipulate spatial data were ArcInfo® 8.3 (Unix), ArcInfo® 9.1 (PC), and ArcView® 3.2. A brief description of spatial themes is provided below.

Soil Landscapes of Canada

The initial ecoregion framework for this project was the Soil Landscapes of Canada spatial database as modified by ENR using the Soil Carbon Digital Database of Canada. This dataset was supplied as a polygon shapefile.

Digital Elevation Model (DEM)

This dataset is derived from Canadian Digital Elevation Data (CDED) files and consists of an ordered array of ground elevations at regularly spaced intervals. The source digital data for CDED at a scale of 1:250,000 is extracted from the hypsographic and hydrographic elements of the digital National Topographic Data Base. This dataset was supplied by ENR as a TIFF file with a ground resolution of 125 meters.

Ecoclimatic Regions of Canada

The Ecoclimatic Regions of Canada Digital Database consists of an ArcInfo spatial cover (shapefiles) with associated Polygon Attribute Table.

Peatlands

Peatlands of Canada digital map and database information was extracted directly from Tamocai *et al.* (2005).

Satellite Imagery

Digital Landsat 7 ETM imagery was supplied by Environment and Natural Resources (ENR – GNWT) as 3 band geoTIF ortho images in 543 band combination. The imagery was acquired during the months of June through September from 1999 to 2002. For some areas where ENR images were not available, Landsat 7 Orthorectified Imagery over Canada, Level 1 was downloaded from GeoBase® (<http://www.geobase.ca>).

2.2.2 Map Production and Database Update

All map products were created with ArcGIS® 9.1, utilizing the extensions 3D Analyst™ and Spatial Analyst™ for 3D surface visualization and analysis. Using these tools and the 125 meter raster DEM, several new feature themes were created:

- Contours at 25, 50 and 100 meter intervals;
- Hillshade raster themes of various sun angles and direction; and
- Vertical exaggeration of datasets to enhance surface variations in the landscape.

Two map products formed the basis for analysis of ecoregions:

- 1) DEM theme maps consisting of a hillshade raster overlaid with 100 meter contours, SLC polygons and base features (hydro, transportation); and
- 2) Landsat 7 maps with 100 meter contours, SLC polygons and base features (hydro, transportation).

Each of these two basic theme maps could then be overlaid with any other theme as required. The general working map scale was 1:500,000. Scales ranging from 1:100,000 to 1:750,000 were used as required.

Spatial and database updates to the modified SLC digital coverage were carried out in ArcGIS® ArcMap™. This environment provided the ability to incorporate various dataset file formats (vector, raster) and allowed for spatial editing based on the underlying themes.

2.3 Field Data Collection

An intensive aerial reconnaissance of the entire Taiga Plains within the Northwest Territories was undertaken in July and August 2005. Flight lines were planned in advance to cover the area to the degree possible given aircraft and fuel supply limitations. A total of 37 days The aerial survey spanned a total of 37 days,, of which 31 days were suitable for flying. A Cessna 185 fixed-wing aircraft on amphibious gear was used for all flying (120 hours) in July; an Aerospatiale A-Star rotary-wing aircraft was used for all flying (60 hours) in August. Aerial traverses totaled over 35,000 km, of which distance about two-thirds was covered by fixed-wing flights. Flying height averaged 800 to 1,100 mASL. A Hewlett-Packard® notepad computer with ArcPad® software was used for navigation. With this system, the planned flight lines, Landsat imagery, and provisional ecoregion lines could be simultaneously viewed, and a Garmin CS76® global positioning system (GPS) unit with an external antenna provided instantaneous location information.

Information collected during aerial traverses included:

- Digital images, captured with a Nikon D70s® six megapixel single-lens reflex camera with a circular polarizing or UV filter;
- Geographic locations (waypoints), collected at the same time as digital images using a Garmin

CS76® GPS unit, along with track logs of the entire route; and

- Comments referenced to waypoint and digital photo numbers that included photo direction and free-form remarks about landform, vegetation, permafrost, and other features.

Nearly 16,500 geo-referenced digital images were collected along with accompanying comments. On average, a geo-referenced image was collected and a comment recorded every two to three km, or about every 30 seconds⁸. Figure 12 shows the flight lines flown in July and August 2005; the Level III ecoregion theme is shown to illustrate transect coverage across each ecoregion. Level III ecoregions are described in Sections 1.4 and 3.3.

Approximately 65 ground stops were made, and plots were established at 57 of these stops where basic site, soil and vegetation information was collected, along with representative geo-referenced digital images. Most of the ground stops were made during helicopter traverses when access to more points was possible.

2.4 Post-field Data Review and Mapping

2.4.1 General Procedures

Digital images were organized by flight line and date to facilitate their use. All of the digital information themes outlined in Section 2.2 and Section 2.4.2 were brought together on the ArcGIS 9.1® platform and manipulated to produce different views of landscapes that provided insights into processes and patterns. In addition, the flight lines were overlaid on the thematic map layers and the digital images and associated comments were reviewed to develop a better idea of vegetation, permafrost, and landform patterns than could be achieved with the other digital information alone. Ecoregion boundaries were finalized and ecoregion descriptions were completed with reference to the conceptual framework agreed upon by Territorial and Federal government representatives. On-screen line adjustments were made using software editing tools.

⁸ The geo-referenced digital image location indicates the point at which the image was collected, not the image center, as most of the images were collected in directions other than directly below the aircraft.

2.4.2 Information Sources Used to Describe Ecoregions

A number of standard information sources were consulted during preparation of the ecoregion descriptions and are briefly discussed below.

Geology and Geomorphology

The Geologic Survey of Canada (GSC) maps listed below were available via the GSC website and provided information for the indicated Level III ecoregions. Soil Landscape of Canada (SLC) polygon attributes also supplied geomorphology information.

Soils

The Canadian System of Soil Classification (Soil Classification Working Group 1998) is the authority for soil nomenclature. Soil maps (Day 1966, 1968, 1972) covered parts of the Taiga Plains MB Ecoregion; elsewhere, Soil Landscape of Canada (SLC) polygon delineations were used to determine typical soils within ecoregions.

Vegetation

Extensive detailed plot sampling was not undertaken during the data collection stages of the 2005 – 2007 Taiga Plains program. Most vegetation descriptions are therefore very general, and have been compiled from information collected over a sparsely distributed plot network and digital photographs collected along aerial transects. For a few ecoregions, namely those adjacent to the border with Alberta and British Columbia, reference community descriptions are based on similar landscape concepts as applied to Northwest Territories Level IV ecoregions (approximately equivalent to Natural Subregions in Alberta). For a few other ecoregions through which the proposed Mackenzie Valley Pipeline passes, there is partial coverage by detailed vegetation classifications available from studies published in 1974 and 2004 (Environmental Social Program 1974; Mackenzie Gas Project 2004); those communities occurring with the greatest proportions in these classifications are probably characteristic of the ecoregion within which they occur.

Common and scientific vascular plant names used throughout this report generally follow *NWT Species 2006 – 2010* (Working Group on General Status of NWT Species 2006). A list of common and scientific plant names is provided in Appendix 1.

GSC Map No. (NTS mapsheet): <i>surficial geology</i>.	Level III Ecoregion to which map applies
1745a (106M),	Taiga Plains HS
1746a (106N)	Taiga Plains HS
1747a (106O)	Taiga Plains HS
1748a (106P)	Taiga Plains HS
1744a (106L)	Taiga Plains HS
1743A (106K)	Taiga Plains HS
1742a (106J)	Taiga Plains HS
1741a (106I)	Taiga Plains HS
1783a (106G)	Taiga Plains HS
1784a (106H)	Taiga Plains HS, Taiga Plains LS
1989a (96E)	Taiga Plains LS
1988a (96D)	Taiga Plains LS
Open file 4662(96C)	Taiga Plains LS
1693a (95NW, 95NE, 95SE, 85SW)	Taiga Plains LS , Taiga Plains HB, Taiga Plains MB
1880a	All Level III ecoregions
1906a	Taiga Plains MB
GSC Map No.: <i>Bedrock geology</i>.	Level III Ecoregion to which map applies
1712a	All Level III ecoregions
Open file 2948o	Taiga Plains LS , Taiga Plains HB, Taiga Plains MB
Open file 2948q	Taiga Plains HS, Taiga Plains LS

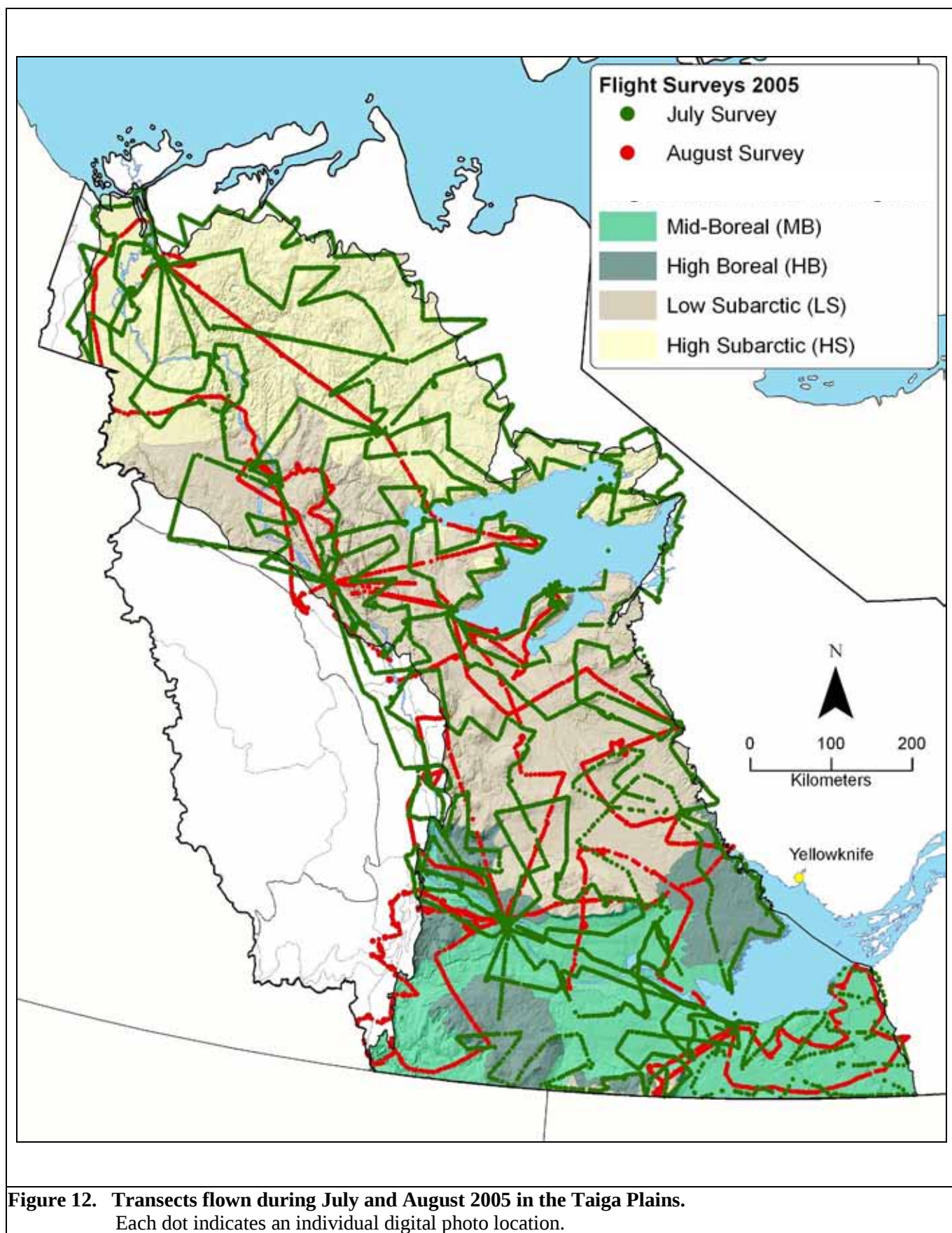


Figure 12. Transects flown during July and August 2005 in the Taiga Plains.
Each dot indicates an individual digital photo location.

Section 3: Level III and Level IV Ecoregions of the Taiga Plains

3.1 Introduction

The Level II Taiga Plains Ecoregion, four Level III ecoregions and 45 Level IV ecoregions are described in this Section. Section 3.2 provides an overview of the Level II Taiga Plains Ecoregion. Section 3.3 describes the general layout of Level III and Level IV ecoregion descriptions. Sections 3.3.1 through 3.3.4 provide detailed discussions of each Level III ecoregion and the Level IV ecoregions nested within them. They are presented in approximately the order of their occurrence on the map, reading from top to bottom and left to right, as shown in the lists below. The section numbers correspond to map unit numbers on the ecosystem classification map; for example, Section 3.3.3 presents attributes of the Level III Taiga Plains HB Ecoregion, and Section 3.3.3.4 presents attributes of the Level IV Trout Upland HB Ecoregion.

The 45 Level IV ecoregions are as follows:

Taiga Plains High Subarctic (HS) Ecoregion (3.3.1)

- 3.3.1.1 Mackenzie Delta HS
- 3.3.1.2 Arctic Red Plain HS
- 3.3.1.3 Campbell Hills HS
- 3.3.1.4 Sitidgi Plain HS
- 3.3.1.5 Travaillant Upland HS
- 3.3.1.6 Anderson Plain HS
- 3.3.1.7 Colville Upland HS
- 3.3.1.8 Colville Plain HS
- 3.3.1.9 Colville Hills HS
- 3.3.1.10 Great Bear Upland HS
- 3.3.1.11 Great Bear Plain HS
- 3.3.1.12 Grandin Plain HS
- 3.3.1.13 Grandin Upland HS
- 3.3.1.14 Lac Grandin Upland HS

Taiga Plains Low Subarctic (LS) Ecoregion (3.3.2)

- 3.3.2.1 Arctic Red Plain LS
- 3.3.2.2 North Mackenzie Plain LS
- 3.3.2.3 Norman Range LS
- 3.3.2.4 Great Bear Upland LS
- 3.3.2.5 Great Bear Plain LS
- 3.3.2.6 Blackwater Upland LS
- 3.3.2.7 Keller Plain LS
- 3.3.2.8 Lac Grandin Plain LS
- 3.3.2.9 Lac Grandin Upland LS
- 3.3.2.10 Bulmer Plain LS
- 3.3.2.11 Ebbutt Upland LS
- 3.3.2.12 Horn Slopes LS
- 3.3.2.13 Horn Plateau LS
- 3.3.2.14 Cameron Plateau LS

Taiga Plains High Boreal (HB) Ecoregion (3.3.3)

- 3.3.3.1 Ebbutt Upland HB
- 3.3.3.2 Horn Plain HB
- 3.3.3.3 Sibbeston Upland HB
- 3.3.3.4 Trout Upland HB
- 3.3.3.5 Cameron Upland HB
- 3.3.3.6 Great Slave Plain HB

Taiga Plains Mid-Boreal (MB) Ecoregion (3.3.4)

- 3.3.4.1 South Mackenzie Plain MB
- 3.3.4.2 Liard Plain MB
- 3.3.4.3 Liard Upland MB
- 3.3.4.4 Trout Upland MB
- 3.3.4.5 Horn Slopes MB
- 3.3.4.6 Great Slave Lowland MB
- 3.3.4.7 Tathlina Plain MB
- 3.3.4.8 Cameron Slopes MB
- 3.3.4.9 Slave Upland MB
- 3.3.4.10 Slave Delta MB
- 3.3.4.11 Slave Lowland MB

3.2 The Taiga Plains

3.2.1 Biophysical Summary of the Taiga Plains

The Level II Taiga Plains Ecoregion occurs mainly within the Northwest Territories and northern Alberta, with small extensions southward into British Columbia and westward into the Yukon. This Ecoregion is part of the Level I Taiga Ecoregion. It is characterized by subdued relief with a few significant hill systems; within the Northwest Territories, it covers 480,493 km². Much of the Taiga Plains drains to

the Arctic Ocean via Canada's largest river, the Mackenzie River, and its main tributaries, the Liard, Root, Peel, Keele, Carcajou, Mountain, Great Bear, and Arctic Red Rivers. Two of Canada's largest freshwater bodies, Great Slave Lake and Great Bear Lake, occur within the Taiga Plains, along with over a hundred thousand smaller lakes and ponds averaging less than 10 ha in size. The total area covered by water is over 88,000 km², or about 18 percent of the Taiga Plains within the Northwest Territories. The Mackenzie River Delta occurs mainly within the Taiga Plains, and is the largest delta in Canada.

Peatlands are extensive; the Mackenzie Valley is one of the major peatland areas of Canada (Robinson 2002), and data supplied by Tarnocai *et al.* (2005) indicate that over 218,000 km² of peatlands occur across the Taiga Plains, nearly half the total area. Upland areas are predominantly level to undulating variable-textured and often bouldery till plains derived from the last major glaciation. Glacial Lake McConnell, an enormous postglacial lake, once covered all of the lowlands from the Northwest Territories – Alberta border north to Great Bear Lake; extensive lacustrine deposits, wave-cut bedrock escarpments and beach ridges (wave-washed, typically coarse-textured linear features) well above the current shorelines of Great Slave Lake and Great Bear Lake attest to its former volume.

The Taiga Plains and adjacent Taiga Shield are sometimes called “the land of little sticks”, where long, cold winters and short cool summers limit tree and other plant growth, and contribute to large areas of permanently frozen soil. Climate is, however, highly variable throughout the Taiga Plains for reasons described in Section 1, and four main climatic – physiographic divisions (Level III ecoregions) defined by vegetation and permafrost features occur within it. The Level III Taiga Plains Mid-Boreal (MB) Ecoregion has the mildest climates and includes a narrow belt across the southernmost third of the Taiga Plains; permafrost is discontinuous to sporadic, and species-rich mixed-wood forests are common. The Taiga Plains High Boreal (HB) Ecoregion is slightly cooler, occurring at higher elevations within the same area as the Taiga Plains MB Ecoregion or at slightly higher latitudes. Permafrost is discontinuous, and mixed-wood forests are usually found on southerly and

westerly aspects where conditions are somewhat warmer. The Taiga Plains Low Subarctic (LS) Ecoregion occupies the middle third of the Taiga Plains, with outliers at higher elevations to the south; permafrost features are common. Closed-to open canopied slow-growing coniferous forests with comparatively low species diversity and black spruce-dominated wetlands are the main community types, and jack pine and trembling aspen are uncommon except on well-drained southerly slopes. The Taiga Plains High Subarctic (HS) Ecoregion occupies the northern third of the Taiga Plains, with outliers at higher elevations to the south. It is characterized by continuous permafrost, fewer wetlands because of lower precipitation, and open, stunted forests of mainly white spruce that grade into treeless arctic tundra at the northern extreme.

Soil development in the Taiga Plains is related to climate, and to local moisture and drainage conditions. *Luvisolic* soils develop under relatively mild climates on medium- to fine-textured soils, where fine particles are leached from the upper horizons; these soils are found mainly in the southern third of the Taiga Plains. *Brunisolic* soils are widespread throughout the region, often on coarse-textured, well-drained soils. *Regosolic* soils have little or no horizon development and are associated with newly deposited materials, such as those found on river terraces; these soils are also distributed throughout the region. *Gleysolic* soils occur on imperfectly- to poorly-drained mineral soils and are most common in the southern third of the Taiga Plains. *Cryosolic* soils are permanently frozen. In the southern third of the Taiga Plains, they occur mainly with frozen peatlands (*Organic Cryosols*); as climates become colder to the north, both mineral and organic materials develop permafrost, and *Cryosols* develop in both types of materials.

3.2.2 Relationship to Other Level II Ecoregions

The Taiga Plains in the Northwest Territories is surrounded by four Level II ecoregions; to the north, the *Southern Arctic Ecoregion*, to the east, the *Taiga Shield Ecoregion*, and to the west, the *Taiga Cordillera* and *Boreal Cordillera Ecoregions* (Figure 13). The borders are not always clearly defined. The sharpest boundary lies between the Taiga Shield and Taiga Plains Ecoregions and is defined by the westward extent of Precambrian granites that are characteristic elements of the Taiga Shield.

The Taiga Plains – Southern Arctic Ecoregion boundary is defined by tree line⁹, north of which trees are restricted to isolated patches usually along rivers, on coarse-textured deposits, and on south-facing slopes where the growing season is long enough to permit conifer survival. This boundary is somewhat arbitrary; in the northernmost parts of the Taiga Plains, extensive treeless, usually shrubby, areas are embedded within a vast expanse of open coniferous forest with a lichen and ericaceous shrub understory. Slow regeneration following fires may contribute to the long-term treeless status of burned areas in the most northerly portions of the Taiga Plains.

The boundary between the Taiga Plains Ecoregion and the Taiga Cordillera Ecoregion is defined by the eastern extent of mountain ranges. From north to south, the foothills of the British-Richardson Mountains, the Franklin Mountains, and the Nahanni Range mark the eastern edge of the Taiga Cordillera. In the extreme southwest, the Kotanalee Range and the Hyland Highlands define the limits of the Boreal Cordillera. The

⁹ Scott (1995) summarizes the work of several researchers; the commonly accepted definition of tree line is the boundary between tundra where trees do not take tree growth form and forest, where trees are typically over 3 m tall. Three mapped representations of tree line (two from the work of previous researchers in the Northwest Territories and one derived from 1:1,000,000 National Topographic Series maps) were reviewed during the mapping process. Oblique large-scale aerial photographs taken during the 2005 field season were examined along with these lines to establish the current boundary between the Southern Arctic and Taiga Plains. This boundary is mostly enclosed within the broad forest-tundra transition area shown by Timoney *et al.* (1992). Tree line also marks the transition from subalpine to treeless alpine areas at higher elevations to the south of the Taiga Plains-Southern Arctic Ecoregions and similarly indicates the climatic limits of tree growth.

transition from Taiga Plains to Taiga Cordillera is clearly marked by an abrupt change from the forested Mackenzie Delta to treeless foothills west of Aklavik, nearly at sea level. Elsewhere, the 400 m contour line arbitrarily defines the boundary between the Taiga Plains and the two Cordilleran ecoregions, reflecting the generally more pronounced topography and greater occurrence of thin soils and exposed bedrock above this elevation.

3.3 Ecoregion Descriptions

Each Level III and Level IV ecoregion description in Section 3 begins with a one or two sentence *overview statement* and a *summary* outlining the distinguishing ecosystem characteristics. *Climate* statistics (mean annual temperature, mean temperatures of the warmest and coldest months, mean annual precipitation, wettest and driest months, mean annual daily solar radiation input, mean daily solar radiation input in June and December) are summarized to the Level III ecoregion rank; for most Level IV ecoregions there is insufficient information to provide a meaningful summary. Where information is available, local climatic influences are discussed.

Within each Level III and Level IV ecoregion, the following attributes are described to the degree possible with the existing data:

- *Total area and elevation range* (source: GIS spatial data);
- *Area and size-class distribution of lakes and major rivers* (source: GIS spatial data provided by Government of the Northwest Territories). Used to produce the bar chart included with each ecoregion;
- *Peatland areas* (source: *Peatlands of Canada 2005* by Tarnocai *et al.* 2005). Used to produce the bar chart included with each ecoregion;
- *General description of ecoregion characteristics*;
- *Discussion of geology and geomorphology*, including dominant surficial landforms and parent material characteristics and underlying geologic features that influence ecosystems (source: Soil Landscapes of Canada polygon attributes within ecoregions, surficial and bedrock geology or soils maps where

available, and 2005 digital photographs and field visits);

- *Discussion of soil features.* Soils are only described to the Great Group level because this reflects the degree of reliability in the available data, and because Great Groups can be reasonably related to major physiographic features and drainage characteristics (source: Soil Landscapes of Canada polygon attributes within ecoregions, and surficial geology or soils maps where available);
- *Discussion of typical vegetation for the ecoregion* (source: 2005 digital photographs, a small sample plot dataset, and for some ecoregions, existing classification systems);
- *Discussion of water and wetland features;*

- *Discussion of notable features* (source: Government of the Northwest Territories staff and 2005 digital photographs and field visits);
- *Descriptive photographs* are included with each ecoregion on facing pages.

Ecozones and Ecoregions of Canada descriptions (Ecological Stratification Working Group 1995) were reviewed and incorporated as appropriate.

A glossary of terms used within this report is provided in Appendix 4.



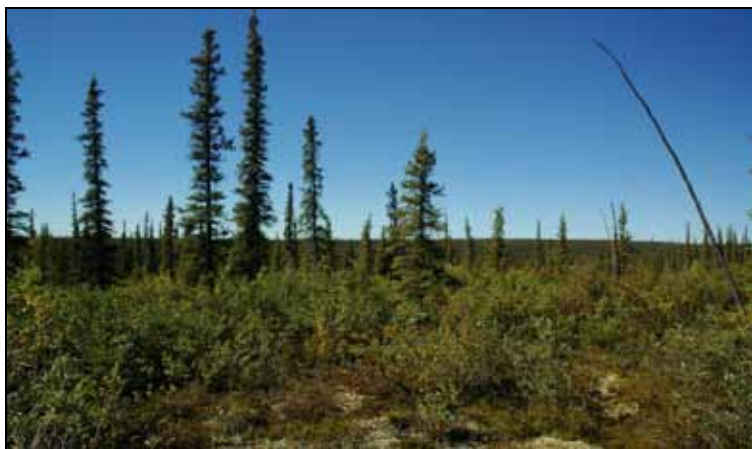
Figure 13. Taiga Plains and Neighbouring Level II Ecoregions (2007).

(As of 2007, the Taiga Cordillera, Boreal Cordillera, Taiga Shield and Southern Arctic Ecoregions were all under revision).

3.3.1 TAIGA PLAINS HIGH SUBARCTIC (HS) ECOREGION



Typical sites in the Taiga Plains High Subarctic (HS) Ecoregion are characterized by stunted, open stands of white spruce, black spruce and larch with understories of dwarf birch, willow, northern Labrador tea, cotton-grass, moss and lichen. Low shrub tundra is common on hilltops and higher elevation areas, and dwarf birch, willow, mountain avens, lichen and cotton-grass are common species. Cryosols and Brunisols are common soils, the latter associated with coarse-textured and/or well-drained surficial materials.



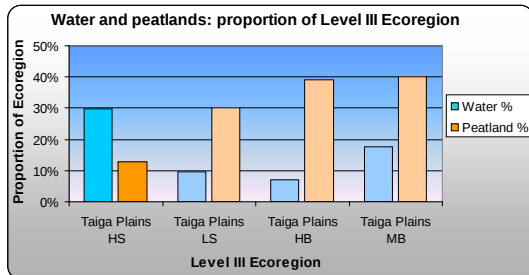
This stand of widely-spaced white and black spruce with an understory of dwarf birch, willow, northern Labrador tea and lichens in the Travaillant Upland is typical of the Taiga Plains HS Ecoregion. Soils are frozen for much of the year and only a thin surface layer thaws during the short summer.



Entire-leaved mountain avens (*Dryas integrifolia*), the floral emblem of the Northwest Territories, is a low-growing, mat-forming plant that occurs throughout the Taiga Plains Ecoregion and is particularly common within the Taiga Plains HS Ecoregion. It favours rocky or gravelly, calcium-rich sites.

3.3.1 TAIGA PLAINS HIGH SUBARCTIC (HS) ECOREGION

Overview: *The Taiga Plains HS Ecoregion occupies the northern third of the Taiga Plains. Undulating to hummocky till plains, slow-growing white and black spruce forests, and active permafrost features such as polygonal peat plateaus and earth hummocks are characteristic.*



(water proportion includes Great Bear Lake)

General Description

The Level III Taiga Plains HS Ecoregion includes fourteen Level IV ecoregions that occupy the northern third of the Taiga Plains. The Taiga Plains HS Ecoregion spans approximately 400 km in a south – north direction. North of the 68th parallel, closed and open forests of white and black spruce give way to sparsely treed white spruce woodlands. Features characteristic of Low Arctic climates, such as patterned ground, earth hummocks, and treeless tundra become more common along the indistinct boundary with the Level II Southern Arctic Ecoregion. Gently sloping, level and undulating till occurs over much of the area, with some areas of significant topography. Peatlands are extensive in a few of the Level IV ecoregions, but occupy a relatively small proportion of the total area within the Taiga Plains Ecoregion relative to more southerly Level III ecoregions. Recent fires have burned over much of the region, and regenerating shrub lands are a widespread cover type. White spruce is the dominant tree species; density and vigour are a function of latitude, with closed stands more common in the south and very open, low-canopied woodlands in the north.

Climate

Inuvik is the only station in the region from which climate data have been collected over long periods, and climatic statistics have been modelled over large areas using these limited data. The climate is colder than the Taiga Plains LS Ecoregion to the south, and is characterized as High Subarctic by the Ecoregions Working Group (1989). Polygonal peat plateaus are the dominant wetland form, earth hummocks and patterned ground become common near the region's northern boundary, and tree growth becomes increasingly suppressed with increasing latitude. Climate models (Agriculture and Agri-Food Canada 1997) provide the following general statistics. The mean annual temperature ranges from –5 to –11°C. The mean temperature in January, the coldest month, ranges from –27 to –29°C, and from



Total area: 170,082 km² (35% of Taiga Plains).
Ecoregion shown in red.

8 to 16.5°C in July, the warmest month. Mean annual precipitation is between 170 and 340 mm, with the wettest period in June through October and the driest period in December through April; about half falls as rain and half as snow. The mean annual daily solar input (refer to Section 1.4.1 for further explanation) ranges between 9.0 and 10.0 mJ/m²/day, with low values of 0 to 0.6 mJ/m²/day in December and highs of 22 to 22.5 mJ/m²/day in June.

Topography, geology, soils, and hydrology

The Taiga Plains HS Ecoregion includes level to hummocky plains, rolling and ridged uplands with significant bedrock exposures in places, and Canada's largest delta. Undulating to hummocky, fine-textured and often bouldery till deposits are the most common landform. Peatlands are more extensive south of the Mackenzie Delta. Permafrost is continuous, and soils are dominantly mineral and Organic Cryosols. There are numerous lakes; Great Bear Lake, Canada's largest lake, lies entirely within this Ecoregion.

Vegetation

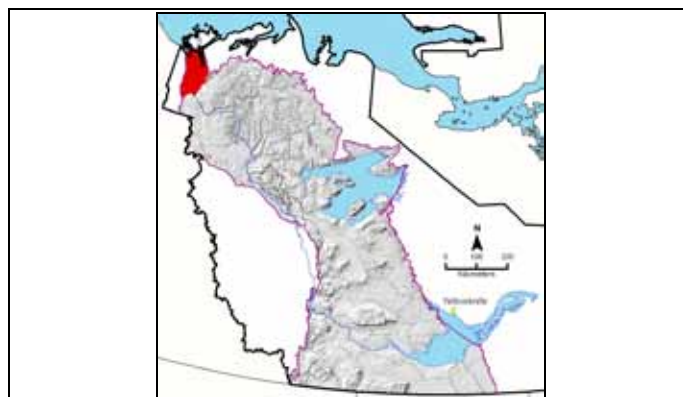
White spruce communities are the most common vegetation types; the species composition of white spruce communities is fairly consistent across the Ecoregion, but progressively more rigorous climates at higher latitudes result in reduced tree height and density, culminating in the transition to shrub-dominated tundra along a broad, poorly defined boundary with the Southern Arctic Ecoregion. Extensive fires have resulted in large areas of regenerating dwarf birch. Treeless lichen – dwarf birch communities cover polygonal peat plateaus. Jack pine does not occur in this Ecoregion; trembling aspen does occur, but only as stunted individuals on south-facing slopes and well-drained alluvial terraces.

3.3.1.1 Mackenzie Delta HS Ecoregion

Overview: *The Mackenzie Delta HS Ecoregion includes Canada's largest delta, an intricate network of small ponds, stream channels, and alluvial uplands with white spruce forests.*

Summary:

- Level alluvial deposits with thousands of ponds and many stream channels.
- Dense and relatively vigorous white spruce stands at the south end, that become more open and stunted towards the north.



Total area: 9,604 km² (5.6% of Taiga Plains Ecoregion).
Ecoregion shown in red.

Average elevation (range) mASL: 25 (0-100)

General Description

The Mackenzie Delta HS Ecoregion includes most of the Mackenzie River Delta, the largest delta in Canada. It is a broad, flat alluvial floodplain confined by the high banks of the Travaillant Upland HS Ecoregion and Level II Southern Arctic Ecoregion to the east, and the Level II Brooks Range Tundra Ecoregion to the west. The northern boundary with the Southern Arctic is defined by tree line; the southern boundary with the Arctic Red Plain HS Ecoregion is clearly marked by the vegetation change from regenerating shrublands and open black spruce to closed white spruce forests on the Delta. The Mackenzie River branches into three channels (Middle, Western, and Eastern) at the southern limits of the Delta, and Middle Channel is the largest. The Ecoregion is a complex of alluvial deposits and water. It is forested by closed and relatively diverse white spruce – tall shrub stands at the south end that become more open and stunted to the north, finally giving way to treeless dwarf birch shrublands near the Beaufort Sea. There are thousands of small ponds and numerous active and abandoned stream channels within this Ecoregion.

Geology and Geomorphology

The Mackenzie Delta HS Ecoregion is an outstanding example of a landscape influenced by active fluvial and thermokarst processes. Fluctuating water levels cut off old channels and create new ones; flood events deposit silts and sands on terraces and in low-lying ponds. Permafrost melting causes lakeshore subsidence, and trees collapse into the lakes creating a star-like pattern of dead snags. In places, streams have built up high levees (flood-deposited sediments along the banks) and they flow in channels elevated several meters above the surrounding lakes and forests.

Soils

Regosolic Turbic Cryosols are the dominant soil group, reflecting both the active fluvial environment (Regosolic soils have little or no horizon development) and permafrost influences.

Vegetation

Plant species and growth form on the Mackenzie Delta HS Ecoregion contrasts sharply with that of surrounding landscapes. In the southern half of the Ecoregion, tall, closed spruce stands with dense, tall green alder and willow understories, a diverse herb mat, and feathermosses are prevalent on well- to imperfectly-drained fine-textured alluvial terraces that have permafrost below the main rooting zone. Horsetails, reed-bentgrass and dense willow – green alder shrublands surround many of these stands on lower, wetter soils next to ponds and stream channels. On higher terraces and at higher latitudes within this Ecoregion, permafrost is closer to the surface and influences vegetation development. Spruce stands become open and stunted; dwarf birch, low-growing green alder and willow, and cloudberry constitute the main understory species in less diverse communities than those occurring in the south, and permafrost is only a few centimeters below the surface. Tree line occurs near the Delta's northern limits where it flows into the Beaufort Sea. Dwarf birch – willow shrublands with scattered white spruce and grasses on exposed dry slopes occur along the steeply sloping and dissected eastern bank of the Delta.

Water and Wetlands

The largest watercourses in this Ecoregion are the three main channels of the Mackenzie River and the Arctic Red River that flows into the Mackenzie River near the Delta's southern border. Over 11,000 small ponds, mostly only a few hectares in size, cover over a third of the Ecoregion together with the main rivers. Wetland types along streambanks and pond shorelines include active and inactive delta marshes, shoreline marshes, shore fens and stream fens with horsetail, reed-bentgrass and sedge vegetation.

Notable Features

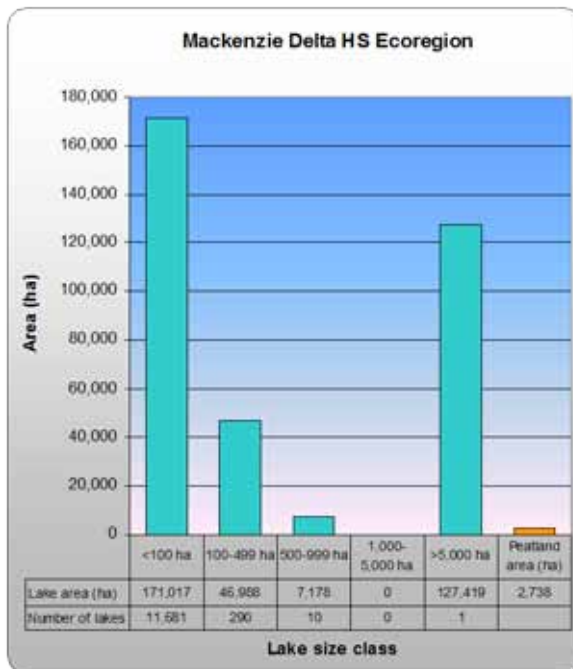
The Mackenzie Delta is the largest delta in Canada. This Ecoregion provides excellent habitat for a number of wildlife species.



This image provides a southwest view across the upper Delta toward the treeless British-Richardson Foothills and Mountains, east of Aklavik. The bright green patches are delta marshes.



Southwest of Inuvik, species-rich tall white spruce – shrub communities with reed grass and horsetail marshes are widespread.



Proportion of Ecoregion occupied by lakes: 36%
Proportion of Ecoregion occupied by bogs and fens: <1%



Stunted open white spruce, dwarf birch, green alder and willow grow on permafrost about 20 km north of Aklavik; compare this image to the image on the top right and note the change in growth form and composition due to climate changes from south to north.

3.3.1.2 Arctic Red Plain HS Ecoregion

Overview: *The Arctic Red Plain HS Ecoregion is an extensive, low-elevation complex of gently undulating glacial till and peatlands with slow-growing black spruce forests and nearly treeless lichen – peat moss bogs.*

Summary:

- Level to gently undulating till mantled by peat layers.
- Black spruce – low shrub forests, nearly treeless peat plateaus, shrubby fens, and regenerating burn shrublands are the dominant communities.



Total area: 22,907 km² (13.5% of Taiga Plains HS Ecoregion).
Ecoregion shown in red.

Average elevation (range) mASL: 50 (25-350)

General Description

The Arctic Red Plain HS Ecoregion is a nearly level, low-elevation complex of till and peatlands. The Travaillant Upland HS and Mackenzie Delta HS Ecoregions and the Level II Brooks Range Tundra Ecoregion provide well-defined boundaries to the east, north and west respectively; the boundary between this Ecoregion and the southerly Arctic Red Plain LS Ecoregion is less obvious. Most of the Ecoregion lies west of the Mackenzie River. The northernmost portion east and west of the Arctic Red River – Mackenzie River confluence is mainly an undulating to gently rolling till plain with some peatlands. South of the confluence, peat plateaus and imperfectly- to poorly-drained level to undulating till plains with thousands of small lakes and thermokarst ponds are the dominant landscape feature. A fine-textured lacustrine plain within this Ecoregion surrounds the southern outlier of the Travaillant Upland HS Ecoregion. Open, slow-growing black spruce – shrub-lichen communities, nearly treeless lichen – peat moss bogs on peat plateaus, shrubby fens, and regenerating dwarf birch and Alaska paper birch – black spruce on recently burned upland areas are the main vegetation types. Small areas of relatively diverse white spruce or spruce – Alaska paper birch occur on alluvial flats and higher sloping terrain.

Geology and Geomorphology

The characteristic landforms south and west of the Mackenzie River–Arctic Red River confluence are gently undulating medium- to fine-textured till plains often mantled by peat deposits. North of the confluence, rolling to hummocky till and a few deeply incised tributaries of the Arctic Red River provide more significant terrain variation resulting in more limited areas of organic accumulation. A lacustrine – organic complex occupies the curved valley through which the Mackenzie River flows between the main Travaillant Upland HS Ecoregion and its southern outlier. A large glacio-fluvial terrace complex occurs at about the midpoint of this valley, and alluvial deposits occur along its lower slopes and along the other major rivers. Thermokarst lakes are common throughout on organic terrain.

Soils

Upland soils are permafrost-affected Static and Turbic Cryosols; gleyed subgroups of the above Cryosols are probably common. Regosols and Brunisols are associated with recently deposited, well-drained alluvium. Organic Cryosols and Organic soils occur with polygonal peat plateaus and horizontal fens.

Vegetation

Black spruce forests with very open, uneven-aged canopies, scattered larch, slow growth rates and an understory of mountain cranberry, willow, red bearberry, dwarf birch and lichen are characteristic communities growing on fine-textured, imperfectly- to poorly-drained tills. Frequent fires have produced large areas of regenerating dwarf birch and Alaska paper birch with an understory of black spruce seedlings. Peat plateaus are vegetated by lichen – dwarf birch – northern and common Labrador tea – peat moss communities with scattered black spruce; sedge – peat moss communities occupy small internal collapse scars. White spruce and white spruce – Alaska paper birch stands with shrub and moss understories are restricted to alluvial terraces or sloping terrain that provide more favourable growth conditions than the prevailing climate.

Water and Wetlands

The Mackenzie, Arctic Red and Peel Rivers are the major watercourses. The largest named lakes are Tundra, Cardinal, Clearwater, Burnt and Campbell Lakes. Numerous shallow ponds and thermokarst lakes occur throughout the area, sometimes connected by small, slow-flowing creeks. Peat plateaus and shrubby horizontal fens are the most common and extensive wetland types. Small polygonal peat plateaus occur in northerly portions of this Ecoregion.

Notable Features

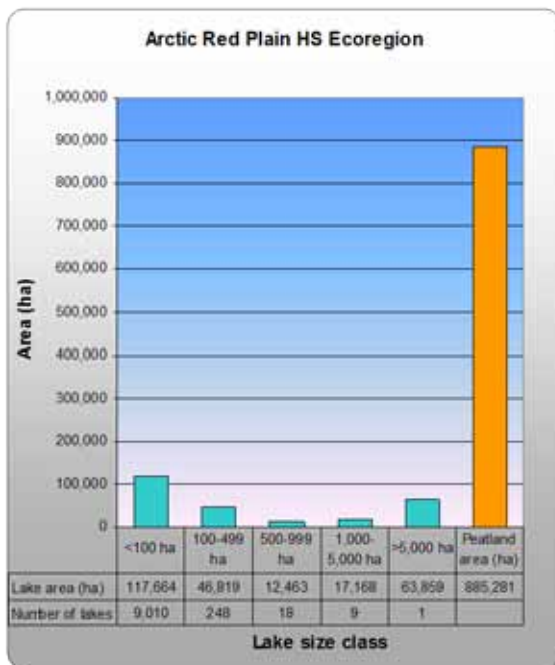
The “reversing delta” between Campbell Lake and the main Mackenzie Delta experiences water flows in both directions depending on water levels in the Mackenzie River.



A complex of peat plateaus, black spruce forests, shrubby fens and regenerating burns is typical of the Arctic Red Plain HS Ecoregion.



Typical vegetation includes treeless peat plateaus (centre of the image), surrounded by black spruce stands with scattered larch (light green trees).



Proportion of Ecoregion occupied by lakes: 11%
Proportion of Ecoregion occupied by bogs and fens: 38%



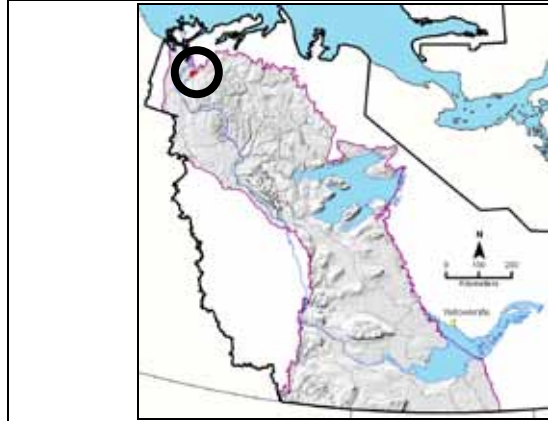
In the northeastern part of the Ecoregion, this “reversing delta” in the upper mid image lies between Campbell Lake and the Mackenzie Delta, and experiences two-way water flows depending on relative water levels; the eastern edge of the Mackenzie Delta is in the foreground and the Campbell Hills lie to the left.

3.3.1.3 Campbell Hills HS Ecoregion

Overview: *The Campbell Hills HS Ecoregion is a sparsely treed island of fractured limestone bedrock surrounded by the Mackenzie Delta to the west and till uplands to the east.*

Summary:

- Fractured bedrock outcrop with thin till and colluvial deposits.
- Stunted black spruce and shrubland communities.



Total area: 207 km² (0.1% of Taiga Plains HS Ecoregion).
Ecoregion shown in red.

Average elevation (range) mASL: 50 (25-350)

General Description

The Campbell Hills HS Ecoregion is a gently domed limestone outcropping lying between the Mackenzie Delta HS and Travaillant Upland HS Ecoregions. Although it is small, it contrasts strongly with the surrounding terrain and is therefore recognized as a separate ecoregion. Stunted, open black spruce-lichen or shrub communities occur in pockets of soil within fractured bedrock or on thin till or organic veneers over bedrock. Sheltered locales and moist colluvial slopes harbor white spruce – black spruce – Alaska paper birch shrub communities; stunted trembling aspen colonies are occasionally found on warm, dry southerly slopes. Runnels with black spruce – lichen and dwarf birch on gentle slopes and earth hummocks attest to the continual influence of permafrost and the cold climate. A local climatic event, the “burst of Beaufort”, frequently affects the Campbell Hills HS, Mackenzie Delta HS and the northern Arctic Red Plain HS Ecoregions throughout the year, where low cloud and fog are pushed across the Delta by northwest winds, accompanied by falling temperatures. The cloud and fog linger for longer periods in August and September than in June or July (Klock *et al.* 2000).

Geology and Geomorphology

The Campbell Hills are Devonian limestones and dolomites that lie atop the “Campbell Uplift” (Cook and Aitkin 1971). Exposed bedrock is the dominant feature. In places, the bedrock is heavily fractured and vertical cliff faces occur. Thin till and colluvial deposits are present, the latter commonly below cliff faces as rubbly talus slopes.

Soils

Colluvial deposition and continual frost action retard soil development and Regosolic Turbic Cryosols or Organic Cryosols are probably the main soil types. There is no soil development on bedrock or on rubbly colluvial talus slopes below cliff faces.

Vegetation

Topography and parent materials within the Campbell Hills HS Ecoregion change rapidly over distances of only a few meters, producing a correspondingly variable plant cover. The most widespread communities on thin, well-drained soils over bedrock are open, variable-aged black spruce – shrub – lichen stands mixed with shrublands that include willow, dwarf birch, mountain cranberry, red bearberry, northern and common Labrador tea, and occasionally stunted balsam poplar and trembling aspen. On the driest areas, sedge – grass communities grow in pockets of soil and lichen communities on exposed bedrock. Relatively diverse black spruce – white spruce stands, sometimes with Alaska paper birch and dense green alder and willow understories, occupy sheltered slopes and ravines. Runnels and bogs forested by open, stunted black spruce – lichen woodlands occur locally on gentle slopes and in depressions where organic veneers and blankets have developed.

Water and Wetlands

There are no major waterbodies within the Ecoregion; Campbell Lake and the “reversing delta” (see image on p. 27) lie adjacent to it. A few shallow ponds are scattered across the Ecoregion. Bogs with permafrost and sparse, stunted black spruce woodlands occur in small pockets and depressions; runnel patterns occur on gentle slopes.

Notable Features

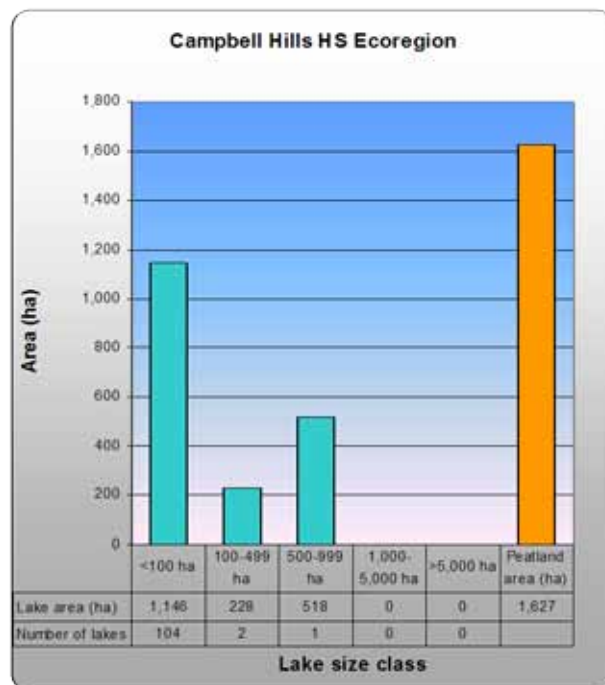
The Campbell Hills are a unique regional feature. Trembling aspen reaches its most northerly distribution in the Northwest Territories here and on nearby cutbanks above the Mackenzie Delta.



This view looks north along the spine of the Campbell Hills towards Inuvik. Note the fracture patterns in the limestone bedrock that provide sheltered valleys where somewhat more vigorous and diverse plant communities occur.



Black spruce – lichen vegetation on thin soils over bedrock is typical across much of the Campbell Hills.



Proportion of Ecoregion occupied by lakes: 9%
Proportion of Ecoregion occupied by bogs and fens: 8%



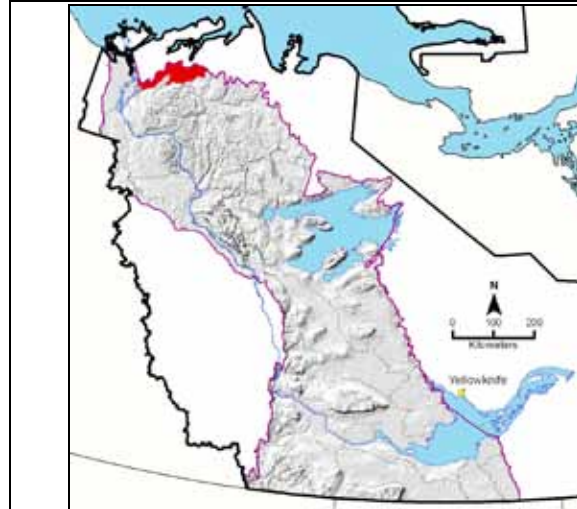
This stunted trembling aspen colony on the east side of the Campbell Hills overlooking Campbell Lake is near the northern limits of aspen growth in the Northwest Territories.

3.3.1.4 Sitidgi Plain HS Ecoregion

Overview: *The Sitidgi Plain HS Ecoregion is a mosaic of treed and treeless, undulating to hummocky till with many features characteristic of both High Subarctic and colder Low Arctic climatic regimes.*

Summary:

- Hummocky to undulating till.
- Treeless tundra areas and sparsely treed southerly slopes.



Total area: 4,933 km² (2.9% of Taiga Plains HS Ecoregion).
Ecoregion shown in red.

Average elevation (range) mASL: 50 (0-200)

General Description

The Sitidgi Plain HS Ecoregion is the northernmost upland ecoregion in the Taiga Plains. A transitional tree line area marks its northern boundary with the Level II Southern Arctic Ecoregion. Because tree line is determined by changes in local and regional climates over time and is therefore dynamic, this boundary is best regarded as a broad line. Its southern boundary with the Travaillant Upland HS and Anderson Plain HS Ecoregions is not clearly defined. The Sitidgi Plain HS Ecoregion is mapped as a separate ecological system because of its lower elevation, somewhat more subdued terrain, and forest – tundra complex. The Ecoregion is an undulating to hummocky till plain, and peatlands account for less than 20 percent of the landscape. Patterned polygonal ground and earth hummocks that occur throughout are indicative of High Subarctic and Low Arctic climate influences. There are numerous small ponds, but wetlands are uncommon and are mainly polygonal peat plateaus. Stunted, widely spaced white spruce and treeless exposed tundra areas are characteristic, and indicate the poorly defined transitional nature of the boundary between the Level II Taiga Plains and Southern Arctic Ecoregions.

Geology and Geomorphology

Middle to upper Cretaceous shales underlie the Ecoregion. Hummocky to undulating medium- to fine-textured till is the main landform type. Patterned ground, earth hummocks and runnels are indicative of active permafrost processes.

Soils

Turbic Cryosols are widespread across the Ecoregion, with Organic Cryosols in fens and polygonal peat plateaus.

Vegetation

The characteristic plant cover is a mix of very sparsely treed white spruce woodlands with low dwarf birch shrub understories, and treeless tundra with dwarf birch, black crowberry, willow, cotton-grasses and sedges. Treeless areas can be extensive on exposed terrain or where slopes are predominantly north facing. They represent outliers of the Level II Southern Arctic Ecoregion that are too small to map at the Level II scale. Marginally improved growing conditions occur in the southern portion of the Ecoregion on warmer southerly slopes and in well-drained nutrient-rich riparian zones.

Water and Wetlands

Sitidgi Lake is the largest waterbody. Numerous small lakes occupy pothole depressions, and generally have well-drained shorelines. Wetlands are uncommon, but there is a locally extensive horizontal fen and northern ribbed fen area west of Sitidgi Lake. Fens and polygonal peat plateaus are generally restricted to small pockets by topography and moisture conditions.

Notable Features

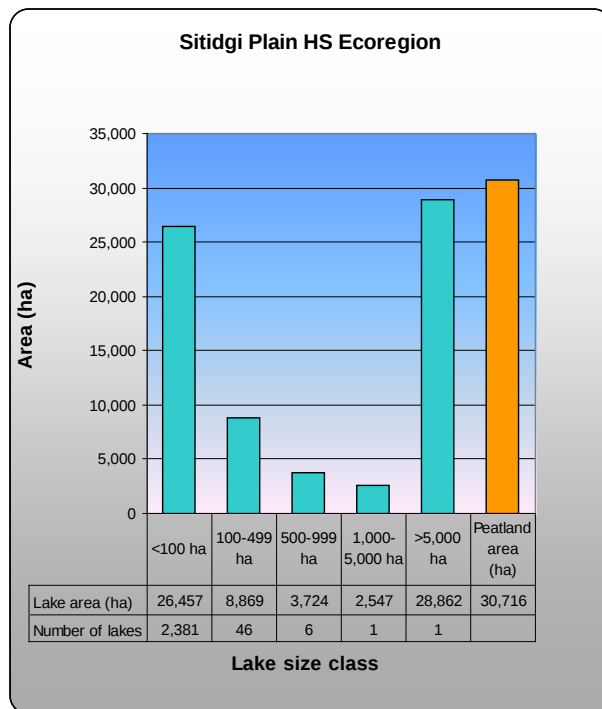
Vegetation and permafrost features indicate that the Sitidgi Plain HS Ecoregion is the coldest and probably the most arid ecoregion in the Taiga Plains.



Near the northern border of the Sitidgi Plain HS Ecoregion, scattered dwarf (2-5 m) white spruce grow on southerly slopes, and hilltops and northerly slopes are treeless.



Slightly better tree growth occurs on steeper south slopes along the southeast boundary of the Ecoregion.



Proportion of Ecoregion occupied by lakes: 14%
Proportion of Ecoregion occupied by bogs and fens: 6%



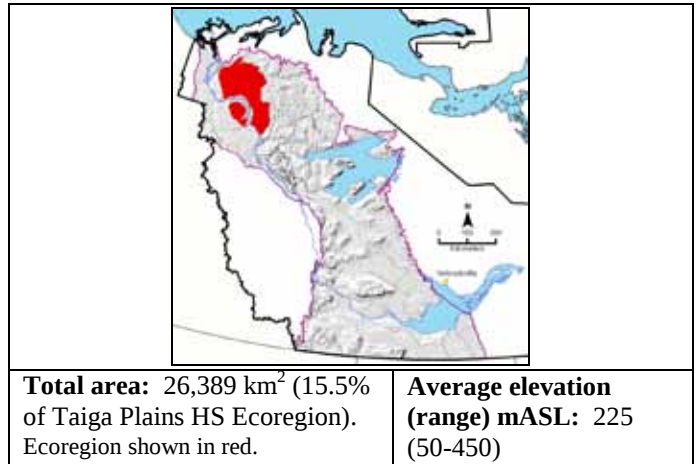
The circular pond and the patterned ground surrounding it are the remnants of a pingo (an ice-cored conical permafrost feature that rises above the surrounding plain) that has melted.

3.3.1.5 Travaillant Upland HS Ecoregion

Overview: *The Travaillant Upland HS Ecoregion is a complex landscape of rolling and dissected till veneers over bedrock, hummocky till uplands, and variable forest cover types.*

Summary:

- Rolling and eroded till veneers and blankets over bedrock in the south, hummocky till uplands in the north.
- Relatively diverse white spruce stands in the south grading to sparsely treed low-canopied woodlands in the north.



General Description

The Travaillant Upland HS Ecoregion is a geologically and topographically complex landscape consisting of a main unit and a southwestern outlier. The main unit shares its eastern boundary with the Anderson Plain HS Ecoregion, its southeastern boundary with the North Mackenzie Plain LS Ecoregion, its western boundary with the Arctic Red Plain HS Ecoregion, and its northern boundary with the Sitidgi Plain HS Ecoregion. The outlying southwestern unit is completely surrounded by the Arctic Red Plain HS Ecoregion. The Travaillant Upland HS Ecoregion occurs at higher elevations and has more pronounced terrain features than all surrounding ecoregions. The southern half of the Ecoregion and its southwestern outlier are rolling and include deeply dissected bedrock-controlled landscapes, thin till veneers and blankets over glacially scoured bedrock, and hummocky till deposits. The northern half of the Ecoregion is mainly a hummocky till upland with scattered polygonal peat plateaus. Vegetation cover varies throughout the Ecoregion, with closed and relatively diverse white spruce forests in the southern third, more open spruce woodlands in central parts, and sparsely treed communities or shrubby tundra in the northern third. Recently burned, regenerating shrub communities share dominance with forested types throughout the Ecoregion.

Geology and Geomorphology

Much of the Ecoregion is underlain by Devonian marine shales. Devonian limestones and Cretaceous shales and sandstones that outcrop east and south of Travaillant Lake produce small flat-topped plateaus. The southern landscapes are most variable, with rolling and ridged glacially scoured bedrock and deeply incised meltwater channels and erosion gullies. Till veneers and blankets overly bedrock in the south; hummocky till uplands are the main landform type north of Travaillant Lake. Peatlands are more extensive in the northern half, where level or depressional areas allow organic deposits to accumulate. Glacio-fluvial deposits are locally extensive in the Travaillant Lake area and along the Iroquois River to the south.

Soils

Turbic Cryosols are widespread across the Ecoregion, reflecting continuous permafrost. Organic Cryosols occur with polygonal peat plateaus.

Vegetation

The characteristic vegetation type in the Travaillant Upland HS Ecoregion is white spruce forest with dwarf birch, mountain cranberry, northern and common Labrador tea, red bearberry, lichens and mosses. Species composition is reasonably consistent across the Ecoregion, but the density and height of white spruce varies widely in response to regional and local conditions. The Ecoregion spans nearly 300 km north to south. In the southern third and in the southwest outlier, climatic conditions are transitional from High Subarctic to Low Subarctic, and closed-canopy relatively diverse white spruce stands often with an Alaska paper birch component are common on rolling, hummocky and dissected till. Northern ribbed fens and well-treed runnel patterns are also more common in the south than elsewhere in the Ecoregion. Northward, in the Travaillant Lake area, more open spruce stands with lower canopies are typical on undulating to hummocky till and polygonal peat plateaus are more widespread. In the northernmost third, open spruce woodlands are most common, with patches of shrub – sedge tundra and landform features indicative of Low Arctic climates, such as earth hummocks and patterned ground in the extreme north by Sitidgi Lake. Recent fires have replaced much of the forest across the Ecoregion with regenerating dwarf birch stands.

Water and Wetlands

There are several named lakes, of which Travaillant, Manuel, Yelte and Caribou Lakes are the largest. Thousands of small lakes occupy pothole depressions, and generally have dry shorelines without much wetland development. Polygonal peat plateaus are the most common wetland type especially around Travaillant Lake and to the north where terrain permits their development. Northern ribbed fens also occur in the south.

Notable Features

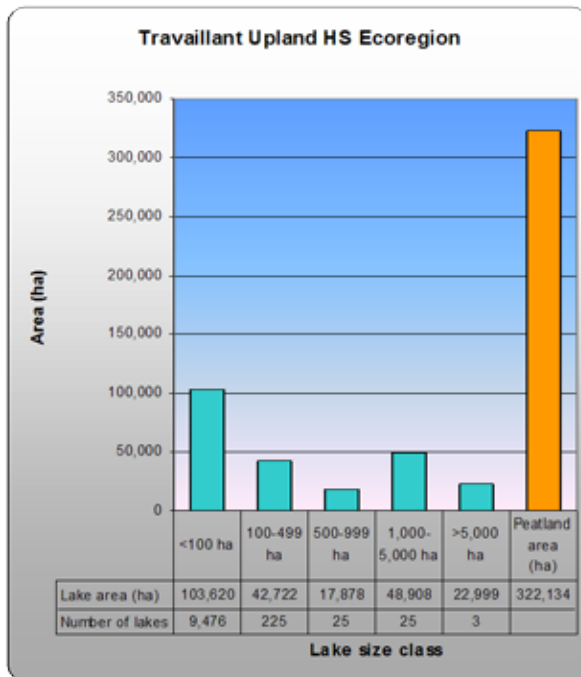
The Travaillant Lake HS Ecoregion is a relatively diverse area compared to neighbouring Ecoregions. Spectacular displays of fireweed in late July on ridges in the southern part are the result of extensive recent fires.



The landscape north of Travaillant Lake is an extensively burned, undulating to hummocky plain; an area of dark green spruce woodland is in the midground.



Open white spruce stands with dwarf birch, Labrador tea and green alder shrubs grow on hummocky till east of Travaillant Lake.



Proportion of Ecoregion occupied by lakes: 9%
Proportion of Ecoregion occupied by bogs and fens: 12%



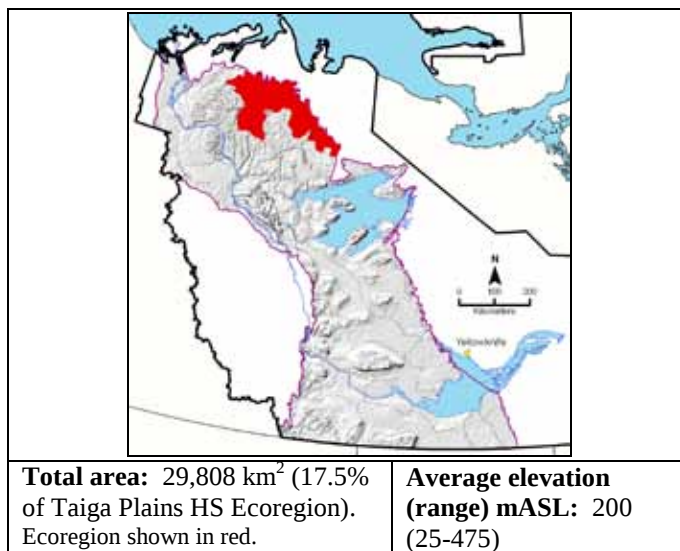
Comparatively diverse and vigorous white spruce forests grow on well-drained and relatively warm southerly till slopes east of Travaillant Lake; a typical ground view of these stands is shown in the image at the top right.

3.3.1.6 Anderson Plain HS Ecoregion

Overview: Hummocky and undulating till deposits, thousands of shallow ponds, and stunted, spruce – low shrub – lichen woodlands are typical of the Anderson Plain HS Ecoregion.

Summary:

- Hummocky and undulating till with many ponds but few wetlands.
- Sparsely treed white spruce – low shrub – lichen woodlands grading into open, treeless plains to the north.



General Description

The Anderson Plain HS Ecoregion includes the northwesterly-sloping drainage basin of the Anderson River. It is bordered on the north by the Level II Southern Arctic Ecoregion, on the west by the higher rolling hills of the Travaillant Upland HS Ecoregion, and on the south by the Colville Upland HS Ecoregion. Its boundary with the Level II Southern Arctic Ecoregion is marked by tree line beyond which trees no longer grow, associated with Low Arctic climates. Because tree line is determined by changes in local and regional climates over time and is therefore dynamic, this boundary is best regarded as a broad line. Most of the Ecoregion is a hummocky or undulating till plain with pockets of coarse-textured glacio-fluvial and eolian materials. Permafrost features indicative of High Subarctic and Low Arctic climates, such as patterned polygonal ground and earth hummocks, occur in the northern part. There are numerous shallow ponds, some of which are calcareous; wetlands are relatively uncommon and are mainly northern ribbed fens or polygonal peat plateaus. The characteristic upland vegetation is low-growing white spruce – dwarf birch – lichen woodlands that become more stunted and sparsely treed toward the north. Spruce attains better growth on south facing slopes and alluvial flats where temperature and drainage conditions are more favourable and contribute to a longer growing season.

Geology and Geomorphology

Cretaceous shales and Devonian limestones and dolomites, the latter along the Anderson River and northwest of Lac Manoir, underlie the Ecoregion. Calcareous ponds, water-filled sinkholes and occasional rock outcrops indicate the location and influence of Devonian bedrock. Hummocky or undulating, medium- to fine-textured till is the dominant landform. Esker complexes, kame deposits, and eolian plains and poorly defined dunes occur in pockets; the meandering Anderson River has deposited large alluvial terraces. Near tree line, patterned ground, earth hummocks, and slope failures due to permafrost melting become locally common and indicate the influence of colder Low Arctic climates.

Soils

Almost all mineral soils are permafrost-affected and are classed as Turbic Cryosols. Minor occurrences of Organic Cryosols and Brunisols occur with polygonal peat plateaus and alluvial or glacio-fluvial materials, respectively.

Vegetation

Low-canopied open white spruce woodlands with an understory of dwarf birch, common and northern Labrador tea, mountain cranberry and reindeer lichen are the most common forest type. This stand type is common throughout the Level III Taiga Plains HS Ecoregion. In the southern Anderson Plain HS Ecoregion, stands are dense enough to carry ground and crown fires, and burned stands with dwarf birch regeneration are fairly common. Towards the northern boundary, open forests give way to very sparsely treed woodlands that are probably too well spaced to carry fire; where fires have occurred, tree regeneration takes a very long time because of slow growth and limited seed supplies. Large treeless dwarf birch-dominated shrublands occur south of the mapped tree line because fire has removed the tree cover or local conditions are too extreme for tree growth; the northern part of this Ecoregion experiences climatic conditions that are a mix of climates in the Level III Taiga Plains HS Ecoregion and the colder, more northerly Level II Southern Arctic Ecoregion.

Water and Wetlands

The Anderson River and its main tributary, the Carnwath River, flow through the Ecoregion. Niwelin Lake, Estabrook Lake, and the western third of Horton Lake are the main named waterbodies. Thousands of shallow ponds occupy depressions between hummocks. Wetlands are sparsely distributed and where they occur are treeless polygonal peat plateaus or treeless northern ribbed fens.

Notable Features

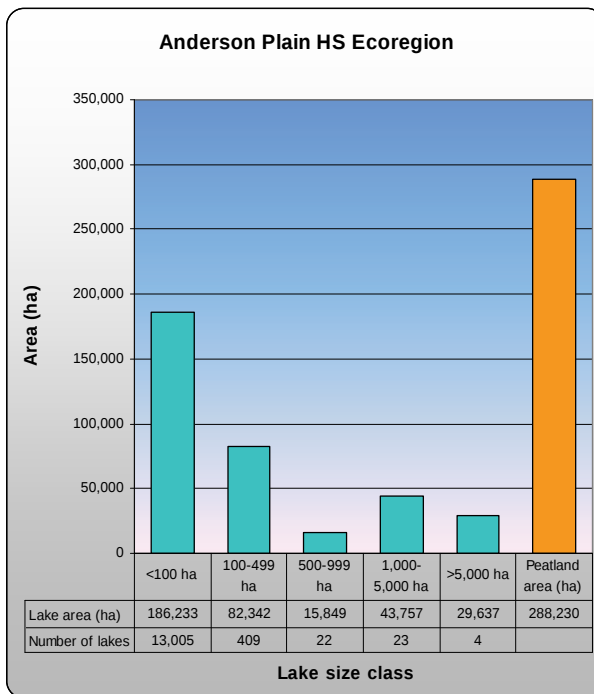
This Ecoregion has the largest land area of all Level IV ecoregions in the Taiga Plains HS Ecoregion.



Undulating till with burned and unburned white spruce – shrub – lichen forests is a typical landscape pattern south part of the Anderson Plain HS Ecoregion.



Sparsely treed rolling to undulating till east of the Anderson River near tree line is typical of the north part of the Ecoregion.



Proportion of Ecoregion occupied by lakes: 12%
Proportion of Ecoregion occupied by bogs and fens: 10%



On the floodplain and valley slopes of the Anderson River, the dark patches on terraces and valley slopes are closed white spruce stands and the lighter green areas are shrublands and sedge meadows.

3.3.1.7 Colville Upland HS Ecoregion

Overview: *The Colville Upland HS Ecoregion includes hummocky till and glacio-fluvial deposits; much of the area has burned within the last several decades, and low-canopied white spruce forests and regenerating shrublands are characteristic cover types.*

Summary:

- Hummocky till plains with significant areas of hummocky well-drained glacio-fluvial deposits.
- Variable white spruce – lichen communities and regenerating post-burn communities.



Total area: 12,451 km² (7.3% of Taiga Plains HS Ecoregion).
Ecoregion shown in red.

Average elevation (range) mASL: 250 (125-400)

General Description

The Colville Upland HS Ecoregion is an extensive hummocky till landscape with many small pothole lakes and several large lakes. It is distinguished from the more northerly Anderson Plain HS Ecoregion by more pronounced local terrain variations and vegetation cover indicating slightly warmer climatic conditions; unlike the Anderson River drainage basin. The Colville Hills HS Ecoregion, the lower-elevation, nearly level Colville Plain HS Ecoregion and the northern extension of the North Mackenzie Plain LS Ecoregion border it on the south and southwest. Hummocky medium- to fine-textured till deposits with numerous pothole lakes and imperfectly- to poorly-drained depressions are the dominant landform, and well-drained glacio-fluvial deposits also occupy significant areas. Uneven-aged, low-canopied white spruce – low shrub – lichen forests are characteristic of upland sites, but several major fires over the last few decades have replaced much of this forest type with regenerating white spruce – dwarf birch shrublands. In the northernmost part of the Ecoregion, these stands assume a very open growth form similar to that which occurs close to tree line; towards the southwest corner, conifer growth improves and small, scattered mixed-wood stands occur on south-facing slopes.

Geology and Geomorphology

Medium- to fine-textured, hummocky till is the most widespread landform, but hummocky glacio-fluvial deposits are also common. Peatlands underlain by permafrost have developed in imperfectly- to poorly-drained depressions between till hummocks. Patterned ground and areas of slope failure due to permafrost melting are present in some areas.

Soils

Most soils on hummocky till are probably Turbic Cryosols. Deep, well-drained glacio-fluvial deposits are likely not affected to the same degree by permafrost, and Brunisolic soils are likely to occur. Organic Cryosols or Gleysolic Turbic Cryosols can be expected in depressions between hummocks.

Vegetation

Vegetation patterns are similar to those of the Colville Plain HS Ecoregion, except that regenerating white spruce-dwarf birch shrublands cover a much larger area. The characteristic mature stand type is uneven-aged white spruce – dwarf birch – willow communities with a significant lichen component in more open stands. These stands are very open woodlands near the northern boundary, but in contrast trees are relatively tall and dense toward the southwest, where white spruce and Alaska paper birch occur together in small patches on southerly slopes. Rapidly drained sites occurring on level to hummocky glacio-fluvial and eolian deposits are generally too dry and nutrient-poor to support communities other than open white spruce – lichen stands with very sparse shrub understories or lichen-dwarf birch communities. Wetlands are not as widespread as in the Colville Plain HS Ecoregion because hummocky topography limits their extent; veneer bogs with black spruce – lichen communities on thin peat veneers and blankets between till hummocks are more common.

Water and Wetlands

Aubry Lake is the largest named lake in the Ecoregion. There are no major watercourses. There is no organized internal drainage; pothole lakes are abundant in hummocky till areas.

Notable Features

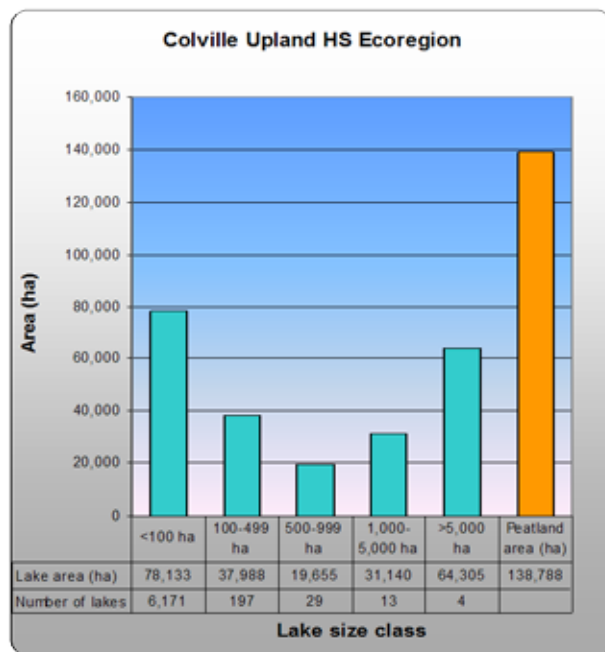
The Colville Upland HS Ecoregion has vegetation and landform features that are typical of intermediate climates within the Taiga Plains HS Ecoregion.



On the Colville Upland HS Ecoregion north of Aubry Lake, hummocky and undulating till supports stunted forests and regenerating shrublands. There are numerous ponds; localized polygonal peat plateaus usually border the ponds.



North of Aubry Lake, white spruce – shrub communities grow on hummocks, whitish-gray spruce – lichen stands occupy lower intervening areas, and paper birch regeneration is evident on a warmer site on a south-facing hillside (light green, center of picture).



Proportion of Ecoregion occupied by lakes: 19%
Proportion of Ecoregion occupied by bogs and fens: 11%



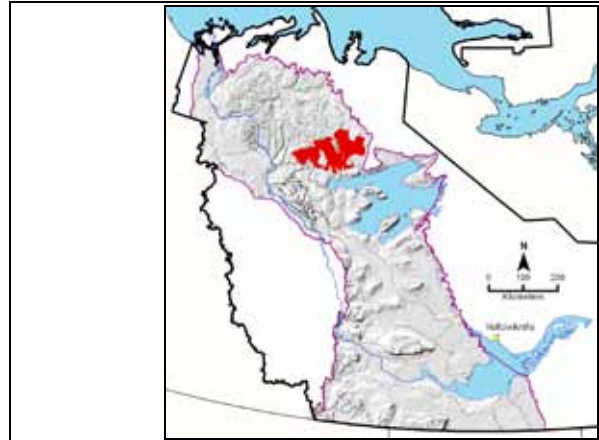
Hummocky glacio-fluvial deposits with open spruce – dwarf birch – lichen communities and small pothole lakes with limited shore or floating fen development are common throughout the Ecoregion.

3.3.1.8 Colville Plain HS Ecoregion

Overview: *The Colville Plain HS Ecoregion occupies a regional low, where level to undulating till plains, white spruce – lichen woodlands, numerous ponds and polygonal peat plateaus are the main landscape features.*

Summary:

- Mostly level to gently undulating till plains with peatlands (polygonal peat plateaus) in low-lying areas.
- Variable white spruce –lichen communities, polygonal peat plateau and patterned fen wetlands.



Total area: 11,686 km² (6.9% of Taiga Plains HS Ecoregion).
Ecoregion shown in red.

Average elevation (range) mASL: 275 (175-475)

General Description

The Colville Plain HS Ecoregion is a level to gently undulating low-elevation plain surrounding parts of the Colville Hills HS Ecoregion. The Colville and Manoir Ridges and the higher-elevation, hummocky Colville Upland HS Ecoregion form its northern boundary. The somewhat higher hummocky to rolling terrain of the Anderson Plain HS and Great Bear Upland HS Ecoregions border it to the east and south, respectively. Imperfectly- to poorly-drained till plains surrounding numerous lakes that are often encircled by treeless polygonal peat plateaus are typical of the Ecoregion. Well-defined permafrost-influenced runnel patterns occur on gently rolling slopes south of Lac Manoir. Open, low-canopied white spruce – low shrub – lichen forests with black spruce and larch are the characteristic upland cover type. Conifer growth improves around lakeshores, on slopes and along streams. Glacio-fluvial and eolian deposits that support open white spruce – lichen communities are scattered throughout the Ecoregion. Sparsely treed patterned sedge fens with thermokarst ponds are most common west of Lac Belot.

Geology and Geomorphology

Cretaceous marine shales underlie the central portion of the Ecoregion. Elsewhere, Cretaceous shales and Devonian limestones are interspersed, and scattered calcareous ponds south of Lac Manoir and Colville Lake and west of Lac Belot indicate the likely presence of Devonian formations. Medium- to fine-textured, level to gently undulating till deposits are the dominant landform. Peatlands overlying till are mainly restricted to low-lying areas such as lakeshores, where polygonal peat plateaus occur most frequently.

Soils

Most soils are probably permafrost-affected Turbic Cryosols. Organic Cryosols occur with polygonal peat plateaus.

Vegetation

Extensive uneven-aged white spruce – dwarf birch – willow communities with a significant lichen component in more open stands are the dominant vegetation cover. Black spruce and larch are associated species. Cold sites and rigorous climates limit tree growth over much of the area. Closed-canopy, relatively tall conifer stands occur on sites that provide better growing conditions such as southerly slopes, well-drained lakeshores and alluvial deposits. There is a general east to west gradient of improving growth as closed-canopy conifer stands become more extensive and mixed white spruce – Alaska paper birch stands occur in small patches on ridged till. Rapidly drained and dry sites, such as those found on the glacio-fluvial and eolian deposits scattered throughout the Ecoregion, support open white spruce – lichen stands with sparse shrub understories. On gently rolling terrain mainly to the east, alternating strips of spruce – lichen and spruce – shrub communities perpendicular to slope define runnel patterns. Thick lichen mats with scattered dwarf birch, northern and common Labrador tea, and cloudberry are the dominant cover on polygonal peat plateaus, which are extensive around lakes and particularly in the Lac Manoir area. Northern ribbed fens with thermokarst ponds are more common in this Ecoregion than in more northerly ecoregions, and sedges, cotton-grasses, willows, and dwarf birch are typical species.

Water and Wetlands

The Colville Plain HS Ecoregion contains most of the large named lakes in the Colville area, including Lac Belot, Colville Lake, Lac De Bois, Lac Manoir, and Kilekale Lake. Because the Ecoregion is surrounded by higher terrain, organized drainage patterns are absent. Small, shallow lakes are especially numerous east of Lac Belot. Polygonal peat plateaus and northern ribbed fens are the most common wetland types.

Notable Features

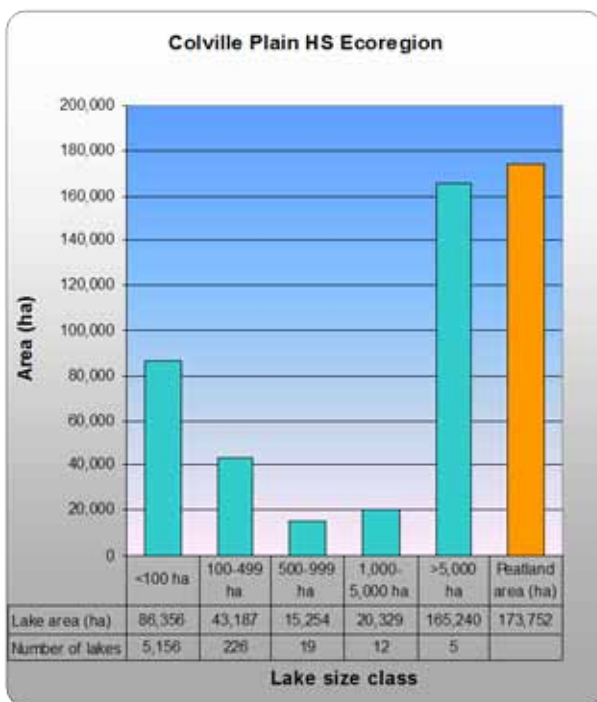
Colville Lake is one of several International Biological Program sites in the Taiga Plains that were recommended for protection in the 1960's and 1970's (Nettleship and Smith 1975).



In the Colville Plain HS Ecoregion east of Lac de Bois; there are numerous ponds, localized polygonal peat plateaus, and stunted forests.



Vegetation growth improves west of Lac Belot toward the North Mackenzie Plain LS Ecoregion and the Mackenzie River valley, indicating somewhat warmer conditions on the west side of the Ecoregion.



Proportion of Ecoregion occupied by lakes: 28%
Proportion of Ecoregion occupied by bogs and fens: 15%



This trembling aspen – white spruce – juniper – Canada buffaloberry community on a steep south slope by Colville airstrip is an uncommon community type in the High Subarctic.

3.3.1.9 Colville Hills HS Ecoregion

Overview: Long, narrow ridges rising several hundred meters above the surrounding lands with forested lower slopes and shrub tundra at the highest elevations define the Colville Hills HS Ecoregion.

Summary:

- Bedrock ridges with exposed bedrock and till blankets and veneers.
- White spruce – lichen communities, with shrub tundra at the highest elevations.



Total area: 2,952 km² (1.7% of Taiga Plains HS Ecoregion).
Ecoregion shown in red.

Average elevation (range) mASL: 350 (225-675)

General Description

The Colville Hills HS Ecoregion is a series of narrow ridges and low hills enclosing Colville Lake and Lac Belot. There are three main ridges. Belot Ridge lies furthest west and trends north – south; it is approximately 100 km in length and three to 11 km wide, attaining a maximum elevation of over 500 mASL. To the east, Manoir Ridge parallels Belot Ridge and has similar dimensions, but exceeds 600 mASL in places. Colville Ridge runs east – west just north of Colville Lake and connects the other two ridges; it is about 50 km long, three to five km wide, and more subdued at only 300 mASL. An isolated upland area south of Colville Lake and east of Lac Belot reaches maximum elevations of 400 mASL and is included with the Colville Hills HS Ecoregion because it shares common topographic and geologic attributes. Most of the ridges and hills are forested by open white spruce – lichen stands, and well-developed runnel patterns occur on the slopes, particularly on the southern hill outlier. At higher elevations, open spruce woodlands occur and are characteristic of areas further north in the Northern Great Bear Plain HS. Tree line is at about 500 mASL; the highest areas exhibit Low Arctic climatic attributes such as earth hummocks, patterned grounds, and slope failures due to permafrost melting.

Geology and Geomorphology

Belot Ridge and the southern hill outlier are composed of Devonian limestones of the Bear Rock formation. Colville and Manoir Ridges are composed of more erosion-resistant Cambrian dolomites (Cook and Aitken 1971). Rock outcrops define the ridgeline of Belot and Manoir Ridges; till veneers and blankets mantle the bedrock on Colville Ridge, the southern hill outlier, and the lower slopes of Belot and Manoir Ridges. Lac Belot Ridge includes some notable karst features (Ford 2008).

Soils

There is no soil development on bedrock exposures. Most soils are probably permafrost-affected Static and Turbic Cryosols. Organic Cryosols occur with polygonal peat plateaus.

Vegetation

Forest cover across this Ecoregion is reasonably uniform in terms of species composition, but exhibits variations in stand structure with elevation and slope. Lower to mid slope positions support relatively well-developed white spruce – lichen stands compared to those further upslope and in the surrounding lower terrain. On steep south-facing protected slopes, trembling aspen may occur as scattered, stunted individuals. At increasing elevations, spruce stands become more open and above about 500 mASL, grade into treeless shrubby tundra. Tundra communities include willows, dwarf birch, black crowberry, cotton-grasses, sedges and lichens. There are few wetlands; polygonal peat plateaus occur along the lower slopes of the Colville Ridge where it meets the northern shore of Colville Lake.

Water and Wetlands

The only named lake within this Ecoregion is Tweed Lake, located within the southern hill outlier. There are no permanent watercourses, and very few wetlands. Veneer bogs probably occur in association with runnels that are especially prevalent on the southern hill outlier; polygonal peat plateaus occur along the lower slopes of the Colville Ridge near Colville Lake.

Notable Features

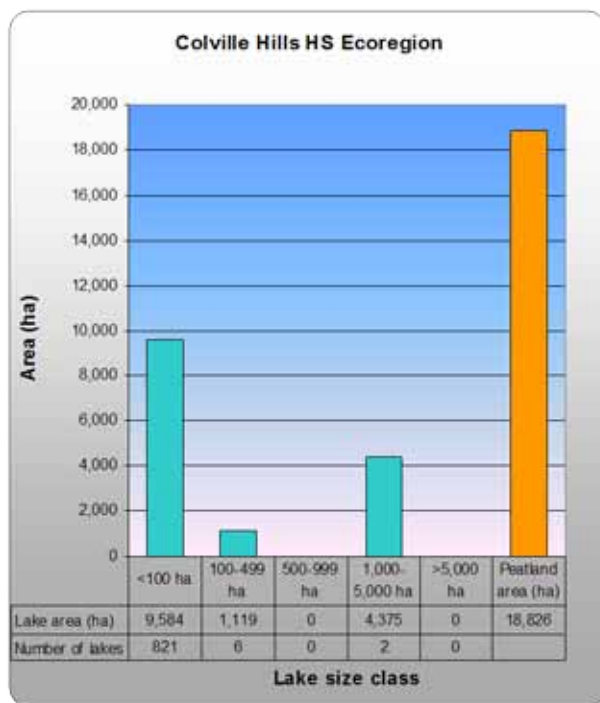
The Colville Hills are a striking feature, rising three to four hundred meters above the surrounding lands. They provide valuable habitat for a number of wildlife species including musk ox.



In this northerly view along Belot Ridge, the westernmost ridge in the Colville Hills HS Ecoregion, the lighter patches are bedrock exposures, and the dark forests are white spruce with a lichen understory.



On Manoir Dome at the north end of Manoir Ridge, the lower slopes are forested, and the upper slopes are treeless shrubby tundra and barren ground.



Proportion of Ecoregion occupied by lakes: 5%
Proportion of Ecoregion occupied by bogs and fens: 6%



Treeless shrubby tundra and bedrock exposures occur on top of Manoir Dome.

3.3.1.10 Great Bear Upland HS Ecoregion

Overview: *The Great Bear Upland HS Ecoregion includes seven units occurring north of Great Bear Lake or on high-elevation terrain to the south; undulating to hummocky till with open spruce woodlands are characteristic landscapes.*

Summary:

- Hummocky and undulating till.
- Sparsely treed white spruce with lichen – shrub understory is typical; hummocky and sloping tills on the northernmost unit show better growth.
- Wetlands are uncommon except in the northernmost unit, where polygonal peat plateaus can be locally extensive.
- Three very small treeless units at the highest elevations on Şehdacho have cold Low Arctic climates and features.

General Description

The Great Bear Upland HS Ecoregion includes seven separate land units. The main unit occurs on generally south-sloping uplands north of Great Bear Lake between 200 and 400 mASL. The other much smaller units occur to the south at elevations of over 500 mASL on Sahoyúé – Şehdacho and along the crest of a long ridge south of McVicar Arm; they are embedded within the Great Bear Upland LS Ecoregion. White spruce – shrub – lichen woodlands with short, widely spaced trees are widespread across all of the units on undulating and hummocky till. Polygonal peat plateaus occupy extensive areas on gently undulating to level terrain in the largest, most northerly unit; in the other units, wetlands are less extensive because of hummocky terrain. South-facing slopes and hummocky tills in the eastern portion of the large northernmost unit support denser and taller white spruce stands; this area is referred to on old topographic maps as the “Big Spruce Hills”. At the very highest elevations on Şehdacho (Scented Grass Hills), there are three small nearly treeless, hummocky till plateau areas that are distinctly different from the surrounding forested areas. Permafrost features such as earth hummocks, patterned ground, and slope failures due to permafrost melting are evident in these areas, where scattered and stunted individual trees grow only in protected locales. These features indicate colder climates at higher elevations in this area, and bear strong similarities to vegetation and permafrost features that are characteristic of the Level II Southern Arctic Ecoregion; however, these areas are too small to represent as ecoregions.

Geology and Geomorphology

Cretaceous shales underlie most of the Ecoregion and are blanketed by till; Devonian limestones outcrop along the lakeshore at the west end of Smith Arm. Hummocky and undulating variable-textured till is the dominant glacial landform. The southern units are generally coarse-textured deposits with steep-sided hummocks, small pothole lakes and little wetland development. Organic veneers and blankets cover significant areas of gently undulating to level till in the northernmost unit.

Soils

Organic and Turbic Cryosols are associated with polygonal peat plateaus and medium- to fine-textured till deposits, respectively.



Total area: 6,997 km² (4.0% of Taiga Plains HS Ecoregion).
Ecoregion shown in red.

Average elevation (range) mASL: 350 (150-700)

Brunisols are associated with well-drained coarse-textured hummocky till deposits where the permafrost table is well below the surface.

Vegetation

The main cover type occurring on all units is a sparsely treed low-growing white spruce woodland with patchy dwarf birch, willow, black crowberry, mountain cranberry, red bearberry and a carpet of lichens. This community is found on undulating to hummocky, variably-textured till and its composition and form is a characteristic vegetation feature of the Level III Taiga Plains HS Ecoregion. Treeless polygonal peat plateaus with lichen – dwarf birch – northern Labrador tea cover are locally extensive on level to gently undulating terrain on the northernmost unit. Relatively diverse, taller and denser white spruce communities occur on hummocky and sloping till along the eastern third of the northernmost unit. Unusual miniature trembling aspen and balsam poplar forests grow on some south-facing hummock slopes in the southerly high-elevation units. Treeless shrubby tundra occupies three small areas at the highest elevations on Şehdacho.

Water and Wetlands

There are no named lakes in this Ecoregion. Several small rivers and streams (Katsyedik River, Olmstead Creek, Glacier Ice Creek, Big Spruce River) flow across the northernmost unit into Great Bear Lake. Small pothole lakes occur in hummocky till areas. Wetlands are uncommon especially on the southern units where closely spaced till hummocks restrict wetland development, but polygonal peat plateaus cover significant areas on level to undulating till.

Notable Features

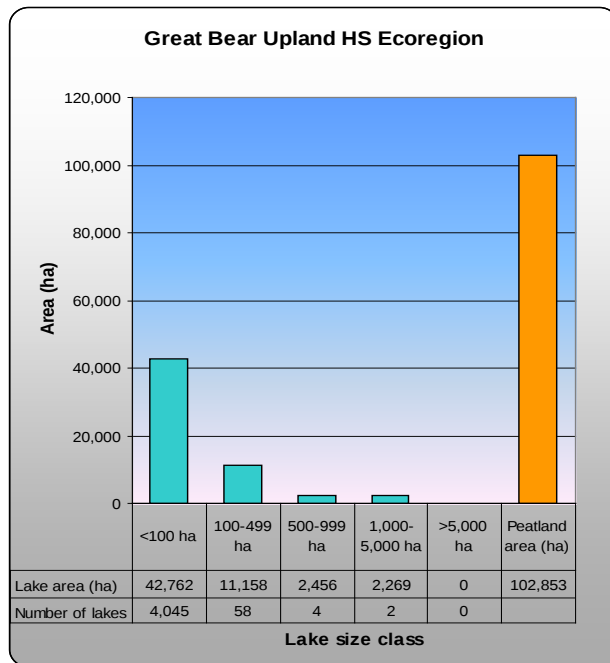
The south-facing slope of the large northern unit has forest cover more typical of the somewhat warmer Level III Taiga Plains LS Ecoregion. Sahoyúé–Şehdacho has recently been designated as a national historic site; the Great Bear Upland HS Ecoregion contributes to its overall diversity.



Undulating to hummocky till with open, short white spruce forests and whitish polygonal peat plateaus around lakes is a common landscape in the Great Bear Upland HS Ecoregion.



Taller, denser spruce forests occur on sloping hummocky till within the northernmost of seven units; Great Bear Lake is in the background.



Proportion of Ecoregion occupied by lakes: 9%
Proportion of Ecoregion occupied by bogs and fens: 15%



Treeless tundra with a few stunted white spruce occurs on the plateau top of Şehdacho. Tree branches are sheared from the lower trunk by ice crystal abrasion, and the cushion of needle-bearing branches at the base indicates the typical depth of a protective snow layer. Great Bear Lake is visible in the distance.

3.3.1.11 Great Bear Plain HS Ecoregion

Overview: *Great Bear Lake is the most conspicuous feature of the Great Bear Plain HS Ecoregion, which otherwise includes low-elevation shorelines along Smith Arm and the north side of Şehdacho.*

Summary:

- Narrow zone of till and glacio-lacustrine deposits at low elevations along Smith Arm and the north shore of Şehdacho.
- Sparsely treed white spruce – shrub – lichen woodlands, polygonal peat plateaus, and runnel patterns are typical.



Total area: 32,683 km² (19.2% of Taiga Plains HS Ecoregion).
Ecoregion shown in red.

Average elevation (range) mASL: 150 (125-375)

General Description

The Great Bear Plain HS Ecoregion is the second largest Level IV ecoregion in the Taiga Plains but over 93 percent of its area is Great Bear Lake. The land portion of this Ecoregion accounts for only about 2,402 km² of the total area, which does not include the islands in Great Bear Lake. It includes the shorelines and low central area of Şehdacho (Scented Grass Hills) peninsula and the western and northern shorelines of Smith Arm below 200 mASL, and all of the islands in Great Bear Lake. Sparsely treed white spruce woodlands on gently sloping to hummocky till and lacustrine deposits and extensive polygonal peat plateaus and runnel patterns are typical of the western and northern shorelines of Smith Arm and Şehdacho. An area of comparatively good conifer growth on the north side of Şehdacho may be the consequence of higher elevations and slopes that provide more favorable growing conditions.

Geology and Geomorphology

Gently sloping to hummocky till deposits and coarse-textured lacustrine deposits are the dominant parent materials on the uplands. Beach ridges indicate the former extent of glacial Lake McConnell and isostatic rebound following the retreat of glacial ice. Glacial meltwaters have cut deeply into Devonian limestones at the southwest corner of Smith Arm, leaving vertical cliff faces many meters high in places.

Soils

Turbic Cryosols occur with mineral soils. Brunisols are likely associated with well-drained coarse-textured glacio-lacustrine deposits where the permafrost table is well below the surface. Organic Cryosols are associated with polygonal peat plateaus.

Vegetation

Open, low-canopied white spruce with a shrub understory including dwarf birch, mountain cranberry, and northern and common Labrador tea is typical of upland sites near the lakeshore. Treeless polygonal peat plateaus cover extensive areas around the western and northern shores of Smith Arm, Şehdacho, and on many of the islands. Runnel patterns occur wherever slopes are sufficient to allow downslope water flow, and spruce – low shrub communities alternate with spruce – lichen communities to form the characteristic striped appearance. Taller and denser white spruce forests grow on a slightly elevated

hummocky bench on the north side of Şehdacho, possibly because this area escapes the cooling effect of the lake and because slopes provide locally favourable conditions. Trembling aspen stands are rare, and are restricted to warm, dry sites such as till knobs or eskers.

Water and Wetlands

Great Bear Lake is the most significant feature of this Ecoregion. It is the largest lake located entirely within Canada, with a surface area of 31,153 km², a maximum depth of 446 m, a volume of 2,236 km³ and 2,719 km of shorelines excluding islands (International Lake Environment Committee, n.d.). Both Great Bear Lake and Great Slave Lake are enormous heat reservoirs; they freeze and thaw months later than other lakes in the region. The median dates of freeze-up and break-up for Great Bear Lake are November 25 and July 5, respectively (Klock *et al.* 2000).

Surface water temperature readings of Great Bear Lake taken in July and August 1964-5 were between 3-5°C (International Lake Environment Committee n.d.), much cooler than the average local air temperatures of 10-12°C for those months. Way *et al.* (2005) indicate that an immense mid-summer inversion observed in 2004 above a mid-lake island was due to the presence of this large cold lake in a warmer large-scale regime. It is likely that Great Bear Lake has a significant summertime cooling effect on adjacent land areas; the lack of tree growth and the extensive occurrence of polygonal peat plateaus and other permafrost features immediately adjacent to the lake are evidence of its effect on local vegetation patterns. Winter winds that blow for long distances across the ice probably contribute to treeless tundra-like conditions along shorelines and on most of the islands through dessication and ice crystal abrasion of the few trees that do become established.

Notable Features

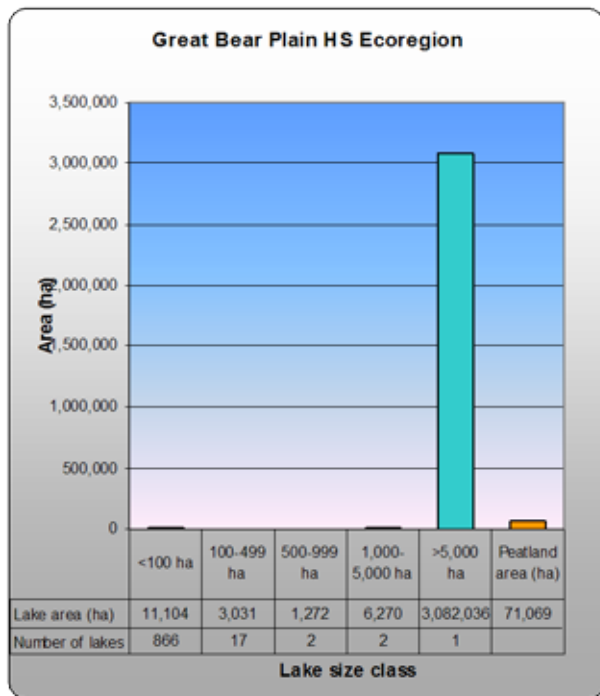
Great Bear Lake is one of the world's largest freshwater lakes. Parts of the Ecoregion lie within Şehdacho; Sahoyúé – Şehdacho has recently been designated as a national historic site.



Stunted white spruce woodlands and polygonal peat plateaus are characteristic of the area along the north shore of Smith Arm, here seen in a westward view.



Upland areas above the lake's climatic influence promote somewhat better white spruce growth.



(Great Bear Lake included)

Proportion of Ecoregion occupied by lakes: 95%
Proportion of Ecoregion occupied by bogs and fens: 2%



A meltwater channel carved deeply into Devonian limestones is an interesting feature in the western part of the Ecoregion.

3.3.1.12 Grandin Plain HS Ecoregion

Overview: *The Grandin Plain HS Ecoregion is nearly level, and includes bedrock controlled sparsely treed landscapes along the shore of Great Bear Lake, and gently undulating, sparsely treed fluted till further inland.*

Summary:

- A narrow band 5-15 km wide adjacent to Great Bear Lake with bedrock exposures, patchy tree cover and calcareous ponds occupies part of the Ecoregion.
- A gently undulating fluted till plain occupies most of the Ecoregion, with mostly open, stunted white spruce forests, polygonal peat plateaus and numerous shallow linear lakes.



Total area: 3,744 km² (2.2% of Taiga Plains HS Ecoregion).
Ecoregion shown in red.

Average elevation (range) mASL: 225 (125-500)

General Description

The Grandin Plain HS Ecoregion is a low relief till and bedrock plain adjacent to Dease Arm on Great Bear Lake. Its northern and western boundary is defined by the surrounding uplands at approximately 300 mASL where slopes and terrain variability increase markedly; tree line occurs along this boundary and Low Arctic climatic features such as patterned ground and earth hummocks are common north of it. Its eastern boundary is defined by the higher-elevation Grandin Upland HS Ecoregion. The Grandin Plain HS Ecoregion includes two main landscape types: thin bedrock-controlled nearly level washed tills and lacustrine materials extending five to 15 km in from the lakeshore, and gently undulating fluted till further inland. Bedrock exposures are prominent features along the narrow eastern portion along the back bay of Dease Arm. Tree growth is very sparse on the bedrock-controlled terrain and takes the form of open white spruce-shrub woodlands; there are very few wetlands, but calcareous ponds and seeps (horizontal and spring fens) are locally common. Open, stunted white spruce – shrub stands are characteristic of uplands in the fluted till area, with treeless lichen-covered polygonal peat plateaus in the swales. Hummocky glacio-fluvial deposits scattered throughout the area of fluted terrain support open spruce – lichen woodlands.

Geology and Geomorphology

Ancient Precambrian Proterozoic shales, mudstones and limestones outcrop along the back bay of Dease Arm and underlie the eastern part of the Ecoregion. Devonian limestones and dolomites lie beneath the central and western portions. Calcareous ponds and seeps are indicative of bedrock influences near or at the surface. Coarse-textured lacustrine deposits and water-washed tills form veneers and blankets over bedrock close to shore; beach ridges indicate the former extent of glacial Lake McConnell. Further inland, fluted and gently undulating fine- to medium-textured till deposits mask bedrock effects. There are a few locally extensive hummocky coarse-textured glacio-fluvial deposits.

Soils

Undulating till upland soils are probably permafrost-affected Turbic Cryosols. Brunisols are probably associated with well- drained lacustrine and glacio-fluvial deposits. Organic Cryosols occur with polygonal peat plateaus.

Vegetation

Vegetation patterns in the Grandin Plain HS Ecoregion are controlled by climate and landform characteristics. Colder conditions at higher elevations to the north and west preclude tree growth. Bedrock exposures along Dease Arm are mostly unvegetated, with patchy shrublands, lichen – dryland sedge communities, or very open white spruce – dwarf birch woodlands in pockets on bedrock or between exposures. On thin washed tills and glacio-lacustrine deposits over bedrock, and on hummocky glacio-fluvial deposits, treeless dwarf birch – dryland sedge communities are interspersed with very open white spruce – dwarf birch stands. Open, stunted white spruce stands with sparse dwarf birch – lichen understories are characteristic of well- to imperfectly-drained fluted till uplands; treeless polygonal peat plateaus with continuous lichen cover and sparse dwarf birch and Labrador tea cover occupy the poorly-drained swales. Tree growth improves somewhat to the west toward the “Big Spruce Hills” at slightly higher elevations, possibly because the cooling effect of Great Bear Lake is reduced by distance and elevation (refer to Section 3.3.1.11 for further discussion of the lake effect).

Water and Wetlands

The Ecoregion borders Great Bear Lake; the only named water body within it is Sulley Lake. The Haldane and Bloody Rivers flow through it from north to south. Calcareous ponds and seeps occur where limestone bedrock is close to or at the surface; numerous shallow linear lakes occupy the swales between flutes. Wetlands are uncommon in bedrock-controlled areas; calcareous horizontal fens and spring fens are locally abundant in some places. Polygonal peat plateaus are common in the fluted terrain and in level or depressional poorly-drained areas.

Notable Features

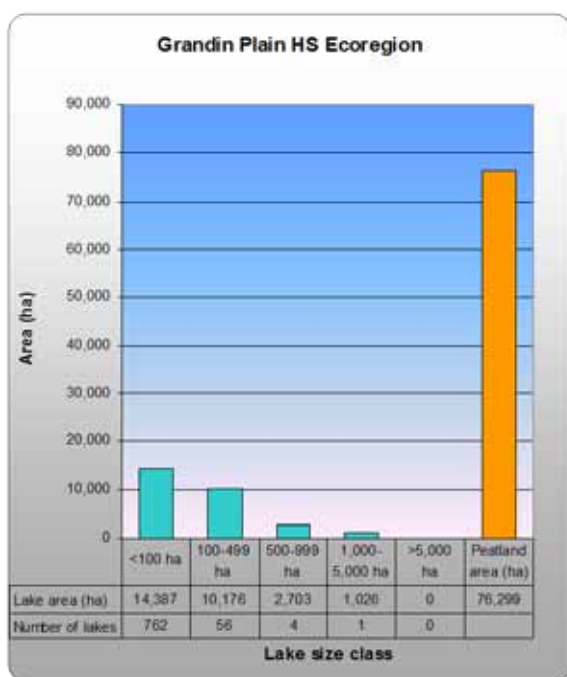
Bedrock exposures of the extent visible along the back bay of Dease Arm are uncommon in the Taiga Plains.



Open, stunted white spruce on uplands (dark tones) and lichen-covered frozen polygonal peat plateaus (lighter tones with dark-colored cracks) is typical on gently undulating fluted terrain.



The lakeshore zones of this Ecoregion are sparsely treed level plains or gentle bedrock-controlled slopes with scattered calcareous ponds and horizontal fens (lighter green area in mid-image).



Proportion of Ecoregion occupied by lakes: 8%
Proportion of Ecoregion occupied by bogs and fens: 23%



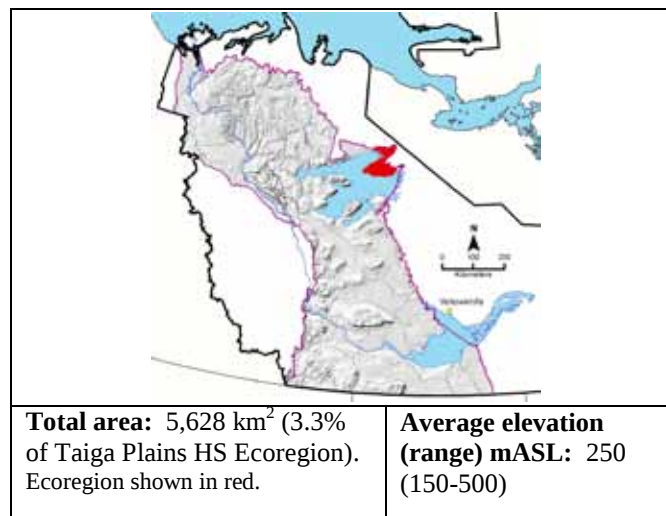
Prominent bedrock exposures scoured by glacial ice are striking features along the back bay of Dease Arm.

3.3.1.13 Grandin Upland HS Ecoregion

Overview: *The Grandin Upland HS Ecoregion occupies a gently domed low-elevation peninsula jutting into Great Bear Lake; stunted white spruce woodlands and shrub – lichen communities on till and coarse-textured lacustrine materials are characteristic.*

Summary:

- Hummocky and rolling till on peninsula with coarse-textured lacustrine and washed till deposits along the lakeshore.
- Open and stunted to closed, relatively tall and dense white spruce forests, lichen – dryland sedge – low shrub communities.
- Wetlands, including permafrost forms, are uncommon.



General Description

The Grandin Upland HS Ecoregion includes most of the peninsula between Dease and McTavish Arms on Great Bear Lake and the upland area east of Dease Arm to tree line. Rolling and hummocky till on uplands above about 300 mASL forms the core of this Ecoregion; coarse-textured lacustrine and wave-washed till deposits occur on the peninsula's lower slopes in a crescent five to 15 km wide. Its northern and eastern boundary with the Level II Southern Arctic Ecoregion is marked by tree line and a greater incidence of Low Arctic features such as patterned ground and earth hummocks. More variable topography in the core area and correspondingly variable vegetation patterns differentiate this Ecoregion from the adjacent Grandin Plain HS Ecoregion; both Ecoregions have comparable vegetation and terrain on low-lying areas adjacent to Great Bear Lake. Vegetation cover is variable on hummocky to rolling till uplands, ranging from very open white spruce – shrub woodlands near tree line and to closed, relatively tall white spruce – shrub forests on southerly slopes and around hummock bases where moisture and temperature conditions are more favourable.

Geology and Geomorphology

The Ecoregion is underlain entirely by ancient Precambrian shales, sandstones and limestones that are exposed in a few places on the peninsula and east of Dease Arm. Calcareous ponds and seeps are locally common east of Dease Arm. Coarse-textured lacustrine deposits and water-washed tills are the dominant parent materials on the narrow band between Great Bear Lake and the till uplands; intricately patterned gravelly beach ridges indicate the former extent of glacial Lake McConnell. Hummocky to rolling, fine- to medium-textured bouldery till covers most of the Ecoregion. Glacio-fluvial deposits are most common on the upland but cover a relatively small area.

Soils

Hummocky till upland soils are probably permafrost-affected Turbic Cryosols. Brunisols are the most likely soil on well-drained till hummock tops and coarse-textured lacustrine and glacio-fluvial deposits. Organic Cryosols occur with polygonal peat plateaus.

Vegetation

The characteristic vegetation type in the Grandin Upland HS Ecoregion is open, low-canopied white spruce with dwarf birch, mountain cranberry, northern and common Labrador tea, and lichen. This cover type has a consistent species composition, but assumes variable forms depending on local and regional climate, moisture and nutrients. Open white spruce woodlands with stunted, widely spaced trees and sporadic shrub cover occur on glacio-lacustrine and beach ridge deposits along Great Bear Lake, on rapidly drained glacio-fluvial deposits, and near tree line to the east. Tree growth restrictions are probably due to a combination of regional climate and local cooling close to the lake (refer to Section 3.3.1.11 for discussion of lake effect), to inadequate moisture, and to colder Low Arctic conditions at higher elevations to the east. On hummocky uplands, relatively vigorous closed-canopy white spruce stands occur on warm south facing slopes, in low areas where moisture is adequate for growth, and along stream channels. Hummock tops subject to excessive dessication and exposure may not support tree growth, and are often vegetated by dwarf birch – dryland sedge – lichen communities. Wetlands are uncommon; small northern ribbed fens occur on gentle slopes in the uplands, and polygonal peat plateaus have developed mainly near the shoreline of Great Bear Lake.

Water and Wetlands

The Ecoregion borders Great Bear Lake; Greenhorn Lakes are the major named waterbodies within it, and the Greenhorn and Dease Rivers flow through it into Great Bear Lake. A few shallow lakes occur in hummocky till deposits on the upland. Northern ribbed fens occur sporadically on gentle slopes and polygonal peat plateaus have developed near Great Bear Lake.

Notable Features

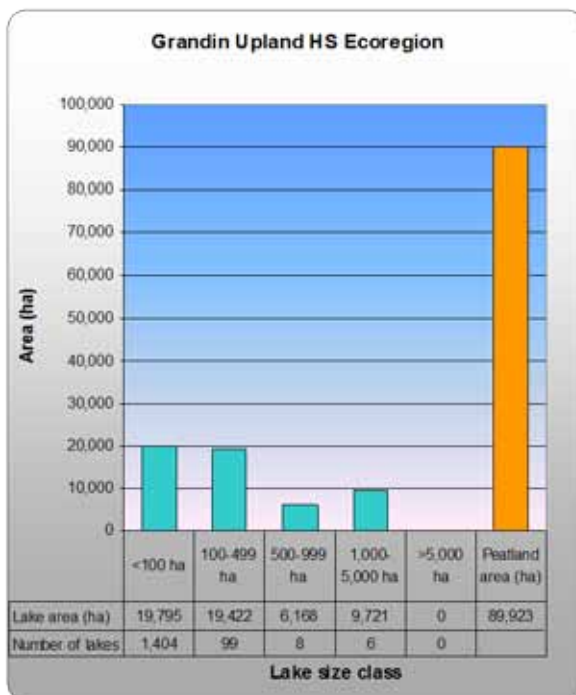
The peninsula includes four International Biological Program sites recommended for protection (Nettleship and Smith 1975).



Gravelly beach ridges occur along the south shoreline of the Grandin Upland HS Ecoregion. Open white spruce, low shrubs and lichen mats grow on the ridges; denser tree and shrub growth occurs on lacustrine flats to the right.



This typical landscape in the core area includes hummocky till deposits that are too dry on top for forest growth, and low-lying areas between hummocks that have enough moisture to support open, stunted white spruce stands and in places northern ribbed fens (light green tones).



Proportion of Ecoregion occupied by lakes: 9%
Proportion of Ecoregion occupied by bogs and fens: 15%



Long, narrow eskers and extensive eolian deposits with white spruce, dwarf birch and lichen occur on the upper part of the peninsula.

3.3.1.14 Lac Grandin Upland HS Ecoregion

Overview: *The Lac Grandin Upland HS Ecoregion includes a small, high-elevation area of hummocky till with spruce communities typical of High Subarctic climates, along with weakly developed permafrost feature in mineral soils.*

Summary:

- Hummocky, coarse-textured till.
- Sparsely treed white spruce with lichen and shrub understory is typical.
- Wetlands are uncommon.



Total area: 194 km² (0.1% of Taiga Plains HS Ecoregion).
Ecoregion shown in red.

Average elevation (range) mASL: 625 (550-700)

General Description

The Lac Grandin Upland HS Ecoregion occupies terrain above 600 mASL on the northernmost of the two uplands comprising the Lac Grandin Upland LS Ecoregion. The boundary between the Lac Grandin Upland HS and Lac Grandin Upland LS Ecoregions is defined by a transition from somewhat open white spruce stands on slopes to sparsely treed white spruce woodlands on a hummocky till plateau, with weakly patterned ground and scattered polygonal peat plateaus. White spruce – shrub – lichen woodlands with short, widely spaced and slow-growing trees on coarse-textured well-drained till hummocks are characteristic of this Ecoregion.

Geology and Geomorphology

Cretaceous shales underlie the Ecoregion and are covered by till. Coarse-textured and bouldery hummocky till is the dominant glacial landform. Organic veneers occur around lakes where the water table is sufficiently high to allow bog formation.

Soils

Turbic Cryosols are associated with medium- to fine-textured till deposits. Brunisols and Regosols occur with well-drained coarse-textured hummocky till deposits where the permafrost table is well below the surface. Organic Cryosols occur with polygonal peat plateaus.

Vegetation

The main cover type is similar to that found at high elevations on hummocky till in the Great Bear Upland HS Ecoregion to the north – sparsely treed low-growing white spruce woodland with patchy dwarf birch, willow, black crowberry, green alder, mountain cranberry, red bearberry, and sedge. Species diversity is relatively low, and treeless polygonal peat plateaus and veneer bogs with lichen – dwarf birch – Labrador tea cover are less common than in surrounding ecoregions.

Water and Wetlands

Ortona Lake is the only named water body in this Ecoregion. A few small pothole lakes occur in rounded depressions between till hummocks. Wetlands are uncommon because the well-drained irregular terrain is not conducive to extensive wetland development.

Notable Features

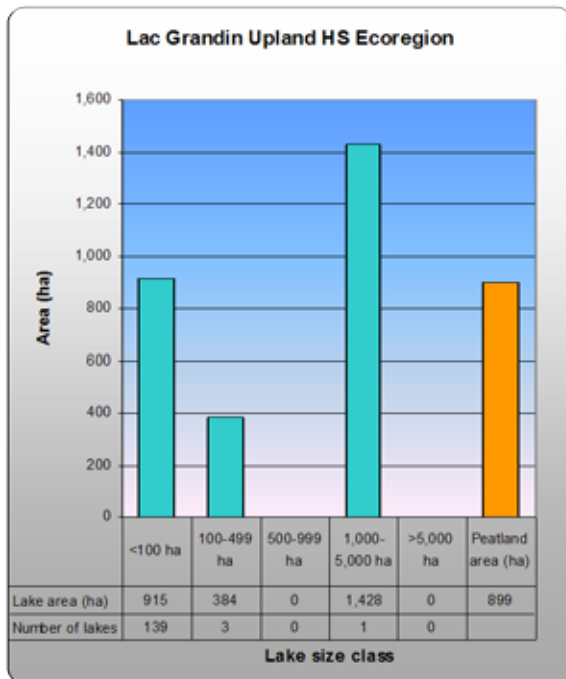
This Ecoregion includes the most southerly High Subarctic white spruce woodland communities and patterned ground in the Taiga Plains. Pronounced taper on the trees, spiral-grained wood visible on snags and closely spaced annual growth rings are indicative of the severe climate.



Hummocky till, sparsely treed white spruce woodlands, few wetlands, and many shallow lakes characterize the Lac Grandin Upland HS Ecoregion.



Weakly patterned mineral soil is a feature of northern High Subarctic and Low Arctic climates. The grayish crisscrossing cracks highlighted by light-colored lichen mats are created by frost action in cold areas.



Proportion of Ecoregion occupied by lakes: 14%
Proportion of Ecoregion occupied by bogs and fens: 5%



The spiral grain, narrow crown and highly tapered trunk of this white spruce snag on a southerly green alder-covered slope attest to the harsh climate.

3.3.2 TAIGA PLAINS LOW SUBARCTIC (LS) ECOREGION



Typical landscapes in the Taiga Plains Low Subarctic (LS) Ecoregion are a mosaic of uplands and wetlands. In the colder northern part of the Ecoregion shown in the photo above, semi-closed to open upland stands of black spruce with understories of dwarf birch, northern and common Labrador tea, moss and reindeer lichen are interspersed with treed or shrubby bogs and fens. Open white spruce and birch stands with discontinuous understories of red bearberry and mountain cranberry and lichens are often found on drier sites. Warmer conditions to the south promote the development of white spruce, paper birch and aspen forests on moist sites; jack pine dominated stands are common on well-drained sandy or gravelly soils. Organic Cryosols and Gleysols are typical wetland soils; Brunisols are common on drier upland sites.



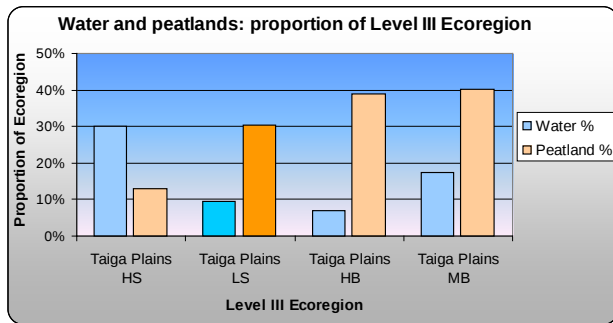
Open and semi-closed stands of slow-growing black and white spruce with shrubby understories of dwarf birch, northern and common Labrador tea, mosses and lichens interspersed with bogs and fens are a common landscape pattern in the Taiga Plains LS Ecoregion.



Cloudberry or baked-apple (*Rubus chamaemorus*) is a low, creeping herb that is common throughout the Taiga Plains in wet bogs, usually with peat mosses. It is particularly common in the Taiga Plains HS and Taiga Plains LS Ecoregions, and its range extends north of tree line.

3.3.2 TAIGA PLAINS LOW SUBARCTIC (LS) ECOREGION

Overview: *The Taiga Plains LS Ecoregion occupies the central third of the Taiga Plains. Level to undulating till plains with white or black spruce stands or regenerating shrub communities are typical of uplands, and peatlands with permafrost are characteristic of low, wet areas.*



Total area: 161,435 km² (34% of Taiga Plains).
Ecoregion shown in red.

General Description

The Level III Taiga Plains LS Ecoregion includes fourteen Level IV ecoregions that occupy the central third of the Taiga Plains at elevations of 200 mASL to over 1000 mASL and one outlying Level IV ecoregion along the Northwest Territories – Alberta border. This Ecoregion spans about 650 km in a north – south direction. Toward the north and at higher elevations, the increased incidence of cold-climate permafrost features such as polygonal peat plateaus and runnels and the decreased incidence of relatively tall and dense upland forests indicate harsher climates. Level to gently sloping and undulating imperfectly- to poorly-drained glacial till occurs over much of the Ecoregion. Peatlands are extensive, particularly on plains in the southern half. Recent fires have burned over much of this Ecoregion, and regenerating shrub lands and young regenerating forests share dominance with low-canopied open black or white spruce forests and peat plateaus. Diverse mixed-wood, deciduous or conifer forests are limited to warm and well-drained microsites.

Climate

Norman Wells is the only station from which climate data have been collected over long periods within the Taiga Plains LS Ecoregion, and climate statistics are therefore determined through interpolated models using the limited available data. Polygonal peat plateaus and slow-growing open conifer stands across most of the region are indicative of a Low Subarctic climate, as defined by the Ecoregions Working Group (1989). Climate models (Agriculture and Agri-Food Canada 1997) provide the following general statistics. The mean annual temperature ranges from –3.5 to –9.0°C. The mean temperature in January, the coldest month, ranges from –25.5 to –29.0°C, and from 11.0 to 16.5°C in July, the warmest month. Mean annual precipitation is between 230 and 350 mm, with the wettest period in June through August and the driest period in December through April; about half falls as rain and half as snow. The mean annual daily solar input (refer to Section 1.4.1 for further explanation) ranges

between 9.5 and 11 mJ/m²/day, with low values of 0.2 to 1.5 mJ/m²/day in December and highs of 21.5 to 22.5 mJ/m²/day in June.

Topography, geology, soils, and hydrology

The Taiga Plains LS Ecoregion includes extensive low-lying plains, uplands, and hill systems embedded in the uplands; slopes are mainly level to very gentle. Devonian limestone underlies the eastern third of the Ecoregion, where numerous calcareous ponds and fens indicate limestone influences on groundwater. Level to undulating and hummocky till is the dominant surficial material; in places it has been deeply grooved by glacial ice movement. Permanently frozen peatlands cover vast areas particularly in the south part of the Ecoregion. Soils are dominantly mineral and Organic Cryosols. Lac la Martre, Keller Lake, and Blackwater Lake are the largest lakes, and there are thousands of small lakes scattered throughout.

Vegetation

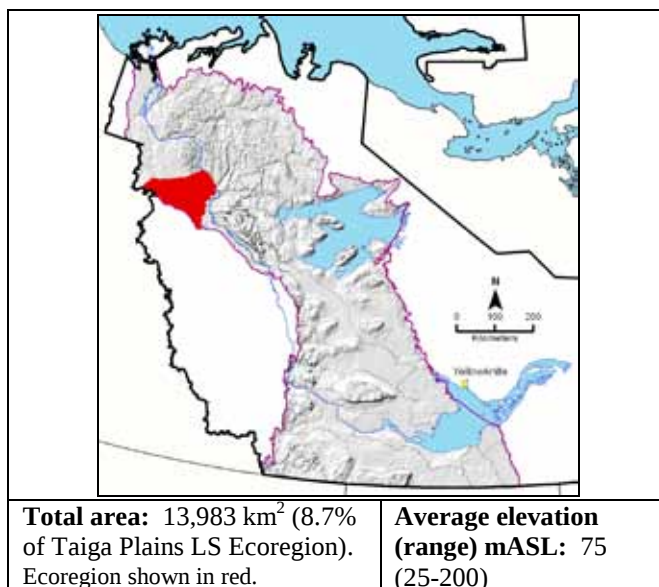
Open mixed black and white spruce stands with a shrubby understory of dwarf birch, northern and common Labrador tea, mosses and lichens are the primary upland vegetation type on areas that have not recently burned; dwarf birch – mixed spruce stands are extensive on recently burned areas, with jack pine on coarse-textured materials. Bogs, collapse scar fens and nearly treeless lichen – Labrador tea – peat moss communities occur across vast areas in association with permafrost features such as peat plateaus, polygonal peat plateaus, and runnels. The northern limits of mixed-wood and jack pine forests are reached within the Taiga Plains LS Ecoregion at about 65° N latitude, and diverse stands exhibiting better growth are restricted to warm and well-drained microsites.

3.3.2.1 Arctic Red Plain LS Ecoregion

Overview: *A nearly flat to gently sloping complex of shallow ponds and poorly-drained frost-affected mineral and organic soils vegetated by black spruce forests, bogs and post-fire regeneration characterizes the Arctic Red Plain LS Ecoregion.*

Summary:

- Complex of level to gently sloping poorly-drained and fine-textured lacustrine and till materials with organic veneers and extensive deep, frozen peatlands.
- Numerous ponds in the central portion.
- Much of the area has been burned, and black spruce forests, bogs with open stunted black spruce, and regenerating shrublands are dominant.



General Description

The Arctic Red Plain LS Ecoregion occupies a broad, gently sloped plain. It is bordered on the west and northeast by the higher-elevation Level II Taiga Cordillera Ecoregion and the Travaillant Upland HS Ecoregion, respectively. The east and south boundary is the shallow valley of the North Mackenzie Plain LS Ecoregion, and the northern boundary is an arbitrary, broad line separating the Arctic Red Plain LS Ecoregion from the physiographically similar but colder Arctic Red Plain HS Ecoregion. A nearly level lacustrine plain trending northwest to southeast with many shallow lakes and extensive peatlands occupies the central portion of this Ecoregion. The western and eastern sections are a complex of gently sloping till plains with organic veneers and blankets. An undulating area near the base of the foothills is dominated by peatlands, and the sloping till plain between this area and the lacustrine plain contains few lakes. Almost the entire area is imperfectly- to poorly-drained, and much of it has recently burned. Open, low-canopied black spruce – shrub forests on mineral soils or thin organic veneers, and bogs with open stunted black spruce on peat plateaus are the primary vegetation types.

Geology and Geomorphology

The main mineral surficial deposits in this Ecoregion are level, fine-textured lacustrine plains and gently inclined and undulating till plains. Alluvial floodplains confined within steep-walled but shallowly incised meandering river channels occupy less than ten percent of the Ecoregion but contrast strongly with the surrounding landscapes. Organic veneers from a few centimeters to less than a meter thick are widespread on mineral soils; thicker peatlands occur over nearly half of the area.

Soils

Both fine-textured, imperfectly- to poorly-drained Turbic Cryosol mineral soils (often associated with earth hummocks) and Organic Cryosols are dominant throughout the area. Regosols occur on alluvial floodplains on recent sediment deposits.

Vegetation

Frequent fires and poor drainage influence present-day vegetation patterns. Fine-textured imperfectly- to poorly-drained permafrost-modified tills support open stands of slow-growing black spruce with an understory of red bearberry, northern and common Labrador tea, willows, and lichen. Peat plateaus are extensive with open stunted black spruce and lichen. Small internal collapse scars are wet and are vegetated by sedges, cotton-grass and peat mosses. Burned areas often have a cover of dwarf birch or regenerating Alaska paper birch and white spruce. Northern ribbed fens with scattered larch on the raised ribs occur infrequently. Alluvial plains, lakeshores and streambanks with favourable microclimate, drainage and nutrient conditions are the only areas where taller, denser and relatively diverse white spruce–black spruce forests are found.

Water and Wetlands

The Arctic Red River flows north through the northwest corner of the Ecoregion to the Mackenzie River. The Ontaratie River flows east into the Mackenzie River, and runs parallel to the northern boundary of the Arctic Red Plain LS Ecoregion. The meandering Ramparts River occupies a shallow, broad valley that arcs from west to east across the southern third of the Ecoregion. Thousands of shallow lakes connected by a network of slow-flowing streams dominate the central lacustrine plain and smaller areas to the east and west. Perennially frozen bogs on peat plateaus and collapse scar bogs are the most common wetland types; northern ribbed fens and horizontal fens are infrequent.

Notable Features

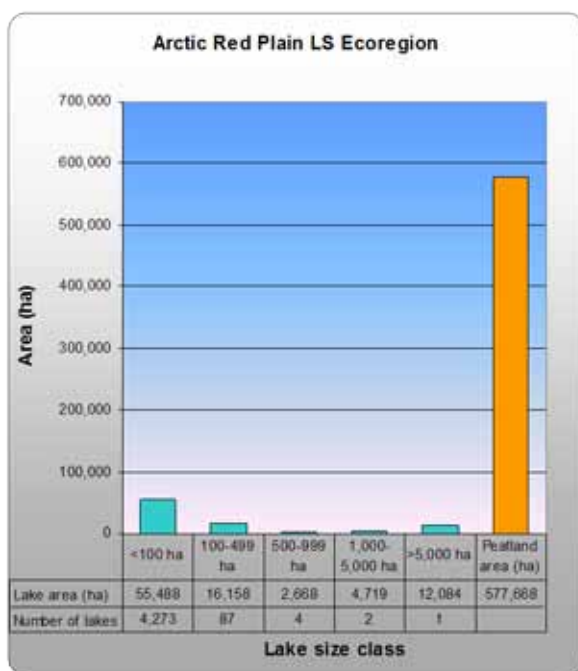
The Arctic Red River, Ramparts River and proximity to the western Cordillera provide local areas of diversity within this Ecoregion.



Level, extensively burned lacustrine plains with peat plateaus and many shallow thermokarst ponds are typical of the Arctic Red Plain LS Ecoregion.



Better black and white spruce growth occurs along stream channels, where slopes are well drained and permafrost is not as close to the surface as it is on the adjacent uplands dominated by a complex of wet peat plateaus with small collapse scars and open black spruce forests.



Proportion of Ecoregion occupied by lakes: 7%
Proportion of Ecoregion occupied by bogs and fens: 41%



This westerly image shows the shallow valley of the Ramparts River and its floodplain that includes wetlands, shrublands, and tall white spruce forests on alluvial terraces. In the midground, many small, shallow ponds dot the wet, frozen organic and till complex characteristic of the Ecoregion.

3.3.2.2 North Mackenzie Plain LS Ecoregion

Overview: Level to gently undulating glacial till deposits with low-canopied coniferous stands and recently burned shrublands within the Mackenzie River valley are typical of the North Mackenzie Plain LS Ecoregion.

Summary:

- Till deposits are dominant, with significant areas of lacustrine, fluvial and glacio-fluvial materials.
- Closed to open mixed spruce – shrub – moss – lichen stands on unburned sites, with dwarf birch and Alaska paper birch regeneration on extensive burned areas.
- Runnel permafrost forms are locally common in the north and south parts of the Ecoregion.

General Description

The North Mackenzie Plain LS Ecoregion parallels the Mackenzie River for over 300 km. It occupies a narrow, gently sloped valley 15 to 30 km wide between the Norman Range LS and the eastern boundary of the Level II Taiga Cordillera Ecoregion, widening to over 60 km at the north and south ends. This Ecoregion is transitional between the Level II Taiga Plains and Taiga Cordillera Ecoregions. It has been assigned to the Taiga Plains Ecoregion because it lies northeast of the main Cordilleran ranges and is likely influenced more by continental than by mountain climates. The Ecoregion includes three main landform types. Fluvial or glacio-fluvial terraces parallel the Mackenzie River and its major tributaries. Lacustrine plains occupy narrow discontinuous bands along the river in the central portion of the Ecoregion but are more extensive around the Great Bear River and Brackett Lake in the south and adjacent to the Arctic Red Plain LS Ecoregion to the north. Undulating to hummocky till veneers and blankets cover upland areas. Recent fires have had a major influence across this Ecoregion, and regenerating white and black spruce – Alaska paper birch – dwarf birch communities are dominant. The gap at Tulita marks the approximate northern limits of trembling aspen and mixed aspen – white spruce forests on sites with average moisture and nutrients, as well as the approximate northern limits of jack pine.

Geology and Geomorphology

A complex of medium- to coarse-textured lacustrine, alluvial and glacio-fluvial deposits parallels the Mackenzie River and its major tributaries. An extensive glacio-fluvial deposit occurs along the Mountain River near its confluence with the Mackenzie. Sand dunes and plains also occur. Undulating to hummocky till deposits occupy higher terrain. Bedrock is exposed in places; the Ramparts and Fossil Lake near Fort Good Hope are evidence of past and present water erosion of Devonian limestones by the Mackenzie River and glacial meltwater streams.

Soils

Turbic Cryosols are probably the most common soil type throughout, with Brunisolic and Luvisolic soils on glacio-fluvial, coarse-textured lacustrine, and alluvial soils. Turbic Cryosols and Organic Cryosols are associated with runnels and peat plateaus.



Total area: 16,016 km² (9.9% of Taiga Plains LS Ecoregion).
Ecoregion shown in red.

Average elevation (range) mASL: 175 (100-350)

Vegetation

Extensive fires have had a major influence on vegetation development. Most of the till uplands have burned in the recent past, and large areas are covered by dwarf birch, green alder and Alaska paper birch shrublands, or regenerating mixed black and white spruce and Alaska paper birch communities. Productivity trends are difficult to discern in burned areas, but remnant stands along rivers, on terraces and islands, and around lakes give some indications of decreasing vigour and diversity toward the north. The most common deciduous tree is Alaska paper birch. Stunted trembling aspen occurs on southerly slopes and coarse-textured materials throughout most of the Ecoregion, and scattered trembling aspen – white spruce stands on till and alluvial deposits in the Great Bear River gap mark the approximate northerly limits of this species on sites with average nutrients and moisture. Remnant white spruce and spruce – birch forests occur along rivers, on alluvial and lacustrine plains and around lakes, and appear to be more vigorous toward the south. On unburned till uplands, mixed open white and black spruce stands with shrub, moss and lichen understories are common. Peat plateaus are scattered throughout, though mainly to the north. East-facing slopes above Brackett Lake show excellent permafrost-related runnel development. A large fen – pond complex occurs on lacustrine plains and peatlands south of Brackett Lake.

Water and Wetlands

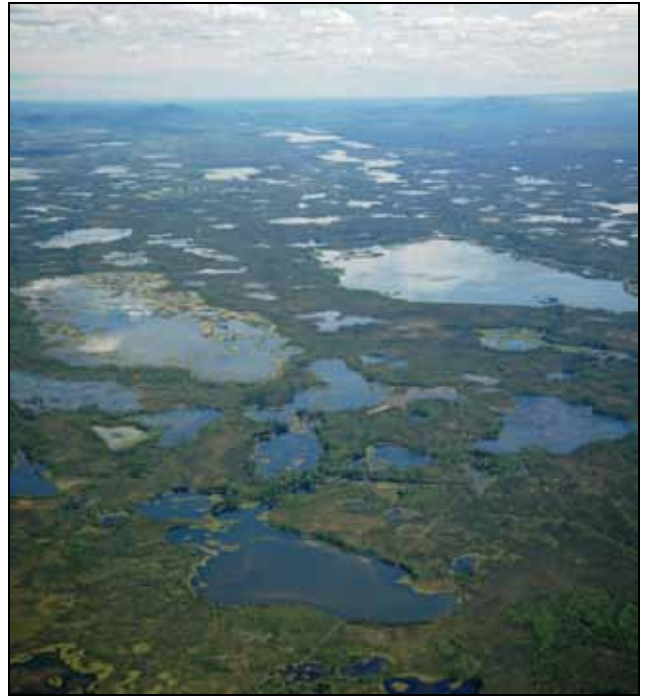
The Mackenzie, Great Bear, Carcajou, Mountain and Hare Indian Rivers are the major watercourses within this Ecoregion. Brackett, Rory, Carcajou, Loon, Fossil and Three Day Lakes are the largest named lakes. Brackett Lake is surrounded by an extensive network of horizontal fens, net fens, northern ribbed fens, and peat plateaus.

Notable Features

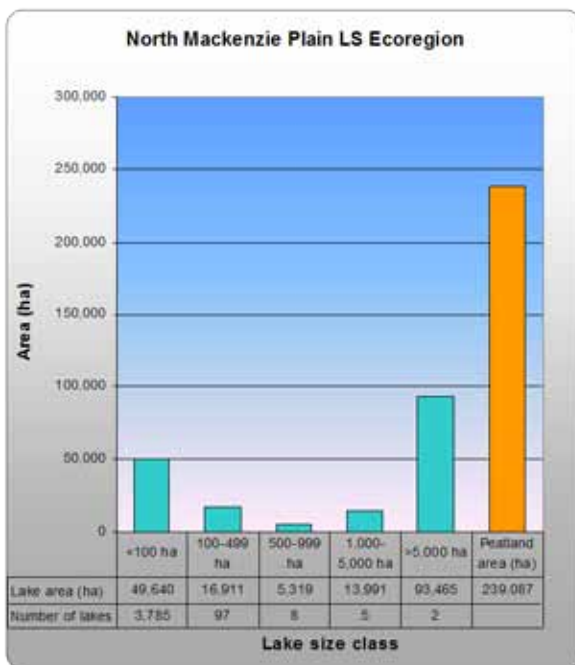
The Ramparts and Fossil Lake, and the extensive wetland complex around Brackett Lake are notable features of this Ecoregion.



This southeast view across the North Mackenzie Plain LS Ecoregion shows extensive gray burned areas, bright green shrub regeneration in moist channels, and dark green residual forests along the river. Bear Rock, Tulita and the Mackenzie River are in the background.



An extensive wetland complex near Brackett Lake in the south portion of the Ecoregion includes horizontal fens, shore marshes, ponds, and peat plateaus, and provides important wildlife habitat.



Proportion of Ecoregion occupied by lakes: 11%
Proportion of Ecoregion occupied by bogs and fens: 15%



In the Fossil Lake area near the Ramparts, a glacial meltwater channel is cut into limestone in the background, with relatively tall and dense white spruce forests on alluvial flats in the foreground.

3.3.2.3 Norman Range LS Ecoregion

Overview: *Well-defined rocky ridges, a central dissected plateau and deep meltwater channel, and diverse vegetation communities comprise the Norman Range LS Ecoregion.*

Summary:

- Major landforms are bedrock ridges, eroded interior plateau, till deposits, and a large meltwater channel.
- Vegetation is a complex of mixed-wood forests on westerly slopes and lacustrine deposits, mixed spruce stands on the interior plateau and slopes, and extensively burned areas.
- Permafrost features are more common to the east.

General Description

The Norman Range LS Ecoregion is a complex landscape of steep-sided bedrock ridges and till-covered bedrock plains, dissected plateaus and deeply incised meltwater channels, reaching maximum elevations of about 1000 mASL southeast of Norman Wells. It is surrounded by the lower-elevation North Mackenzie Plain LS Ecoregion to the north and west, and by the Great Bear Upland LS Ecoregion to the east. The Norman Range LS Ecoregion is transitional between the Level II Taiga Plains and Taiga Cordillera Ecoregions. It is assigned to the Taiga Plains because its average elevation is much lower than that of the Mackenzie Mountains to the west and the Franklin Mountains to the south, and because it consists of several well-separated ridges rather than a continuous mountain range. Narrow rocky ridges with treeless alpine tundra and exposed rock generally above 500 mASL define the outer boundaries of the Ecoregion. The interior area between the main ridges is a rolling, ridged and often deeply eroded plateau, through which glacial meltwaters have carved a deep channel over 100 km from north to south that is presently occupied by wetlands and lakes. Forest cover and permafrost features show definite east to west trends. The western and northwestern portions have a relatively high proportion of mixed-wood deciduous and conifer forests and white spruce stands, with scattered peat plateaus. Towards the east, low-canopied mixed spruce stands with moss or lichen understories are more common, as are peat plateaus and runnel patterns. Much of the area has recently burned.

Geology and Geomorphology

Dolomites and limestones of Cambrian to Devonian age underlie much of this Ecoregion and form the main ridges. Till veneers and blankets over bedrock and rolling to hummocky fine- to medium-textured tills are the dominant landform. Fine- to coarse-textured lacustrine and glacio-fluvial deposits are common in the northwest between the ridges and in the main meltwater channels. Talus slopes occur below steep ridges. Organic deposits occur on valley floors or as thin veneers on slopes.

Soils

Turbic Cryosols are probably the most common soil type in the eastern portion, with Brunisolic and Luvisolic soils on southerly and westerly slopes. Regosols and non-soils are associated with talus slopes and exposed bedrock ridges.



Total area: 7,521 km² (4.7% of Taiga Plains LS Ecoregion).
Ecoregion shown in red.

Average elevation (range) mASL: 300 (200-1025)

Vegetation

Vegetation and permafrost patterns indicate apparent west to east climatic variations. Mixed-wood forests including trembling aspen, Alaska paper birch and white and black spruce with shrub understories and relatively vigorous white spruce forests are most common on slopes below the western ridges, in the lower-elevation lacustrine and till plains surrounding the northernmost ridges, and on southerly slopes in the interior plateau. Mixed black and white spruce stands with shrub, moss and lichen understories occur throughout the Ecoregion, but are generally taller and have denser canopies to the west. Vast areas have burned in the recent past, and fires burned extensive areas of the northern interior plateau in 2005. Regenerating stands of Alaska paper birch, black and white spruce, and dwarf birch are typical, with better growth to the west. Jack pine stands occur only near the southern limits of the Ecoregion. Runnel patterns and peat plateaus are localized in western parts, but become more common towards the east especially on easterly and northerly slopes. Sedge and shrub communities are the dominant vegetation of horizontal and channel fens and marshes along meltwater and stream channels. Tundra communities occur on ridgetops above about 500 m.

Water and Wetlands

Turton and Kelly Lakes occupy the meltwater channel; Chick, Moon and Oscar Lakes are the other three named lakes. Numerous intermittent streams drain the slopes. Locally extensive horizontal fens and channel marshes occupy the meltwater channel between Turton and Kelly Lakes and low areas adjacent to Chick and Oscar Lakes.

Notable Features

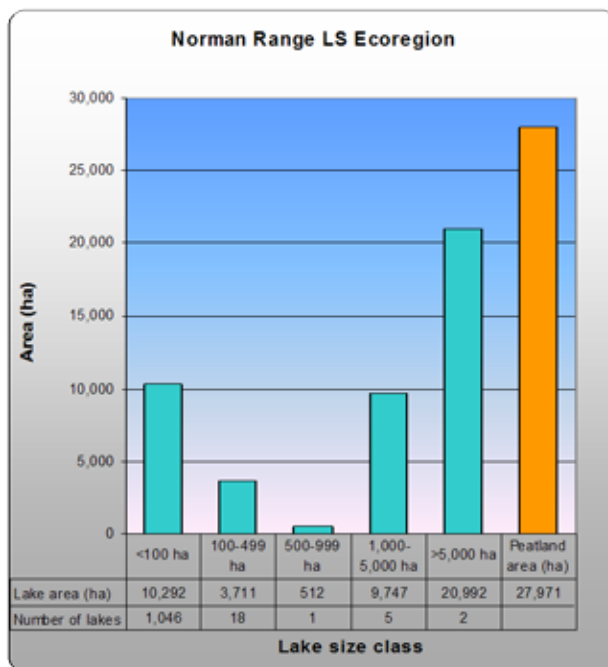
This Ecoregion is unique in the Taiga Plains because of its varied physiography, high-elevation terrain, and vegetation. Rock glaciers are an interesting geologic feature and occur mainly below cliffs along westerly and northerly ridges.



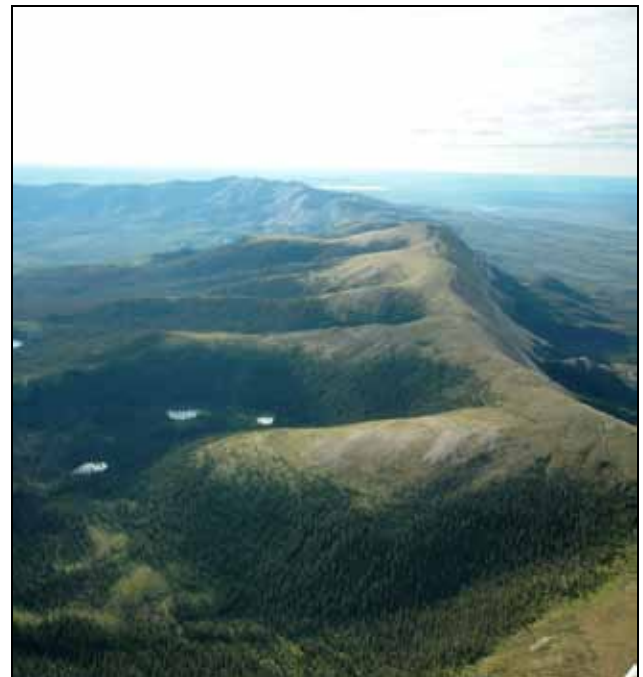
This late afternoon southern view shows the westernmost spine of the Norman Range; the North Mackenzie Plain LS Ecoregion and the Mackenzie River lie to the right of this ridge. Tundra and subalpine forests occur on the ridgetops and upper slopes.



The Ecoregion includes a dissected central plateau; Alaska paper birch regeneration on a recent burn produces bright green tones in this image. The Mackenzie River is visible in the distance.



Proportion of Ecoregion occupied by lakes: 6%
Proportion of Ecoregion occupied by bogs and fens: 4%



The northernmost ridge in the Ecoregion includes a complex of arctic – alpine tundra along the ridge and upper slopes and black spruce – white spruce forests on the lower slopes.

3.3.2.4 Great Bear Upland LS Ecoregion

Overview: *The Great Bear Upland LS Ecoregion is the third largest Level IV ecoregion in the Taiga Plains; its size and elevation range produce a wide range of climatic and site conditions with corresponding diversity in landscapes, permafrost features and vegetative cover.*

Summary:

- Till deposits over much of the area; major hill systems on Sahoyúé – Şehdacho and paralleling the southern lakeshore.
- Spruce forests are extensive, and become more open and stunted to the north and at higher elevations.
- Dwarf birch occurs extensively over recently burned areas.
- Polygonal peat plateaus and runnels increase northward.

General Description

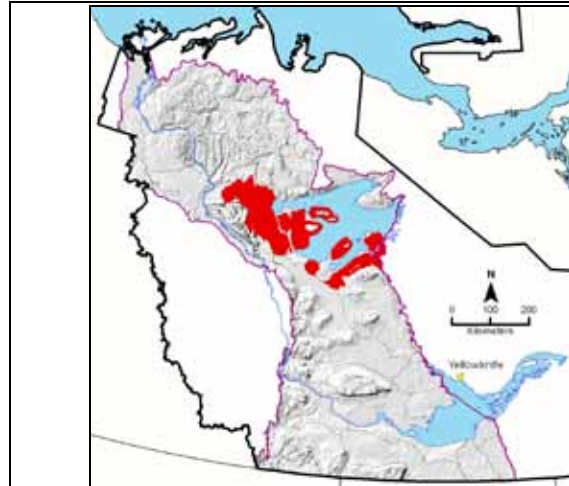
The Great Bear Upland LS Ecoregion includes three units surrounding Great Bear Lake to the south and west and three units including major hill systems on large peninsulas (Sahoyúé – Şehdacho) jutting north and east into the lake. It is a highly variable ecoregion, spanning a range of nearly 300 km south to north and over 400 m from the lowest to highest points. The resulting range of climatic conditions together with variable parent materials and bedrock geology produce a gradient of permafrost and forest types. The relative proportion of polygonal peat plateaus to other permafrost features increases northward. Vegetation diversity and productivity is highest on the southern peninsulas and uplands. Within the northern units a complex of mature and sparse, stunted spruce – dwarf birch – lichen woodlands and recently burned areas with regenerating dwarf birch shrublands combine to form the main cover over vast areas.

Geology and Geomorphology

Most of the Ecoregion is underlain by middle and upper Cretaceous conglomerates and shales. Devonian limestones, dolomites and sandstones that lie beneath the northwest portion are exposed in places along meltwater channels or as rocky islands; outcroppings of Proterozoic sediments occur in the far southeast. Most of the area is covered by medium- to fine-textured, undulating, inclined and hummocky till, about 20 to 30 percent of which is mantled by organic layers. Slope failures are extensive along steeper slopes on the two peninsulas. Deeply incised meltwater channels now occupied by the Hare Indian River and Lac à Jacques cross the northernmost part of this Ecoregion, and extensive alluvial terraces support plant communities that are relatively vigorous and diverse for this area.

Soils

Organic Cryosols are the dominant soil type in wetlands. Turbic Cryosols occur with mineral soils.



Total area: 30,719 km² (19.0% of Taiga Plains LS Ecoregion).
Ecoregion shown in red.

Average elevation (range) mASL: 275 (150-650)

Vegetation

Coniferous forests are the dominant cover type across most of the Ecoregion, but their vigour and canopy closure varies widely with latitude, elevation, slope and parent material. Vegetation types that have been described for Sahoyúé – Şehdacho (EBA 2005) are probably generally distributed across the southern part of this Ecoregion. Relatively tall and diverse white spruce forests with shrubby understories occur extensively on slopes. More open-canopied slow-growing stands characterize coarse-textured well-drained beach ridges and eolian deposits, and poorly-drained runnels, peat plateaus and polygonal peat plateaus. Mixed black and white spruce stands grow on undulating to hummocky till. Deciduous and mixed-wood stands are uncommon, occurring only as small patches along rivers, on well-drained sites and on slopes; jack pine stands occur only in the extreme south. To the north, colder conditions restrict conifer growth, and open forests give way to low-canopied, widely spaced spruce with an understory of dwarf birch and lichen. Across the Ecoregion, recent fires have resulted in large treeless areas dominated by regenerating dwarf birch.

Water and Wetlands

Tunago and Mahoney Lakes, Lac à Jacques, and the Great Bear and Hare Indian Rivers are the main water bodies in this Ecoregion. Peat plateaus, runnels and polygonal peat plateaus are the main wetland types. Runnels become more clearly defined towards the north, sparsely treed peat plateaus and treeless, lichen-covered polygonal peat plateaus occur around many of the numerous small ponds that become more numerous north of the Great Bear River. Northern ribbed fens are relatively uncommon and occur mostly in the south.

Notable Features

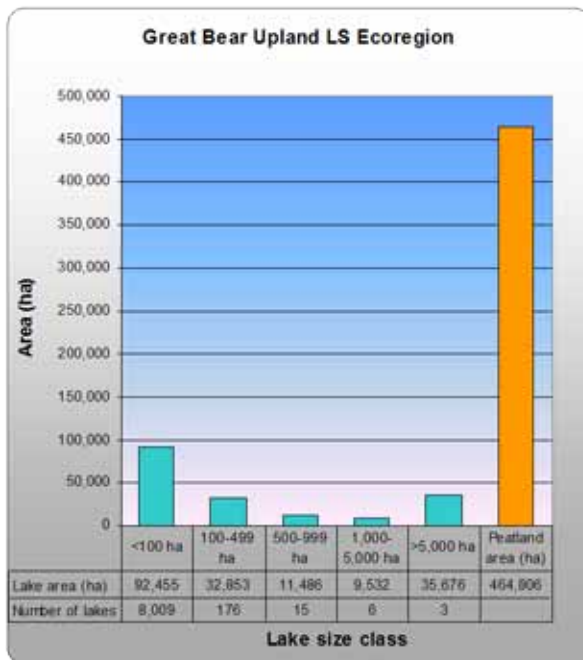
Sahoyúé – Şehdacho has recently been designated as a national historic site and lies mostly within this Ecoregion.



Extensive polygonal peat plateaus (light areas), peat plateaus, and shallow ponds occur on level to gently undulating terrain due east of Norman Wells and reflect extensive permafrost.



In the southern part of the Ecoregion, peat plateaus and somewhat better forest growth are characteristic.



Proportion of Ecoregion occupied by lakes: 6%
Proportion of Ecoregion occupied by bogs and fens: 15%



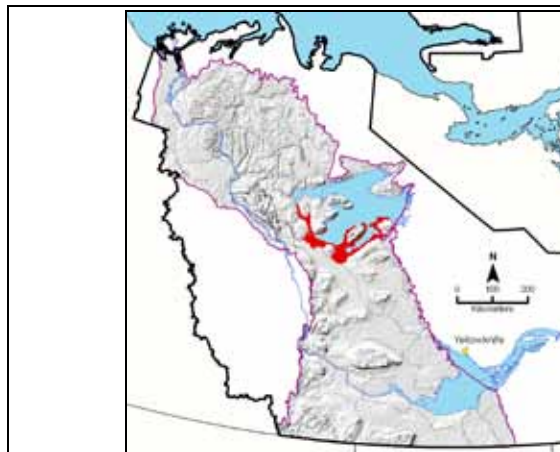
Fall colors are appearing in mid-August 2005 on the southerly sideslope of Sahoyué. Patchy deciduous stands indicate warmer, drier microclimates within the Taiga Plains LS Ecoregion.

3.3.2.5 Great Bear Plain LS Ecoregion

Overview: *The Great Bear Plain LS Ecoregion occupies low-lying, gently sloping and undulating till and peatlands along the south shore of Great Bear Lake; open white spruce – shrub stands occupy a variety of sites.*

Summary:

- Till and peatlands with widespread permafrost
- White spruce – dwarf birch – lichen communities occur on peat plateaus, polygonal peat plateaus, runnels, till, and beach ridge or eolian deposits.



Total area: 6,314 km² (3.9% of Taiga Plains LS Ecoregion). Ecoregion shown in red.

Average elevation (range) mASL: 175 (100-300)

General Description

The Great Bear Plain LS Ecoregion occupies low-lying areas along the southern shore of Great Bear Lake and the shallow northern valley between two parts of the Great Bear Upland LS Ecoregion. It is a complex of ancient beach ridges and eolian deposits, gently sloping, undulating and terraced till, level lacustrine materials, and frozen organic terrain. Low-canopied white spruce – shrub forests are common on permafrost-modified mineral soils. Bogs having open, stunted white or black spruce cover occur on slopes along with sloped or horizontal fens with sedges, peat mosses and dense shrublands; thin organic veneers over permafrost-modified mineral soils are typical. Small patches of mixed conifer and deciduous stands and occasionally jack pine stands occur on well-drained warm microsites.

Geology and Geomorphology

Dolomite, limestone and sandstone of Cambrian to Devonian age underlie the southern shore of Great Bear Lake, including Sahoyúé; calcareous ponds between Keith and McVicar Arms attest to the influence of these formations on groundwater chemistry. Much of the area is covered by medium- to fine-textured, undulating, inclined and hummocky till, about half of which is mantled by organic layers. In the southwest portion of this Ecoregion, gently sloping till deposits with thin organic veneers and coniferous forests alternate with level lichen-covered polygonal peat plateaus and peat plateaus to form a distinctive steplike terrace pattern. Sandy and gravelly beach ridges and eolian deposits well above the current lake level are evidence of both the former levels of glacial Lake McConnell and the processes of isostatic rebound (the increase in elevation of land surfaces after the downward pressure of glacial ice has been removed). A lacustrine – organic complex occupies a former bay of the glacial lake around Lac St. Therese.

Soils

Organic Cryosols are the dominant soil type in wetlands. Turbic Cryosols occur on mineral soils; Brunisols are associated with coarse-textured soils.

Vegetation

Vegetation studies on Sahoyúé – šehdacho (EBA 2005) report that open to closed white spruce – dwarf birch – lichen forests are the dominant cover type on upland sites in Sahoyúé and that black spruce forests are uncommon in this area. Observations made in 2005 for the current Taiga Plains classification indicate that the white spruce type occurs across a wide range of site conditions. In runnel areas, stunted and open-canopied white spruce – dwarf birch – lichen stands grow on organic veneers with a shallow active layer over fine-textured frozen till. Widely spaced white spruce with understories of dwarf birch and lichen also occupy coarse-textured well-drained beach ridges and eolian deposits and poorly-drained, frozen peat plateaus and polygonal peat plateaus. Somewhat taller closed-canopy mixed black and white spruce – dwarf birch forests grow on undulating and hummocky till. On recently burned areas, dwarf birch communities form the main cover type. Deciduous, mixed-wood and jack pine forests are found only in small patches along rivers, on well-drained sites and on southerly aspects. Nearly treeless polygonal peat plateaus occupy parts of the offshore islands and a narrow belt along the north-facing shore of Great Bear Lake. This interesting “reverse tree line” effect could be related in part to locally cooler conditions near the lake; surface water temperatures may not exceed 5°C even in summer (World Lakes Database, n.d.) and would likely moderate nearshore air temperatures (refer to Section 3.3.1.11 for further discussion of lake effect). Winter winds that blow across the ice probably contribute to treeless tundra-like conditions along shorelines through dessication and ice crystal abrasion of the few trees that do become established.

Water and Wetlands

Lac St. Therese and the Johnny Hoe and Great Bear Rivers are the main named water bodies in this Ecoregion. Runnels, peat plateaus and polygonal peat plateaus are the main permafrost wetland types.

Notable Features

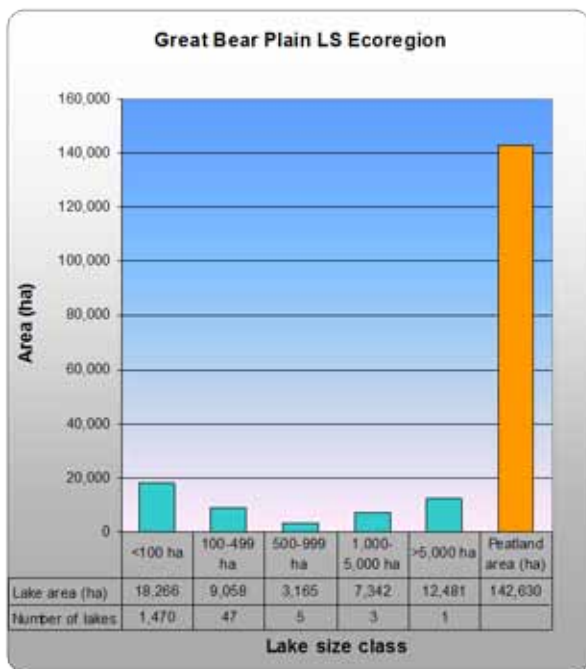
Sahoyúé – šehdacho has recently been designated as a national historic site. Parts of Sahoyúé’s lower slopes are included in the Great Bear Plain LS Ecoregion.



A gently sloping steplike pattern of polygonal peat plateaus (light tones on level areas) and runnels (dark tones, on gentle slopes) forms an interesting and unique pattern in this west-facing view along the southwest shore of Great Bear Lake.



In this detailed view of a runnel, the darker stripes are white spruce – shrub forests on wet, fine-textured soils in shallow channels, and the lighter areas are open white spruce – lichen stands on shallow frozen organic deposits.



Proportion of Ecoregion occupied by lakes: 8%
Proportion of Ecoregion occupied by bogs and fens: 23%



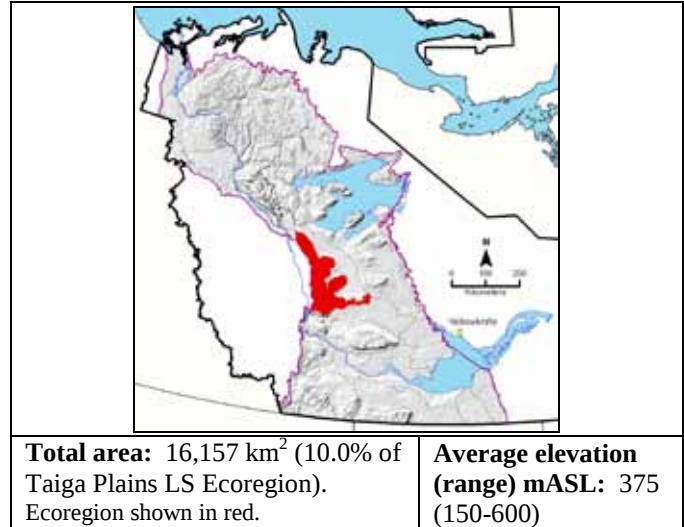
A large triangular sandy glacio-fluvial deposit with open white spruce – lichen woodlands occurs a short distance inland from the lakeshore near Cloud Bay. The white areas are unvegetated windblown sands.

3.3.2.6 Blackwater Upland LS Ecoregion

Overview: *The Blackwater Upland LS Ecoregion parallels the Franklin Mountains for over 250 km; both variable topography and climate changes from north to south produce diverse ecosystems.*

Summary:

- Undulating to rolling till upland with open black spruce forests throughout, patchy deciduous, mixed-wood and jack pine forests in the south and extensive polygonal peat plateau and runnel areas in the north.
- Colder climates in the north part of the Ecoregion as indicated by permafrost and vegetation features.



General Description

The Blackwater Upland LS Ecoregion parallels the eastern slopes of the Franklin Mountains and includes terrain between about 300 and 600 mASL. The Franklin Mountains rise steeply to define its western boundary, and the low-elevation, nearly flat Keller Plain LS Ecoregion surrounds it to the east. The narrow easterly extension along the southern boundary is a low gently domed upland that separates the slightly higher and colder Keller Plain LS Ecoregion from the Bulmer Plain LS Ecoregion; this landscape is more similar to the Blackwater Upland LS Ecoregion than it is to the Lac Grandin Upland LS Ecoregion. In the southern half, several rolling hill systems form peninsulas that jut east into the Keller Plain LS Ecoregion, reaching elevations of over 500 mASL. Rolling, inclined and undulating till covers much of the Ecoregion; glacio-fluvial deposits occur in places between the hills. Permafrost features vary across the Ecoregion; polygonal peat plateaus and runnels are more common in the north half, and peat plateaus are common throughout the area. Vegetation is similarly variable. The characteristic forest type for this Ecoregion is open low-canopied black spruce with a shrubby understory; in the south half, scattered regenerating jack pine stands occur and deciduous, mixed-wood and white spruce forests occur in small patches on slopes and till ridges.

Geology and Geomorphology

Glacial till covers most of this Ecoregion. Along the western boundary, colluvial deposits from the adjacent Franklin Mountains form small fans. Coarse-textured glacio-fluvial deposits occur locally around the hill bases. Organic veneers from a few centimeters to less than a meter thick are widespread on mineral soils; thicker peatlands occur over about a third of the area.

Soils

Both fine-textured, imperfectly- to poorly-drained Turbic Cryosol mineral soils and Organic Cryosols occur. Southward, on warmer southerly slopes, discontinuous Brunisols and Luvisols would be expected.

Vegetation

The Blackwater Upland LS Ecoregion is over 250 km from north to south. Vegetation and permafrost patterns reflect climate trends over this distance as well as topographic and parent material influences. The characteristic vegetation for this Ecoregion is open, low-canopied black spruce with a Labrador tea, willow, and lichen understory; this type is typical of much of the Taiga Plains LS Ecoregion. White spruce may be codominant with black spruce or replace it. Trembling aspen and Alaska paper birch occur as scattered trees on well-drained uplands in the northern part. Towards the south, particularly near the Franklin Mountains, southerly slopes and glacial flutings are forested by small patches of trembling aspen, mixed-wood and conifer stands with shrubby understories including typical Boreal species such as low-bush cranberry and green alder. Coarse-textured soils on recently burned areas mainly south of Blackwater Lake support dense young jack pine stands with sparse low shrub and lichen understories. Peat plateaus and polygons are vegetated by open, stunted black spruce with nearly continuous lichen cover. The striped runnel patterns perpendicular to slope in the northern part of the Ecoregion are produced by black and white spruce with dwarf birch and willow (dark stripes), and mixed spruce – lichen (light stripes) (see upper right image, facing page and p. 9, Figure 7).

Water and Wetlands

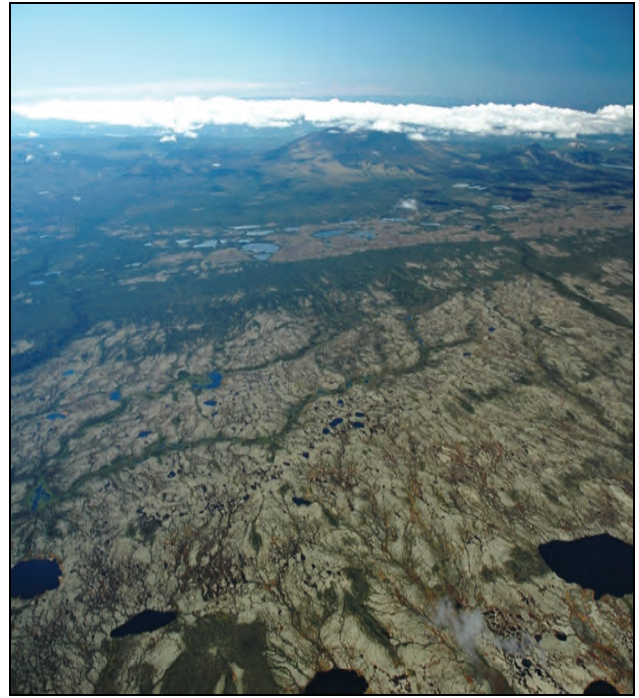
Blackwater, Fish and Greasy Lakes are the main water bodies; Blackwater Lake drains to the west via the Blackwater River that flows through a gap in the Franklin Mountains. A few small intermittent streams flow down the slopes. Shallow ponds usually occupy depressions in fluted terrain. Polygonal peat plateaus, often with thermokarst ponds, are extensive in the north. Peat plateaus occur throughout, with larger collapse scars in the south indicative of warmer conditions.

Notable Features

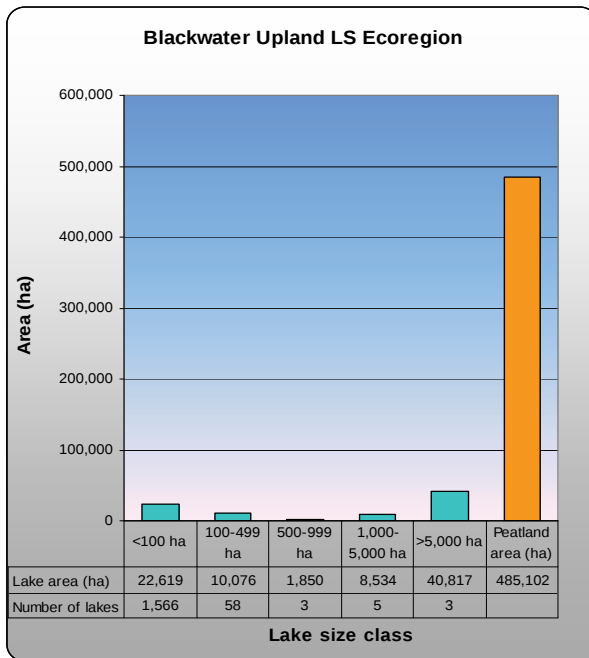
Significant plant and wildlife diversity could be expected in this Ecoregion because of climatic and topographic variability.



This typical landscape in the relatively warm south part of the Blackwater Upland LS Ecoregion shows the mix of young regenerating mixed-wood forests on well-drained uplands and peat plateaus with large collapse scars in depressions.



This high-altitude view of the steplike runnel (dark-toned) – polygonal peat plateau (light-toned) pattern on fluted terrain at the north end of the Blackwater Upland LS is a different pattern than that seen in the south and reflects cooler climates. The Franklin Mountains rise in the distance.



Proportion of Ecoregion occupied by lakes: 5%
Proportion of Ecoregion occupied by bogs and fens: 30%



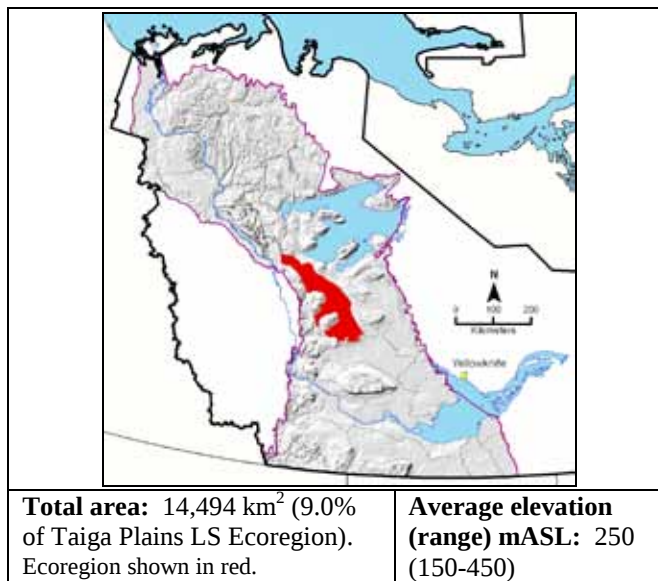
The gravelly shoreline of Fish Lake is lined by white spruce – Alaska paper birch forests; the Franklin Mountains are in the distance.

3.3.2.7 Keller Plain LS Ecoregion

Overview: *The Keller Plain LS Ecoregion is a long, narrow till plain with well-developed glacial fluting, and level organic areas with numerous lakes; sparsely treed bogs on peat plateaus or polygonal peat plateaus are the dominant cover type.*

Summary:

- Linear and curved glacial fluting covers more than half of the area, with regenerating shrublands or spruce – low shrub – moss forests on the flutes and peat plateaus and shrubby fens in the swales.
- Level to gently undulating till vegetated by burned or sparsely treed shrub – moss or spruce – moss – lichen bogs on peat plateaus.



General Description

The Keller Plain LS Ecoregion is a long, relatively narrow and nearly level till plain bordered by the higher-elevation Blackwater Upland LS Ecoregion to the west and south, and the Lac Grandin Plain LS and Great Bear Plain LS Ecoregions to the east and north. Parallel glacial flutings many kilometers in length with shallow linear ponds, fens and peat plateaus in the depressions are a striking feature of this Ecoregion. There are also broad gently undulating till plains with hundreds of shallow lakes and widespread peat plateaus. The Ecoregion extends over 300 km from north to south, and changes in permafrost and vegetation features are indicative of climatic variability over that distance. Conifer forests are the dominant upland cover type; they exhibit generally better growth in the southernmost part of the Ecoregion and on small till uplands. Polygonal peat plateaus are absent from the southern half, but occupy extensive areas north of Keller Lake.

Geology and Geomorphology

Glacial ice movements created linear and curved fluted terrain over more than half of the Ecoregion. Nearly level fine-textured till plains cover most of the remainder, and are mantled by thick peatlands. Less than ten percent of the area is moderately well-drained upland till; these deposits occur adjacent to the Blackwater Upland LS Ecoregion. An extensive local glacio-fluvial plain lies southwest of Keller Lake at the base of the Blackwater Upland HS Ecoregion.

Soils

Permafrost is present in both mineral and organic soils. Organic Cryosols are the dominant soil type in this Ecoregion. Turbic Cryosols, mixed by frost action and permanently frozen at some depth, are the dominant mineral soil type; most of these are poorly-drained Gleysolic subgroups, but Brunisolic Turbic Cryosols and Brunisols occur infrequently on better-drained sites. Horizontal fens and polygonal peat plateaus are the most common wetland types.

Vegetation

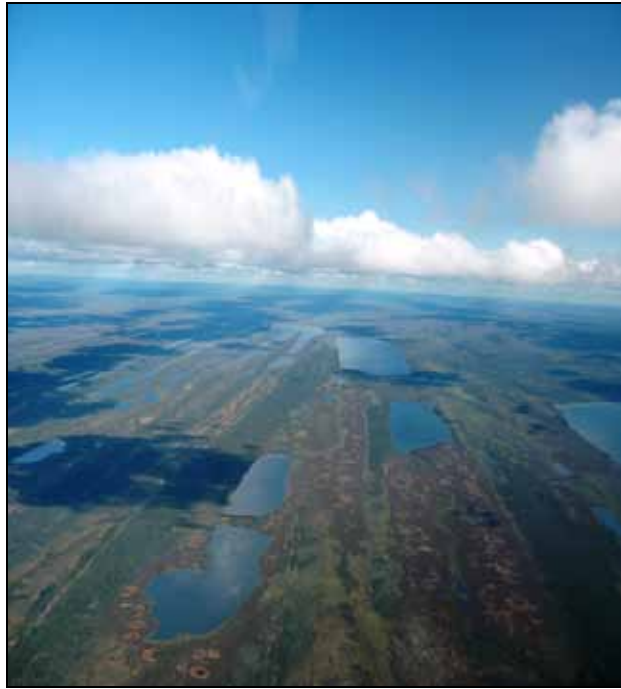
The two main landform types – gently undulating till plains mantled by peatlands, and glacial flutings – produce different vegetation complexes. On the broad poorly-drained till plains, regenerating dwarf birch – lichen – peat moss communities on burned peat plateaus and stunted spruce – lichen bogs on unburned peat plateaus are the dominant cover types over 80 percent of that landform type. Slightly raised, somewhat better drained uplands in these areas are vegetated by regenerating dwarf birch shrublands on recently burned sites or by open spruce stands. Nearly treeless lichen-dominated polygonal peat plateaus cover hundreds of square kilometers between Keller Lake and the northern limits of this Ecoregion. On glacial flutings, low-canopied white and black spruce – shrub – lichen – moss stands or post-fire regenerating dwarf birch shrublands are typical on the ridged uplands, with horizontal fens vegetated by sedges and shrubs and sparsely treed or burned peat plateaus in the swales between ridges. Where medium- to coarse-textured undulating to hummocky till deposits produce gently sloping and better drained conditions, closed canopy forests of mixed black and white spruce, Alaska paper birch, trembling aspen and jack pine may achieve relatively good growth for this area. Relatively vigorous and diverse white spruce communities occur in narrow riparian belts along the Johnny Hoe River and other watercourses.

Water and Wetlands

Keller Lake, Birch Lake, Tache Lake, and the meandering Johnny Hoe River are the main named waterbodies in the Keller Plain LS Ecoregion. A dense network of linear lakes in fluted areas and shallow circular lakes on level organic terrain covers almost the entire Ecoregion except for a few slightly elevated upland areas.

Notable Features

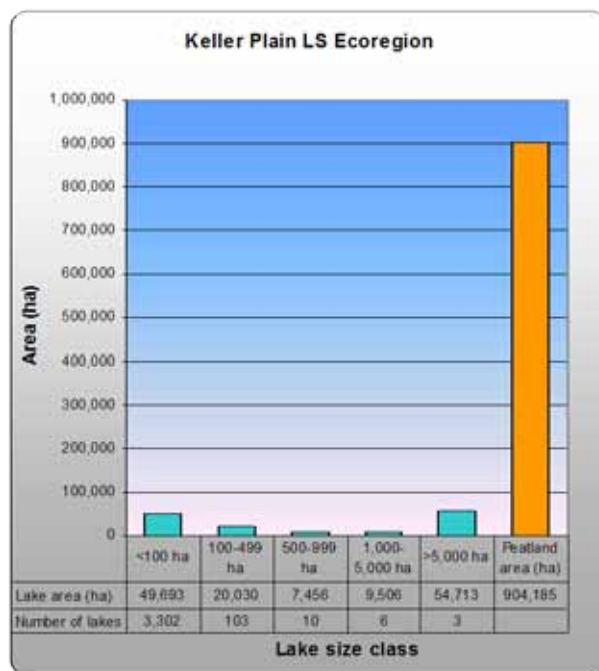
Polygonal peat plateaus in the northern part of the Ecoregion appear to be melting, and many thermokarst lakes now occupy what were formerly lichen – shrub communities on permafrost.



Glacial fluting caused by ice scouring is a striking feature of the Keller Plain LS Ecoregion. White and black spruce forests or regenerating shrublands grow on the elevated flutes. Brown-toned peat plateaus, shallow ponds and horizontal fens occupy the interflute areas.



The whitish areas are lichen-covered polygonal peat plateaus. The permafrost underlying them is melting, as indicated by the dense network of thermokarst ponds and the golden-brown collapse scar areas that occupy what formerly were polygonal ice-wedge cracks.



Proportion of Ecoregion occupied by lakes: 10%
Proportion of Ecoregion occupied by bogs and fens: 62%



On this level peat plateau plain in the northeastern part of the Ecoregion, the brownish areas are peat plateaus, and the dark green areas are moderately dense, low-canopied white and black spruce forests.

3.3.2.8 Lac Grandin Plain LS Ecoregion

Overview: *Ridged and hummocky till, calcareous bedrock and frequent fires across the Lac Grandin Plain LS Ecoregion produce a complex of mixed spruce upland types, regenerating shrublands, and young jack pine and deciduous stands.*

Summary:

- Complex glacial landscape of fluted and hummocky terrain with local elevation variability of up to 200 m.
- Much of the Ecoregion is underlain by limestone bedrock that influences vegetation, soils and groundwater.
- Mixed black and white spruce stands are most common; relatively tall and diverse white spruce and mixed-wood stands in the south.

General Description

The Lac Grandin Plain LS Ecoregion is a complex landscape of undulating, hummocky, ridged and deeply fluted till overlying limestone bedrock. Although it slopes generally toward the northeast, local topographic variations of up to 200 m above the general terrain level occur throughout. It is bounded by Precambrian Shield granites of the Level II Taiga Shield Ecoregion to the east, by the geologically similar Great Slave Plain HB Ecoregion to the south, by the lower and wetter Bulmer Plain LS and Keller Plain LS Ecoregions to the west, and by the higher uplands of the Great Bear Upland LS Ecoregion to the north. Two upland areas above 500 mASL belonging to the Lac Grandin Upland LS Ecoregion are embedded within the Lac Grandin Plain LS Ecoregion. Much of the area has recently burned, and the dominant vegetation cover is either closed to open white spruce – black spruce with shrub, moss and lichen understories or regenerating dwarf birch. Calcareous ponds and net fens form complexes with these stands over much of the landscape. Relatively diverse and vigorous closed mixed-wood and white spruce forests or fire-successional jack pine stands occupy rolling to ridged glacial flutings in the southwest portion and scattered patches in hummocky till along the eastern boundary. Peat plateaus can be locally extensive on level terrain around or adjacent to lakes in the central and northwestern portion of the Ecoregion; elsewhere they are restricted to relatively small pockets in hummocky and ridged till.

Geology and Geomorphology

Dolomites and limestones of Cambrian to Devonian age underlie much of the Lac Grandin Plain LS Ecoregion. Bedrock is exposed in places as horizontally-bedded strata or produces karst topography (sinkhole lakes), particularly in the central part of the Ecoregion. Thousands of calcareous ponds provide evidence of bedrock influence on local hydrology. Hummocky, calcareous and often bouldery till is the dominant glacial parent material throughout the eastern third and on higher terrain to the west. Ice scouring has produced rolling to ridged fluted till in the southwestern portion. Undulating to level till plains occur in the central and northwest parts of this Ecoregion and peatlands are most common and extensive in these areas. Coarse-textured glacio-fluvial and eolian deposits are scattered throughout the Ecoregion.



Total area: 26,034 km² (16.1% of Taiga Plains LS Ecoregion).
Ecoregion shown in red.

Average elevation (range) mASL: 325 (175-600)

Soils

Turbic Cryosols are the most common soil type, with calcareous Brunisols on well-drained terrain in the southern part. Organic Cryosols occur with peat plateaus and runnels.

Vegetation

Low-canopied white and black spruce stands with variable canopy closure and shrub, moss and lichen understories occur on well- to imperfectly-drained till uplands throughout the Ecoregion. Fire has been a major recent influence, and large areas are vegetated by dwarf birch shrublands. Young jack pine and Alaska paper birch or trembling aspen forests occur in patches on hummocky tills adjacent the Shield border and on ridged tills in the southwest. Mixed-wood and conifer stands occur in steeply ridged and fluted terrain to the southwest, along some of the streams, and in patches near the larger lakes; those occurring in the fluted terrain grow more vigorously here than elsewhere in the Taiga Plains LS Ecoregion. Horizontal fens vegetated by sedges and shrubs are common throughout the Lac Grandin Plain LS Ecoregion, but are not extensive. Bogs containing open black spruce – lichen communities and collapse scar bogs with peat moss – sedge complexes are extensive in the central and northwestern parts of the Ecoregion.

Water and Wetlands

Lac la Martre is the largest lake in this Ecoregion; other named lakes include Lac Grandin, Agira, Rome, Dennison, Etna, and Hottah Lakes. Rivière à Martre and Rivière Grandin are the major rivers. Thousands of small ponds surrounded by horizontal fens occur throughout; many are calcareous. Peat plateaus are common, but runnels and polygonal peat plateaus are uncommon.

Notable Features

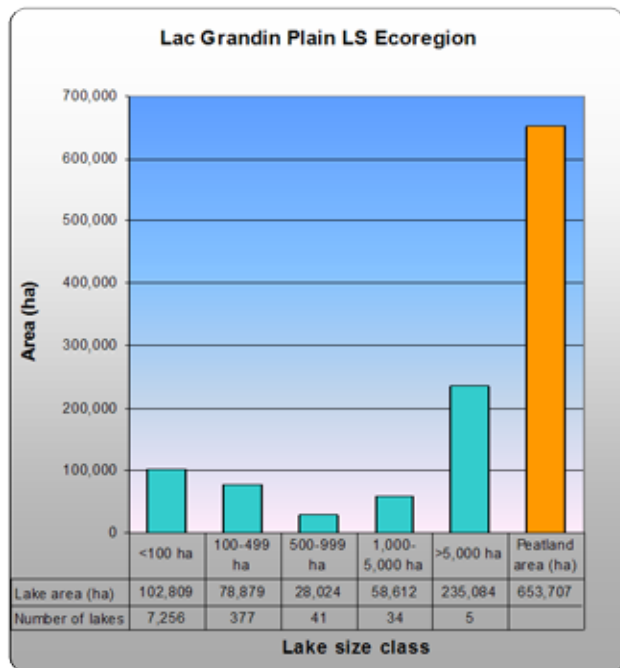
Some of the tallest and most diverse forests in the Taiga Plains LS Ecoregion area are found on the deeply fluted terrain in the southwest corner of the Lac Grandin Plain LS Ecoregion.



White and black spruce stands with variable canopies and calcareous horizontal fens and marl ponds are typical of much of the Ecoregion; this image was taken near Rivière Grandin.



Deeply fluted terrain in the southwestern part of the Ecoregion supports relatively tall, diverse closed white spruce, trembling aspen and Alaska paper birch stands.



Proportion of Ecoregion occupied by lakes: 19%
Proportion of Ecoregion occupied by bogs and fens: 25%



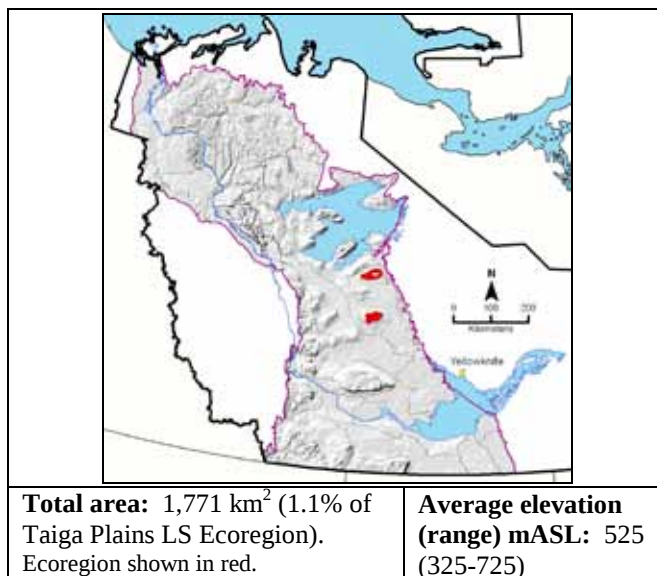
Fire is an active agent of change in this and other ecoregions.

3.3.2.9 Lac Grandin Upland LS Ecoregion

Overview: *The Lac Grandin Upland LS Ecoregion occupies hummocky and rolling terrain over 500 mASL and is largely mature or regenerating forest with limited permafrost occurrence.*

Summary:

- Consists of two hummocky to rolling till units at elevations over 500 mASL.
- Vegetation cover on the southern unit is more diverse and more vigorous than that of the northern unit, and has fewer permafrost features.



General Description

The Lac Grandin Upland LS Ecoregion consists of two isolated hills separated by about 100 km north to south and includes terrain at elevations above 500 mASL. This Ecoregion is embedded within the Lac Grandin Plain LS Ecoregion; rolling and hummocky till is the dominant landform. The southern upland is a patchwork of mixed spruce stands, mixed deciduous – coniferous forests and early-successional dwarf birch and willow shrublands. There are numerous small circular pothole lakes, and permafrost features are uncommon. The northern upland is more homogeneous, with mixed white and black spruce stands or regenerating dwarf birch shrublands as the main cover types; peat plateaus are a common component. These features indicate that the southern unit is influenced by both High Boreal and Low Subarctic climates, whereas the northern upland is controlled by colder Low Subarctic climates.

Geology and Geomorphology

Cretaceous marine shales lie beneath upper elevations of the Lac Grandin Upland LS, and in contrast to the surrounding Lac Grandin Plain LS, ponds and lakes are typically not calcareous. Calcareous springs and ponds do occur in lower slope positions, reflecting the influence of deeper Devonian limestone strata. Hummocky and rolling medium- to fine-textured till deposits are dominant in both areas.

Soils

Turbic Cryosols are probably the most widespread soil type on the northern upland. Brunisols are probably more common on the southern upland. Organic Cryosols are associated with peat plateaus.

Vegetation

There are notable differences in vegetation composition between the north and south units. Trembling aspen forms patchy stands that may be mixed with white spruce on the southern upland. Recent burns with early successional willow – dwarf birch shrublands are extensive. Peat plateaus are uncommon. On the northern upland, white and black spruce closed-canopy stands with dwarf birch, feathermoss and lichen understories, and dwarf birch shrublands on recently burned areas are the dominant cover types. Trembling aspen and Alaska paper birch are usually scattered within coniferous stands mainly on southerly aspects, and rarely form pure stands. Black spruce communities on peat plateaus are more common in the northern upland, often on lower slope positions. Taller conifers with denser canopy closure on the southern upland indicate better forest growth there. These trends in composition, permafrost occurrence and growth are similar to the latitude-related trends discussed for the Blackwater Upland LS, Keller Plain LS, and Great Bear Upland LS Ecoregions.

Water and Wetlands

There are no named lakes or rivers in this Ecoregion. Hundreds of small pothole lakes dot the landscape; peat plateaus, slope fens, northern ribbed fens and spring fens occur in depressions and lower slope positions.

Notable Features

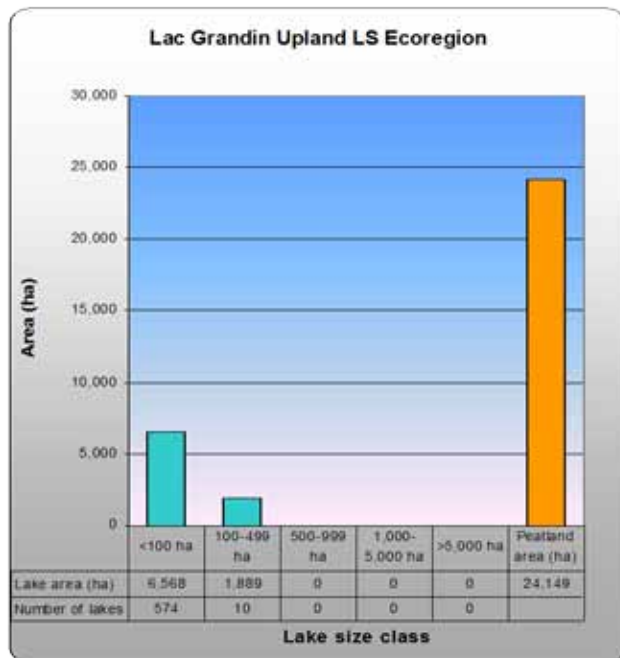
The southern upland together with the adjacent fluted area in the Lac Grandin Plain LS likely provide a large area of good wildlife habitat.



Climatic conditions favor the growth of deciduous and mixed-wood stands in the southern unit of the Lac Grandin Upland LS Ecoregion; hummocky till is a common landform



Burns are extensive; the gray tones in this image are burned snags, and the greenish tints are regenerating shrubs growing between the snags.



Proportion of Ecoregion occupied by lakes: 5%
Proportion of Ecoregion occupied by bogs and fens: 14%



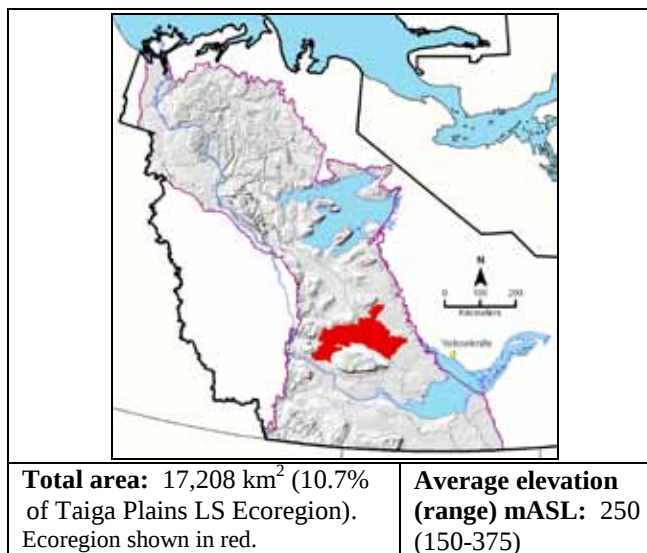
This northward-facing view shows open white spruce stands on a northeast slope in the northern upland unit; colder conditions are indicated by the absence of deciduous and mixed-wood stands and by shrub tundra on hilltops.

3.3.2.10 Bulmer Plain LS Ecoregion

Overview: *Extensive burned peat plateaus on nearly level terrain with regenerating coniferous forests and shrublands on bouldery till uplands characterize the Bulmer Plain LS Ecoregion.*

Summary:

- Level plain dominated by peat plateaus; much of the area has burned recently.
- Thousands of shallow ponds that are calcareous east of Bulmer Lake.
- Bouldery till uplands with regenerating black spruce, jack pine, and dwarf birch; deciduous and mixed-wood stands are uncommon.



General Description

The Bulmer Plain LS Ecoregion surrounds the north side of the Horn Plateau, bordered on the west and south by the higher terrain of the Ebbutt Upland HB and Horn Slopes LS Ecoregions, on the north by the low ridge of the Blackwater Upland LS Ecoregion, and on the east by the slightly higher Lac Grandin Upland LS Ecoregion. Most of the area is covered by level peatlands with a dense network of shallow ponds; east of Bulmer Lake, these ponds are often calcareous. Peat plateaus are the characteristic landform feature, but level to gently sloping or undulating bouldery till occurs over about thirty percent of the Ecoregion. Much of the area has recently burned, and regenerating black spruce on peat plateaus is the most common vegetation type. Upland communities are typically regenerating black spruce, dwarf birch, and occasionally white spruce and jack pine. A few marginally productive areas are found on river valley slopes and in very narrow belts along stream drainages.

Geology and Geomorphology

Horizontally bedded dolomite, limestone and sandstone of Cambrian to Devonian age underlie this Ecoregion east of Bulmer Lake. Solution waters derived from groundwater seeping through limestones are high in dissolved solids, and white calcium carbonate deposits form on the bottom and along the shorelines of shallow ponds in the east part of the Ecoregion. Bouldery glacial till overlies bedrock throughout all of this Ecoregion with the exception of a small lacustrine area to the east. Thick peatlands mantle about 65 percent of the area.

Soils

Organic Cryosols are the dominant soil type. Turbic Cryosols occur on imperfectly- to poorly-drained perennially frozen till deposits; Brunisols are common on well- to moderately well-drained till.

Vegetation

The very flat terrain, dominance of peatlands, and recent fire history has produced a relatively simple sequence of vegetation communities. The characteristic vegetation type for this Ecoregion is regenerating spruce bog with slow-growing black spruce seedlings, northern and common Labrador tea, cloudberry, and sparse lichen, with sedges, peat mosses and cotton-grasses in the collapse scars. Dense young jack pine stands with sparse species-poor understories develop after fire on well-drained upland till deposits. On well- to poorly-drained sites, regenerating species include black spruce, larch, dwarf birch, Alaska paper birch, and occasionally white spruce. Open, low-canopied black spruce with a Labrador tea, willow, and lichen understory is the most common upland type where fire has been absent for several decades. There are only a few locales where better forest growth occurs, such as the valley slopes of the Willowlake River and within narrow belts paralleling streams. Northern ribbed fens with sedges, shrubs, and scattered larch are interspersed with peat plateaus on gently sloping areas.

Water and Wetlands

Bulmer Lake and the Willowlake and Horn Rivers are the major named water bodies in this Ecoregion. Thousands of small ponds are interspersed with peat plateaus and are densest east of Bulmer Lake. Peat plateaus with large collapse scars indicating permafrost thawing are dominant; thermokarst lakes occur throughout the Ecoregion. Northern ribbed fens and net fens are locally extensive.

Notable Features

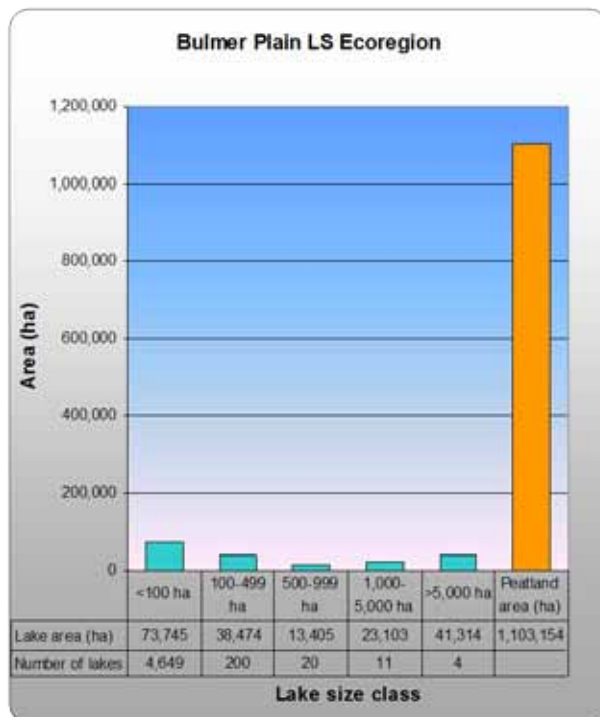
Northern pitcher plants, reported as rare in the Northwest Territories by McJannet *et al.* (1995), were found in collapse scars within burned peat plateaus north of the Horn River during field work in 2005.



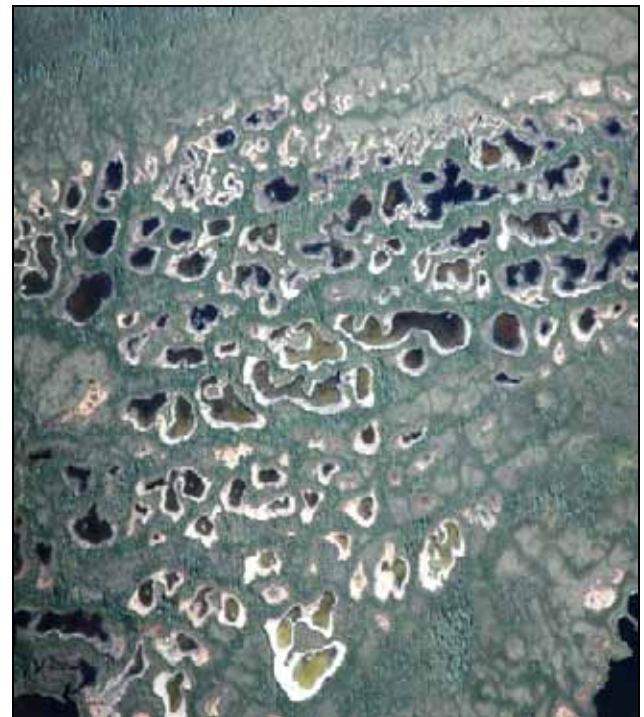
Burned peat plateaus (dark brown with brownish-orange collapse scars) and calcareous thermokarst ponds (fine-textured tan-colored features with many small ponds) are dominant throughout much of the Ecoregion.



This image shows a large collapse scar with sedges, cottongrasses, shrubs and mosses. An elevated and burned peat plateau surrounds the collapse scar and rises about a meter above it.



Proportion of Ecoregion occupied by lakes: 11%
Proportion of Ecoregion occupied by bogs and fens: 64%



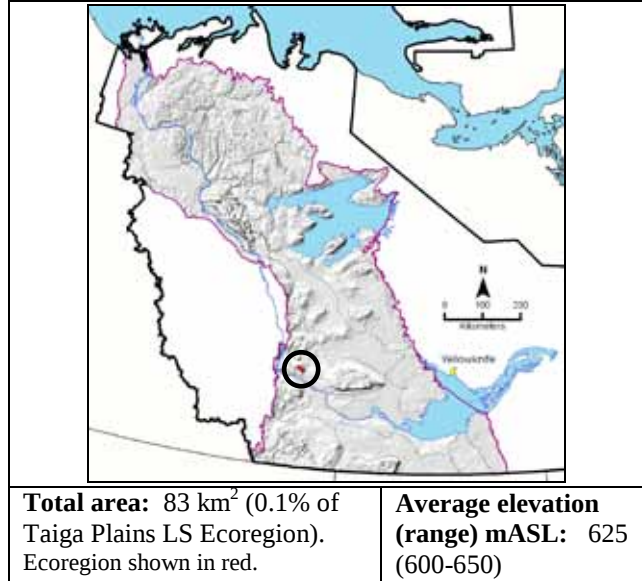
Groundwater and geology interact to produce an interesting calcareous net fen – thermokarst pond pattern east of Bulmer Lake.

3.3.2.11 Ebbutt Upland LS Ecoregion

Overview: *The Ebbutt Upland LS Ecoregion is a small island of peat plateaus and weakly developed runnels at the highest elevations of the Ebbutt Hills.*

Summary:

- Mix of undulating and hummocky till and organic veneers and blankets.
- Peat plateaus with small collapse scars and weakly developed runnel patterns are typical permafrost forms associated with Low Subarctic climates.



General Description

The Ebbutt Upland LS Ecoregion is a very small unit at the highest elevations (600 mASL) within the Ebbutt Hills, and is completely surrounded by the Ebbutt Upland HB Ecoregion. The smallest Level IV ecoregion in the Taiga Plains, it is distinguished from the surrounding Level IV Ebbutt Upland HB Ecoregion by the presence of weakly developed runnels, peat plateaus with relatively small collapse scars, and a shallow (less than 40 cm to permafrost) active layer in late summer, all characteristic of Low Subarctic climates. The landscape is a mix of undulating to hummocky till, peat plateaus, and weakly developed runnel patterns on which open black spruce-dominated forests and bogs with stunted black spruce have developed.

Geology and Geomorphology

Horizontally bedded Cretaceous shales underlie level to undulating and hummocky till deposits. Peatlands of variable thickness have developed over about 40 percent of the Ecoregion.

Soils

Organic Cryosols are the dominant soil type in wetlands. Gleysols and Cryosols occur in association with black spruce stands on mineral soils.

Vegetation

The characteristic vegetation type is a species-poor bog; open, stunted black spruce, common and northern Labrador tea, cloudberry, lichen, peat mosses and feathermosses occur on frozen peat plateaus, with sedges, cotton-grasses and peat mosses in the collapse scars. Imperfectly- to poorly-drained upland sites are typically forested by open, slow-growing black spruce with common and northern Labrador tea, alpine bilberry, lichen, and feathermoss understories.

Water and Wetlands

There are no named waterbodies in this Ecoregion, and only a few small, shallow lakes. Wetlands are mainly peat plateaus, with weakly developed runnel patterns in a few places.

Notable Features

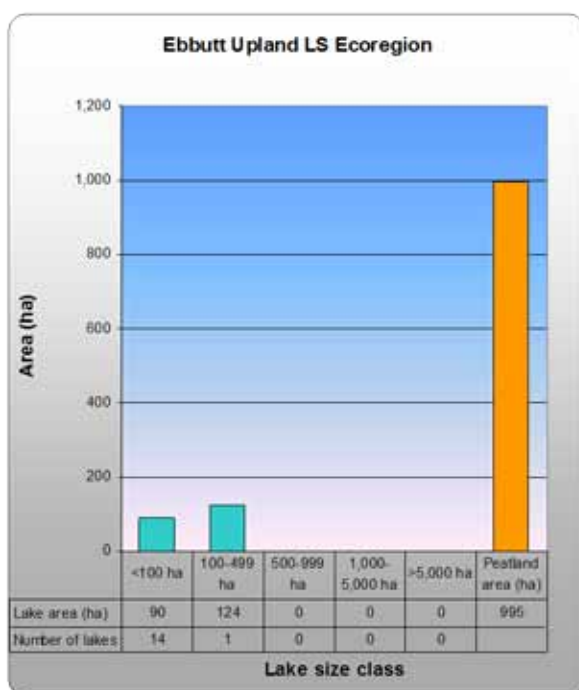
The Ebbutt Upland LS Ecoregion possibly contains the most southerly occurrences of runnel permafrost features in the Northwest Territories Taiga Plains.



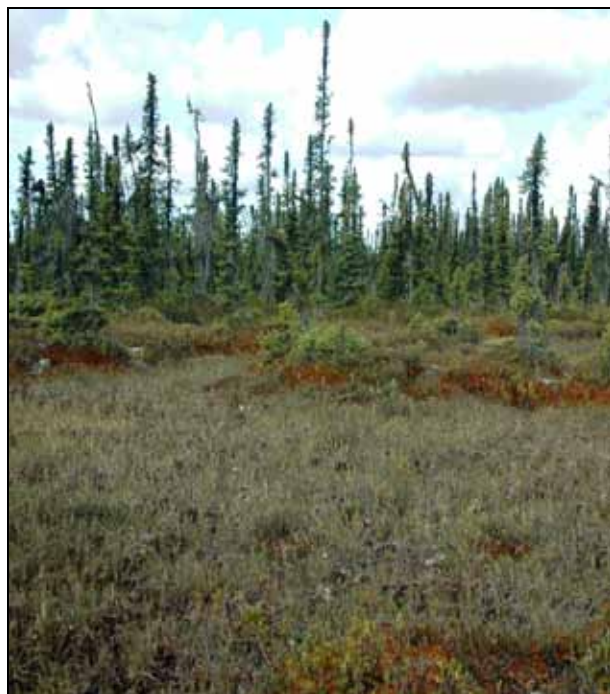
Peat plateaus with small collapse scars and thermokarst lakes are characteristic of the Ebbutt Upland LS Ecoregion.



This image shows a detail of a runnel (a permafrost feature), and a minor creek drainage with somewhat taller white spruce. The whitish tones are lichen ground cover showing through a very open black spruce canopy.



Proportion of Ecoregion occupied by lakes: 3%
Proportion of Ecoregion occupied by bogs and fens: 12%



Permafrost occurs at about 30 cm below the surface in early August in the forested peat plateau, which rises about 50 to 70 cm above the wet sedge – shrub fen occupying the collapse scar in the foreground where permafrost is over a meter deep.

3.3.2.12 Horn Slopes LS Ecoregion

Overview: Gently inclined northerly slopes with fire-successional dwarf birch and undulating to hummocky westerly slopes with a mix of spruce – shrub forests and peat plateaus typify the Horn Slopes LS Ecoregion.

Summary:

- Gently north-sloping till deposits with extensive regenerating dwarf birch shrublands and remnant spruce stands.
- Till and organic complex on undulating to hummocky northwest and west slopes with closed spruce – shrub and open spruce – lichen forests, and peat plateaus.



Total area: 5,460 km² (3.4% of Taiga Plains LS Ecoregion). Ecoregion shown in red.

Average elevation (range) mASL: 400 (250-775)

General Description

The Horn Slopes LS Ecoregion includes the smooth, gently inclined northerly slopes and undulating to hummocky, somewhat steeper westerly slopes of the Horn Plateau. Its southern and eastern upper boundary with the Horn Plateau LS Ecoregion is marked by a subtle change in topography from gently sloped within the Ecoregion to nearly level on the Horn Plateau LS Ecoregion, and by the scattered occurrence of polygonal peat plateaus in the latter Ecoregion. It grades into the lower-elevation Horn Plain HB and Bulmer Plain LS Ecoregions. Many small, intermittent streams drain down the slopes from the Horn Plateau. Peat plateaus are common on lower slope positions. Most of the northerly slopes have burned and regenerating dwarf birch communities are widespread. Undulating and hummocky, often boulder-strewn till deposits mainly on the upper portions of west- and northwest-facing slopes support closed-canopy mixed white and black spruce forests with shrubby understories and more open spruce – lichen mixtures. Scattered jack pine and mixed-wood communities occur mainly on northwesterly and westerly slopes on locally elevated terrain or along stream valleys.

Geology and Geomorphology

Horizontally stratified Upper Cretaceous marine shales and conglomerates underlie the Horn Plateau and the Horn Slopes LS Ecoregion. Seepage from these formations might contribute to local streamflow and soil moisture conditions. Most of the area is covered by medium- to fine-textured, bouldery till. Organic veneers and blankets cover between 30 and 50 percent of the landscape.

Soils

Permafrost is present in both the mineral and organic soils. Organic Cryosols are the dominant soil type in peat plateaus. Turbic Cryosols, mixed by frost action and permanently frozen at depth, are the dominant mineral soil type.

Vegetation

Much of the Horn Slopes LS Ecoregion has recently burned, and along most of the gentle northern slopes, dwarf birch is the dominant cover type with remnant white and black spruce stands as narrow stringers along stream channels. Undulating and hummocky well- to poorly-drained till deposits are found mainly on the upper half of west and northwest facing slopes; they support closed-canopy mixed black and white spruce stands with dwarf birch, willow, green alder and feathermoss understories, and open spruce – lichen stands. Mixed-wood communities and jack pine stands are infrequent, occurring on well-drained slopes or fluvial terraces. Bogs on perennially frozen organic terrain (peat plateaus) are scattered across upper slope positions, but become nearly continuous on mid to lower slope positions, interspersed with slope fens and northern ribbed fens; most have been recently burned. Runnel patterns are weakly developed.

Water and Wetlands

The Willowlake and Horn Rivers flow in parallel channels down the approximate centre of the Ecoregion and diverge at the slope base to the west and east, respectively. Many small intermittent streams drain the slopes and are tributaries to these rivers. There are a few small, shallow ponds along the upper western and northwestern slopes. Peat plateaus are the most common wetland type; northern ribbed fens and slope fens also occur on lower slope positions.

Notable Features

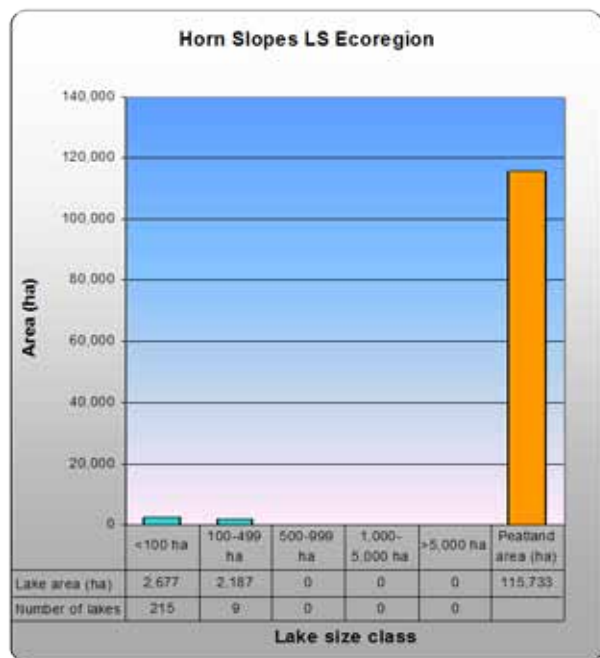
This Ecoregion is ecologically very different from the Horn Slopes MB Ecoregion. Northerly slopes combined with low sun angles at this latitude result in a lower intensity of incident solar radiation compared to the Horn Slopes MB Ecoregion. Consequently, vegetation, soil, and permafrost patterns typical of colder conditions occur.



Upper slopes in the western portion of the Horn Slopes LS Ecoregion have mixed black and white spruce and open spruce – lichen stands on undulating to hummocky till.



Open white spruce – black spruce forests have lichen and shrub understories that lend a grayish-white tone.



Proportion of Ecoregion occupied by lakes: 1%
Proportion of Ecoregion occupied by bogs and fens: 21%



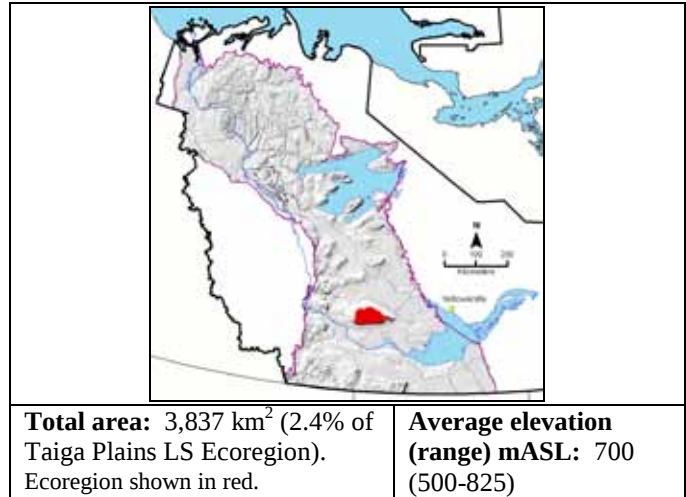
This west-facing view across the smooth, gentle northern slopes shows that most of the forests have burned off in recent fires, leaving remnant stands along streams. Scattered peat plateaus occur, increasing in frequency downslope.

3.3.2.13 Horn Plateau LS Ecoregion

Overview: *The Horn Plateau LS Ecoregion is an undulating to hummocky recently burned till plain elevated well above the surrounding plains, with permafrost features typical of more northerly locations.*

Summary:

- Hummocky to undulating till plain, with locally extensive peat veneers and blankets.
- Regenerating shrublands on burned areas, with remnant black spruce–lichen woodlands; locally taller and denser white spruce and mixed-wood stands.
- Locally common peat plateaus and polygonal peat plateaus, the latter similar to those occurring several hundred kilometers north.



General Description

The Horn Plateau LS Ecoregion is an undulating to hummocky till plateau rising over 400 m above the surrounding plains and lowlands. The Horn Slopes LS Ecoregion borders it on the west and north and the Horn Slopes MB Ecoregion borders it on the south; gentle to abrupt slope breaks define the boundaries. Undulating and hummocky till deposits are the dominant landform; organic veneers and blankets cover most level to gently undulating till areas. Recent fires have burned over much of the plateau and regenerating shrub communities are the dominant cover type; open black spruce – low shrub – lichen forests are characteristic of unburned uplands. Relatively tall and dense white spruce or mixed trembling aspen – spruce communities occur infrequently on southerly slopes, and small regenerating jack pine stands occur on coarser-textured tills. Peat plateaus and veneer bogs are the dominant wetland types, but treeless, lichen-covered polygonal peat plateaus are locally common on level areas or northerly slopes in the eastern half of the Ecoregion.

Geology and Geomorphology

Horizontally stratified Upper Cretaceous marine shales and conglomerates underlie the Horn Plateau. Most of the area is covered by medium-textured, often bouldery till. Organic veneers and blankets cover between 30 and 50 percent of the landscape.

Soils

Permafrost is present in both mineral and organic soils. Organic Cryosols are the dominant soil type in peat plateaus and polygonal peat plateaus. Turbic Cryosols, soils that have been mixed by frost action and that are permanently frozen at some depth, are the dominant mineral soil type, with Brunisols and Luvisols on well-drained slopes and coarse-textured materials.

Vegetation

A resource assessment for the Edézhíe candidate protected area, which includes the Horn Plateau, indicates that most of the Horn Plateau has burned within the last 25 years (EBA-CWS 2005). This assessment identifies thirteen community types for the Edézhíe area, of which four or five types probably occur in the Horn Plateau LS Ecoregion. Dwarf birch and willow shrublands

are typical of burned upland areas. Fire-successional jack pine stands occur in small scattered patches, usually on coarse-textured till pockets. Unburned uplands are vegetated by closed to open, generally low-canopied black spruce stands with dwarf birch, northern and common Labrador tea and lichen understories, but taller, denser white spruce and occasionally mixed trembling aspen – white spruce stands occur on moderate southerly slopes such as those found on the local hill system south of Big Island Lake. Peat plateaus and veneer bogs are common on level to gently undulating terrain throughout the Ecoregion, and like the upland areas, have been mostly burned over. Burned peat plateaus and veneer bogs are dark-colored and vegetated by dwarf birch – Labrador tea – peat moss communities; stunted black spruce – lichen – peat moss bogs are characteristic of unburned wetlands. Sedges, cotton-grasses and peat mosses grow in collapse scars within peat plateaus. Nearly treeless polygonal peat plateaus with continuous lichen mats, sparse dwarf birch and northern and common Labrador tea cover, and permafrost within 30 cm of the surface in late summer are locally common on level areas and northerly slopes in the eastern half of the Ecoregion. These features are similar to those noted in the Keller Lake LS Ecoregion about 200 km north, and their occurrence on the Horn Plateau LS Ecoregion is probably attributable to colder local climates at higher elevations that have preserved characteristics of a colder climatic regime in the past.

Water and Wetlands

Willow, Hornel, Big Island and Mustard Lakes are the main named waterbodies. The Willowlake and Horn Rivers drain the plateau. Numerous smaller lakes surround Big Island Lake and the south and west sides of Willow Lake. Drainage systems on the Plateau are local and internal; a flowing cold iron-stained spring observed on an island in Willow Lake is probably indicative of local groundwater recharge-discharge systems. Polygonal peat plateaus and peat plateaus are the dominant wetland types.

Notable Features

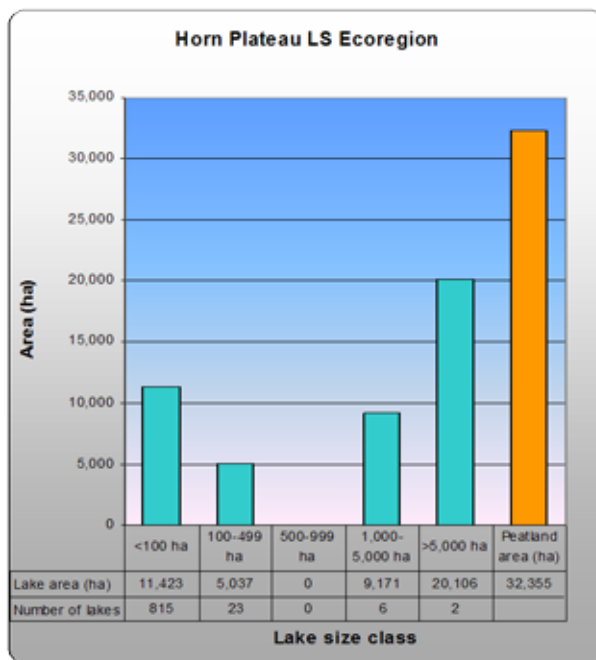
A large portion of the Horn Plateau LS Ecoregion is an International Biological Program site (Nettleship and Smith 1975), and is included in the Edézhíe candidate protected area under the Northwest Territories Protected Areas Strategy.



A high-altitude view of the Horn Plateau HS Ecoregion shows light brown burned peat plateaus with golden-brown collapse scars in the foreground and darker-toned remnant black spruce forests and woodlands in background.



Mixed-wood and trembling aspen forests occur on well drained, relatively warm sites on hummocky till south of Willow Lake.



Proportion of Ecoregion occupied by lakes: 12%
Proportion of Ecoregion occupied by bogs and fens: 8%



Polygonal peat plateaus occur in the easternmost part of the Ecoregion and might be remnant features of a colder climate in past years. The large cracks are water filled and have no permafrost to depths of more than a meter; the whitish areas are lichen and peat moss (mainly *Sphagnum*) covered treeless areas with permafrost 30 to 40 cm below the surface.

3.3.2.14 Cameron Plateau LS Ecoregion

Overview: Rolling to hummocky glacial till with open black spruce and occasionally lodgepole pine stands and extensive areas of peat plateaus and veneer bogs are typical of the Cameron Plateau LS Ecoregion.

Summary:

- Level to gently sloping organic veneers and blankets with peat plateaus and veneer bogs.
- Rolling to hummocky till uplands with black spruce forests are secondary.
- Lodgepole pine and pine hybrids at higher elevations.



Total area: 1,833 km² (1.1% of Taiga Plains LS Ecoregion).
Ecoregion shown in red.

Average elevation (range) mASL: 700 (475-875)

General Description

The Cameron Plateau LS Ecoregion occurs at the highest elevations (600-800 mASL) in the Cameron Hills. Its boundary with the Cameron Slopes MB Ecoregion is often abrupt; frozen bogs atop the plateau may occur within a few meters of mixed-wood stands on the failing sideslopes. Its lower boundary with the Cameron Upland HB Ecoregion is similarly defined by the occurrence of permafrost features such as veneer bogs and peat plateaus. The southern boundary is the Alberta–Northwest Territories border. Rolling and hummocky till is the dominant upland landform; gently sloping to level till is usually covered by organic veneers and blankets that occupy extensive areas in the southern part of the Ecoregion. Black spruce–low shrub–lichen communities occur extensively on well-drained uplands. Lodgepole pine forests and forests composed of jack pine – lodgepole pine hybrids are locally common on well-drained sites at the highest elevations in the northeast part of the Ecoregion. Deciduous and mixed-wood communities are uncommon and localized to warm slopes or stream terraces. Bogs with stunted open black spruce woodlands and collapse scar communities are characteristic wetland vegetation types that occur throughout the area in association with peat plateaus and organic veneers on slopes. The Cameron Hills exert a local influence on weather; in summer, thunderstorms are more frequent (Klock *et al.* 2000), and rainfall amounts are likely higher in this Ecoregion than in the surrounding lowland terrain.

Geology and Geomorphology

Cretaceous marine shales underlie level to undulating, hummocky, rolling and fluted till deposits. Small inclusions of glacio-fluvial and alluvial materials occur along old meltwater channels or present-day streams. Peatlands of variable thickness have developed on level to gently sloping areas.

Soils

Organic Cryosols are the dominant soil type in wetlands. Acidic, fine-textured Brunisols are the main upland soil type.

Vegetation

Vegetation in the Cameron Plateau LS Ecoregion is similar to that described for the Boreal Subarctic Natural Subregion in Alberta (Natural Regions Committee 2006). The characteristic wetland vegetation type is a species-poor bog; open black spruce with common and northern Labrador tea, cloudberry, lichen, peat mosses and feathermosses occur on peat plateaus underlain by permafrost, while sedges, cotton-grasses and peat mosses occupy the collapse scars. Well- to imperfectly-drained upland sites are typically forested by open, slow-growing black spruce with common and northern Labrador tea, alpine bilberry, lichen, and feathermoss understories. Lodgepole pine or lodgepole pine – jack pine hybrid stands with species-poor lichen-dominated understories are locally common at higher elevations on well-drained sites, mainly in the eastern part of the Ecoregion. Trembling aspen and mixed-wood stands are uncommon and occur on southerly slopes or on coarse-textured alluvial terraces where microclimates are sufficiently warm and dry. Northern ribbed fens occur between till ridges and are sometimes intricately patterned.

Water and Wetlands

Silt Lake is the only named lake in this Ecoregion. Linear ponds occupy depressions between glacial flutings in the southeast portion, and numerous small pothole lakes occupy low areas in undulating and hummocky till in the western portion. Peat plateaus on level areas and veneer bogs on slopes are extensive across the southern half; intricately patterned northern ribbed fens are interesting local features.

Notable Features

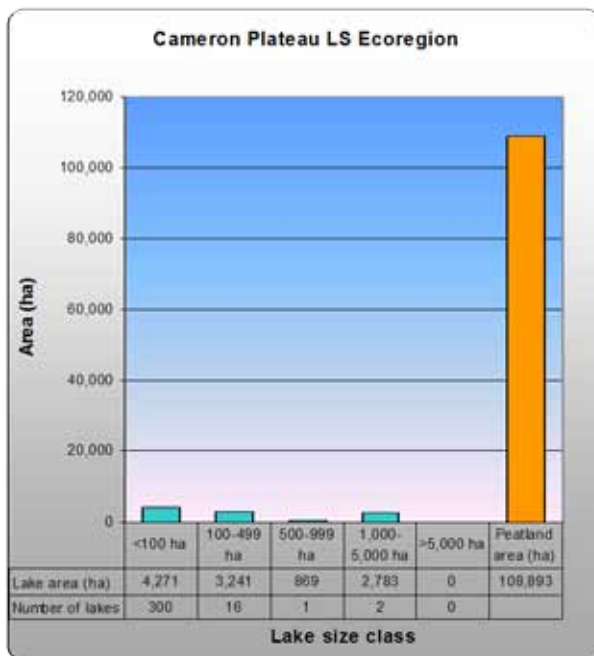
This Ecoregion is the most southerly representative of the Taiga Plains LS Ecoregion in the Northwest Territories. Outstanding examples of glacial fluting occur in the southeast corner, and intricately patterned northern ribbed fens in the northeast. Lodgepole pine reaches its easternmost limits in the Northwest Territories here.



Black spruce on hummocky till is a dominant landscape feature in the eastern part of the Cameron Plateau LS Ecoregion.



Veneer bogs, a permafrost feature that occurs on sloping terrain, show in this image as grayish-white areas. They are lichen-dominated and sparsely treed.



Proportion of Ecoregion occupied by lakes: 6%
Proportion of Ecoregion occupied by bogs and fens: 59%



A striking example of glacial fluting occurs on the eastern portion of the Ecoregion, with light green lodgepole pine on the higher ridges, or flutes, and bogs forested by dark-toned black spruce in the depressions.

3.3.3 TAIGA PLAINS HIGH BOREAL (HB) ECOREGION



Typical upland landscapes in the Taiga Plains High Boreal (HB) Ecoregion are forested by closed to semi-closed stands of mostly black spruce and pine with some paper birch and understories of feathermoss, mountain cranberry, alpine bilberry, common Labrador tea, and lichen. White spruce and aspen mixed-wood stands occur on warm, moist well-drained sites. On drier sites mixed, open stands of black spruce and jack pine are widespread. Bog and fen complexes consisting of black spruce, common Labrador tea, alpine bilberry, bog rosemary, cloudberry, sedges and peat mosses dominate cold, wet, poorly drained sites. Shore fen wetlands are common but are not as extensive as those in the warmer Taiga Plains MB Ecoregion. Brunisols and Luvisols are common upland soils. Organic soils, Organic Cryosols and Gleysols are associated with wetlands.



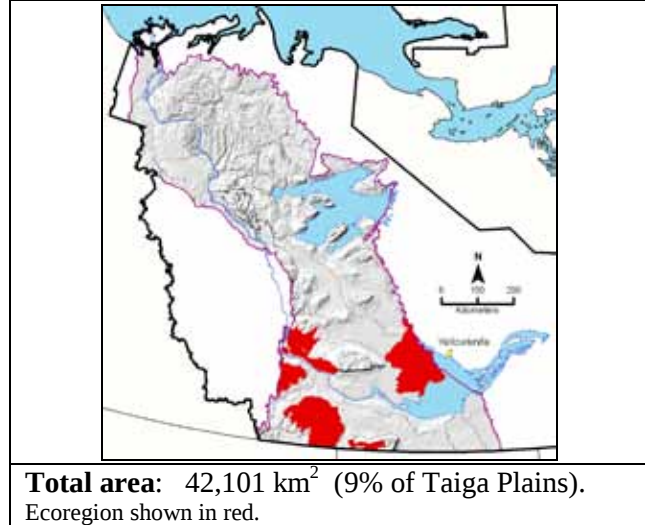
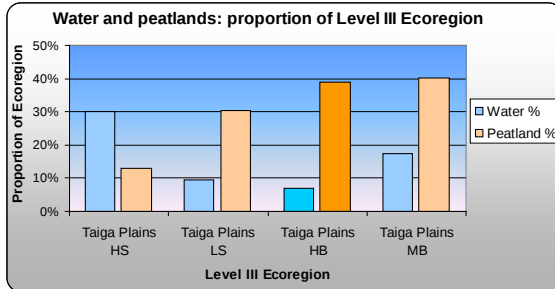
This photograph on the Ebbutt Upland shows the white spruce and aspen mixed-wood forests that grow on many slopes in the Taiga Plains HB Ecoregion, particularly those with southerly aspects. The photograph also includes a narrow sedge fen, a common feature on mid- to lower-slope positions where groundwater discharges produce flowing springs.



Bunchberry (*Cornus canadensis*) is a small, low-growing woody-stemmed herb that occupies moist woodlands and clearings. It is a widespread and very common plant of the boreal forest throughout the Taiga Plains.

3.3.3 TAIGA PLAINS HIGH BOREAL (HB) ECOREGION

Overview: The Taiga Plains HB Ecoregion occurs at higher elevations in the southern Taiga Plains; it is surrounded by or lies immediately north of the lower-elevation Taiga Plains MB Ecoregion, and has a cooler climate.



General Description

The Level III Taiga Plains HB Ecoregion extends across the southern third of the Taiga Plains at elevations of 300 to 700 mASL; the six Level IV ecoregions within it are surrounded by or lie immediately north of the lower-elevation Taiga Plains MB Ecoregion. Relatively poor forest growth and a higher proportion of organic terrain and peat plateaus are indicative of colder conditions at higher elevations. Imperfectly- to poorly-drained and gently sloping, level and undulating till occurs over much of the area; it is frequently mantled by peatlands. Low-growing open black spruce forests, treed bogs, horizontal fens and peat plateaus are dominant. Hill slopes, till with local relief, or coarse-textured parent materials provide generally better drained and warmer local environments, and allow the development of upland deciduous, mixed-wood and coniferous forests.

Climate

The Taiga Plains HB Ecoregion has sparse long-term climate data. Cooler conditions, relative to the adjacent lower-elevation Taiga Plains MB Ecoregion are indicated by the increased extent of permafrost features (peat plateaus) and less vigorous forest growth on uplands. These conditions are characteristic of High Boreal climates as defined by the Ecoregions Working Group (1989). Summer precipitation is expected to be higher than on the surrounding plains because of convective storms that form over higher terrain (Klock *et al.* 2000). Climate models (Agriculture and Agri-Food Canada 1997) provide the following general statistics. The mean annual temperature ranges from -2.0 to -4.5°C. The mean temperature in January, the coldest month, ranges from -24 to -28°C, and from 15.5 to 17.0°C in July, the warmest month. Mean annual precipitation is between 300 and 390 mm, with the wettest period in June through August and the driest period in December through April; about 55 percent

falls as rain and 45 percent as snow. The mean annual daily solar input (refer to Section 1.4.1 for further explanation) ranges between 10.5 and 11.0 mJ/m²/day, with low values of 1.0 to 1.5 mJ/m²/day in December and highs of 21.5 to 22.0 mJ/m²/day in June.

Topography, geology, soils, and hydrology

Hill systems at elevations of 300 to 700 mASL surrounded by the gently sloping to undulating plains of the Taiga Plains MB Ecoregion characterize four of the six Level IV ecoregions within the Taiga Plains HB Ecoregion; the other two Level IV ecoregions occur at more northerly latitudes. The most common landform is imperfectly- to poorly-drained glacial till on which Organic and Gleysolic soils or Organic Cryosols have developed. Brunisols and Luvisols occur along slopes and on hummocky or ridged till, or well-drained fluvial and glacio-fluvial materials. There are few named lakes and no major rivers in the Ecoregion.

Vegetation

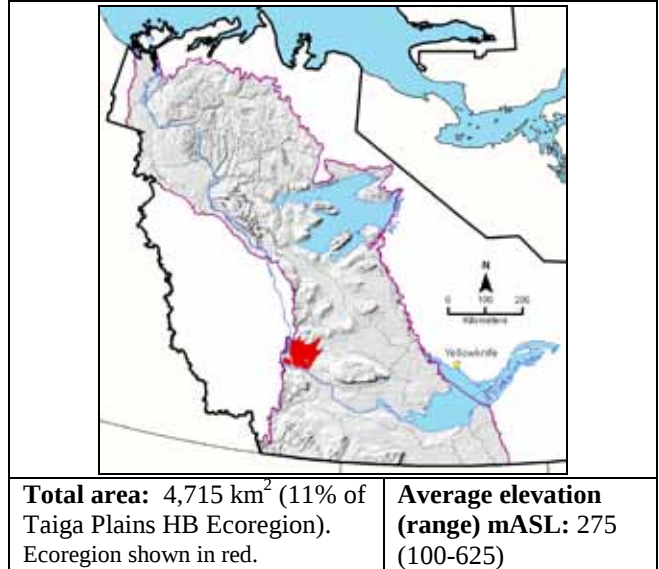
Stunted black spruce forests with Labrador tea-feathermoss understories, black spruce bogs, horizontal fens, and peat plateaus are widespread on wet, poorly-drained sites. Warmer and better drained slopes, hummocky and ridged landforms, and coarse-textured materials are sites where more vigorous and diverse mixed-wood, deciduous and conifer stands are locally abundant. Elsewhere, upland forests are restricted to relatively small areas. Black spruce forests, bogs and peat plateaus are more extensive than in the Taiga Plains MB Ecoregion. Northern ribbed fen and horizontal fen development is also different between these two Level III ecoregions; plant growth is not as vigorous and larch is less common on fens in the Taiga Plains HB Ecoregion.

3.3.3.1 Ebbutt Upland HB Ecoregion

Overview: *The Ebbutt Upland HB Ecoregion includes several prominent hills with relatively tall and diverse mixed-wood forests on the slopes and a central gently domed plateau covered by slow-growing black spruce forests and peat plateaus.*

Summary:

- South and west slopes with relatively tall and diverse mixed-wood forests.
- Level to gently sloping, poorly-drained areas with more open and stunted black spruce-shrub forests and peat plateaus.



General Description

The Ebbutt Upland HB Ecoregion includes gently to steeply sloping terrain at elevations from 200 m ASL to 600 m ASL. It slopes gently up to the north and east from the South Mackenzie Plain MB Ecoregion. Its eastern extent is defined by the poorly-drained expanse of burned peat plateaus that typifies the Bulmer Lake LS Ecoregion, and its northern boundary is the generally higher-elevation and colder Blackwater Upland LS Ecoregion. Gently sloping and undulating till plains surround three prominent hills; there is also an outlying smaller hill to the west of the main ecoregion unit. Tall and diverse mixed-wood and deciduous stands occupy south and west facing slopes; slumping occurs on steep terrain on the upper slopes of the hills. The central part of the Ecoregion is a gently domed plateau forested by wet black spruce stands with shrubby understories; peat plateaus with large collapse scars are common and these features together with poor spruce growth on slopes are indicative of the cooler climate. The Ebbutt Hills generate convective summer storms, and rainfall amounts are likely higher than in the surrounding lowland terrain (Klock *et al.* 2000).

Geology and Geomorphology

Horizontally bedded Cretaceous shales underlie the Ebbutt Hills. Till is the dominant surficial landform, and is gently undulating and sloping with some ridged areas. Slope failures are common particularly on the upper slopes of the highest hill to the south and along parts of the Willowlake River; springs and seeps occur in places. Peatlands overlie till materials to varying depths in the gently sloping bowl between the hills and on the hilltops. Coarse-textured glacio-fluvial materials occur in pockets mainly in the northwest part of the Ecoregion. Permafrost is discontinuous but locally extensive in the bowl and on the hilltops, occurring mainly as peat plateaus.

Soils

Fine-textured Luvisolic and Brunisolic soils are associated with conifer, mixed-wood and aspen stands on the slopes; colluvial deposits (i.e., slump areas) have Regosolic soils. The central bowl-shaped area is imperfectly- to poorly-drained, and Gleysols or Gleysolic subgroups of mineral Cryosols and Organic soils are the dominant soil types along with Organic Cryosols under peat plateaus.

Vegetation

Vegetation in the Ebbutt Upland HB Ecoregion varies with aspect, slope position, and parent material. On the gentle southerly and westerly slopes adjacent to the Mackenzie River and along the steeper slopes of the hills and the Willowlake River valley, relatively tall and dense trembling aspen, mixed-wood and white spruce stands with diverse and vigorous understories including low-bush cranberry and prickly rose occur on moderately well-drained soils. On the undulating plain between the hills, slow-growing closed black spruce-low shrub communities are widespread on imperfectly- to poorly-drained sites; peat plateaus that include open black spruce-lichen forests and large, sedge and peat-dominated collapse scars are common. Jack pine stands occur on sandy glacio-fluvial deposits in the northwest part of the Ecoregion.

Water and Wetlands

The Willowlake River carves a broad, deep valley through the northern part of the Ecoregion. Numerous small intermittent and permanent streams flow off the hillsides. Peat plateaus are the most common wetland type; spring fens occur along the slopes of the major hill systems.

Notable Features

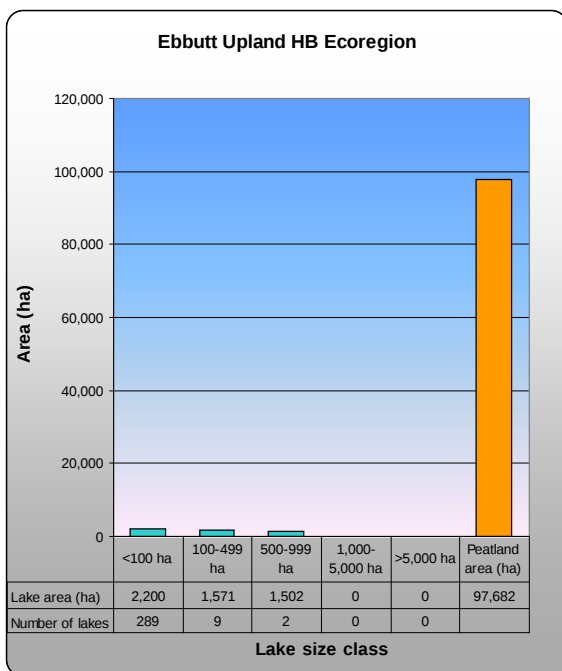
The south and west slopes of the Ebbutt Upland HB Ecoregion are probably the most northerly occurrence of extensive, relatively tall and diverse boreal mixed-wood stands in the Taiga Plains.



Tall, diverse white spruce and trembling aspen stands cover the southwest slope of one of three major hills in the Ebbutt Upland HB Ecoregion.



A poorly-drained black spruce – peat plateau complex dominates the central gently domed plateau of the Ecoregion.



Proportion of Ecoregion occupied by lakes: 1%
Proportion of Ecoregion occupied by bogs and fens: 21%



Groundwater seepage together with south-facing aspects supports good growth of mixed-wood forests on the slopes and gives rise to this mossy spring, midslope on the most southerly hill within the Ecoregion.

3.3.3.2 Horn Plain HB Ecoregion

Overview: *The Horn Plain HB Ecoregion is a gently sloping, generally wet plain with a mix of open, slow growing black spruce forests and patterned fens, patchy mixed-wood and jack pine growth, and peat plateaus in the north.*

Summary:

- Gently sloping plain.
- Mixed spruce forests and patterned fens on wet, poorly-drained soils across most of the Ecoregion.
- Jack pine and mixed-wood forests where drainage is better and along the southern border.
- Peat plateaus are common in the north.



Total area: 2,061 km² (5% of Taiga Plains HB Ecoregion).
Ecoregion shown in red.

Average elevation (range) mASL: 250 (125-400)

General Description

The Horn Plain HB Ecoregion, at the base of the Horn Plateau, slopes gently south toward the Mackenzie River. The colder Bulmer Plain Low Subarctic (LS) and Horn Slopes LS Ecoregions lie to the north, and the warmer South Mackenzie Plain MB and Horn Slopes MB Ecoregions to the south and east. Till plains, frequently mantled by organic veneers and blankets, are the dominant landform; open, slow growing forests of black and white spruce grow on very moist to wet sites. Scattered pockets of coarse-textured glacio-fluvial deposits provide adequate sites for jack pine and trembling aspen stands. Patterned fens occur on the slopes; along the northern border, peat plateaus are extensive. This Ecoregion is distinct from the Ebbutt Upland HB Ecoregion to the west and the Horn Slopes MB Ecoregion to the east because it has less pronounced terrain and generally less vigorous forest cover than the latter two Ecoregions.

Geology and Geomorphology

Fine-textured, imperfectly- to poorly-drained till deposits, frequently overlain by organic veneers and blankets, constitute the main materials on the gently sloping plain. Ancient meltwater channels and pockets of glacio-fluvial or washed till materials are scattered across the plain. Thicker organic deposits occur as peat plateaus along the northern border.

Soils

Gleysols and Organic soils are the most common soil type and are associated with wet soils across much of the Ecoregion. Brunisols occur on coarser-textured glacio-fluvial materials in association with jack pine and mixed-wood stands and Luvisols near the base of the slope in association with trembling aspen and mixed-wood stands. Organic Cryosols occur with peat plateaus.

Vegetation

The very gentle southerly slopes within the Horn Plain HB Ecoregion are probably seepage areas, receiving surface and groundwater inputs from the adjacent higher-elevation Horn Plateau and Ebbutt Hills. These conditions support short, open canopied mixed black spruce and white spruce stands with shrub and moss understories on wet mineral soils and organic veneers and blankets; patterned sedge fens with larch and black spruce occupy slightly wetter sites. Patches of slightly elevated till or coarse-textured glacio-fluvial materials provide better drainage, and are occupied by trembling aspen, mixed-wood and white spruce stands with shrubby understories including low-bush cranberry and prickly rose. Jack pine stands with sparse lichen and low shrub understories occur on dry, rapidly drained glacio-fluvial deposits. Relatively tall and dense white spruce stands grow only in narrow riparian zones. Near the base of the slope, trembling aspen and mixed-wood stands become more continuous. Peat plateaus with open stunted black spruce-northern Labrador tea-lichen stands and sedge-moss communities in the collapse scars are extensive in the northernmost part of this Ecoregion, where it adjoins the Bulmer Plain LS Ecoregion.

Water and Wetlands

There are no major rivers traversing the Ecoregion, and only a few small, shallow ponds. Wetlands are mainly northern ribbed fens and horizontal fens; peat plateaus become more common to the north. Small, circular thermokarst lakes have developed in places where permafrost has thawed. Groundwater seepage and surface water flows from the adjacent uplands are probably both important contributors to generally wet conditions.

Notable Features

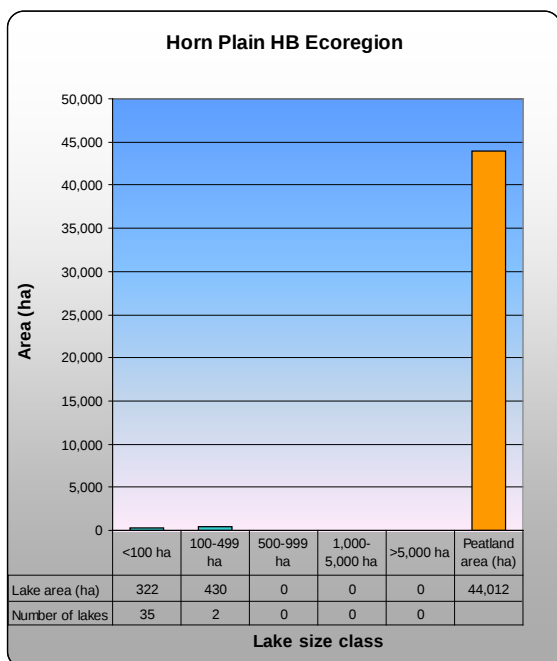
This Ecoregion is transitional between the colder permafrost-dominated landscapes to the north and the generally warmer lacustrine plains and slopes to the south and east.



Closed canopy black and white spruce forests with horizontal and northern ribbed fens and scattered trembling aspen and mixed-wood stands (the lighter green tones in upper half of image) are typical of landscapes in the Horn Plain HB Ecoregion. .



Relatively tall and diverse conifer-dominated forests are restricted mainly to narrow bands along stream channels; here, white spruce and willow shrublands parallel a sluggish creek.



Proportion of Ecoregion occupied by lakes: <1%
Proportion of Ecoregion occupied by bogs and fens: 21%



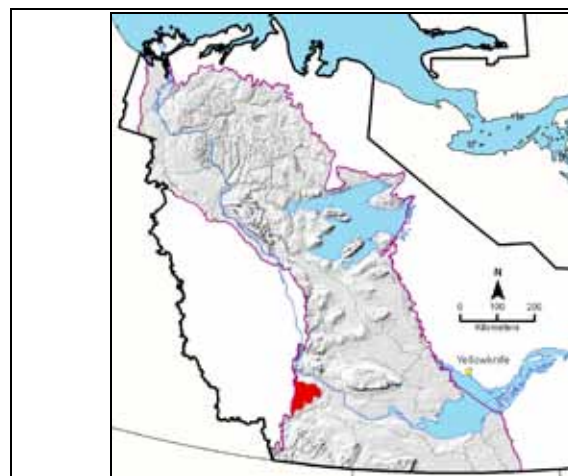
Northern ribbed fens with larch and black spruce occur on gentle slopes in the Ecoregion; the small ponds are probably the result of melting permafrost (thermokarst).

3.3.3.3 Sibbeston Upland HB Ecoregion

Overview: A complex of hills, slopes and low-lying areas create highly contrasting ecosystems, including diverse upland forests on warm, relatively well-drained slopes, wet, low-lying areas with black spruce stands, and extensive peat plateaus.

Summary:

- The Martin Hills, two smaller hills, and the lowermost slopes of the Nahanni Range provide locally warmer, better-drained conditions that favor upland forest development.
- Peat plateaus, horizontal fens and northern ribbed fens occupy large areas around Sibbeston Lake, and much of the remaining area is forested by black spruce-Labrador tea stands.



Total area: 3,846 km² (9% of Taiga Plains HB Ecoregion).
Ecoregion shown in red.

Average elevation (range) mASL: 400 (250-800)

General Description

The Sibbeston Upland HB Ecoregion occurs at elevations of about 300 to 600 m ASL. It is surrounded on the north, east and south by the lower-elevation South Mackenzie Plain MB Ecoregion; the lower colluvial slopes of the Nahanni Range form its western border. Vegetation community structure is affected by slope, local moisture and climate. The slopes of the Martin Hills and two other smaller hills to the south, the lower slopes below the Nahanni Range, and till ridges provide somewhat warmer, better drained sites and promote the development of deciduous, mixed-wood and coniferous stands interspersed with northern ribbed fens. Below the slopes on level to gently undulating wet till plains, shallow to deep peat deposits have developed. Open, slow-growing forests of black and white spruce occur on slightly sloping areas, and extensive peat plateaus and horizontal fens with black spruce occupy level terrain. The Martin Hills generate convective summer storms, and rainfall amounts are likely higher than in the surrounding lowland terrain (Klock *et al.* 2000).

Geology and Geomorphology

Fine-textured till deposits occur across the Ecoregion; there are striking glacial fluting features north of Sibbeston Lake. Slope failures are common and sometimes spectacular on the steeper slopes of the Martin Hills and the lower slopes of the Nahanni Range. Minor alluvial and glacio-fluvial deposits occur along narrow stream valleys.

Soils

On the warmer south facing slopes, Luvisols and Brunisols are associated with relatively vigorous upland forests and Regosols with recently slumped terrain. Cryosols occur with mineral soils over much of the area, Organic soils with fens, and Organic Cryosols with peat plateaus.

Vegetation

Vegetation growth is strongly influenced by slope, aspect and soil moisture within this Ecoregion. The gentle to moderate slopes of the Martin Hills and two other smaller hills to the south, and the east-facing slopes below the Nahanni Range are moderately well- to imperfectly-drained and relatively warm on easterly, southerly and westerly aspects. They support a mixture of trembling aspen, mixed-wood and white spruce forests; rich larch – sedge patterned fens occur in seepage areas on lower slope positions and in some places, extensive tall green alder and willow shrublands occur. On the surrounding lower-elevation areas, deciduous and coniferous forests including jack pine grow along the well-drained tops of parallel till ridges. Elsewhere, the water table is near the surface, and short, open-canopied black spruce stands with Labrador tea and moss understories grow on poorly-drained wet mineral soils and organic veneers and blankets. Deep peat deposits are extensive, and treed fens and peat plateaus are a dominant feature of the central and northern parts of this Ecoregion.

Water and Wetlands

Sibbeston, Little Doctor, Cli and Tsetso Lakes are the main waterbodies. Many intermittent streams flow off the hills and drain into Sibbeston Lake or into tributaries of the Liard and Mackenzie Rivers. Bogs forested by open, stunted black spruce on peat plateaus, collapse scar bogs, northern ribbed fens, and horizontal fens are common on level to gently undulating terrain throughout the Ecoregion.

Notable Features

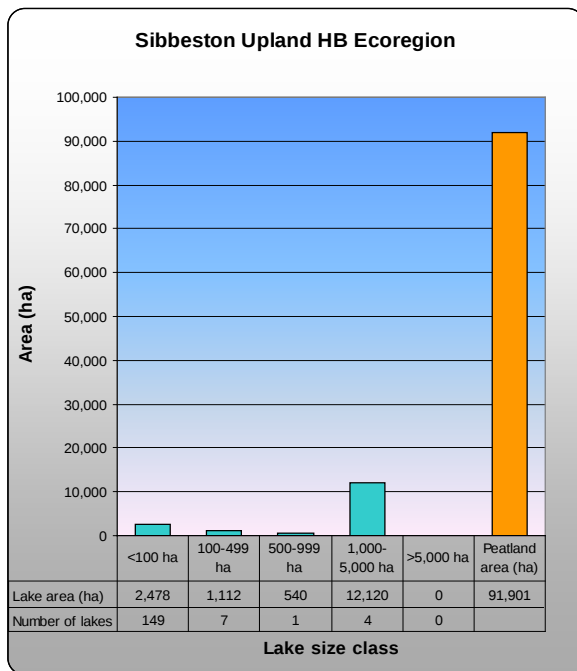
Northern pitcher plants, reported as rare in the Northwest Territories by McJannet *et al.* (1995), were found in collapse scars within peat plateaus near Sibbeston Lake during fieldwork in 2005.



Mixed-wood forests are dominant on the side slopes of the Martin Hills, the major hill system within the Sibbeston Upland HB Ecoregion. .



Tall, dense white spruce – trembling aspen – Alaska paper birch mixed-woods are typical of the north slope of the Martin Hills.



Proportion of Ecoregion occupied by lakes: 4%
Proportion of Ecoregion occupied by bogs and fens: 24%



Northern pitcher plants are reported as rare by McJannet *et al.* (1995), but this and other recent studies indicate that it may be widespread.

3.3.3.4 Trout Upland HB Ecoregion

Overview: Level to hilly till uplands with peat plateaus, black spruce bogs, and scattered upland forests on slopes and raised till features are characteristic of the Trout Upland HB Ecoregion.

Summary:

- Extensive peat plateaus at higher elevations, and bogs and nutrient-poor horizontal fens throughout.
- Deciduous, mixed-wood and conifer forests are restricted to slopes, locally elevated areas and stream courses.
- Lodgepole pine and pine hybrids occur at higher elevations.



Total area: 14,193 km² (34% of Taiga Plains HB Ecoregion).
Ecoregion shown in red.

Average elevation (range) mASL: 525 (275-800)

General Description

The Trout Upland HB Ecoregion occurs at elevations of 400 to 700 mASL. It is bordered on the west, north and east, respectively, by the lower-elevation Trout Upland MB, South Mackenzie Plain MB, and Tathlina Plain MB Ecoregions; the southern boundary is the Alberta – British Columbia border. A series of low hills above 600 mASL trending northwest to southeast occupy about a third of the Ecoregion; the remainder is a plain that gently slopes to the northeast. Till plains and ridges are mantled by peatlands over much of the Ecoregion, including the hills. Peat plateaus at higher elevations and bogs with open, stunted black spruce woodlands are characteristic peatland types throughout the Ecoregion. Deciduous, mixed-wood, white spruce and lodgepole pine stands or jack pine – lodgepole pine hybrid stands are found only as scattered patches on slopes and on hummocky or fluted till. The Trout Upland and Cameron Hills generate convective summer storms, and rainfall amounts are likely higher than in the surrounding lowland terrain (Klock *et al.* 2000).

Geology and Geomorphology

Fine-textured till deposits are the most common parent material, and are usually covered by organic veneers and blankets. Thick peat layers have accumulated over time on level areas and depressions. Glacial fluting is common on the hilltops. Numerous small meltwater channels run perpendicular to contour mainly along the northern third of the Ecoregion, minor alluvial deposits occur along small local streams.

Soils

Organic Cryosols, Organic soils and Gleysols are associated with peat plateaus, bogs and fens and are the most common peatland soil types. Brunisols are probably the most common mineral soil, occurring on fine- to coarse-textured parent materials.

Vegetation

Peat plateaus and their associated open black spruce – Labrador tea – lichen – moss plateau communities and sedge – moss collapse scar communities are widespread and characteristic of higher terrain in this Ecoregion. Short open-canopied wet black spruce – shrub forests, black spruce bogs, treed black spruce – larch fens and sedge fens are common throughout. Deciduous and mixed-wood forests are restricted to hill slopes or areas of local relief where moisture and temperature conditions are conducive to tree growth. White spruce grows well only in narrow belts immediately adjacent to stream drainages. Young lodgepole pine and hybrid lodgepole pine – jack pine stands, commonly with a black spruce component, are common on till parent materials at higher elevations.

Water and Wetlands

Trout, Trainor and Cormack Lakes are the main waterbodies. Many intermittent streams flow off the hills and into Trout Lake. Wetlands are common on level to gently undulating terrain throughout the Ecoregion, and are mainly bogs with open, stunted black spruce cover or sparsely forested horizontal fens.

Notable Features

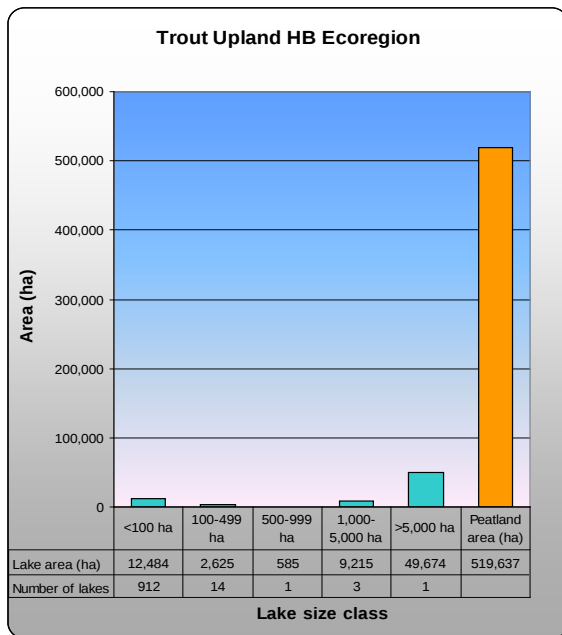
Veneer bogs, characteristic features of Low Subarctic climates that occur in the Cameron Plateau LS Ecoregion to the east, also occur within this Ecoregion on high, sloping terrain over areas too small to map at the ecoregion scale and indicate a transition to colder conditions at higher elevations.



Peat plateaus and bogs with scattered islands of deciduous and mixed-wood forest are characteristic of the Trout Upland HB Ecoregion.



In this oblique view of peat plateaus, the dark brown areas are burned bogs with Labrador tea and dwarf birch regeneration, the brownish-orange patches are collapse scars, and the green areas are sedge and shrub fens.



Proportion of Ecoregion occupied by lakes: 5%
Proportion of Ecoregion occupied by bogs and fens: 37%



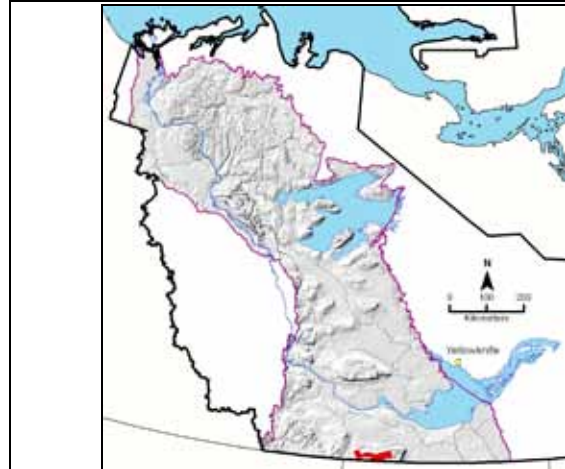
Late evening sun across the western part of the Ecoregion highlights glacial fluting patterns; deciduous forests occupy the elevated flutes and black spruce bogs occupy the interflute depressions. White spruce stands grow well on well-drained warm sites, such as the stream terraces in the foreground.

3.3.3.5 Cameron Upland HB Ecoregion

Overview: *Wet, level to gently sloping terrain with peat plateaus and fens, and lodgepole pine stands on hummocky till characterize this small, relatively high-elevation ecoregion atop the Cameron Hills.*

Summary:

- Level, gently sloping and hummocky till with organic veneers and blankets in level to gently sloping areas.
- Peat plateaus and sloping fens on level to sloping peatlands; and lodgepole pine or pine hybrids on hummocky and ridged till.



Total area: 1,449 km² (3% of Taiga Plains HB Ecoregion).
Ecoregion shown in red.

Average elevation (range) mASL: 625 (525-800)

General Description

The Cameron Upland HB Ecoregion, the smallest Level IV ecoregion within the Level III Taiga Plains HB Ecoregion, includes level to gently sloping areas at elevations mainly above 600 m in the Cameron Hills. It is bordered on the north and west by the Cameron Slopes MB Ecoregion and on the east and south by the Cameron Plateau LS Ecoregion. Peatlands frequently blanket fine-textured till materials, and hummocky tills in the western portion create a knob-and-kettle landscape with many pothole lakes and wetlands. Lodgepole pine stands or jack pine – lodgepole pine hybrid stands occur on well- to imperfectly-drained sites; trembling aspen stands are occasional. Wet, sometimes intricately patterned northern ribbed fens, and peat plateaus with black spruce and lichen cover are dominant features of this Ecoregion. Summer thunderstorms are more frequent and rainfall amounts are likely higher in the Cameron Hills than in the surrounding lowland terrain (Klock *et al.* 2000).

Geology and Geomorphology

Fine-textured till parent materials occur as gently sloping plains, hummocky knob and kettle deposits, ridges and flutings. Organic veneers and blankets are dominant on level to gently sloping areas. Coarse-textured level to hummocky glacio-fluvial deposits occur in scattered pockets. Permafrost is discontinuous but locally extensive, occurring mainly as peat plateaus.

Soils

Brunisolic and Luvisolic soils are probably common on well- to moderately well-drained hummocky and ridged till deposits. Gleysols and gleyed subgroups of other soil types are likely typical of sloping tills that are not blanketed by peat deposits. Organic soils are associated with patterned and sloping fens, and Organic Cryosols with peat plateaus.

Vegetation

Vegetation in the Cameron Upland HB Ecoregion is probably very similar to that described for the adjacent Upper Boreal Highlands Natural Subregion in Alberta. Wetlands are extensive and include patterned sedge fens, sloping black spruce fens, and bogs forested by open black spruce-northern Labrador tea-peat moss-lichen communities and underlain by permafrost (peat plateaus). Upland forests are mainly young to mid-successional lodgepole pine – jack pine hybrids or pure lodgepole pine at the highest elevations, with black spruce as a frequent and sometimes dominant associate. Forest understories are typically species-poor, and include common and northern Labrador tea, mountain cranberry, feathermosses and lichens (Natural Regions Committee 2006). Trembling aspen is uncommon, occurring on hummocky till or on stream valley walls.

Water and Wetlands

There are no named permanent water bodies in this Ecoregion; many small pothole lakes occur in areas of hummocky till. Deeply incised gullies mark the headwaters of tributaries to Kakisa and Cameron Rivers. Bogs on peat plateaus and associated collapse scar bogs are the most common wetland type; northern ribbed fens with closely spaced, fine strings are an interesting feature of this Ecoregion.

Notable Features

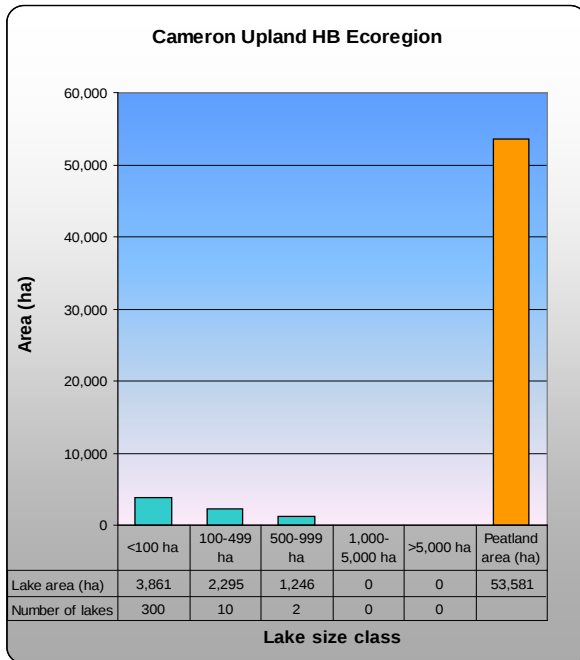
Lodgepole pine and lodgepole pine-jack pine hybrids reach their northern distribution limits in the Taiga Plains within the Northwest Territories, where they occur only at higher elevations in the Cameron Upland and Trout Upland.



The Cameron Upland HB Ecoregion and the deeply incised Cameron River valley occupy the foreground, with the lower-elevation Tathlina Plain MB Ecoregion in the background. White spruce, scattered trembling aspen and lodgepole pine – jack pine hybrids occur here on well-drained valley slopes.



Peat plateaus (grayish-green) with large brownish-yellow collapse scars are typical of about 40 percent of the Ecoregion. The linear feature is a seismic line used for petroleum exploration.



Proportion of Ecoregion occupied by lakes: 5%
Proportion of Ecoregion occupied by bogs and fens: 37%



Hummocky till with lodgepole pine and lodgepole pine-jack pine hybrids occupies the western part of the Ecoregion in this northwest view; Dogface Lake is in the upper image.

3.3.3.6 Great Slave Plain HB Ecoregion

Overview: *Marl ponds, sinkholes, coarse-textured beach ridges, and extensive jack pine and white spruce forests characterize the Great Slave Plain HB Ecoregion.*

Summary:

- Dry, well-drained and frequently burned washed tills forested by extensive young jack pine stands and slow growing white spruce.
- Limestone exposures, karst topography, and shallow marl ponds.



Total area: 15,838 km² (38% of Taiga Plains HB Ecoregion).
Ecoregion shown in red.

Average elevation (range) mASL: 200 (125-300)

General Description

The Great Slave Plain HB Ecoregion is the largest Level IV ecoregion within the Level III Taiga Plains HB Ecoregion. It is bounded on the east by the Level II Taiga Shield Ecoregion, on the south by Great Slave Lake, and on the north and west by the nearly level Bulmer Lake LS and Great Slave Lowland MB Ecoregions. Its regional topography is gently dome-shaped. Limestone escarpments, thousands of marl ponds and associated wetlands, sinkholes (karst topography), and beach ridges with intricate scroll patterns make this Ecoregion unique within the Taiga Plains HB Ecoregion. Young jack pine and white spruce forests cover most of the northern half; deciduous and mixed-wood forests become more common to the south. Permafrost features (peat plateaus) occur along the western boundary.

Geology and Geomorphology

Horizontally bedded dolomite, limestone and sandstone of Cambrian to Devonian age underlie this Ecoregion. Scalloped escarpments parallel to Great Slave Lake are evidence of wave erosion by glacial Lake McConnell. Where the limestone has dissolved, areas of karst topography have developed, especially in the northeastern portion. Solution waters are high in dissolved solids, and white calcium carbonate deposits form on the bottom and along the shorelines of shallow ponds. Water-washed gravelly and highly calcareous till deposits overlying bedrock form a low, dry north – south ridge through the centre of the Ecoregion; on this surface, intricately shaped, concentric beach ridges formed after the last glaciation as glacial Lake McConnell withdrew and the land surface rose following removal of thick glacial ice sheets. Eolian deposits occur inland from Lonely Bay on Great Slave Lake.

Soils

Coarse-textured Brunisolic soils occur throughout the Ecoregion. Gleysols occur adjacent to ponds. Deep peat deposits are uncommon.

Vegetation

The Great Slave Plain HB Ecoregion is characterized by coarse-textured and rapidly drained glacial till and highly calcareous soils. Extensive pure jack pine stands with sparse common bearberry and lichen understories occupy many frequently burned areas. White spruce is common throughout the area with similar understory associates; it generally has narrow crowns and only grows well adjacent to small streams and wetlands. Trembling aspen becomes more common toward the south near Great Slave Lake. Some of the washed till deposits on the long, low ridge that runs north to south through the centre of the Ecoregion are too dry to support tree growth, and sparse communities of common bearberry and shrubby cinquefoil grow on calcareous gravels and coarse sands. Small horizontal fens, typically sedge-dominated, occur together with calcareous ponds and in aggregate cover about half the Ecoregion. Peat plateaus are uncommon.

Water and Wetlands

There are no major rivers traversing the Ecoregion. Chedabucto, Bras d'Or and Birch Lakes are the three largest water bodies, and are shallow. Thousands of small, very shallow permanent and ephemeral marl ponds dot the landscape on either side of the low north – south ridge, which has virtually no standing water. Calcium-rich net fens surrounding these ponds cover extensive areas. Permafrost-influenced wetlands are uncommon, occurring mainly along the western boundary.

Notable Features

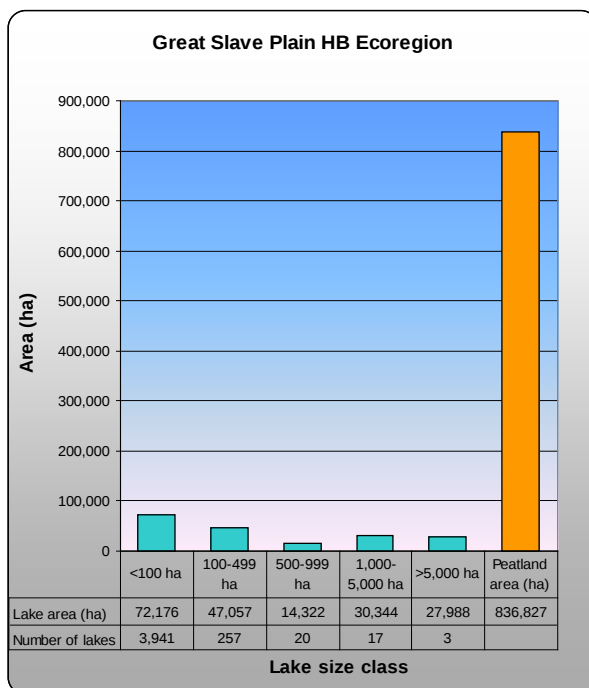
This Ecoregion is unique within the Level III Taiga Plains HB Ecoregion; its surface and subsurface geology create a mosaic of very dry pine-dominated uplands and calcareous ponds and wetlands, and the convoluted beach ridge patterns are rarely seen elsewhere in the Taiga Plains.



A complex of jack pine forests (light green tones, mid-image) on well-drained sandy and gravelly uplands and calcareous ponds and fens in low-lying areas is common in the Great Slave Plain HB Upland.



The central ridge through this Ecoregion is very well-drained. These intricate scrollwork patterns are old beach ridges consisting of coarse gravelly deposits and vegetated by open jack pine stands with sparse understories.



Proportion of Ecoregion occupied by lakes: 12%
Proportion of Ecoregion occupied by bogs and fens: 53%



Dwarf shrubs such as common bearberry and shrubby cinquefoil are the dominant ground vegetation on the highly calcareous gravels of the beach ridges in the top right-hand image.

3.3.4 TAIGA PLAINS MID-BOREAL (MB) ECOREGION



Mixed-wood forests of aspen, balsam poplar, white spruce and occasionally paper birch, containing diverse herb and shrub understories, are typical of early to mid-successional landscapes in the Taiga Plains Mid-Boreal (MB) Ecoregion. White spruce, herbs and feathermosses characterize late-successional stands. Dense to open stands of jack pine, often in combination with shorter, slower-growing black spruce, occur extensively on dry, sandy to gravelly sites. Expanses of flat, poorly drained terrain result in extensive bog and fen development throughout the Ecoregion. Black spruce, larch (in fens), Labrador tea, mountain cranberry, leatherleaf, sedges, mosses and reindeer lichen dominate these cold, wet, poorly drained sites. Lush sedge, grass and willow fens associated with stream floodplains and lakeshores are common. Brunisols and Luvisols are typical upland soils; Organic soils, Organic Cryosols and Gleysols are associated with wetlands.



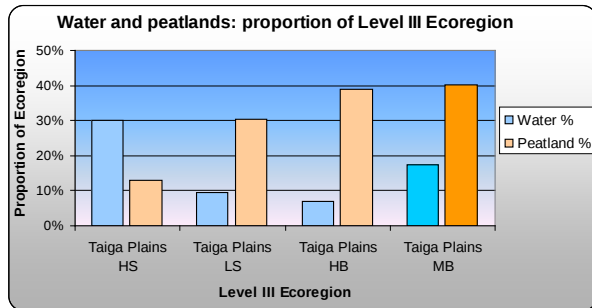
Diverse stands of white spruce, aspen and balsam poplar are common on well-drained sites within the Taiga Plains MB Ecoregion. Extensive areas of highly productive, large-diameter mixed-wood stands are common in the Liard Plain and Liard Upland, where poplars may grow 30 meters tall in less than 100 years. Understory vegetation is highly diverse, with lush and vigorous low-bush cranberry, prickly rose, red osier dogwood, dwarf red raspberry, meadow-horsetail and other shrubs and herbs.



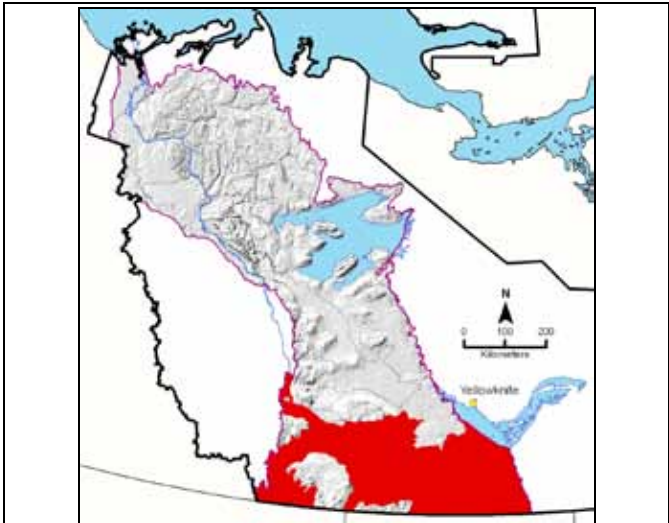
Prickly rose (*Rosa acicularis*), a small- to medium-sized shrub with a thorny stem, is common and widespread throughout the Taiga Plains and particularly in the Taiga Plains MB Ecoregion. It favours open forests, riverbanks, clearings and burns.

3.3.4 TAIGA PLAINS MID-BOREAL (MB) ECOREGION

Overview: *The Taiga Plains MB Ecoregion has the mildest climatic regime in the Taiga Plains. Extensive till and lacustrine plains, organic blankets and alluvial deposits are typical landforms. Mixed-wood and jack pine stands, large fens and bogs with discontinuous permafrost are characteristic vegetation and wetland types.*



(water proportion includes part of Great Slave Lake)



Total area: 106,876 km² (22% of Taiga Plains).
Ecoregion shown in red.

General Description

The Level III Taiga Plains MB Ecoregion occurs across the southern third of the Taiga Plains and includes 11 Level IV Ecoregions, part of Great Slave Lake, and the southern reaches of the Mackenzie River. Much of the area was covered by glacial Lake McConnell, and the present-day landscapes are shaped by glacio-lacustrine and till deposits that have been reworked in places by fluvial, eolian, and mass wasting processes. The cold boreal climates and wet conditions in low-lying poorly-drained areas retard organic matter decomposition, and peatlands of varying thickness occur over extensive areas as patterned and horizontal fens, treed bogs, and peat plateaus, the latter on permanently frozen organic soils. On better-drained upland sites, the interplay of parent materials and active processes such as fire and alluvial deposition results in a mix of deciduous, mixed-wood and coniferous forests.

Climate

The Taiga Plains MB Ecoregion is classified as having a Mid-Boreal climate (Ecoregions Working Group 1989) and enjoys the mildest conditions in the Northwest Territories. There are a few stations from which climate models (Agriculture and Agri-Food Canada 1997) have been developed. These models provide the following statistics. The mean annual temperature ranges from -2.0 to -5.5°C. The mean temperature in January, the coldest month, ranges from -25.5 to -28°C, and from 15.5 to 16.5°C in July, the warmest month. Mean annual precipitation is between 310 and 410 mm, with the wettest period in June through August and the driest period in December through April; about 55 percent falls as rain and 45 percent as snow. The mean annual daily solar input (refer to Section 1.4.1 for further explanation) ranges between 10.0 and 11.0 mJ/m²/day, with low values of 0.5 to 1.5 mJ/m²/day in December and highs of 21.5 to 22.0 mJ/m²/day in June.

Topography, geology, soils, and hydrology

Most of the Taiga Plains MB Ecoregion is level to gently undulating, but the lower elevation portions of three major hill systems— the Cameron Hills, the Trout Upland, and the Horn Plateau – are partly included. On the plains and lowlands, extensive lacustrine and till deposits are often blanketed by peatlands that have developed since glacial times. Fluvial deposits occur along the Liard, Slave and Mackenzie Rivers. Pronounced slopes of major hill systems are ecologically distinct because of aspect, hydrology and mass movements. Bedrock has a significant effect on landscapes and vegetation in places. Major watercourses include the Mackenzie, Liard, Slave and Hay Rivers; the main lakes are Great Slave, Buffalo, Kakisa and Tathlina Lakes.

Vegetation

Productive mixed-wood, deciduous and coniferous stands occur on imperfectly- to rapidly drained mineral soils and form large continuous forests particularly in areas where fluvial processes are dominant, such as the Slave, Mackenzie and Liard Rivers. Jack pine stands are common after fire on coarse-textured soils. Elsewhere, upland forests occur less extensively on undulating or sloping terrain where drainage and soil conditions support their development. On level landscapes, water tables are usually high and organic materials have developed to varying depths; fens with black spruce, larch, dwarf birch, sedges and mosses are widespread, and peat plateaus (complexes of open, stunted black spruce – lichen forest and wet sedge – moss dominated collapse scars) are common.

3.3.4.1 South Mackenzie Plain MB Ecoregion

Overview: Level to gently undulating fine-textured lacustrine and alluvial deposits with a patchwork of mixed-wood, deciduous and coniferous forests interspersed with fens are typical landscapes of the South Mackenzie Plain MB Ecoregion.

Summary:

- Mainly fine-textured level to gently undulating lacustrine deposits, with some coarser-textured alluvial and eolian deposits.
- Not as wet as the Great Slave Lowland MB Ecoregion to the east; wetlands are less extensive.
- A mix of trembling aspen, white spruce and jack pine stands on uplands, with black spruce forests and northern ribbed fens or horizontal fens on wetter sites; forests are more vigorous than those of adjacent ecoregions to the east and north.

General Description

The South Mackenzie Plain MB Ecoregion parallels the Liard and Mackenzie Rivers in a broad belt between the Horn Plateau and the Trout Upland MB Ecoregion, narrowing toward its northern boundary at the south tip of the Franklin Mountains and surrounding the Sibbeston Upland HB Ecoregion to the west. Its eastern boundary with the Great Slave Lowland HB Ecoregion is indistinct, but the South Mackenzie Plain HB Ecoregion has somewhat more local relief, less extensive wetlands, and more vigorous upland forests. Much of this Ecoregion is a level to gently undulating lacustrine plain on which a complex of northern ribbed fens and horizontal fens has developed in wet depressions, and coniferous or mixed-wood stands on slightly higher uplands. Pure jack pine and trembling aspen stands develop on coarser-textured eolian and alluvial materials.

Geology and Geomorphology

Much of this Ecoregion was flooded by glacial Lake McConnell, and level to gently undulating fine-textured lacustrine plains are the most common landform. Extensive variably-textured alluvial terraces occur along the Liard and Mackenzie Rivers. Coarse-textured eolian deposits occur throughout the Ecoregion, with some large dune fields near Fort Simpson. There are minor deposits of fine-textured till.

Soils

Corridor studies for the Mackenzie Gas Pipeline impact assessment (Mackenzie Gas Project, 2004) indicate that Eutric Brunisols are the most common upland soil type, occurring in association with jack pine and mixed-wood stands on rapidly to moderately drained sites. Gleysols and Organic soils are associated with wet forests and fens. Organic Cryosols are associated with peat plateaus.



Total area: 16,398 km² (15.3% of Taiga Plains MB Ecoregion). Ecoregion shown in red.

Average elevation (range) mASL: 225 (150-400)

Vegetation

About half of this Ecoregion is wet and poorly-drained. The dominant vegetation type is black spruce with an understory of common Labrador tea and feathermosses on very moist to wet, poorly-drained sites, according to studies from the Mackenzie Gas Pipeline impact assessment (Mackenzie Gas Project, 2004). Upland sites having relatively good drainage support mixed trembling aspen – white spruce – jack pine stands with green alder, prickly rose, Canada buffaloberry and low-bush cranberry understories. Jack pine stands with an understory of green alder, prickly rose and lichen develop on coarse-textured eolian and glacio-fluvial deposits. Although horizontal fens and northern ribbed fens are common, they are not as extensive as in the adjacent Great Slave Lowland HB Ecoregion. Black spruce – lichen – cloudberry stands associated with peat plateaus are present throughout the Ecoregion but cover a relatively small proportion of its area.

Water and Wetlands

The Mackenzie and Liard Rivers are the dominant watercourses; Jean Marie River is a tributary of the Mackenzie River. Antoine Lake is the largest named standing water body. Peatlands occur throughout the Ecoregion and are typically northern ribbed fens or horizontal fens, with some peat plateaus.

Notable Features

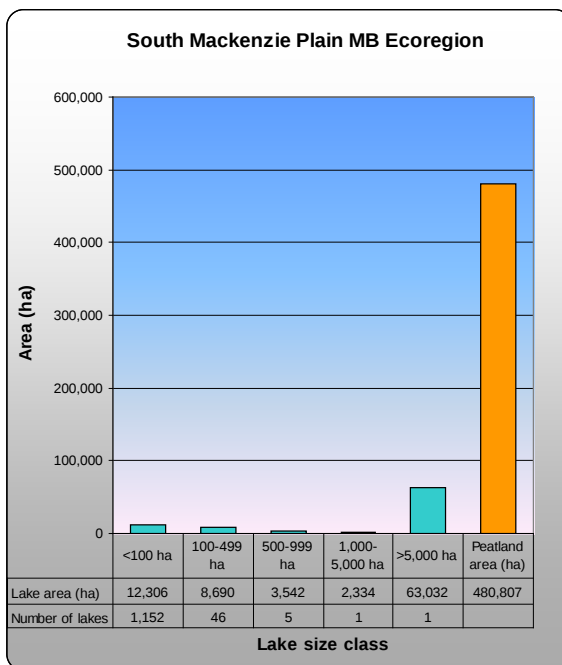
Overall, forest productivity on upland sites in this Ecoregion appears to be higher than in adjacent ecoregions, with the exception of the Liard Plain MB Ecoregion.



Part of the South Mackenzie Plain MB Ecoregion is a level to gently undulating lacustrine plain with mixed-wood and deciduous forests on uplands (lighter green tones), black spruce fens (dark green tones) and shrubby sedge fens surrounding shallow lakes.



This image shows typical mixed-wood and trembling aspen forests on uplands, with white spruce – black spruce forests in lower, slightly wetter positions and horizontal fens with black spruce cover in depressions.



Proportion of Ecoregion occupied by lakes: 5%
Proportion of Ecoregion occupied by bogs and fens: 29%



These linear hummocks are wind-deposited (eolian) dry sands on which jack pine stands with sparse understories grow; ponds surrounded by horizontal fens dominated by sedges and shrubs occur between the sand hummocks.

3.3.4.2 Liard Plain MB Ecoregion

Overview: *The Liard Plain MB Ecoregion, together with the Liard Upland MB Ecoregion, experiences the warmest climatic conditions in the Northwest Territories. Very productive deciduous, mixed-wood and conifer forests grow on the broad low-lying alluvial terraces of the Liard River.*

Summary:

- Warm climate, with Chinook-like winds relatively common in winter
- Productive plant communities on rich alluvial flats and lacustrine deposits



Total area: 3,364 km² (3.1% of Taiga Plains MB Ecoregion).
Ecoregion shown in red.

Average elevation (range) mASL: 250 (150-650)

General Description

The Liard Plain MB Ecoregion includes the broad flat alluvial plains of the Liard River from just south of Fort Liard north to the Nahanni Butte area along the Blackstone River; it is bounded on the east by hills of the Trout Upland, and on the west by the Kotanalee Range. The Liard River flows in broad loops across the plain, depositing silty soils in wide scroll-like patterns. Ponds and rich shrubby or herbaceous wetlands are common in low-lying areas, in abandoned channels, and in gently undulating terrain along the lower slopes of the adjacent uplands. This Ecoregion has the warmest climates of any area in the Northwest Territories, and commonly experiences Chinook-like winds in winter. Warm climates and rich alluvial deposits support the most productive forests in the Northwest Territories, with tree heights exceeding 30 m in older stands.

Geology and Geomorphology

The most important present-day influence on this Ecoregion is the Liard River. Impressive meander scrolls have developed on the floodplain, and indicate an environment of active deposition and change. Together the river and its floodplains occupy about half the area. To the east, adjacent to the Trout Uplands, gently undulating lacustrine deposits and lacustrine veneers over till occur over the remaining half of the Ecoregion.

Soils

Active deposition by the Liard River means that soils in the vicinity of the river are very young (Regosolic); they are often poorly-drained as well. Gleysols and Luvisols occur with lacustrine and till materials; Organic soils occur under wetlands. Permafrost is uncommon.

Vegetation

Upland vegetation of the Liard Plain MB Ecoregion reflects the influences of warm climates and moist, rich site conditions. Willow shrublands occur in belts on recently flooded areas beside the Liard River, young trembling aspen – balsam poplar forests on somewhat drier alluvial terraces, and extensive, mature stands of trembling aspen, balsam poplar, and white spruce on alluvial terraces that are not regularly flooded or on undulating terrain to the east. Forest understories are usually lush and diverse, with low-bush cranberry, prickly rose, red osier dogwood, dwarf red raspberry, meadow-horsetail and other herbs. Rich willow – sedge fens occupy low-lying areas on the alluvial plains and undulating uplands to the east and south.

Water and Wetlands

Water covers only about five percent of the total area. The Liard River is the dominant water feature, and numerous linear or crescent-shaped ponds, channel marshes, channel fens and horizontal fens occupy low-lying areas and abandoned river channels on the alluvial flats. Small permanent and intermittent streams drain into the Liard Plain MB Ecoregion from the adjacent Trout Upland MB Ecoregion, and small shallow lakes occur in undulating areas, mainly in the south half of the Ecoregion.

Notable Features

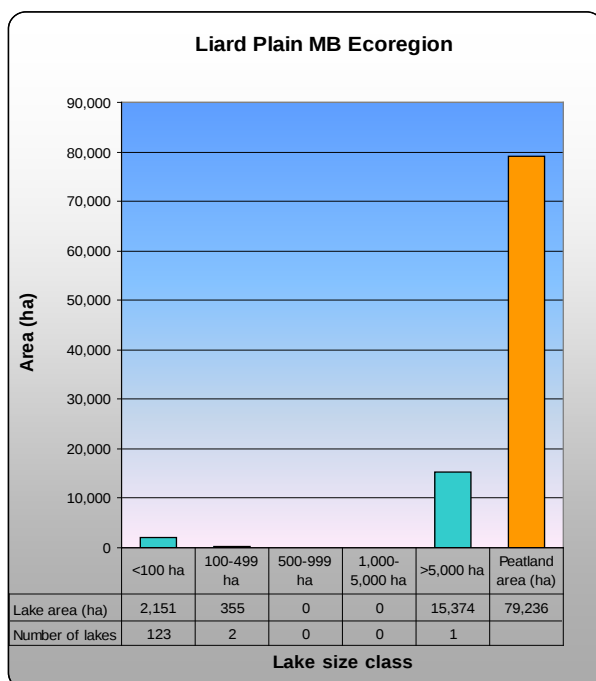
The rich fluvial terraces support productive communities and probably support some relatively uncommon plant and animal species. Along with the Liard Upland MB Ecoregion, this area is casually referred to as the “Banana Belt” of the Northwest Territories.



The Liard River (left), meander scrolls (curved features produced by river migration across the floodplain), and a mix of wet fens (light green) and productive mixed-wood floodplain forests (darker green and grayish tones) are dominant landscape features of the Liard Plain MB Ecoregion near Nahanni Butte.



Highly productive trembling aspen, balsam poplar, and white spruce stands occur along with scattered paper birch on floodplain terraces of the Liard River.



Proportion of Ecoregion occupied by lakes: 5%
Proportion of Ecoregion occupied by bogs and fens: 24%



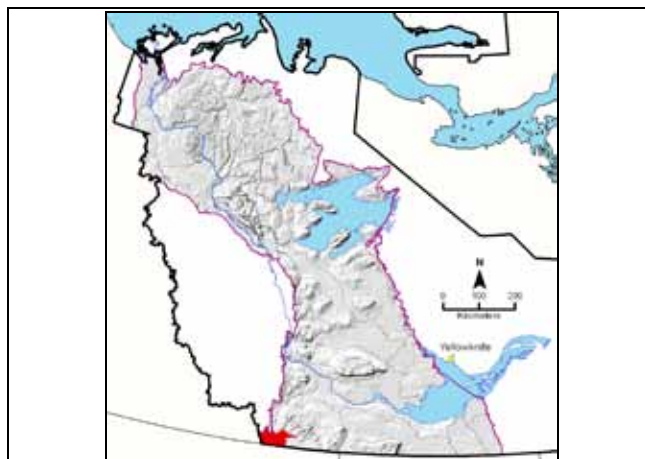
A former channel of the Liard River is now occupied by a sluggish muddy creek, channel fens and marshes and is bordered by productive mixed-wood floodplain forests. The bright green tones are horsetail (*Equisetum* spp.) stands.

3.3.4.3 Liard Upland MB Ecoregion

Overview: *The Liard Upland MB Ecoregion is the most southwesterly ecoregion in the Northwest Territories. Gently undulating to rolling landscapes support productive mixed-wood forests.*

Summary:

- Warm climate, with Chinook-like winds relatively common in winter.
- Productive tree growth on lacustrine and till deposits.



Total area: 2,933 km² (2.7% of Taiga Plains MB Ecoregion).
Ecoregion shown in red.

Average elevation (range) mASL: 350 (250-400)

General Description

The Liard Upland MB Ecoregion includes the undulating to rolling upland areas south of the Liard Plains MB Ecoregion. It is bounded on the east by the Trout Upland and on the west by the Kotanalee Range. The Liard River occupies a relatively narrow channel. Highly productive mixed-wood forests occur along the Liard River and its tributaries and on the surrounding uplands. This Ecoregion, like the Liard Plains MB Ecoregion, is the warmest in the Northwest Territories, is influenced by the adjacent mountain ranges, and experiences Chinook-like winds (Klock *et al.* 2000) in winter.

Geology and Geomorphology

Fluvial processes dominate in the Liard River Valley and its tributaries, where alluvial terraces and large islands have developed. Elsewhere, undulating to rolling till is the dominant landform. Slumping occurs occasionally in places where the Liard River and its tributaries have cut relatively deep, steep-sided valleys.

Soils

Active deposition and high water tables along the Liard River and its tributaries produces Regosolic and Gleysolic soils on the terraces and banks; Regosols are also associated with areas of slope failure. Across most of the area, Luvisols and Brunisols occur with till materials; Gleysols and Organic soils occur under wetlands. Permafrost is uncommon.

Vegetation

Highly productive deciduous and mixed-wood stands are the dominant vegetation type. Trembling aspen, balsam poplar, and white spruce may grow to 30 m or more in less than a hundred years, and understories are usually lush and diverse, with low-bush cranberry, prickly rose, red osier dogwood, dwarf red raspberry, meadow-horsetail and other herbs. Wetlands are less common in this Ecoregion than in the adjacent Liard Plain MB Ecoregion, and are typically rich, wet horizontal fens vegetated by sparse trees, willows and sedges.

Water and Wetlands

Water covers less than five percent of the total area; the Liard, Petitot, and Muskeg Rivers are the main streams, and Fisherman and Bovie Lakes are the largest standing water bodies. Wetlands are limited in area by the undulating to rolling terrain.

Notable Features

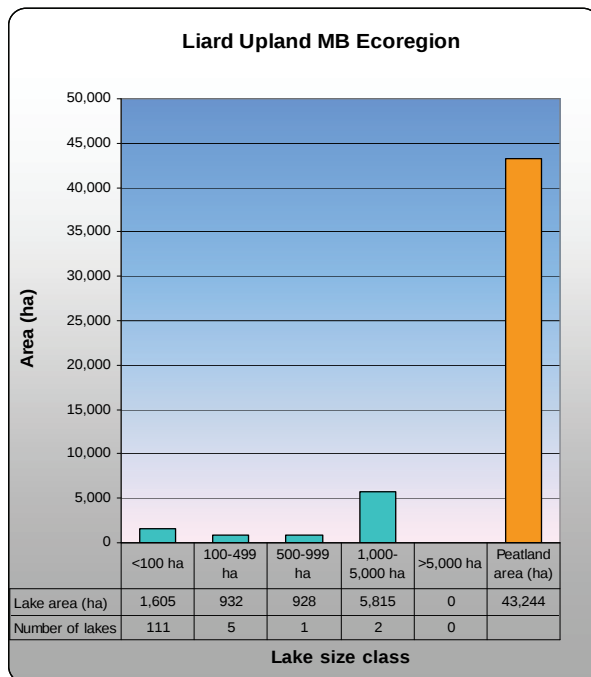
The varied landscapes in this Ecoregion are among the most productive in the Northwest Territories and probably provide habitat for some relatively uncommon plant and animal species.



Within the Liard Upland MB Ecoregion, the Liard River is confined by high banks, unlike the broad floodplain that it occupies in the Liard Plain MB Ecoregion (middle-upper portion of image).



Highly productive stands of trembling aspen, Alaska paper birch, paper birch, and white spruce occupy the valley sides and terraces.



Proportion of Ecoregion occupied by lakes: 3%
Proportion of Ecoregion occupied by bogs and fens: 15%



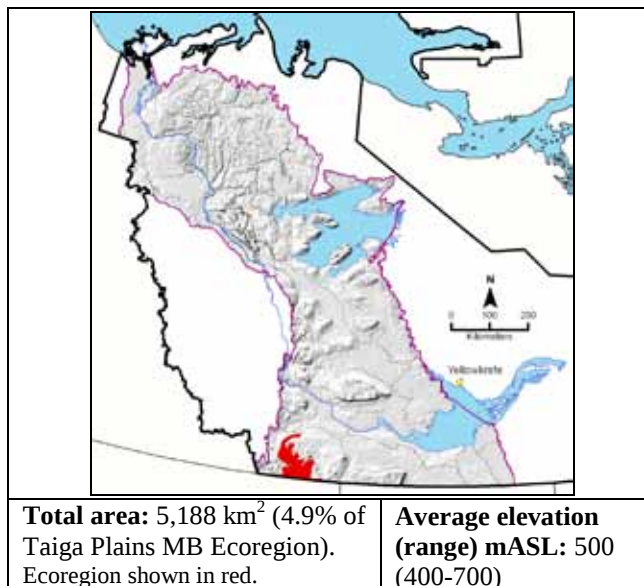
This balsam poplar is about 50 cm in diameter and nearly 30 m tall; the Liard Upland MB Ecoregion and the Liard Plain MB Ecoregion have the most productive forests in the Northwest Territories.

3.3.4.4 Trout Upland MB Ecoregion

Overview: *Gently sloping treed wetlands with islands of upland forest on a gently sloping south and west facing crescent above the Liard River are typical of the Trout Upland MB Ecoregion.*

Summary:

- Gently sloping till plain blanketed by peatlands.
- Treed wetlands cover much of the area; scattered deciduous, mixed-wood and conifer forests occur on better-drained sites.



General Description

The Trout Upland MB Ecoregion occupies a roughly crescent-shaped area of higher terrain east of the Liard River on the southern and western slopes of the Trout Upland MB Ecoregion above 400 m ASL and below 600 mASL. This Ecoregion is influenced by a climate similar to that of the Liard Plain MB and Liard Upland MB Ecoregions, but its slightly higher elevation likely produces somewhat cooler conditions. Much of the landscape is occupied by wetlands, with a mix of treed fens on gently sloping till plains and jack pine or mixed-wood stands on ridged or hummocky till and glacio-fluvial deposits. Relatively tall, dense and diverse deciduous and mixed-wood forests occur on lower south-facing slopes and along river and stream valleys.

Geology and Geomorphology

Much of the area is a poorly-drained till plain, covered by organic blankets and veneers. Hummocky and ridged till deposits provide changes in local relief. Small coarse-textured gently undulating glacio-fluvial plains are present, and narrow alluvial terraces occur along streams that have cut deep V-shaped valleys.

Soils

Organic soils and Gleysolic soils are common and are associated with wetlands. Brunisols occur on the coarser-textured upland areas, usually with jack pine or trembling aspen. Finer-textured Luvisols are associated with mixed-wood stands on moderately well-drained sites. Regosols occur along valley walls and on alluvial flats where there has been relatively little time for soil development because of slope movement or sediment deposition.

Vegetation

There is a relatively rapid transition between the diverse and productive upland forests of the Liard Plain MB and Liard Upland MB Ecoregions to the less productive forests of this Ecoregion. Extensive areas of poorly-drained organic and mineral soils characterize sites that are vegetated by closed and open canopied black spruce, scattered larch, and horizontal fens. Jack pine forests occur on well- to rapidly-drained till knobs and scattered glacio-fluvial deposits. Mixed-wood stands occur along river and stream valleys, on warm, southerly aspects, and in scattered islands surrounded by organic terrain.

Water and Wetlands

The Muskeg and Arrowhead Rivers are the main watercourses. A number of small permanent or intermittent streams drain into these rivers or into the Liard River. Treed horizontal fens and flat bogs are the dominant landscape feature; peat plateaus are not as common.

Notable Features

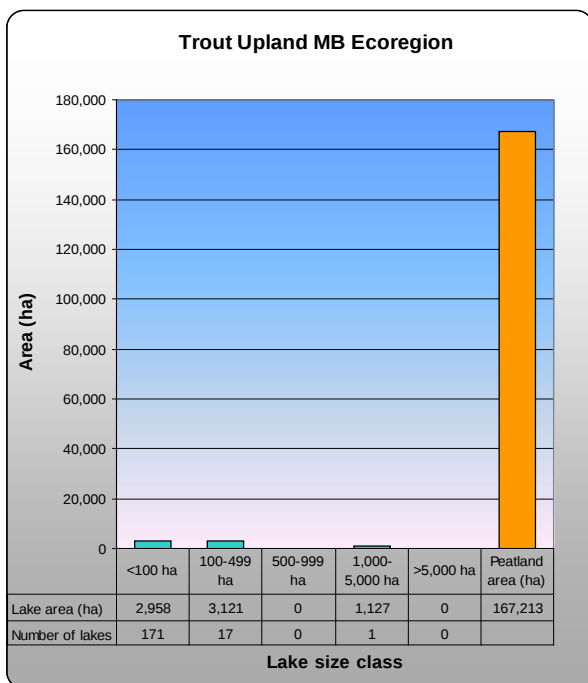
There are well-developed glacial flutings across the low hills above Trout Lake.



The Muskeg River valley cuts into the slopes of the western Trout Upland MB Ecoregion and is forested by trembling aspen and mixed aspen – white spruce stands. Closed black spruce – larch forests on wet organic deposits occupy much of the upland areas.



Peat plateaus (dark green bogs with black spruce and brownish collapse scar bogs) are dominant across parts of the Ecoregion and surround lighter green trembling aspen or mixed-wood stands on slightly higher uplands.



Proportion of Ecoregion occupied by lakes: 1%
Proportion of Ecoregion occupied by bogs and fens: 32%



Glacial fluting patterns on the lower slopes of a hill above Trout Lake are produced by moving ice that scores deep grooves in the underlying bedrock. The uplands are forested by mixed-wood stands, with horizontal fens in the depressions.

3.3.4.5 Horn Slopes MB Ecoregion

Overview: *The Horn Slopes MB Ecoregion includes the gentle to steeply inclined south-facing slopes of the Horn Plateau; mostly young, vigorous forests, massive slope failures, and a belt of mineral-rich ponds and fens along the slope base indicate the active influence of fire and groundwater seepage on this boreal ecosystem.*

Summary:

- Gentle to steep, relatively warm south-facing slopes.
- Mass movements of soil due to groundwater seepage and slumping.
- Mineral-rich ponds and fens along the toe slopes.
- Vegetation is a mosaic of older white spruce and young deciduous stands, the latter on recently burned areas.

General Description

The Horn Slopes MB Ecoregion includes the gently to steeply inclined southern slopes of the Horn Plateau. Dozens of small, permanent or ephemeral streams flow down the slopes, pronounced groundwater seepage and slumping occur along the upper third of the slope, and a string of mineral-rich shallow ponds parallel the slope base. Flowing surface and subsurface waters produce moist, rich conditions, and soil temperatures in the rooting zone are probably higher throughout the growing season than on the adjacent plains because of sun exposure. Like the Cameron Hills and Trout Upland, the Horn Plateau exerts a local influence on weather; in summer, thunderstorms are more frequent (Klock *et al.* 2000), and seasonal rainfall amounts are likely higher along the slopes and on the plateau than in the surrounding lowland terrain.

Geology and Geomorphology

Horizontally stratified Upper Cretaceous marine shales and conglomerates underlie the Horn Plateau, and are probably one source of groundwater flow. Studies elsewhere on formation waters in similar geologic formations indicate that sodium carbonate-containing waters might be expected in the Upper Cretaceous formation (Karsten and Bachu 2001), and might partly explain the mineral deposits around ponds at the base of the main slope. The boundary between the Horn Slopes MB Ecoregion and the Horn Plateau LS Ecoregion is abrupt, often because of slope failures. Colluvial deposits occur on and below slumped areas, occupying about 30 to 40 percent of the Ecoregion on upper slopes; the remainder is covered by till materials.

Soils

Regosolic soils are associated with colluvial materials; Brunisolic and Luvisolic soils are associated with till materials. Permafrost-affected soils are relatively uncommon because of groundwater flow and the predominantly south-facing warm aspect.



Total area: 1,951 km² (2% of Taiga Plains MB Ecoregion).
Ecoregion shown in red.

Average elevation (range) mASL: 400 (300-750)

Vegetation

Characteristic vegetation of the Horn Slopes MB Ecoregion includes young deciduous forests, shrublands, and scattered stands of mature white spruce. Much of the area has burned in the last 20 years. Understory vegetation is similar to that of the Cameron Slopes MB Ecoregion, with prickly rose, low-bush cranberry, willow, green alder, wild sarsaparilla, and reed-bentgrass. Recent slope failures are unvegetated or have sparse herbaceous cover. Treed, shrubby and sedge-dominated wetlands occur along the southern boundary of this Ecoregion where the slopes level out and occasionally behind slumped blocks along the slope.

Water and Wetlands

There are no major water bodies in the Horn Slopes MB Ecoregion. Many small permanent and intermittent streams run perpendicular to the slope, and there are a few ponds in mid and upper slope positions where seepage waters have collected behind slumped blocks. Near the slope base, stands of fox-tail barley around ponds and sloughs with whitish mineral shoreline crusts suggest that the groundwater is mineral-rich. Spring fens occur locally in association with groundwater seepage along the slopes. Northern ribbed fens and horizontal fens occur along the southern boundary at the slope base.

Notable Features

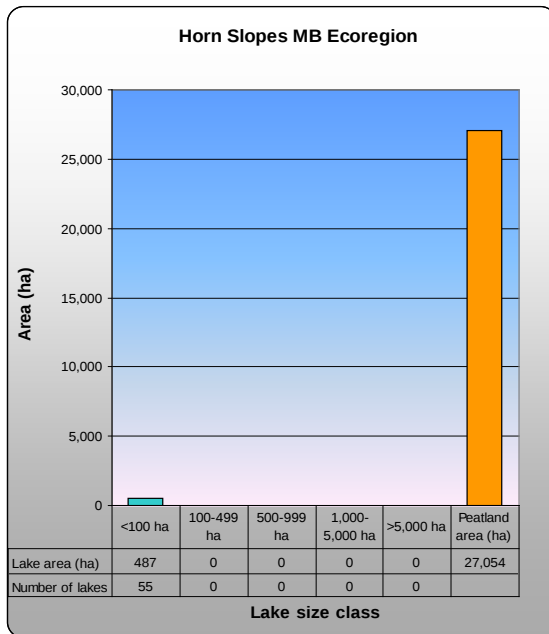
The Horn Slopes MB Ecoregion is notable for its consistent southerly aspect for a distance of nearly 140 km, its steepness, and its instability. Plants and wildlife that are characteristic of more southerly areas or that are associated with groundwater discharge areas likely occur in this Ecoregion.



The western Horn Slopes MB Ecoregion is characterized by extensive slumping and mixed stands near the top of the slope; a patchwork of mature white spruce, young deciduous regeneration, and shrublands. The slopes contrast sharply with the Horn Plateau LS Ecoregion above the break.



Along the slopes to the east of the left-hand image, white spruce and regenerating trembling aspen and Alaska paper birch occur on mid- and upper slope positions.



Proportion of Ecoregion occupied by lakes: <1%
Proportion of Ecoregion occupied by bogs and fens: 14%



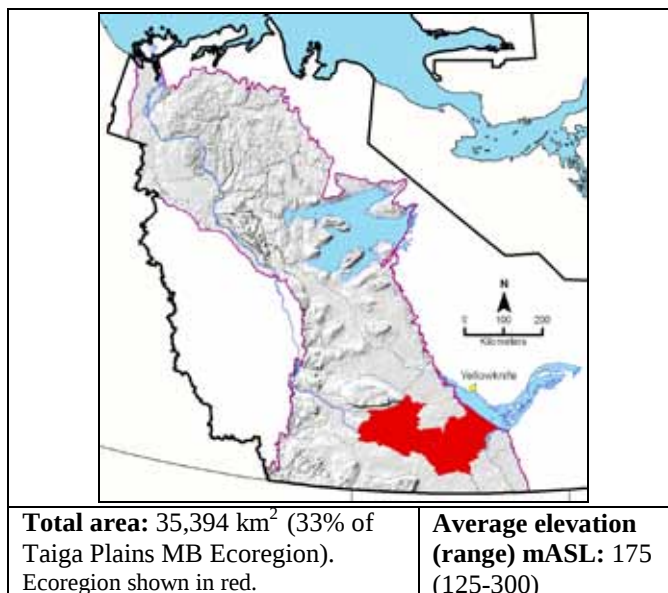
Massive slope failures are common along the length of the Horn Slopes MB Ecoregion; groundwater seepage causes slope instability and produces mudslides like this one.

3.3.4.6 Great Slave Lowland MB Ecoregion

Overview: *The Great Slave Lowland MB Ecoregion, a vast, nearly flat wetland-dominated area, is the largest Level IV ecoregion in the Taiga Plains. Scattered patches of mixed-wood and jack pine forests rise only a few meters above a sea of patterned and horizontal fens and peat plateaus.*

Summary:

- Nearly flat, includes part of Great Slave Lake and the upper reaches of the Mackenzie River.
- Vast northern ribbed fen, net fen, and horizontal fen –upland complexes; small changes in the water table can flood extensive areas.
- Permafrost occurs more frequently west of Great Slave Lake.



General Description

The Great Slave Lowland MB Ecoregion is the largest Level IV ecoregion in the Taiga Plains. It includes the area from the base of the long, abrupt limestone escarpment running roughly parallel to the Mackenzie River, north to the Horn Slopes MB Ecoregion, east to the slightly higher terrain of the Great Slave Plain MB Ecoregion, and west towards the confluence of the Liard and Mackenzie Rivers. Sluggish, low-gradient streams drain into the Mackenzie River. Huge northern ribbed fens, net fens, and horizontal fens occupy much of the area; linear beach ridges and other upland areas occur as islands within them and usually support mixed forests of pine, black and white spruce, trembling aspen, and balsam poplar. Because the area is so flat, even a slight rise in the water table can promote extensive flooding, and in the recent past, large tracts of upland forest have been flood-killed.

Geology and Geomorphology

Devonian limestones are exposed along the escarpment forming the boundary between this Ecoregion and the Tathlina Plain MB Ecoregion to the south; in places along the escarpment and below the Horn Plateau, groundwater discharges leave behind calcareous, saline or sulphur deposits. Lacustrine plains overlain by peatlands cover much of the area. Fine- to coarse-textured lacustrine and till materials occur on uplands, with alluvial deposits along the Mackenzie River and in pockets northeast of Great Slave Lake. Beach ridges, prominent linear features running parallel to contour, extend for many kilometers south and west of Great Slave Lake; they mark the former extent of glacial Lake McConnell and are typically coarse-textured alluvial or wave-washed till deposits.

Soils

Organic soils are most common, and Gleysols are probably extensive on low-lying upland areas adjacent to wetlands. Brunisolic soils are associated with coarse-textured beach ridge deposits, while Luvisolic soils occur elsewhere on moderately well-drained sites. Organic Cryosols underlie peat plateaus.

Vegetation

Characteristic vegetation in the Great Slave Lowland MB Ecoregion consists of treed, shrubby and sedge-dominated fens over much of the area. Jack pine and jack pine – trembling aspen stands with sparse shrub, forb and lichen understories occur on dry, coarse-textured soils such as those associated with beach ridges. Pure or mixed stands of trembling aspen, black and white spruce, balsam poplar and Alaska paper birch with understories of low-bush cranberry, prickly rose, green alder and forbs occur on variable-textured soils on other upland areas. Open black spruce – northern and common Labrador tea – lichen stands form complexes with sedge – cotton-grass – peat moss collapse scars on peat plateaus that are most extensive on the flats north of Mills Lake.

Water and Wetlands

Great Slave Lake occupies 41 percent of the Ecoregion. The upper reaches of the Mackenzie River, Hay River, Buffalo River, Mills Lake, Kakisa Lake, Fawn Lake and Mink Lake are the other main water bodies. Melting permafrost in former peat plateau areas has left behind an intricate network of thermokarst lakes separated by low sparsely treed stringers; these northern ribbed fens and net fens are especially evident west of Hay River near Great Slave Lake.

Notable Features

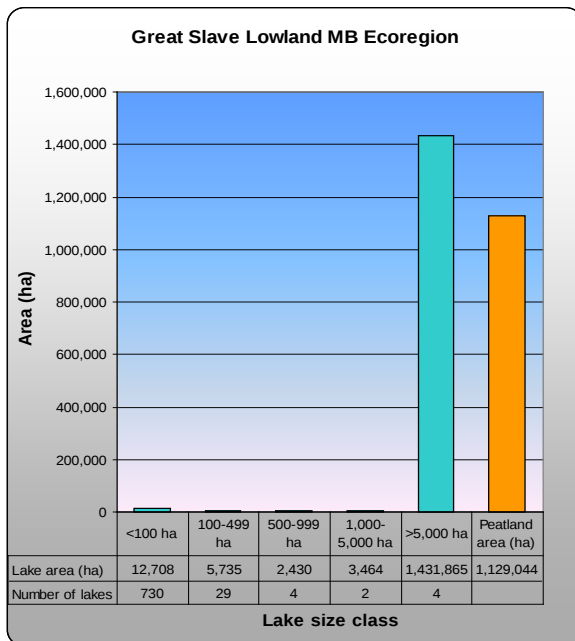
Unusual saline and sulfur springs with rare plant species occur near Fawn Lake; sulfur springs also occur along the Buffalo River. The limestone escarpments and associated exposed limestone plains provide unique habitats (alvars). The Horn River and Mills Lake are International Biological Program sites (Nettleship and Smith 1975) that are included in the Edézhíé candidate protected area under the Northwest Territories Protected Areas Strategy.



The Great Slave Lowlands MB Ecoregion is wetland-dominated, as shown by this complex of wet, rich northern ribbed fens, horizontal fens, and net fens surrounding mixed-wood stands on slightly raised uplands. Flooding mortality has killed trees in low-lying areas (grayish tones).



A thermokarst lake – sedge fen complex is surrounded by mixed-wood (trembling aspen – white spruce) and conifer stands.



(Great Slave Lake accounts for the majority of lake area)

Proportion of Ecoregion occupied by lakes: 41%
Proportion of Ecoregion occupied by bogs and fens: 32%



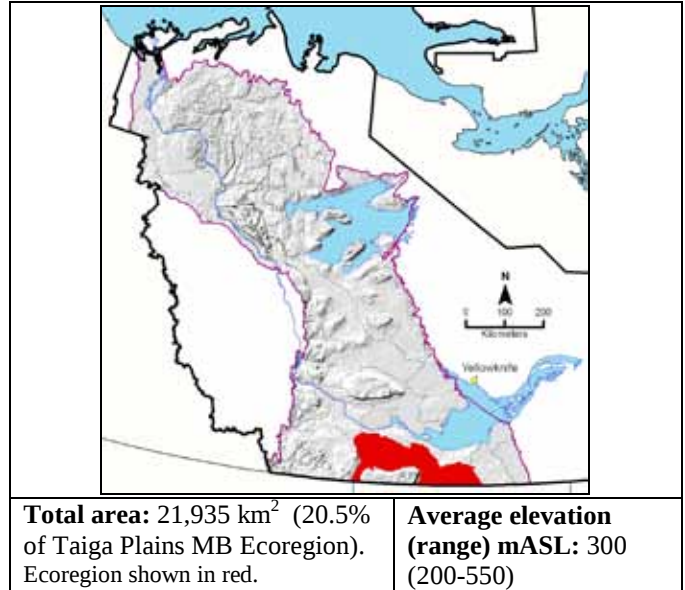
This is one of several saline sulfur springs near Fawn Lake, in the northwestern corner of the Ecoregion; spring discharges have produced a large dome a few meters high. Diverse plant communities that include several rare plants occur in this area.

3.3.4.7 Tathlina Plain MB Ecoregion

Overview: *Extensive peat plateau, net fens and northern ribbed fens with limited occurrences of upland forest on drier terrain and along rivers and streams are characteristic of the Tathlina Plain MB Ecoregion.*

Summary:

- Peat plateaus, net fens and northern ribbed fens are the dominant landform over much of the Ecoregion.
- Taller and more diverse forests occur on islands of upland terrain and along rivers where drainage and soil temperatures are more conducive to growth.



General Description

The Tathlina Plain MB Ecoregion occupies the extensive plains below the eastern Trout Upland MB Ecoregion and around the Cameron Hills, east to the Slave Upland HB Ecoregion and north to the edge of the limestone escarpment running parallel to Great Slave Lake. Peatlands dominate the landscape; peat plateaus and northern ribbed fens occupy extensive areas. Gently undulating lacustrine and till deposits provide slightly raised islands and patches on which jack pine, spruce and mixed-wood stands grow. Relatively tall and diverse forests are generally restricted to the vicinity of rivers and streams.

Geology and Geomorphology

Devonian limestones underlie glacial and organic deposits, and are exposed in places along the wave-cut escarpments and alvars that form the northern boundary of the Ecoregion and extend south of Kakisa Lake; west of Kakisa Lake, there are locally extensive limestone plains that have thin, discontinuous soil and dominantly jack pine cover. Thick organic blankets have developed over a complex of fine-textured lacustrine and till materials. Permafrost features are common; peat plateaus with large collapse scars cover large areas, and thermokarst lakes and intricately structured net fens and northern ribbed fens have formed where the permafrost has thawed. Beach ridges, deposits of coarse-textured wave-washed till and lacustrine materials, are common near Buffalo Lake. Alluvial and colluvial deposits originating from the Cameron Hills and Caribou Mountains provide moist, rich mineral soils that support diverse plant communities.

Soils

Organic Cryosols are probably the most common soil, and are associated with peat plateaus. Brunisols occur on the coarser-textured upland areas, usually covered with jack pine or trembling aspen. Luvisols occur with mixed-wood stands on moderately well-drained sites; Gleysols are associated with poorly-drained lowland forests and wetlands.

Vegetation

Vegetation patterns are similar to those reported for the Northern Mixedwood Natural Subregion in Alberta (Natural Regions Committee 2006). Characteristic sites are vegetated by closed and open grown black spruce stands with scattered larch on extensive areas of poorly-drained organic and mineral soils. Open black spruce – lichen – northern Labrador tea stands are distributed across frozen peat plateaus, with sedges, cotton-grass, and mosses in the associated collapse scars. Jack pine forests (often with black and white spruce components) having low shrub and lichen ground cover occur on well- to rapidly drained sites such as remnant beach ridges and shallow soils over bedrock. Trembling aspen, balsam poplar, white spruce and black spruce occur in mixed or pure stands on mineral uplands and along the banks and alluvial flats of watercourses. The most vigorous forests grow in linear belts in riparian zones and on alluvial and colluvial fans south of Buffalo and Tathlina Lakes. Northern ribbed fens are extensive, and larch, black spruce, and sedges are common associates.

Water and Wetlands

The Hay, Buffalo and Kakisa Rivers are the dominant watercourses. Tathlina, Kakisa, Buffalo and Copp Lakes are the main standing water bodies. Wetlands associated with organic materials are quite extensive. Thermokarst lakes and palsa ridges form vast netlike patterns (net fens and northern ribbed fens) in former peat plateau areas where the permafrost has melted.

Notable Features

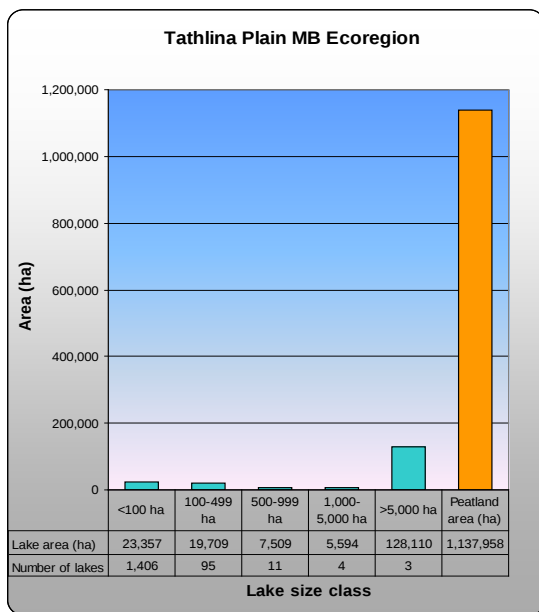
Alexandra and Louise Falls plunge from bedrock ledges along the Hay River. Elsewhere, bedrock exposures above the escarpment and near Kakisa Lake provide unique habitats (“alvars”) that support unusual plant communities. The gentle alluvial-colluvial slopes above Buffalo and Tathlina Lake are excellent wildlife habitat.



Peat plateaus typical of the Tathlina Plain MB Ecoregion are in the foreground, with a large northern ribbed fen in the mid-upper image (light green).



This low-level oblique view of a peat plateau shows the typical open black spruce cover and lichen on the raised permafrost area and large brownish collapse scars where the permafrost has melted.



Proportion of Ecoregion occupied by lakes: 8%
Proportion of Ecoregion occupied by bogs and fens: 52%



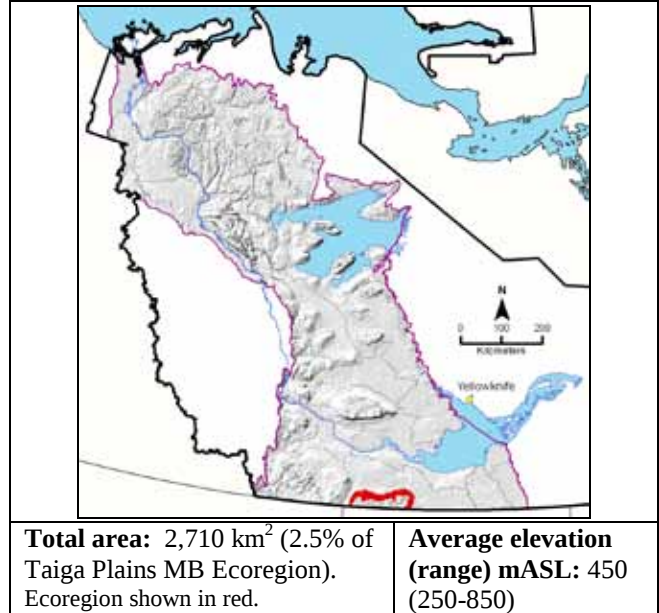
This image shows an *alvar*, a limestone exposure near the escarpment. In the foreground is exposed bedrock with sparse moss and lichen cover. Junipers, dryland sedges, and grasses and forbs typical of dry areas far to the south are in the midground, and jack pine – paper birch – trembling aspen forests grow on shallow soils in the background. These are uncommon features in the Northwest Territories.

3.3.4.8 Cameron Slopes MB Ecoregion

Overview: *Gentle to moderately inclined and often unstable side slopes of the Cameron Hills, forested by productive mixed-wood stands on mid to upper slope positions and rich fens on lower slopes are characteristic of the Cameron Slopes MB Ecoregion.*

Summary:

- Gentle to moderate slopes with frequent groundwater seepage and slope failures.
- Slopes are generally moist, rich sites that support productive deciduous, mixed-wood and white spruce forests.



General Description

The Cameron Slopes MB Ecoregion includes the gentle to moderate slopes between the low-elevation Tathlina Plain MB Ecoregion and the higher-elevation Cameron Plateau LS and Cameron Upland HB Ecoregions. Many small or intermittent streams flow down the slopes, and groundwater seepage and slumping are common. Flowing surface and subsurface waters produce moist, rich conditions. Soil temperatures in the rooting zone are probably higher throughout the year than on the adjacent plains because of sun exposure on easterly or southerly aspects and organic deposits that are not thick enough to insulate the soil and prevent summer thawing. The Cameron Hills exert a local influence on weather; in summer, thunderstorms are more frequent (Klock *et al.* 2000), and rainfall amounts are likely higher in this Ecoregion than in the surrounding lowland terrain.

Geology and Geomorphology

Parent materials are till and colluvium, the latter associated with slumping areas. The gentle fan-shaped landscape above Tathlina Lake is a complex of alluvial and colluvial materials that supports a diverse array of plants and wildlife.

Soils

Luvisolic and Brunisolic soils are probably most common. Gleysols occur along stream drainages and on seepage areas where drainage is poor and water tables are high, with Organic soils in fens. Regosols occur in areas of recent deposition or mass movement.

Vegetation

Vegetation in the Cameron Slopes MB Ecoregion is probably very similar to that described for the adjacent Low Boreal Highlands in Alberta, where characteristic vegetation includes pure or mixed stands of trembling aspen, balsam poplar and white spruce, with understories dominated by prickly rose, low-bush cranberry, willow, green alder, wild sarsaparilla, and reed-bentgrass (Natural Regions Committee 2006). At higher elevations near the boundary with the Cameron Plateau and Cameron Upland Ecoregions, lodgepole pine – jack pine hybrids also occur. In the wettest areas near the lower boundary, rich northern ribbed fens with larch, sedge and mosses occur in a narrow band, grading into the peat plateaus of the surrounding Tathlina Plain MB Ecoregion.

Water and Wetlands

Hundreds of small, permanent or intermittent streams drain from the Cameron Plateau LS and Cameron Upland HB Ecoregions. Dogface Lake and Cameron River are the largest water bodies. Northern ribbed fens are locally extensive near slope bases. Spring fens occur along slopes in association with groundwater seepage.

Notable Features

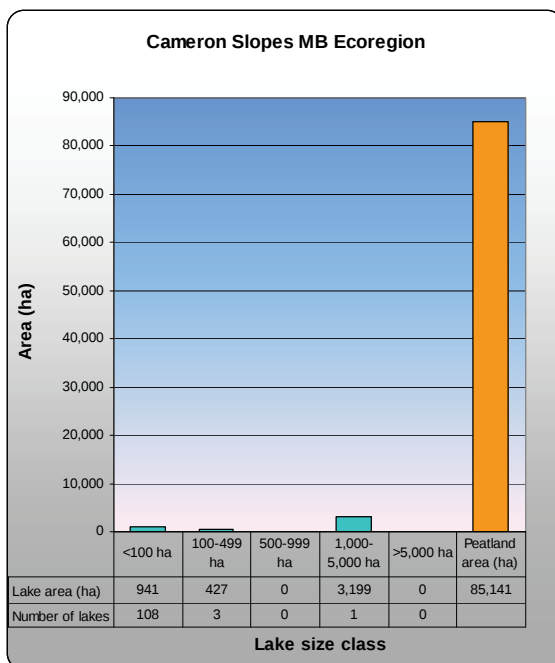
Productive forest communities that support diverse plant and wildlife populations occur on the gently sloping floodplain above Tathlina Lake. Slope failures create an intricate array of topographic features and moisture conditions; ecosystems along the slopes are correspondingly complex.



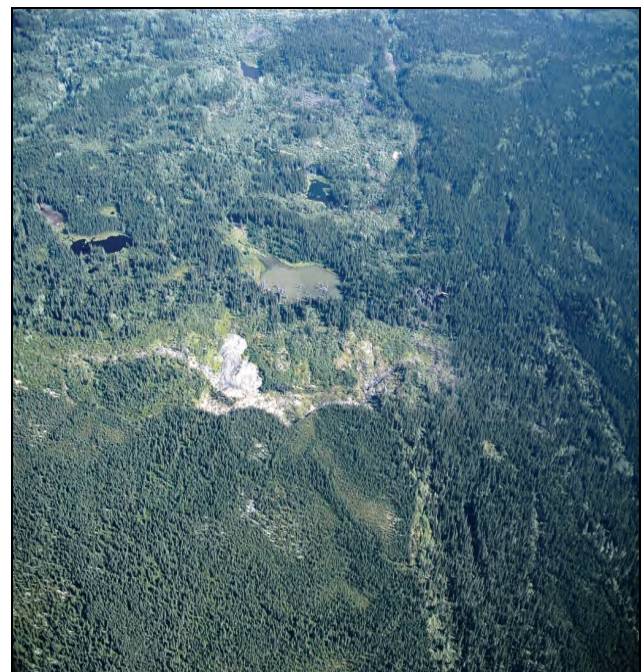
The alternating dark and light green bands on the south-facing failing slopes of the Cameron Slopes MB Ecoregion are forested by white spruce and trembling aspen; the permafrost-dominated stunted wetland forests of the Cameron Plateau LS Ecoregion to the right contrasts sharply with the slopes.



Vigorous mixed-wood forests grow along the lower Cameron Slopes and include trembling aspen, white spruce, and paper birch. Tall green alder and willow shrublands are also common.



Proportion of Ecoregion occupied by lakes: 2%
Proportion of Ecoregion occupied by bogs and fens: 31%



Slopes are actively failing as shown by the whitish scar in mid-image and the dark gray mudslide directly above it. A spring-fed pond is visible in the left center.

3.3.4.9 Slave Upland MB Ecoregion

Overview: *Glacial deposits over limestone bedrock have produced a complex landscape within the Slave Upland MB Ecoregion; sinkholes, thousands of calcareous fens and ponds, and ridges left behind when an ancient glacial lake receded produce an intricate mosaic of forest and wetland communities.*

Summary:

- Lacustrine, alluvial, till and eolian deposits of varying thickness blanket highly calcareous Devonian bedrock.
- Thousands of calcareous sedge fens and shallow ponds, karst topography (sinkholes in bedrock).
- Jack pine, trembling aspen, and white spruce occur on dry to moist sites, and black spruce – white spruce forests on wet sites; recent fires have burned over large areas.

General Description

The Slave Upland MB Ecoregion is bordered to the east by a wave-cut bedrock escarpment below which the Slave Lowland MB Ecoregion occurs, to the west by the wetter Tathlina Plain MB Ecoregion, to the north by Great Slave Lake, and to the south by the Alberta border. This Ecoregion is distinguished from its neighbours by the variety of glacial deposits – lacustrine, alluvial, till, and eolian – and the presence of highly calcareous Devonian limestone close to or at the surface. Hundreds of sinkholes, shallow calcareous ponds and calcium-rich fens dot the landscape. These features, along with extensive coarse-textured dry uplands, produce a patchwork of forest and wetland vegetation communities.

Geology and Geomorphology

Dolomite, limestone and sandstone of Cambrian to Devonian age underlie this Ecoregion. In the northeast, fine- to coarse-textured lacustrine deposits overlie bedrock to a depth of several meters. Beach ridges and wave washed till deposits, left behind as glacial Lake McConnell receded, occur parallel to the lakeshore of Great Slave Lake; extensive veneers and blankets of wave-washed till over bedrock occur along the highway to Fort Smith. The underlying limestone has dissolved in many places, pockmarking the landscape with sinkholes (karst topography) and contributing mineral-rich groundwater to calcareous ponds and wetlands.

Soils

Brunisolic and Luvisolic soils occur with variable-textured materials on well- to moderately well-drained uplands. Gleysols are common in the wetland – upland complexes that occur throughout, and Organic soils and Organic Cryosols are associated with peat plateaus in the south.



Total area: 7,514 km² (7% of Taiga Plains MB Ecoregion). Ecoregion shown in red.

Average elevation (range) mASL: 200 (150-300)

Vegetation

Vegetation patterns are strongly controlled by landforms and geology in this Ecoregion. On the driest uplands, such as beach ridges, coarse-textured washed till and eolian deposits, young fire-successional jack pine with a secondary component of trembling aspen form large densely stocked stands with sparse shrub and herb understories. Regenerating young jack pine stands and remnant white spruce stands occur extensively across a dry ridge that occupies the western third of the Ecoregion. Elsewhere, mixed black spruce and white spruce stands, often with larch, occur on wet upland patches between numerous calcareous fens and shallow ponds; dwarf birch, willows, mosses and sedges are typical understory associates. Willow and dwarf birch or sedge-dominated horizontal fens grow on the wettest mineral soils. Peat plateaus with open, stunted black spruce – Labrador tea – lichen woodlands on raised permafrost areas and peat mosses, sedges and cotton-grasses in collapse scars occur mainly in the southernmost parts of the Slave Upland MB Ecoregion.

Water and Wetlands

The Nyarling and Sass Rivers flow through this Ecoregion. The western third is relatively dry and there are few wetlands. Much of the remaining area is occupied by thousands of shallow calcareous ponds; sulfur springs may occur occasionally. Wetlands (mainly northern ribbed fens and net fens) occur mainly on fine-textured mineral soils, and there are locally extensive peat plateaus (bogs with stunted black spruce cover on permafrost and collapse scars) in the southern third.

Notable Features

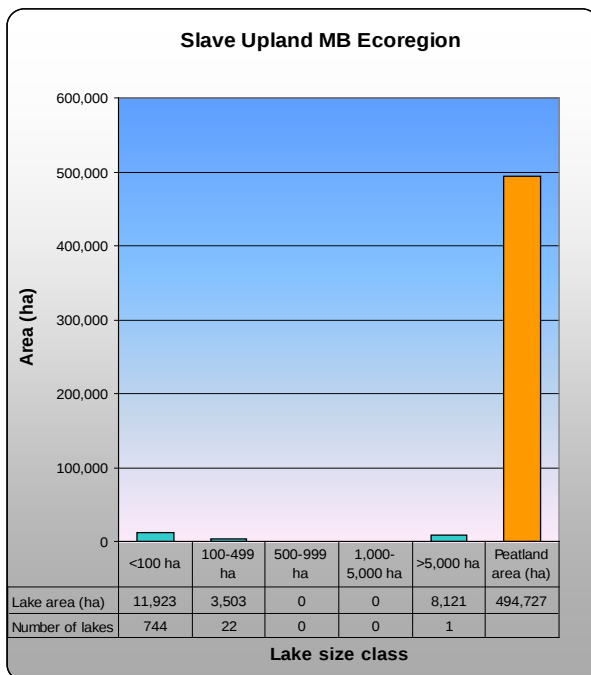
The extent of karst topography, calcareous fens and ponds is unique in the Taiga Plains MB Ecoregion; the Nyarling River actually disappears in places and runs underground through bedrock caverns. This Ecoregion contains the only known nesting grounds of whooping cranes in the world. It was formerly part of the Boreal Plain Ecozone in the 1995 Ecozone and Ecoregions classification (Ecological Stratification Working Group 1995) but a review of available climate information led to its reassignment to the Taiga Plains.



In this typical landscape in the Slave Upland MB Ecoregion, a beach ridge marking the former elevation of a glacial lake runs through the center of the image; it is vegetated by mixed-wood forests, with calcareous thermokarst ponds and net fens in wet areas on either side.



The Ecoregion contains a high concentration of calcareous ponds, fens and moist to wet uplands forested by black spruce, white spruce and larch. Some of these complexes are important whooping crane habitat.



Proportion of Ecoregion occupied by lakes: 3%
Proportion of Ecoregion occupied by bogs and fens: 66%



A water-filled sinkhole is a karst feature that is formed when underlying limestone bedrock dissolves and the ground surface collapses.

3.3.4.10 Slave Delta MB Ecoregion

Overview: *The Slave Delta MB Ecoregion is a wide, actively expanding freshwater delta over 70 kilometers across, with diverse mixed-wood forests on river terraces and wetlands in abandoned channels and low-lying floodplains.*

Summary:

- Active delta, with young, vigorous upland forests, rich willow, black spruce and sedge fens, and marshlands.
- Flooding mortality is common especially along the lower third of the Delta.



Total area: 3,803 km² .
(3.6% of Taiga Plains MB
Ecoregion).
Ecoregion shown in red.

**Average elevation
(range) mASL:** 150
(150-175)

General Description

The Slave Delta MB Ecoregion includes the actively growing Slave River Delta, one of the largest freshwater deltas in the Northwest Territories. It is bounded on the east by the Level II Taiga Shield Ecoregion, on the west by the Little Buffalo River and a low rise, and on the south by slightly higher terrain where delta-forming processes are currently inactive. Flooding and deposition of fine-textured materials produces a mosaic of young, vigorous deciduous and mixed-wood stands and rich treed, shrubby, and sedge fens. There is often less than a meter of elevation difference between upland and wetland sites. Flooding mortality is common especially on the northern half of the Delta.

Geology and Geomorphology

Flooding and deposition are the dominant processes in this Ecoregion. The Slave River meanders east to west across the Delta, deposits broad, low relief alluvial terraces, and leaves abandoned water-filled channels where the river once flowed. Glacial Lake McConnell covered this area thousands of years ago, but fluvial processes have since replaced lacustrine sediments with alluvial deposits.

Soils

Active deposition and high water tables produce Regosolic and poorly-drained, fine-textured Gleysolic soils on the terraces. Organic soils and Gleysols occur under wetlands. Permafrost is uncommon.

Vegetation

Young deciduous, mixed conifer – deciduous, and pure coniferous stands grow well on better drained terrain, such as slightly raised alluvial terraces and levees. On these comparatively dry sites, trembling aspen, balsam poplar, white spruce and black spruce occur as pure stands or in mixtures with understories of typical boreal species such as low-bush cranberry, prickly rose, and reed-bentgrass. Black spruce and mixed black and white spruce stands occur where the water table is closer to the mineral soil surface. Horizontal fens dominated by black spruce, willow – alder shrublands and sedge occur on wet mineral and organic soils; shrub and sedge communities are most common along the outer parts of the Delta where it builds into Great Slave Lake. Bulrush and sedge-dominated active and inactive delta marshes occur in places where the water table is consistently above the mineral soil surface.

Water and Wetlands

The Slave River is the only large water feature in the Slave Delta MB Ecoregion, and accounts for about 20 percent of the total area. The Taltson River flows along the east side, and numerous small oxbow lakes and abandoned channels occur within the delta. Channel fens, channel marshes, and active and inactive delta marshes occur throughout the Ecoregion, the latter near the river mouth.

Notable Features

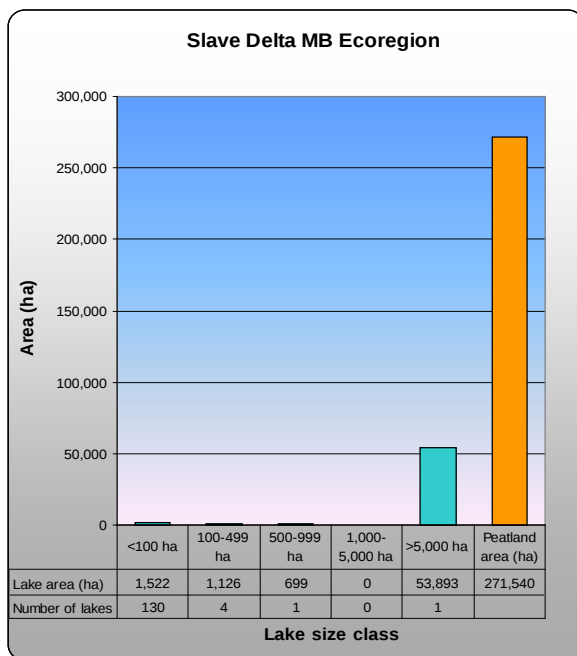
The vegetation and landform complex on the Delta produces a rich array of habitats for moose and furbearers, and important winter range for willow ptarmigan. This Ecoregion was formerly part of the Boreal Plain Ecozone in the 1995 Ecozone and Ecoregions classification (Ecological Stratification Working Group 1995) but a review of available climate information led to its reassignment to the Taiga Plains.



Near its mouth, the Slave River Delta is an intricate complex of wet sedge and shrub-dominated channel fens (light green), drier terraces with young mixed-wood, deciduous and conifer forests, and horizontal fens with black spruce cover in abandoned river channels.



The Slave River Delta inland from the delta mouth supports tall white spruce – black spruce forests (dark green patches), trembling aspen – balsam poplar forests (medium green) and small horizontal fens (light green and grayish tones).



(Water area includes Slave and Taltson Rivers)

Proportion of Ecoregion occupied by lakes: 15%
Proportion of Ecoregion occupied by bogs and fens: 71%



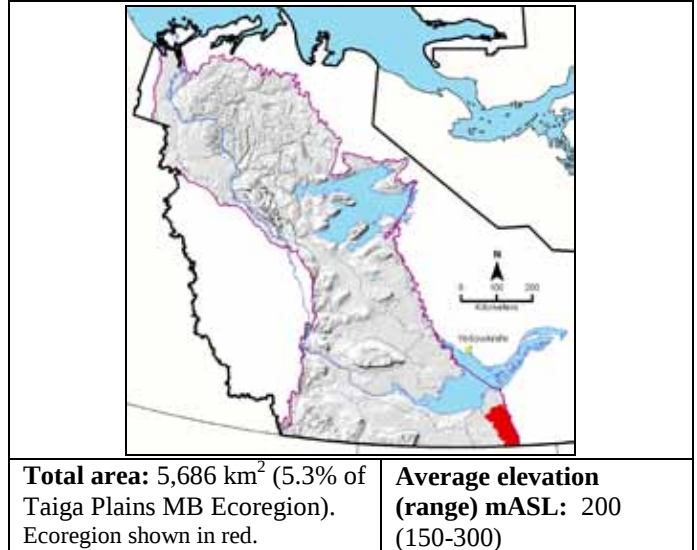
The mouth of the Slave River Delta is densely vegetated by willow – alder – birch shrublands; a sedge-dominated channel marsh is a lighter green tone along the shore of Great Slave Lake.

3.3.4.11 Slave Lowland MB Ecoregion

Overview: Nearly level lacustrine and alluvial deposits with a mosaic of sedge and grass meadows, diverse forests and wetlands typify the Slave Lowland MB Ecoregion, paralleling the Slave River between the Canadian Shield to the east and a bedrock escarpment to the west.

Summary:

- Formerly a bay of Glacial Lake McConnell that has since filled in with lacustrine and alluvial deposits.
- Rich sedge and grass meadows, upland forests, and extensive wetlands.



General Description

The Slave Lowland MB Ecoregion is bounded on the east by the Level II Taiga Shield Ecoregion, on the west by a wave-cut bedrock escarpment marking the former extent of glacial Lake McConnell, on the north by the active portion of the Slave River Delta, and on the south by the Alberta border. This area occupies a former bay of glacial Lake McConnell that over time has filled with lacustrine and alluvial deposits. Large fens, sedge and grass meadows, and diverse upland forests are the main vegetation types.

Geology and Geomorphology

A former bay of glacial Lake McConnell defines the current extent of the Slave Lowland MB Ecoregion. Wave action cut the escarpment on the west side, and the Precambrian Shield contained the lake on the east. As the lake receded, the Slave River Delta grew progressively northward, the bay filled with alluvial and lacustrine deposits, and the Slave River carved channels through these mostly fine-textured sediments as the land surface gradually rose following deglaciation (isostatic rebound). An immense sand delta formed near Fort Smith with banks 30 m higher than the Slave River. Active alluvial processes still operate along the Slave and Taltson Rivers. Saline groundwater discharges from Devonian formations containing gypsum and salt produce local saline meadows near the western bedrock escarpments.

Soils

Fluvial processes close to the river produce Regosolic soils; Gleysolic soils are dominant on the generally poorly-drained terrain. Organic soils also occur with wetlands. Permafrost is uncommon.

Vegetation

Vegetation patterns are similar to those of the Slave Delta MB Ecoregion, but flooding mortality is not as widespread. Trembling aspen, balsam poplar, white spruce and black spruce grow in pure stands or in mixtures with understories of typical boreal species such as low-bush cranberry, prickly rose, and reed-bentgrass on drier sites such as raised alluvial terraces and levees. Moist meadows dominated by awned sedge, reed-bentgrass, and other grasses, sedges and forbs occur on imperfectly- to poorly-drained fine-textured mineral soils; groves of trembling aspen and willow occur within and around the meadows. Pure and mixed black spruce and white spruce stands grow where the water table is closer to the mineral soil surface. Large horizontal fens with black spruce, willow and sedge components occur on wet alluvial and lacustrine plains. Saline meadows occur near the western edge of the Ecoregion below the escarpment and belts of salt-tolerant vegetation such as red glasswort and fox-tail barley form concentric rings around saline sloughs and seepage areas.

Water and Wetlands

The Slave River is the largest water feature in the Slave Delta Ecoregion, and accounts for about five percent of the total area. The Taltson River flows along the east side, and numerous, intricately braided abandoned channels indicate the current and past extent of the Slave River. Horizontal fens cover large areas, and are interspersed with drier sedge and grass meadows and upland forests.

Notable Features

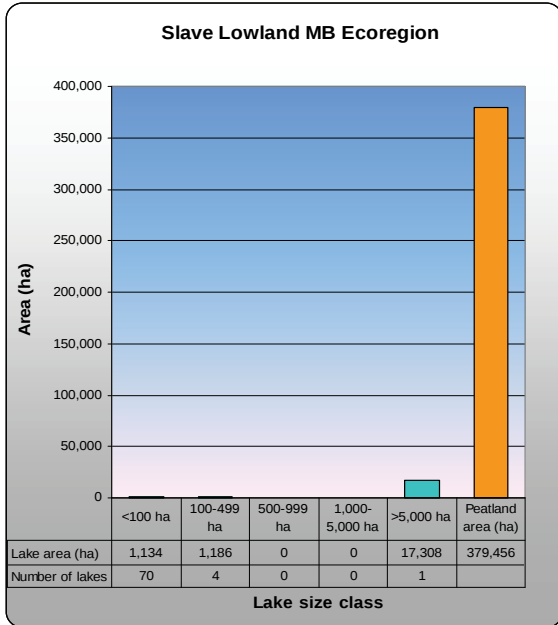
A mosaic of grass and sedge meadows is a unique feature of this Ecoregion, and provides important bison and moose habitat. White pelicans nest on islands in the Slave River and feed in the rapids along the Slave and Taltson Rivers. Saline meadows occur below the western escarpment; uncommon species such as red glasswort and saline plantain occur there. This Ecoregion was formerly part of the Boreal Plain Ecozone in the 1995 Ecozone and Ecoregions classification (Ecological Stratification Working Group 1995) but a review of available climate information led to its reassignment to the Taiga Plains.



Mixed lacustrine and alluvial deposits, with a complex of light green meadows (mixed shrub, sedge, and grass communities) and horizontal fens occupy the foreground, with vigorous mixed-wood forests in the mid and upper image.



Bison trails are faintly visible in the middle and upper image in this near-ground view of a relatively dry meadow. The whitish patches are weakly saline lacustrine materials that support a mix of grasses and sedges. The meadow is surrounded by mixed-wood forests and shrublands.



Proportion of Ecoregion occupied by lakes: 3%
Proportion of Ecoregion occupied by bogs and fens: 67%



Red glasswort (red tinted vegetation) grows in areas of high salinity in this ground view of a saline meadow. A belt of fox-tail barley surrounds the glasswort, and awned sedge and reed-bentgrass meadows in the foreground occupy less saline areas.

Section 4: Mammals and Birds of the Taiga Plains

4.1. Introduction

More than 50 species of mammals are found in the Taiga Plains. Nearly 250 species of birds occur fairly regularly in the Taiga Plains, and at least 50 more are occasional visitors. Few bird species reside year-round, and some are winter residents from nesting areas in the Arctic. The majority that breeds in the Taiga Plains migrates south for the winter, often to tropical or subtropical destinations. The Mackenzie Delta, Mills Lake and the Slave River Delta are especially important staging areas for thousands of migrating waterfowl and other aquatic migratory birds.

Vegetation is a key element of wildlife habitat. Climate, in turn largely determines what plants grow in a particular area as well as their abundance. The climate of the Level II Taiga Plains Ecoregion ranges from boreal in the south to subarctic in the north. The Taiga Plains boreal climate is characterized by warm, moist summers and cold, snowy winters whereas in the subarctic regions, precipitation (rain and snow) is less with cool, short summers and very cold and long winters. This greatly influences the distribution and abundance of plants and animals in the Taiga Plains, with species diversity and biomass highest in the warmer and moister boreal regions of the south.

The Taiga Plains and neighbouring Taiga Shield share similar climatic regimes and display an ecological transition through three major biomes –Tundra, Taiga, and Boreal – a transition that enhances species richness from north to south. Species richness and abundance however is greater within the Taiga Plains due to better, more fertile and extensive soils that have developed from the more erodible sedimentary bedrock parent materials characteristic of the Taiga Plains. The resistant granitic bedrock of the Taiga Shield does not lend itself to good soil development.

The Level III High Subarctic Ecoregion that arcs across the northern end of the Taiga Plains is an Ecoregion where forest and tundra often form an interspersed mosaic across the landscape. As such, it contains wildlife habitats and species typical of both forested areas further south and tundra areas to the north. It is unlikely that any of the resident birds are restricted to this transitional Ecoregion. As tree cover diminishes to more open

woodlands, arboreal habitats for forest-dwelling birds are reduced. Toward the outer edges of the High Subarctic Ecoregion, more treeless areas consisting mostly of dwarf birch, ericaceous shrubs, tussock grass-sedge meadows and peat polygons provide habitat for birds that typically occupy tundra habitats.

Historical and current literature on the abundance and distribution of mammals and birds has been reviewed and summarized for all of the Taiga Plains Level III ecoregions – High Subarctic, Low Subarctic, High Boreal and Mid-Boreal. Early exploration parties often included skilled naturalists such as John Richardson who published several volumes on the wildlife he encountered. In the 1860s, a young zoologist named Robert Kennicott inspired many of the Hudson's Bay Company employees throughout the Mackenzie region to collect and forward thousands of wildlife specimens to the Smithsonian Institution. His efforts resulted in the verification of species distribution that remains relevant today. Some Hudson's Bay Company officers such as Roderick MacFarlane and Bernard Ross went on to publish important works on birds and mammals.

Starting in the 1900s, Edward Preble, Dewey Soper, Alfred Porsild and several other naturalists carried out biological investigations for governments and museums. Realizing their limitations, many relied extensively on the local knowledge of the aboriginal people to help determine the distribution and abundance of species in areas beyond the usual travel routes.

The next period of intensive information gathering was the 1970s. During that time the Mackenzie Valley pipeline was being proposed and wildlife baseline data were required.

More recently, the annual Christmas Bird Count, North American Breeding Bird Survey, Northwest Territories/Nunavut Bird Checklist, eBird (on-line database of bird distribution and abundance), contributions to North American Birds, ecological assessments under the Northwest Territories Protected Areas Strategy, Settlement Area land claims projects, and other programs have advanced the state of our knowledge of wildlife distribution and abundance. This information has been captured in a species database, including complete reference listings that may be accessed on the Department of Environment and Natural Resources website: <http://www.enr.gov.nt.ca>.

4.2 Mammals of the Taiga Plains

4.2.1 Ungulates

Several types of caribou are found in the Taiga Plains. Seasonal ranges of Bluenose West, Bluenose East and Cape Bathurst barren-ground caribou occur within the Taiga Plains High Subarctic Ecoregion, mainly east of the Mackenzie River. They also winter in the Low Subarctic Ecoregion west and south of Great Bear Lake. In recent decades, they have not occupied areas between Lac La Martre, Horn Plateau and the Mackenzie River as extensively as in the past. Bathurst barren-ground caribou occasionally wander west of the North Arm of Great Slave Lake into the Taiga Plains High Boreal Ecoregion. Barren-ground caribou rarely cross the Taltson River into the Mid-Boreal Ecoregion.

The distribution of Grant's caribou from the Porcupine caribou herd is usually limited to Alaska and the Yukon; however they may migrate as far east as Aklavik and Fort McPherson during some winters.

Woodland caribou (boreal ecotype) range across nearly the entire extent of the Taiga Plains. To the west, the Cordilleran foothills separate them from the mountain ecotype woodland caribou. The Taiga Shield to the east is occupied almost solely by barren-ground caribou. In the High Subarctic Ecoregion, ranges overlap between barren-ground caribou and non-migratory boreal caribou, as they do in the Low Subarctic Ecoregion west and south of Great Bear Lake.



Boreal caribou occur throughout much of the Taiga Plains. During winter, they prefer open mature coniferous forests and bogs; in spring and summer wetter areas such as fens, marshes, river, and lake shorelines are favoured. *Photo: J. Nagy*

With few exceptions, boreal caribou are the only caribou that occur in the Taiga Plains High Boreal Ecoregion. They are also scattered throughout the Mid-Boreal Ecoregion in small groups, usually in association with peatlands that support good lichen growth. These animals rarely wander into the Slave River lowlands that act as a buffer between the boreal caribou to the west and barren-ground caribou to the east.

Muskoxen currently occur in the northern portion of the Taiga Plains and are most common in the eastern half of the High Subarctic Ecoregion. The trade in hides from 1860 to 1915 essentially exterminated muskoxen from the Taiga Plains. Numbers have recovered since then; first in the northeast and since the 1980s muskoxen have expanded their range west and south into the Low Subarctic Ecoregion north of the Great Bear River between Great Bear Lake and the Mackenzie River.



Muskoxen prefer upland areas with shallow snows, in close proximity to lush sedge and shrub lowlands. *Photo: R. Popko*

Moose range throughout the entire Taiga Plains but densities are highest in the Mid-Boreal Ecoregion where preferred habitats and food resources are more plentiful than elsewhere. Early successional mixed-wood and riparian areas such as in the Liard River Valley, especially contain high moose numbers. In the High Boreal Ecoregion regenerating burns, riparian vegetation, and fringes of shallow lakes provide good quality food and locally high moose densities. Moose are widespread in the Low Subarctic Ecoregion, and are locally abundant on shorelines and islands in the Mackenzie River. Numbers are generally low in the High Subarctic Ecoregion, where moose are most common along river valleys and other wetlands such as those in the Mackenzie River Delta.



Optimal moose habitat consists of early successional forest, mostly a result of fire, which consists of willow and regenerating aspen, birch and poplar. Riparian areas, with their abundance of shrubs and aquatic vegetation, are also used extensively by moose. *Photo: P. Myers*

White-tailed deer have been observed in the Taiga Plains Mid-Boreal and infrequently in the High Boreal Ecoregion. There has been one report of a white-tailed deer in the Low Subarctic along the Mackenzie River. Mule deer have occurred in the Mid-Boreal Ecoregion in the past; they have not been reported here in recent decades.

Elk occasionally wander into the southwestern corner of the Northwest Territories. There have been recent reports of elk from areas along the Liard River south of Fort Liard and from near the mouth of the North Nahanni River.

Wood bison, formerly widespread throughout the Taiga Plains Mid-Boreal and High Boreal Ecoregions, were nearly extirpated by the turn of the 20th century. Wood Buffalo National Park was created in 1922 to protect the few remnant herds west of Fort Smith. Soon after, over 6,000 plains bison were released in the Park and quickly hybridized with the indigenous wood bison.

The semi-open prairies along the Slave River formerly supported a large wood bison population. By the 1940s, the area was recolonised by plains bison-wood bison hybrids, and numbers grew until the 1970s. Since then the population has experienced a dramatic decline, possibly due to the debilitating effects of tuberculosis and brucellosis.



Bison occupy southern areas of the Taiga Plains, primarily south and west of Great Slave Lake. Areas with extensive sedge and grass meadows are important habitat, particularly during winter.

Photo: B. Oosenbrug

Disease-free wood bison from a remnant herd in northeastern Wood Buffalo National Park (Needle Lake) were reintroduced north of the Mackenzie River (Mackenzie Bison Sanctuary, 1963) and the Liard Valley (1980). These new populations are increasing and expanding their range. A bison-free zone is maintained between the Mackenzie Bison Sanctuary and Wood Buffalo National Park for the purpose of preventing disease transmission from the Park to healthy herds.

Wood bison formerly occurred in the vicinity of Lac La Martre, and the Mackenzie Sanctuary bison are slowly returning to northerly parts of their historical range. They are also moving westward into the Low Subarctic Ecoregion north of the Horn Plateau. In the High Boreal

Ecoregion, wood bison occur throughout the Great Slave Plains west of Great Slave Lake, mainly foraging in the many marl lake beds that support lush sedge meadows.

4.2.2 Large Carnivores

Grizzly bears have large home ranges. Although more abundant in the tundra areas north of the Taiga Plains, their distribution also includes the High Subarctic Ecoregion and a portion of the Low Subarctic Ecoregion between Great Bear Lake and the Mackenzie Mountains.

Black bears are common throughout the Taiga Plains High Boreal and Mid-Boreal Ecoregions, areas that contain the most diverse and productive habitats. Black bears are less common in the Low Subarctic Ecoregion. They may have difficulty occupying areas with inadequate tree cover in the High Subarctic Ecoregion where grizzlies occur because means of escape are lacking.



The diverse and abundant assemblage of fruit-bearing shrubs and forbs, particularly in the southern Taiga Plains, provides a good food source for black bears. *Photo: M. Bradley*

The highest lynx densities occur in the Taiga Plains Mid-Boreal Ecoregion, where disturbances such as frequent fires provide early successional forest vegetation - optimal habitat for snowshoe hares, the lynx's primary prey species. Traditionally, Fort Simpson and Fort Providence have traded the greatest numbers of pelts. Lynx are less common in the other Ecoregions, occasionally ranging as far north as the limit of trees.



Lynx prefer young deciduous-dominated forests. When hare populations erupt, lynx numbers can increase dramatically. *Photo: M. Bradley*

Wolves range throughout the entire Taiga Plains. Both timber and tundra wolves occur in the High Subarctic and Low Subarctic Ecoregions. Tundra wolves migrate with the large caribou herds to wintering grounds below the tree line. Sandy areas along the northern edge of the High Subarctic Ecoregion can provide ideal denning habitat for tundra wolves. Because moose and woodland caribou occur at low densities in these Ecoregions, resident packs of timber wolves travel extensively through large home ranges to sustain themselves. Timber wolves inhabit the High Boreal and Mid-Boreal Ecoregions; their abundance is reflected by the distribution and densities of moose, bison, and woodland caribou.

Coyotes are uncommon in the Taiga Plains. They are occasionally taken by trappers in years when prey populations are high. Their range is confined largely to the High and Mid-Boreal Ecoregions, and elsewhere along the Mackenzie River Valley.

Red foxes are most abundant in the Taiga Plains Mid-Boreal Ecoregion and are widely distributed elsewhere. Red and Arctic foxes are common in many parts of the Taiga Plains High Subarctic Ecoregion. Although red foxes are dispersed across various habitats in the Low Subarctic and High Boreal Ecoregions year-round, Arctic foxes make only seasonal use of the Low Subarctic Ecoregion when they may accompany wintering barren-ground caribou to scavenge carrion. In rare instances Arctic foxes will range as far south as the Mid-Boreal Ecoregion.



Red foxes are common throughout the Taiga Plains and occupy a diverse range of habitats, from coniferous forests to open tundra. Photo: B. Oosenbrug

4.2.3 Mustelids and Skunks

Marten are common and widespread throughout the dense coniferous forested habitats of the Taiga Plains; they may achieve very high densities in optimal habitat of the High Boreal and Mid-Boreal Ecoregions. Extensive open areas with sparse tree cover are less suitable as marten habitat. However, parts of the Low Subarctic and High Subarctic Ecoregions, such as the Anderson River watershed, are noted for high quality pelts of this important furbearer. Fishers, a close relative of marten, occur at low densities south of Great Slave Lake, mainly in the vicinity of the

Liard and Slave Rivers. They favour dense coniferous or mixed-wood forests with high continuous canopy cover.



American marten frequent coniferous forests throughout the Taiga Plains, where they prey largely on small mammals including mice, voles and red squirrels as well as a variety of small birds. Photo: N. Earle

Mink inhabit the Taiga Plains wherever there are adequate prey around lakes, streams and wetlands. They are particularly abundant in the Mackenzie River Delta and the Slave River Delta. Otters are more restricted to streams with open rapids throughout the winter to enable access to fish. Otter populations may be reliant on beaver activities for winter denning, and entrance under the ice. They are most abundant in the larger rivers of the Mid-Boreal Ecoregion and have been reported as far as treeline in the High Subarctic Ecoregion.

Wolverines are distributed at low densities across the entire Taiga Plains. As opportunistic predators, they travel extensively in large home ranges. Wolverines thrive where large concentrations of ungulates provide a source of carrion for food.

Least and short-tailed weasels are widely dispersed across a diversity of habitats. Their abundance depends very much on small mammal populations.

Striped skunks are occasionally observed and caught in traps in the Taiga Plains Mid-Boreal Ecoregion.



Short-tailed weasels, or ermines, change colour in winter and their white pelage provides value as furbearers. Photo: A. Gunn

4.2.4 Large Rodents

Beavers are widespread in the Taiga Plains and are usually found wherever suitable habitat occurs. They rely on woody deciduous vegetation near watercourses. Populations are generally highest in the Mid-Boreal and High Boreal Ecoregions where optimal habitats such as watercourses bordered by aspen forest are more plentiful.

Beaver populations in the Taiga Plains High Subarctic and Low Subarctic Ecoregion are generally limited by food supply. Much of the habitat within these two Ecoregions is marginal due to the predominance of coniferous vegetation and scarcity of aspen. Productive riparian habitats in the Mackenzie Delta, and those associated with the Arctic Red, Ontonagon, and Ramparts River systems, as well as wetland complexes east of the Norman Range, support high beaver densities.

Muskrats are widespread in the Taiga Plains and may penetrate well into the forest-tundra transition, wherever water bodies occur that do not freeze to the bottom. In especially favourable habitats they are capable of achieving very high densities. Records from 1940 indicate that almost 250,000 muskrats were harvested from the Mackenzie River Delta (High Subarctic Ecoregion), representing the bulk of that year's total Northwest Territories muskrat catch. Large numbers of muskrats are also trapped in the marshy wetlands of the Slave River Delta (Mid-Boreal Ecoregion).

Porcupines require woody vegetation for food; populations tend to be small and widely scattered throughout most of the Taiga Plains. They are generally most common in the Mid-Boreal and High Boreal Ecoregions. Porcupines are rare in sparsely treed areas of the High Subarctic Ecoregion.



Porcupines are adept climbers and consume the inner bark of a variety of trees in winter. With the exception of fishers, they have few predators. Photo: R. Kennedy

Red squirrels occur at highest densities in closed coniferous forests. They are most abundant in the forests of the Taiga Plains Mid-Boreal Ecoregion, and have been reported as far north as the High Subarctic Ecoregion. Northern flying squirrels may also be widespread in the

Mid-Boreal and High Boreal forests, but they are difficult to detect.

Arctic ground squirrels range across the Taiga Plains High Subarctic Ecoregion wherever soil conditions allow burrowing. They also occur in parts of the Taiga Plains Low Subarctic Ecoregion west of Great Bear Lake.

Woodchucks and least chipmunks have been reported only from those portions of the Taiga Plains High Boreal and Mid-Boreal Ecoregions south of the Mackenzie River.



Arctic ground squirrels, or 'sik-siks' burrow into soil for nesting and hibernation, including moraines, eskers, riverbanks, lakeshores and meadows. With the short northern summer they may be active above ground for only a few months.

Photo: J. Nagy

4.2.5 Mice, Voles and Lemmings

These small mammals are important prey species for some carnivores and birds of prey that inhabit the Taiga Plains. Their populations can fluctuate dramatically and thereby greatly influence the distribution and abundance of their predators.

A number of species of voles – meadow, northern red-backed, southern (Gapper's) red-backed, taiga (chestnut-cheeked), tundra and heather voles – inhabit the Taiga Plains. Of these, meadow and northern red-backed voles are most common and widespread; meadow voles occur in open habitats throughout the entire Taiga Plains, while northern red-backed voles are excluded from the Mid-Boreal Ecoregion south of the Mackenzie River (near the Kakisa River) and east of the Liard River where they are replaced by southern red-backed voles. Taiga voles occur throughout most of the Taiga Plains, and can attain high densities in extensive colonies, then disappear from these areas for decades. The range of heather voles is confined largely to the High and Mid-Boreal Ecoregions, whereas tundra voles are restricted to the High Subarctic and some portions of the Low Subarctic Ecoregion.

Deer mice occupy a wide range of habitats throughout the the Mid-Boreal, High Boreal and Low Subarctic Ecoregions of the Taiga Plains. Their range extends north into the High Subarctic along the Mackenzie River to the Mackenzie River Delta. Meadow jumping mice are

confined largely to the Mid-Boreal and High Boreal Ecoregions south of the Mackenzie River.

Lemmings are close relatives of voles. Both collared and brown lemmings are more typically found in Arctic tundra habitats to the north, and in the Taiga Plains. are confined to the High Subarctic Ecoregion, mostly east of the Mackenzie River. Bog lemmings range throughout the Mid-Boreal, High Boreal, Low Subarctic and western High Subarctic Ecoregions where they occupy wet forest, bog, meadow and tundra habitats.



Small mammals such as brown lemmings are a staple food source and their availability may affect the reproductive success of predators such as Arctic foxes, Snowy Owls, and Rough-legged Hawks. Photo: A. Gunn

4.2.6 Lagomorphs

Snowshoe hares range throughout the Taiga Plains wherever forest and tall shrub habitats occur; they favour early successional forest, and their numbers periodically irrupt. In the Taiga Plains High Subarctic Ecoregion, Arctic hares may be locally or occasionally abundant in rocky tundra habitats.



Snowshoe hares change their colour according to the seasons, to blend into their surroundings and hide from predators. Photo: R. Kennedy

4.2.7 Insectivores

Shrews, like many other small mammals, undergo wide population fluctuations. Masked shrews are the most common and widespread species within the Taiga Plains. American pygmy shrews occur throughout the Taiga

Plains High Boreal and Mid-Boreal Ecoregions. Dusky shrews seem to reside only south of Great Slave Lake in the Taiga Plains. Besides masked shrews, American water shrews and Arctic shrews may be the only insectivores present in the Low Subarctic Ecoregion, but information on their distribution and abundance is lacking. Tundra shrews, and possibly barren-ground shrews, only occur in the High Subarctic Ecoregion.

4.2.8 Bats

The distribution of bats in the Taiga Plains has not been well documented. Little brown bats, big brown bats and northern long-eared bats have been reported in the Mid-Boreal Ecoregion. They have never been reported in the High Subarctic Ecoregion, but could be expected because of their mobility. Hoary bats reside in southern portions of the Taiga Plains and may extend their range to the limit of trees.

4.3 Birds of the Taiga Plains

4.3.1 Birds of Prey

Bald Eagles and Ospreys are closely associated with larger lakes and rivers where fish and suitable tall nesting trees are readily available. Golden Eagles are more reliant on steep cliffs and hunt for their prey in hilly open woodlands. The distribution of Peregrine Falcons largely depends on steep cliffs for nesting, and wetlands where shorebirds and waterfowl prey are abundant. The breeding distribution of Rough-legged Hawks and Gyrfalcons is restricted to the Taiga Plains High Subarctic Ecoregion. Both raptors also nests on cliffs, although trees may be used by Gyrfalcons if cliffs are not available.



Peregrine falcons are agile flyers that prey largely on waterfowl and shorebirds. They usually nest and lay their eggs on steep cliff ledges near wetlands, wherever these habitats and food conditions occur. Photo: M. Bradley

Other raptors such as Northern Harriers, Red-tailed Hawks, Sharp-shinned Hawks, American Kestrels and Merlins are more abundant in the southerly (High Boreal and Mid-Boreal) Ecoregions. Northern Goshawks and Hawk Owls inhabit forests, while Northern Harriers and Short-eared Owls prefer marshes, bogs and other open

wetlands. Snowy Owls often appear as migrants from their breeding range on the Arctic tundra. Great Horned, Great Grey, Boreal and Northern Hawk Owls are restricted to the Low Subarctic, High Boreal, and Mid-Boreal Ecoregions where they reside year-round.



Great Grey Owls hunt primarily mice and voles, and often perch in trees along roadsides during the day.
Photo: D. Johnson

4.3.2 Loons and Grebes

Red-throated, Pacific, Yellow-billed and Common Loons occur extensively on many of the lakes of the Taiga Plains High Subarctic and Low Subarctic Ecoregions. Horned and Red-necked Grebes are found in marshy habitats. Common Loons, Horned Grebes and Red-necked Grebes nest more often in the High Boreal and Mid-Boreal Ecoregions, along with Pied-billed Grebes.

4.3.3 Waterfowl

The Arctic coast of the Mackenzie Delta (immediately north of the Taiga Plains) is a key breeding area for Tundra Swans, Snow Geese and Greater White-fronted Geese. Where suitable habitat occurs, some of these birds also nest in parts of the High Subarctic Ecoregion. Canada Geese are widespread breeding residents throughout the Taiga Plains but are more common in the southerly ecoregions. During spring and fall swans and geese migrate to and from breeding grounds further north.



Populations of Greater Scaups are declining throughout much of their North American range, but those that migrate to the Northwest Territories Taiga Plains appear to be stable.
Photo: A. Korpach

The Taiga Plains provides important breeding habitat for many species of ducks. Mallards, Northern Pintails, American Widgeons, Northern Shovelers and Green-winged Teal are the main dabbling ducks that breed in the numerous shallow lakes, ponds and marshes. After an absence of many decades, Gadwalls have returned as far north as the Mackenzie Delta. Ringed-necked Ducks, Greater Scaups, Lesser Scaups, White-winged Scoters, Surf Scoters, Long-tailed Ducks, Common Goldeneyes, Buffleheads, Common Mergansers and Red-breasted Mergansers are the resident diving ducks. Dabbling ducks such as Blue-winged Teal and Ruddy Ducks, and divers like Redheads, Canvasbacks, Hooded Mergansers are more abundant in the Mid-Boreal Ecoregion. Brackett Lake, Mills Lake and Beaver Lake are particularly important staging areas for migrating waterfowl.

4.3.4. Wading Birds

Sandhill Cranes are the most widespread wading birds in the Taiga Plains, and are the only ones in this group that breed in the High Subarctic Ecoregion. Whooping Cranes formerly ranged widely across the Taiga Plains before becoming restricted to a small isolated nesting area in the northeastern part of Wood Buffalo National Park. In recent years they have expanded their breeding area beyond the Park to some extensive wetlands along the western edge of the Slave River Lowlands. Occasionally, American Bitterns, American Coots, Yellow Rails and Soras occur in marshy wetlands as far north as the Low Subarctic Ecoregion. Great, Snowy and Cattle Egrets, and Great Blue Herons have been visitors to the Mid-Boreal Ecoregion.



Whooping cranes are summer residents that nest almost exclusively in an isolated wetland portion of the north-eastern corner of Wood Buffalo National Park, within the Taiga Plains Mid-Boreal Ecoregion. *Photo: B. Johns*

4.3.5 Other Fish-eaters

Belted Kingfishers occur in the Taiga Plains wherever there are adequate nesting sites in steep eroded banks near fish-bearing watercourses.

American White Pelicans from the Slave River nesting colony near Fort Smith (Taiga Shield) occasionally venture to Great Slave Lake and the Mackenzie River. A

small breeding colony existed in the Taiga Plains Mid-Boreal Ecoregion on Ile Demarais, near the outlet of Great Slave Lake until the 1930s.

Double-crested Cormorants were found on Great Slave Lake until the late 1800s when populations across North America declined severely. The U.S. National Museum contains a specimen collected from Big Island, near the outlet of Great Slave Lake. As breeding colonies are becoming re-established in Canada, including northern Alberta, this species may someday return to the Northwest Territories; there have been some recent unconfirmed sightings on Great Slave Lake.

Sea birds occasionally wander inland. A Least Auklet and a Thick-billed Murre, the latter likely from the Cape Parry colony about 200 km north of the Taiga Plains (the only known Murre breeding colony in the western Canadian Arctic) have been reported from the Mackenzie Delta. A Black Guillemot was found near Fort Good Hope in the Low Subarctic Ecoregion.

4.3.6 Shorebirds

Lesser Yellowlegs, Spotted Sandpipers, Solitary Sandpipers and Common Snipe breed throughout the Taiga Plains; however most shorebirds are migrants that nest in the Arctic tundra. These include sandpipers of the Genus *Calidris*, a closely related group of small, highly migratory Arctic breeding sandpipers, Black-bellied Plovers, Whimbrels, Long-billed Dowitchers, Hudsonian Godwits and Ruddy Turnstones. Although Semipalmated Plovers and Red-necked Phalaropes are generally more associated with the Arctic tundra, they may also breed in the High Subarctic and Low Subarctic Ecoregions of the Taiga Plains.

Killdeer and Greater Yellowlegs are common in the Taiga Plains High Boreal and Mid-Boreal Ecoregions. More southerly breeding species such as Upland Sandpipers, Short-billed Dowitchers, Wilson's Phalaropes, Marbled Godwits and American Avocets are rare with breeding records only from the Mid-Boreal Ecoregion.

4.3.7 Gulls, Terns, and Jaegers

Bonaparte's, Mew, and Herring Gulls and Arctic Terns are widespread around many lakes in the Taiga Plains, while Glaucous Gulls are occasional migrants from the Arctic coast. Parasitic and Long-tailed Jaegers are common in the High Subarctic Ecoregion. Ring-billed Gulls, California Gulls and Common Terns and Black Terns are found mainly in the Mid-Boreal Ecoregion.

4.3.8 Grouse

Spruce Grouse and Sharp-tailed Grouse occupy suitable habitats throughout the Taiga Plains. Tundra-nesting Willow Ptarmigan and Rock Ptarmigan often nest in the High Subarctic Ecoregion. Willow Ptarmigan are most abundant as winter residents throughout most of the Taiga

Plains, and have been observed in some Low Subarctic habitats in summer, such as on the Horn Plateau. Ruffed Grouse prefer the extensive mixed forests of the Mid-Boreal Ecoregion.



Spruce Grouse inhabit mature coniferous forest of the Taiga Plains throughout the year. In winter, their diet consists almost entirely of conifer needles and buds. Photo: T. Van Dam

4.3.9. Corvids and Blackbirds

Common Ravens, Gray Jays and Rusty Blackbirds are widespread and common throughout most habitats of the Taiga Plains. American Crows and introduced European Starlings occur mostly in and near communities in the southern Northwest Territories.

Black-billed Magpies have extended their range to the Taiga Plains in recent decades and have taken residence in or near most communities in the Mid-Boreal Ecoregion. Red-winged Blackbirds breed in marshes and wetlands, primarily in the Mid-Boreal and High Boreal Ecoregions. Common Grackles, Brewer's Blackbirds, Yellow-headed Blackbirds and Brown-headed Cowbirds are seasonal residents of the Mid-Boreal Ecoregion. Western Meadowlarks and Baltimore Orioles are occasional summer visitors to southern portions of the Ecoregion.



Red-winged Blackbirds are locally abundant in wetlands and marshes, mainly in the southern portions of the Taiga Plains. Photo: J. Nagy

4.3.10 Woodpeckers

Ground-foraging Northern Flickers are the most common and wide-ranging summer residents of the Taiga Plains; they migrate south when ants and other ground insects

become unavailable. Other common species include Hairy Woodpeckers and smaller Downy Woodpeckers, but their ranges are confined largely to the Mid-Boreal, High Boreal and the more southern portions of the Low Subarctic Ecoregion. Northern (American) Three-toed, and to a lesser extent Black-backed Woodpeckers range throughout much of the Taiga Plains, but are not common anywhere. They depend on mature and burned-over conifer stands and their range extends into the High Subarctic Ecoregion. Other than Flickers, all of these woodpeckers reside year-round and in winter feed on dormant tree insects.

Yellow-bellied Sapsuckers are seasonal residents that feed mainly on the flowing sap of hardwoods, especially white birch, and are most abundant in the Mid-Boreal Ecoregion of the Taiga Plains. The largest species, Pileated Woodpeckers prefer mature and over-mature dense canopy mixed-wood and deciduous forests, and their range is confined almost exclusively to the Mid-Boreal Ecoregion.

4.3.11 Aerial Insect-eaters

This group specializes in catching insects in flight. The short summers that restrict flying insect activity severely limit the time these birds can reside each year in the Taiga Plains. Tree, Bank, Cliff and Barn Swallows and Ruby-crowned Kinglets have been the most successful in the High Subarctic Ecoregion. Northern Shrikes add small mammals and birds to their insect diet. All vireos and flycatchers, as well as Common Nighthawks and Violet-green Swallows are found nearly exclusively in the Mid-Boreal Ecoregion. Although both Eastern Phoebe and Olive-sided Flycatchers are widely distributed in this Ecoregion, the latter especially may be threatened by habitat loss in its southern wintering areas.



Eastern Phoebe range throughout much of the Boreal and Taiga forest regions, and like other flycatchers are dependent on the abundant but short-lived populations of northern summer insects.
Photo: J. Nagy

4.3.12 Warblers

Tennessee, Orange-crowned, Magnolia, Yellow-rumped, Yellow, Wilson's, Blackpoll and Palm Warblers, Northern Waterthrushes and Common Yellowthroats (generalist

insect-eaters) are fairly prevalent throughout the Taiga Plains.

Mourning, Canada, MacGillivray's and Connecticut Warblers are restricted to the vicinity of the Liard Valley in the Mid-Boreal Ecoregion. Townsend's, Pine and Black-throated Green Warblers may be occasional visitors to the Mid-Boreal Ecoregion. Ovenbirds and Western Tanagers migrate to the Mid-Boreal and High Boreal Ecoregions. Cape May, Bay-breasted and Black-and-white Warblers and American Redstarts range as far north as the Low Subarctic Ecoregion.

Some opportunistic species, such as Cape May Warblers may be present only during major infestations of forest insects such as spruce budworm.



Wilson's Warblers are common summer residents of the Taiga Plains, and prefer shrublands and open woodland habitats.
Photo: J. Nagy

4.3.13 Other Insectivores

Horned Larks and American Pipits, both more typical of Arctic and alpine tundra, are at the margins of their breeding range in the Taiga Plains High Subarctic Ecoregion. American Pipits prefer rocky open landscapes. Horned Larks are insectivorous in the summer breeding season, but change their diet more to seeds during the rest of the year. Bohemian Waxwings are widely distributed throughout the Taiga Plains in summer and employ a similar strategy of switching to seeds and fruits when insects become unavailable. They occasionally overwinter in the Mid-Boreal and High Boreal Ecoregions.

The distribution of House, Winter and Marsh Wrens, and Red-breasted Nuthatches is limited in the Taiga Plains to the Mid-Boreal Ecoregion.

American Dippers are usually found near swift streams in Cordilleran areas, but they occasionally wander into the Taiga Plains High Subarctic and Low Subarctic Ecoregions.

4.3.14 Thrushes

Gray-cheeked Thrushes and American Robins are common throughout the Taiga Plains, whereas

Swainson's, Hermit and Varied Thrushes have limited distribution in the High Subarctic Ecoregion. Mountain Bluebirds are regular spring migrants in the southern Taiga Plains on their way west to the mountains, and Townsend's Solitaires wander into western parts from the Cordillera. Veerys have a limited distribution in the Mid-Boreal Ecoregion. Northern Wheatears and Bluethroats occasionally visit the northern Taiga Plains from the west.

4.3.15 Sparrows and Related Species

American Tree, Chipping, Fox, Savannah, Lincoln's, Swamp, and White-crowned Sparrows, as well as Dark-eyed Juncos are ground-foraging seed-eaters that occur throughout the Taiga Plains.



Savannah Sparrows are ground-nesting summer residents of the Taiga Plains; they prefer open country habitats such as meadows, marshes, bogs, shrublands and tundra. *Photo: J. Nagy*

Some sparrows may breed only in the Mid-Boreal Ecoregion of the Taiga Plains. Nelson's Sharp-tailed Sparrows exist at low density in marshy habitats and Golden-crowned and Lark Sparrows have been reported from the Liard Valley. Vesper Sparrows are a grassland species rarely found in the Northwest Territories outside of the Slave Lowlands. House Sparrows (Weaver Finches) are an introduced species and occur mainly around towns and communities.

Clay-coloured, LeContes, Song and White-throated Sparrows migrate as far as the Low Subarctic Ecoregion, and Golden-crowned Sparrows may be occasional visitors from the west.

Harris' Sparrow, Lapland and Smith's Longspurs, and Snow Buntings often breed in the High Subarctic Ecoregion; however most birds in the Taiga Plains are migrants from Arctic tundra nesting areas.

4.3.16 Finches and Other Tree Seed-eaters

Tree seeds are an enduring food supply, and birds that utilize them can often remain in the Taiga Plains through the winter. As white spruce do not bear heavy cone crops every year, species that rely on the seeds may at times experience significant population fluctuations.

Pine Grosbeaks, White-winged Crossbills, Common Redpolls and Boreal Chickadees occupy most regions of the Taiga Plains year-round. Hoary Redpolls are tundra nesters that return below treeline as common winter residents. Purple Finches, Red Crossbills, Pine Siskins, Evening Grosbeaks and Rose-breasted Grosbeaks reside in both the Mid-Boreal and High Boreal Ecoregions throughout the year. Black-capped Chickadees also reside here and may extend their range further north into the Low Subarctic Ecoregion.



Pine Grosbeaks are year-round residents of the Taiga Plains, although some birds may drift south in winter from the more northern parts of their range. They prefer open coniferous forest for nesting and for foraging tree seeds. *Photo: D. Johnson*

4.3.17 Hummingbirds

Calliope and Rufous Hummingbirds have been infrequently reported from the Taiga Plains Mid-Boreal Ecoregion, south of the Mackenzie River.

4.3.18 Doves

Mourning Doves and Rock Doves (an introduced species) are fairly regular inhabitants of some permanent human settlements within the Taiga Plains Mid-Boreal Ecoregion.

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Appendix 1. Plant Species List

For the reader's convenience, the following plant species list is sorted by both scientific and common name. Vascular plant scientific and common names follow *NWT Species 2006-2010* (Working Group on General Status of NWT Species (2006)); scientific names are based on the *Flora of North America*¹⁰. Non-vascular plant names follow those given in *Alberta Plants and Fungi – Master Species List and Species Group Checklists* (Alberta Environmental Protection 1993). Some unusual plants of the Taiga Plains Ecoregion are shown below.



The northern groundcone, *Boschniakia rossica*, has no chlorophyll and is a parasite of alders and willows. It is uncommon in the southern Taiga Plains, but frequently occurs under white spruce – alder – willow stands on the Mackenzie Delta. This specimen is about 10 cm tall. Photo: R. Decker



Insectivorous plants are found on wetlands throughout the Taiga Plains. The English sundew (*Drosera anglica*) catches insects on modified leaves with glue-tipped hairs (inset) that fold over and trap the victim; the leaf surface secretes digestive enzymes. Individual plants are only a few centimeters across. Photo: D. Downing



The northern pitcher plant, *Sarracenia purpurea*, is another insectivorous plant of wetlands. It has thick, leathery leaves (at the base of the flower stalk) that form a container holding water and digestive enzymes. Insects crawl onto the leaves searching for nectar, but cannot escape because of downward-facing hairs on the inner leaf surface (inset) and eventually drown in the pool of water below. The flowering stalks are about 30 cm high; the leaves are about 10cm long. Photo: D. Downing



Red glasswort (*Salicornia rubra*) is an uncommon plant with a fleshy stem and rudimentary leaves (inset) that grows on saline meadows of the Slave Lowland MB Ecoregion in the southeast Taiga Plains and occasionally on saline soils elsewhere. Individual plants are less than 10 cm tall and have a spreading growth form. Photo: R. Decker

¹⁰ <http://hua.huh.harvard.edu/FNA/>. Information on vascular plant nomenclature sources provided by Suzanne Carrière, Government of the Northwest Territories, February 2007.

Alaska paper birch	Betula neoalaskana Michx.
Alnus viridis (Chaix.) DC.	green alder
alpine bilberry, bilberry	Vaccinium uliginosum L.
Aralia nudicaulis L.	wild sarsaparilla
Arctostaphylos rubra (Rehd. & Wils.) Fern	red bearberry
Arctostaphylos uva-ursi (L.) Spreng.	common bearberry
awned sedge	Carex atherodes Spreng.
balsam poplar	Populus balsamifera L.
Betula glandulosa Michx.	dwarf birch, ground birch
Betula neoalaskana Michx.	Alaska paper birch
Betula papyrifera Marsh.	paper birch, white birch
black crowberry	Empetrum nigrum L. ssp. hermaphroditum (Lge.)
black spruce	Picea mariana (Mill.) BSP.
Boschniakia rossica (Cham. & Schlecht.) Fedtsch.	northern groundcone
bunchberry, dwarf dogwood	Cornus canadensis L.
Calamagrostis canadensis (Michx.) Beauv.	reed bent-grass, bluejoint
Carex atherodes Spreng.	awned sedge
Carex spp.	sedges
Cassiope tetragona (L.) D. Don	arctic white heather, mountain-heather
Chamaedaphne calyculata (L.) Moench	leatherleaf
Chamerion angustifolium (L.) Holub	fireweed
Cladina mitis (Sandst.) Hale & W. Culb.	reindeer lichen
Cladonia spp., Cladina spp.	lichens, reindeer lichens
cloudberry, baked-apple	Rubus chamaemorus L.
common bearberry	Arctostaphylos uva-ursi (L.) Spreng.
common Labrador tea	Ledum groenlandicum Oeder
common wild rose, woods rose	Rosa woodsii Lindl.
Cornus canadensis L.	bunchberry, dwarf dogwood
Cornus sericea L.	red osier dogwood
cotton-grass	Eriophorum spp.
Drepanocladus spp.	One of several mosses comprising wet moss peat
Drosera anglica Huds.	English sundew
Dryas integrifolia M.Vahl.	mountain avens (entire-leaved mountain avens)
dwarf birch, ground birch	Betula glandulosa Michx.
dwarf red raspberry, dewberry	Rubus pubescens Raf.
Empetrum nigrum L. ssp. hermaphroditum (Lge.) Böcher	black crowberry
Equisetum pratense Ehrh.	meadow horsetail
Equisetum spp.	horsetails
Eriophorum spp.	cotton-grass
fireweed	Chamerion angustifolium (L.) Holub.
fox-tail barley	Hordeum jubatum L.
green alder	Alnus viridis (Chaix.) DC.
Hordeum jubatum L.	fox-tail barley
horsetails	Equisetum spp.
jack pine	Pinus banksiana Lamb.
junipers	Juniperus spp.
larch (tamarack)	Larix laricina (Du Roi) Koch
Larix laricina (Du Roi) Koch	larch (tamarack)
leatherleaf	Chamaedaphne calyculata (L.) Moench
Ledum groenlandicum Oeder	common Labrador tea
Ledum palustre subsp. decumbens (Aiton) Hultén	northern Labrador tea, narrow-leaved Labrador tea
lichens, reindeer lichens	Cladonia spp., Cladina spp.
lodgepole pine	Pinus contorta Loud. var. latifolia Engelm.
lodgepole x jack pine	Pinus contorta x banksiana
low-bush cranberry, squashberry	Viburnum edule (Michx.) Raf.
meadow horsetail	Equisetum pratense Ehrh.
mountain avens (entire-leaved mountain avens)	Dryas integrifolia M.Vahl.

mountain cranberry, rock cranberry, bog cranberry	Vaccinium vitis-idaea L.
mountain-heather, arctic white heather	Cassiope tetragona (L.) D. Don
northern groundcone	Boschniakia rossica (Cham. & Schlecht.) Feddsch.
northern Labrador tea, narrow-leaved Labrador tea	Ledum palustre subsp. decumbens (Aiton) Hultén
paper birch, white birch	Betula papyrifera Marsh
peat mosses	Sphagnum spp, Drepanocladus spp. .
Picea glauca (Moench) Voss	white spruce
Picea mariana (Mill.) BSP.	black spruce
Pinus banksiana Lamb.	jack pine
Pinus contorta Loud. var. latifolia Engelm.	lodgepole pine
Pinus contorta x banksiana	lodgepole x jack pine
northern pitcher plant	Sarracenia purpurea L.
Plantago eriopoda Torr.	saline plantain
Populus balsamifera L.	balsam poplar
Populus tremuloides Michx.	trembling aspen
Dasiphora fruticosa (L.) Rydberg	shrubby cinquefoil
prickly rose	Rosa acicularis Lindl.
reed bent-grass, bluejoint	Calamagrostis canadensis (Michx.) Beauv.
red bearberry	Arctostaphylos rubra (Rehd. & Wils.) Fern
red glasswort	Salicornia rubra A. Nels.
red osier dogwood	Cornus sericea L.
reindeer lichen	Cladina mitis (Sandst.) Hale & W. Culb.
Rosa acicularis Lindl.	prickly rose
Rosa spp.	wild and prickly rose
Rosa woodsii Lindl.	common wild rose, woods rose
Rubus chamaemorus L.	cloudberry, baked-apple
Rubus pubescens Raf.	dewberry, dwarf red raspberry
Salicornia rubra A. Nels.	red glasswort
saline plantain	Plantago eriopoda Torr.
Salix spp.	willows
Sarracenia purpurea L.	northern pitcher plant
sedges	Carex spp.
Shepherdia canadensis (L.) Nutt.	Canada buffaloberry, soapberry
shrubby cinquefoil	Dasiphora fruticosa (L.) Rydberg.
snowberry	Symphoricarpos albus (L.) Blake
soapberry, Canada buffaloberry	Shepherdia canadensis (L.) Nutt.
Sphagnum spp.	peat mosses
English sundew	Drosera anglica Huds.
Symphoricarpos albus (L.) Blake	snowberry
trembling aspen	Populus tremuloides Michx.
Vaccinium uliginosum L.	alpine bilberry, bilberry
Vaccinium vitis-idaea L.	rock cranberry, bog cranberry, mountain cranberry
Viburnum edule (Michx.) Raf.	squashberry, low-bush cranberry
white birch, paper birch	Betula papyrifera Marsh
white spruce	Picea glauca (Moench) Voss
wild and prickly rose	Rosa spp.
wild sarsaparilla	Aralia nudicaulis L.
willows	Salix spp.

Appendix 2. Changes to 1996 Ecozones and Ecoregions

Introduction

This Appendix summarizes the changes made to the 1996 version of Ecozones and Ecoregions as defined by the Ecological Stratification Working Group (1996) that have resulted in the current version as presented in this report.

The review process started in early 2004, when the Government of the Northwest Territories (GNWT) contracted Timberline Forest Inventory Consultants (Timberline) to complete a review of the Ecozone, Ecoregion, and Soil Landscapes of Canada (SLC) polygon framework focusing on the Taiga Plains and Boreal Plains Ecozones. In March 2004, a summary report was submitted (Downing 2004). The Timberline report made the following overall recommendations respecting Ecozones and Ecoregions:

- Reassign the single ecoregion belonging to the Boreal Plains Ecozone within the Northwest Territories to the Taiga Plains Ecozone, and remove the Boreal Plains Ecozone from the Northwest Territories classification system;
- Reassign the Nahanni Plateau Ecoregion, the southern two-thirds of the Peel River Plateau Ecoregion, the Franklin Mountains Ecoregion, and the west half of the Sibbeston Lake Plain Ecoregion to the Taiga Cordillera Ecozone based on geologic, topographic and physiographic characteristics that indicated a much stronger affinity with the Taiga Cordillera Ecozone than with the Taiga Plains Ecozone;
- Subdivide the Horn Plateau Ecoregion based on local knowledge of productivity differences between the plateau, the plateau slopes, and the surrounding lowlands, and examine higher-elevation areas to the north and west of the Horn Plateau for similar tendencies;
- Divide the Mackenzie River Plain Ecoregion into at least two units to reflect climatic changes with latitude;
- Adjust the Northern Alberta Uplands Ecoregion line to extend the Hay River

Lowlands Ecoregion southwest to Fort Liard; and

- Subdivide the Northern Alberta Uplands into side slope and plateau units to reflect productivity and climatic differences;

A number of GNWT ecosystem experts and two federal experts from Agriculture and Agri-Food Canada¹¹ participated in a mapping workshop in December 2004 at which the Timberline recommendations were discussed; the group consensus was that improvements to the 1996 Ecozones and Ecoregions ecosystem classification should be made to better meet the needs of resource managers. These improvements included:

- Refinements to existing ecoregion and ecozone boundaries;
- Subdivision of existing ecoregions into more ecologically homogeneous map units;
- Inclusion of a climatic component by re-integrating the 1989 *Ecoclimates of Canada* classification; and
- Enhancement of ecoregion names to reference not only the geographic locale, but also the main landform and the regional climate.

Subsequent work in early 2005 included another mapping workshop at which a number of significant changes were proposed, a visit to Norman Wells to discuss the proposed changes with GNWT biologists familiar with the northern Northwest Territories, discussions with Alberta ecosystem experts respecting the northern extent of the Boreal Plains Ecozone, and field planning for summer 2005 to assess the proposed changes.

An intensive field program was carried out in July and August 2005 (refer to Section 2 of this report) and over 16,000 geographically referenced digital photographs were collected along with limited ground survey data throughout the entire Taiga Plains Ecozone, along the Mackenzie River valley between the Franklin and Mackenzie Mountains, and along the southwestern front ranges between Fort Simpson and Fort Liard. The Mackenzie River valley, the Franklin Mountains, and the southwestern front ranges were surveyed because

¹¹ The agency responsible for coordinating the 1996 Ecozones and Ecoregions of Canada report and map.

they were included as part of the 1996 Taiga Plains Ecozone.

From 1996 to early 2006, the Canadian ecosystem classification framework was employed to delineate and describe ecosystem units within the Northwest Territories (Ecological Stratification Working Group 1995; Downing *et al.* 2006). Subsequent discussions with other experts in Canada and the United States in May 2006 led to the adoption of a North American continental ecosystem classification scheme (refer to Section 1.2 in main document for further discussion).

The continental system is a multilevel, nested system for delineating and describing ecosystems; the Government of the Northwest Territories uses this information for planning and reporting purposes. Currently, the top four levels of the continental framework as applied in the Northwest Territories to the Taiga Plains are Level I ecoregions, Level II ecoregions, Level III ecoregions, and Level IV ecoregions.

Record of changes to 1996 classification

Revised ecoregion naming convention

A three-part naming convention has been adopted for Level IV ecoregions to provide better information on where they are located and what their physiographic and climatic characteristics are. This naming convention is described in Section 1.5 of this report.

Ecosystem classification changes

Compared to the 1996 Ecoregions and Ecozones map, in which there were 19 ecoregions distributed throughout the western Northwest Territories in the Taiga Plains, Taiga Cordillera, Boreal Cordillera and Boreal Plains Ecozones, the 2007 ecosystem classification identifies 45 distinct Level IV ecoregions within the Level II Taiga Plains Ecoregion. Nine Level IV ecoregions that formerly belonged to the Taiga Plains Ecozone have been reassigned to the Level II Taiga Cordillera Ecoregion on the basis of climate, elevation and physiography. Changes between the 1996 and 2007 versions of the Taiga Plains and adjacent Level II ecoregions and their Level III and Level IV ecoregion components are summarized in Table 3.

Figures 14 and 15 compare the 1996 and 2007 versions. For the sake of clarity, the individual ecoregion names are not included in the two figures; grayscale changes corresponding to major physiographic elements in the Taiga Plains graphically illustrate broad-scale changes to ecosystem classification.

1996 Boreal Cordillera and Taiga Cordillera Ecoregions

Revision of 1996 Boreal Cordillera and Taiga Cordillera Ecoregions is not part of the current Taiga Plains project and is not discussed elsewhere in this document. These ecoregions were assigned climate labels based on the *Ecoclimatic Regions of Canada* report and map (Ecoregions Working Group 1989) as shown in Table 3.

Table 3. Summary of Changes Between 1996 Ecozones and Ecoregions, and 2007 Level II and Level IV Ecoregions, western Northwest Territories. Climate annotation (abbreviations following Level IV ecoregion names) for Taiga Cordillera and Boreal Cordillera from *Ecoclimatic Regions of Canada* (1989).

1996 Ecozone	1996 Ecoregion	2007 Level II Ecoregion	2007 Level IV Ecoregion	Main changes
Boreal Plains	Slave River Lowland	<i>Taiga Plains</i>	Slave Delta MB	Reviews of available climate information, consultation with Alberta experts, and a review of the 1996 Boreal Plains concept led to the conclusion that this area is better matched to the Level II Taiga Plains than to the warmer Boreal Plains. The 1996 Slave River Lowland Ecoregion was assigned to three Level IV ecoregions that are distinct because of geologic, vegetation and geomorphic process differences. The Slave Delta MB Ecoregion differs from the other two by active fluvial processes.
	Slave River Lowland	<i>Taiga Plains</i>	Slave Lowland MB	See comments for Slave Delta MB.
	Slave River Lowland	<i>Taiga Plains</i>	Slave Upland MB	See comments for Slave Delta MB. Differs from the Slave Delta MB and Slave Lowland MB Ecoregions because of limestone bedrock influences and variable parent materials and correspondingly different vegetation.
Boreal Cordillera	Hyland Highlands	<i>Boreal Cordillera</i>	Hyland Highlands Alpine/Subalpine Mid-Cordilleran (MCsa)	Addition of ecoclimate label to name.
Taiga Cordillera	Selwyn Mountains	<i>Taiga Cordillera</i>	Selwyn Mountains Subalpine/Alpine Northern Cordilleran (NCsa)	Addition of ecoclimate label to name.
	Mackenzie Mountains	<i>Taiga Cordillera</i>	Mackenzie Mountains NCsa	Addition of ecoclimate label to name.
	British-Richardson Mountains	<i>Taiga Cordillera</i>	British-Richardson Mountains Subalpine/Alpine Northern Subarctic Cordilleran (NSCsa)	Addition of ecoclimate label to name from <i>Ecoclimatic Regions of Canada</i> .
Taiga Plains	Nahanni Plateau	<i>Taiga Cordillera</i>	Nahanni Plateau NCsa	Re-assignment to Taiga Cordillera based on pronounced relief and Cordilleran climatic regime as reported in <i>Ecoclimatic Regions of Canada</i> (1989).
	Peel River Plateau (above approx. 300 mASL, 100 mASL in far north)	<i>Taiga Cordillera</i>	British-Richardson Foothills NSCsa (adjacent British-Richardson Mountains)	Re-assignment to Taiga Cordillera based on pronounced relief and Northern Cordilleran climatic regime based on permafrost and vegetation characteristics; renamed to British-Richardson Foothills to reflect geographic locale.
	Peel River Plateau (above approx. 300 mASL, 100 mASL in far north)	<i>Taiga Cordillera</i>	Northern Mackenzie Foothills NCsa	Re-assignment to Taiga Cordillera based on pronounced relief and Northern Cordilleran climatic regime based on permafrost and vegetation characteristics; renamed to Northern Mackenzie Foothills to reflect geographic locale.
	Peel River Plateau (above approx. 300 mASL, 100 mASL in far north)	<i>Taiga Cordillera</i>	Southern Mackenzie Foothills NCsa	Re-assignment to Taiga Cordillera based on pronounced relief and and Northern Cordilleran climatic regime based on permafrost and vegetation characteristics; renamed to Southern Mackenzie Foothills to reflect geographic locale.
	Franklin Mountains	<i>Taiga Cordillera</i>	Franklin Mountains NCsa	Re-assignment to Taiga Cordillera based on pronounced relief and geologic relationship to Cordillera; Northern Cordilleran climatic regime based on permafrost and vegetation characteristics.
	Mackenzie River Plain (southern half)	<i>Taiga Cordillera</i>	Central Mackenzie Plain Boreal Northern Cordilleran (NCb)	Re-assignment to Taiga Cordillera based on location between Franklin Mountains and Mackenzie Mountains and vegetation and permafrost evidence that Taiga Cordilleran climates are more influential than continental Low Subarctic climates.
	Sibbeston Lake Plain (west-central)	<i>Taiga Cordillera</i>	Nahanni Range NCsa	High-elevation Cordilleran element.

Table 3 (continued)

1996 Ecozone	1996 Ecoregion	2007 Level II Ecoregion	2007 Level IV Ecoregion	Main changes
Taiga Plains	Sibbeston Lake Plain (west of Nahanni Range)	<i>Taiga Cordillera</i>	Tetcela Valley NCb	Re-assignment to Taiga Cordillera based on the likelihood that Cordilleran climates are more influential than continental climates and location between Nahanni Front Range and Ram Plateau Mountains. Not addressed in this report.
	Sibbeston Lake Plain (northernmost part)	<i>Taiga Cordillera</i>	Ram Plateau NCsa	Re-assignment to Taiga Cordillera based on pronounced relief and Cordilleran climatic regime as reported in <i>Ecoclimatic Regions of Canada</i> (1989). Not addressed in this report.
	Sibbeston Lake Plain (southern and western two-thirds)	<i>Taiga Cordillera</i>	Kotanalee Range MCsa	Re-assignment to Taiga Cordillera based on pronounced relief and Cordilleran climatic regime as reported in <i>Ecoclimatic Regions of Canada</i> (1989). Not addressed in this report.
	Sibbeston Lake Plain (southern and western two-thirds)	<i>Taiga Cordillera</i>	South Nahanni MCsa	Re-assignment to Taiga Cordillera based on pronounced relief and Cordilleran climatic regime as reported in <i>Ecoclimatic Regions of Canada</i> (1989). Not addressed in this report.
	Sibbeston Lake Plain (eastern third)	<i>Taiga Plains</i>	Sibbeston Upland HB	Change of landscape descriptor from plain to upland to reflect landform, and addition of ecoclimate label.
	Sibbeston Lake Plain (southern and western two-thirds)	<i>Taiga Plains</i>	Liard Plain MB (partly within 1996 Sibbeston Lake Plain Ecoregion))	Landscape produced by fluvial processes; distinct from Sibbeston Upland HB Ecoregion both physiographically and climatically.
	Mackenzie River Plain (northern half)	<i>Taiga Plains</i>	North Mackenzie Plain LS	North half of 1996 ecoregion influenced more by Low Subarctic climates than by Taiga Cordilleran climates as indicated by vegetation and permafrost features.
	Hay River Lowland	<i>Taiga Plains</i>	Liard Plain MB (partly within 1996 Hay River Lowland Ecoregion)	Landscape produced by fluvial processes; distinct from South Mackenzie Plain MB that has less floodplain development.
	Hay River Lowland	<i>Taiga Plains</i>	South Mackenzie Plain MB	Recognized as distinct ecoregion within former Hay River Lowland because of greater local relief and less wetland than Great Slave Lowland MB to the east.
	Hay River Lowland	<i>Taiga Plains</i>	Tathlina Plain MB	Recognized as distinct ecoregion because of dominant permafrost-affected peatlands.
	Hay River Lowland	<i>Taiga Plains</i>	Great Slave Lowland MB	Recognized as distinct ecoregion because of extensive wetlands.
	Northern Alberta Uplands	<i>Taiga Plains</i>	Liard Upland MB	1996 Northern Alberta Uplands assigned to 6 ecoregions in 2007. Liard Upland MB Ecoregion has warmer climate and more productive, diverse vegetation than the general concept for the 1996 Northern Alberta Uplands Ecoregion.
	Northern Alberta Uplands	<i>Taiga Plains</i>	Trout Lake Upland MB	Somewhat warmer climatic regime on southerly aspects and lower elevations near the NWT-BC border than the general concept for the 1996 Northern Alberta Uplands Ecoregion.
	Northern Alberta Uplands	<i>Taiga Plains</i>	Trout Lake Upland HB	Distinct from other ecoregions recognized within former Northern Alberta Uplands by hill systems and forest cover patterns.
	Northern Alberta Uplands	<i>Taiga Plains</i>	Cameron Plateau LS	Distinct from other ecoregions recognized within former Northern Alberta Uplands by permafrost features and physiography.
	Northern Alberta Uplands	<i>Taiga Plains</i>	Cameron Upland HB	Distinct from other ecoregions recognized within former Northern Alberta Uplands by physiography, hydrology.

Table 3 (continued)

1996 Ecozone	1996 Ecoregion	2007 Level II Ecoregion	2007 Level IV Ecoregion	Main changes
Taiga Plains	Northern Alberta Uplands	<i>Taiga Plains</i>	Cameron Slopes MB	Warmer climates than on higher-elevation uplands and plateau; nutrient/water flow processes different on slopes.
	Horn Plateau	<i>Taiga Plains</i>	Horn Plateau LS	1996 Horn Plateau Ecoregion assigned to 7 ecoregions in 2007. Horn Plateau LS Ecoregion is different from adjacent 2007 ecoregions – colder climates above about 700 m elevation and vegetation/landforms typical of Low Subarctic, supported by permafrost and vegetation characteristics.
	Horn Plateau	<i>Taiga Plains</i>	Horn Slopes LS	Northerly slopes assigned to cooler ecoclimatic regime; slopes designation infers different moisture/nutrient processes than surrounding terrain, supported by vegetation, hydrology and wetland patterns.
	Horn Plateau	<i>Taiga Plains</i>	Horn Slopes MB	Southerly slopes assigned to warmer ecoclimatic regime; slopes designation infers different moisture/nutrient processes than surrounding terrain, supported by vegetation and hydrology.
	Horn Plateau	<i>Taiga Plains</i>	Horn Plain HB	Gently sloping plain between colder, wetland-dominated Bulmer Plain LS Ecoregion and warmer South Mackenzie Plain MB Ecoregion; transitional area.
	Horn Plateau	<i>Taiga Plains</i>	Ebbutt Upland HB	Differs from 1996 concept of Horn Plateau Ecoregion; Ebbutt Hills are lower than Horn Plateau and have different vegetation and permafrost patterns.
	Horn Plateau	<i>Taiga Plains</i>	Ebbutt Upland LS	Recognition of geographic separation of Horn Plateau and Ebbutt Hills areas, and recognition of colder climates at higher elevations in Ebbutt Hills as indicated by permafrost patterns
	Horn Plateau	<i>Taiga Plains</i>	Bulmer Plain LS (partly within 1996 Horn Plateau Ecoregion)	Recognized as distinctly different from ecoregions occurring atop and on the slopes of the Horn Plateau.
	Great Slave Lake Plain	<i>Taiga Plains</i>	Bulmer Plain LS (partly within 1996 Great Slave Lake Plain Ecoregion)	Recognition that Bulmer Lake LS and Great Slave Plain HB Ecoregions are climatically and geologically distinct as expressed by vegetation and wetland patterns.
	Great Slave Lake Plain	<i>Taiga Plains</i>	Great Slave Plain HB (wholly within 1996 Great Slave Lake Plain Ecoregion)	1996 Great Slave Plain assigned to 4 ecoregions in 2007, one of which is Great Slave Plain HB Ecoregion; the other three ecoregions are Keller Plain LS, Bulmer Plain LS, and Lac Grandin Plain LS.
	Great Slave Lake Plain	<i>Taiga Plains</i>	Lac Grandin Plain LS (partly within 1996 Great Slave Lake Plain Ecoregion)	Recognition of climatic and physiographic differences as expressed by greater incidence of permafrost features in Lac Grandin LS Ecoregion and different landforms.
	Great Slave Lake Plain	<i>Taiga Plains</i>	Keller Plain LS (partly within 1996 Great Slave Lake Plain Ecoregion)	Only a small part of the 1996 Great Slave Lake Plain Ecoregion occurs in the Keller Plain LS Ecoregion; the Keller Plain LS has colder climate and different landforms and permafrost features than the Bulmer Plain LS Ecoregion that was also part of the 1996 Great Slave Lake Plain Ecoregion.
	Keller Lake Plain	<i>Taiga Plains</i>	Lac Grandin Plain LS (eastern 2/3 of 1996 Keller Lake Plain Ecoregion)	Lac Grandin Plain LS Ecoregion physiographically different (higher elevation, more variable terrain) with significantly less wetlands than the 2007 Keller Plain LS Ecoregion.
	Keller Lake Plain	<i>Taiga Plains</i>	Keller Plain LS (western 1/3 of 1996 Keller Lake Plain Ecoregion)	Similar concept to 1996 Keller Lake Plain Ecoregion.

Table 3 (continued)

1996 Ecozone	1996 Ecoregion	2007 Level II Ecoregion	2007 Level IV Ecoregion	Main changes
Taiga Plains	Norman Range	<i>Taiga Plains</i>	Keller Plain LS (east-southeast part of 1996 Norman Range Ecoregion)	1996 Norman Range Ecoregion assigned to 5 ecoregions in 2007, differentiated by vegetation, landform, geology and permafrost features. The Keller Plain LS Ecoregion differs from the adjacent Blackwater Upland LS Ecoregion because of more subdued topography and higher peatland cover in the former; these ecoregions were formerly combined in the 1996 Norman Range Ecoregion.
	Norman Range	<i>Taiga Plains</i>	Blackwater Upland LS (wholly within 1996 Norman Range Ecoregion)	Refer to comments on Keller Plain LS Ecoregion.
	Norman Range	<i>Taiga Plains</i>	North Mackenzie Plain LS (partly within 1996 Norman Range Ecoregion)	The North Mackenzie Plain LS Ecoregion is distinct from the Norman Range LS Ecoregion; fluvial processes are more important and bedrock features are less important in the former ecoregion, with corresponding vegetation and landform differences.
	Norman Range	<i>Taiga Plains</i>	Great Bear Upland LS (partly within 1996 Norman Range Ecoregion)	The Great Bear Upland LS Ecoregion is distinct from the adjacent Norman Range LS Ecoregion because of bedrock-controlled more rugged topography and Taiga Cordilleran climatic influences in the latter.
	Norman Range	<i>Taiga Plains</i>	Norman Range LS (wholly within 1996 Norman Range Ecoregion)	Similar to the core concept of the 1996 Norman Range Ecoregion.
	Great Bear Lake Plain	<i>Taiga Plains</i>	Great Bear Plain LS	The 1996 Great Bear Lake Plain accounted for about 20 percent of the Taiga Plains Ecozone, and included a broad spectrum of climatic and physiographic conditions. It has now been assigned to 8 ecoregions in 2007. The Great Bear Plain LS Ecoregion occupies low-elevation, level to gently undulating areas adjacent to Great Bear Lake; the neighbouring Great Bear Upland LS Ecoregion occurs on more pronounced terrain at higher elevations.
	Great Bear Lake Plain	<i>Taiga Plains</i>	Great Bear Plain HS	Locally extensive and important near-shore permafrost features were not identified explicitly in the 1996 ecoregion map unit.
	Great Bear Lake Plain	<i>Taiga Plains</i>	Great Bear Upland LS	The Great Bear Upland LS Ecoregion identifies uplands within the southern half of the 1996 ecoregion that have diverse and relatively productive vegetation compared to upland areas in the north part of the 1996 ecoregion.
	Great Bear Lake Plain	<i>Taiga Plains</i>	Great Bear Upland HS	The Great Bear Upland HS Ecoregion includes islands of High Subarctic climate and associated vegetation and permafrost features not explicitly recognized in the 1996 mapped unit.
	Great Bear Lake Plain	<i>Taiga Plains</i>	Travaillant Upland HS	More pronounced terrain, fewer peatlands and different vegetation than the neighbouring Arctic Red Plain HS Ecoregion; both were part of the 1996 Great Bear Lake Plain Ecoregion. Northern boundary of the Level II Taiga Plains Ecoregion moved northward from 1996 position; boundary drawn with reference to tree line mapped on 1:250,000 National Topographic Series maps augmented by georeferenced digital photographs taken in 2005.
	Great Bear Lake Plain	<i>Taiga Plains</i>	Anderson Plain HS	Less pronounced terrain than the neighboring Travaillant Upland HS Ecoregion, and permafrost and vegetation more indicative of Low Arctic conditions. Northern boundary of the Taiga Plains Ecozone moved northward from 1996 position; boundary drawn with reference to tree line mapped on 1:250,000 National Topographic Series maps and mapped by Timoney et al. (1992), augmented by georeferenced digital photographs taken in 2005.

Table 3 (concluded)

1996 Ecozone	1996 Ecoregion	2007 Level II Ecoregion	2007 Level IV Ecoregion	Main changes
Taiga Plains	Great Bear Lake Plain	<i>Taiga Plains</i>	Arctic Red Plain HS	See comments for Travaillant Upland HS Ecoregion.
	Grandin Plains	<i>Taiga Plains</i>	Grandin Plain HS	Minor change to the 1996 ecoregion concept; the 1996 ecoregion is assigned to two ecoregions. The Grandin Plain HS Ecoregion is topographically more diverse and has different vegetation and permafrost patterns than the Grandin Upland HS Ecoregion. Northern boundary of the Taiga Plains Ecozone moved northward from 1996 position; boundary drawn with reference to tree line mapped on 1:250,000 National Topographic Series maps augmented by georeferenced digital photographs taken in 2005.
	Grandin Plains	<i>Taiga Plains</i>	Grandin Upland HS	See comments for Grandin Plain HS Ecoregion.
	Colville Hills	<i>Taiga Plains</i>	Colville Hills HS	Recognition of three physiographically distinct units with differing vegetation and permafrost attributes within 1996 Colville Hills Ecoregion. The 2007 Colville Hills HS Ecoregion includes bedrock ridges and elevated uplands with fewer peatlands and lakes than the other two Colville Ecoregions.
	Colville Hills	<i>Taiga Plains</i>	Colville Plain HS	Relatively flat ecoregion, in contrast to the ridges of the Colville Hills HS Ecoregion and the hummocky terrain of the Colville Upland HS Ecoregion.
	Colville Hills	<i>Taiga Plains</i>	Colville Upland HS	See Colville Hills HS and Colville Plain HS Ecoregions.
	Fort McPherson Plain	<i>Taiga Plains</i>	Arctic Red Plain LS	Ecoregions were renamed to identify the major river flowing through them; Low and High Subarctic ecoregions were split with reference to changes in vegetation and permafrost features (Level III ecoregions).
	Fort McPherson Plain	<i>Taiga Plains</i>	Arctic Red Plain HS	See comments for Arctic Red Plain LS Ecoregion.
	Fort McPherson Plain	<i>Taiga Plains</i>	Travaillant Upland HS	Travaillant Upland HS Ecoregion is hilly, not a nearly level plain.
	Mackenzie Delta	<i>Taiga Plains</i>	Mackenzie Delta HS	Basic concept and area delineated similar to 1996 ecoregion; climate label added; wetlands not as extensive as reported for 1996 ecoregion and primary tree species is white spruce.
Southern Arctic	Dease Arm Plain	<i>Taiga Plains</i>	Anderson Plain HS (in part)	Part of the 1996 Dease Arm Plain and Dease Arm Upland Ecoregions reassigned to the Level II Taiga Plains Ecoregion with reference to tree line mapped on 1:250,000 National Topographic Series maps augmented by georeferenced digital photographs taken in 2005.
	Tuktoyaktuk Coastal Plain	<i>Taiga Plains</i>	Sitidgi Plain HS	Revised tree line concept (see Anderson Plain HS Ecoregion); renamed ecoregion for largest lake.

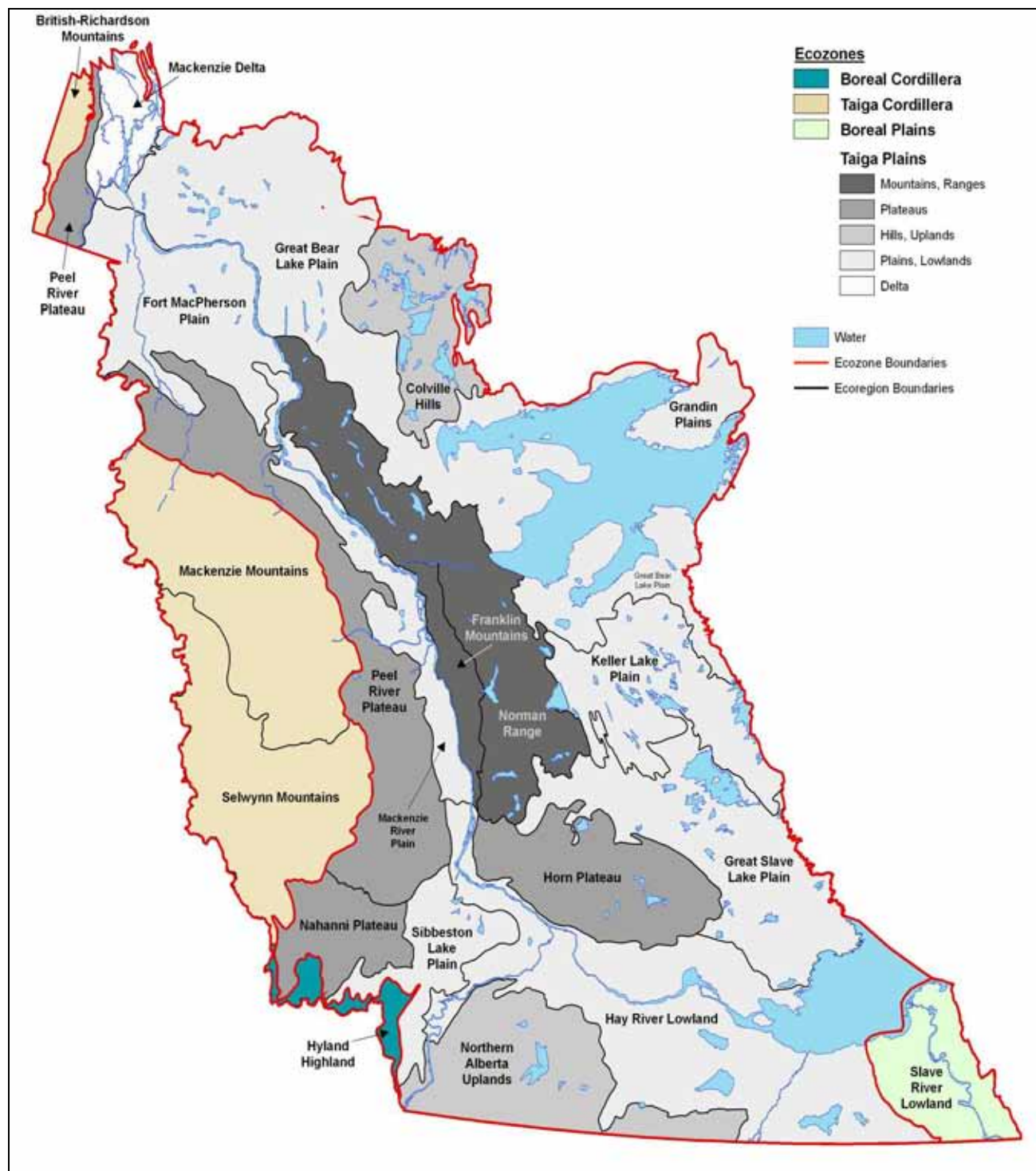


Figure 14. 1996 Ecozones, Ecoregions and Major Physiographic Elements of the Taiga Plains.

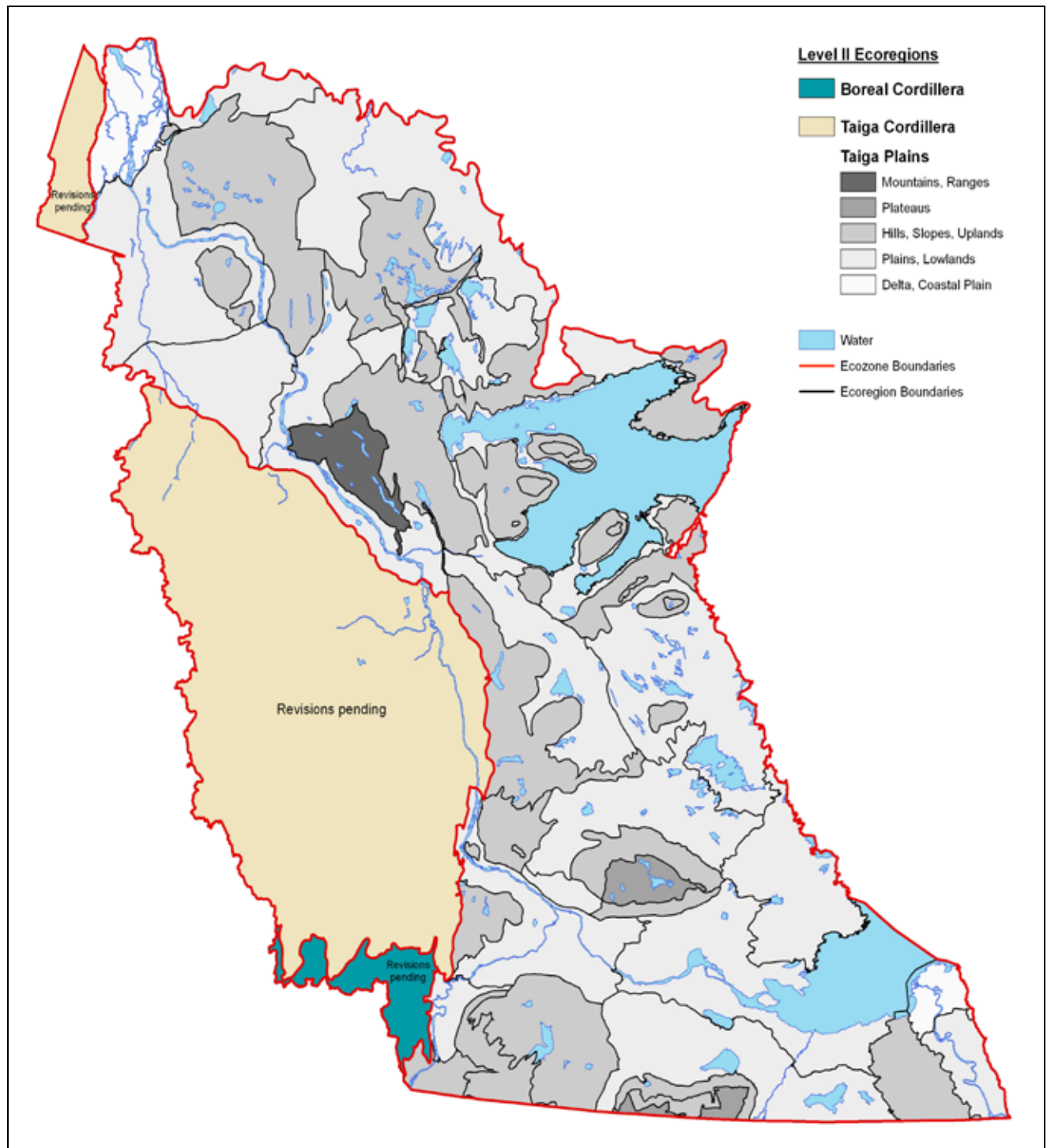


Figure 15. 2007 Level II Ecoregions, Level IV Ecoregions and Major Physiographic Elements of the Taiga Plains. Only the linework is shown for Level IV ecoregions; refer to Appendix 3 for ecoregion labels and legend.

Appendix 3. Level III and Level IV Ecoregions of the Taiga Plains

Taiga Plains High Subarctic (HS) Ecoregion (3.3.1)

- 3.3.1.1 Mackenzie Delta HS
- 3.3.1.2 Arctic Red Plain HS
- 3.3.1.3 Campbell Hills HS
- 3.3.1.4 Sitidgi Plain HS
- 3.3.1.5 Travaillant Upland HS
- 3.3.1.6 Anderson Plain HS
- 3.3.1.7 Colville Upland HS
- 3.3.1.8 Colville Plain HS
- 3.3.1.9 Colville Hills HS
- 3.3.1.10 Great Bear Upland HS
- 3.3.1.11 Great Bear Plain HS
- 3.3.1.12 Grandin Plain HS
- 3.3.1.13 Grandin Upland HS
- 3.3.1.14 Lac Grandin Upland HS

Taiga Plains Low Subarctic (LS) Ecoregion (3.3.2)

- 3.3.2.1 Arctic Red Plain LS
- 3.3.2.2 North Mackenzie Plain LS
- 3.3.2.3 Norman Range LS
- 3.3.2.4 Great Bear Upland LS
- 3.3.2.5 Great Bear Plain LS
- 3.3.2.6 Blackwater Upland LS
- 3.3.2.7 Keller Plain LS
- 3.3.2.8 Lac Grandin Plain LS
- 3.3.2.9 Lac Grandin Upland LS
- 3.3.2.10 Bulmer Plain LS
- 3.3.2.11 Ebbutt Upland LS
- 3.3.2.12 Horn Slopes LS
- 3.3.2.13 Horn Plateau LS
- 3.3.2.14 Cameron Plateau LS

Taiga Plains High Boreal (HB) Ecoregion (3.3.3)

- 3.3.3.1 Ebbutt Upland HB
- 3.3.3.2 Horn Plain HB
- 3.3.3.3 Sibbeston Upland HB
- 3.3.3.4 Trout Upland HB
- 3.3.3.5 Cameron Upland HB
- 3.3.3.6 Great Slave Plain HB

Taiga Plains Mid-Boreal (MB) Ecoregion (3.3.4)

- 3.3.4.1 South Mackenzie Plain MB
- 3.3.4.2 Liard Plain MB
- 3.3.4.3 Liard Upland MB
- 3.3.4.4 Trout Upland MB
- 3.3.4.5 Horn Slopes MB
- 3.3.4.6 Great Slave Lowland MB
- 3.3.4.7 Tathlina Plain MB
- 3.3.4.8 Cameron Slopes MB
- 3.3.4.9 Slave Upland MB
- 3.3.4.10 Slave Delta MB
- 3.3.4.11 Slave Lowland MB

TAIGA PLAINS



Figure 16. 2007 Level III and Level IV Ecoregions of the Taiga Plains.

Appendix 4. Glossary of Terms

The following definitions are taken mainly from *Terminology of Ecological Land Classification in Canada* (Cauboue *et al.* 1999) and *Soil and Environmental Science Dictionary* (Gregorich *et al.* 2001), supplemented by *Glossary of terms in Soil Science* (Canadian Society of Soil Science 1976), *Multi-language glossary of permafrost and related ground-ice terms* (van Everdingen, 2005), *Glossary of Permafrost and Related Ground-ice Terms* (National Research Council 1988), and *Wetlands of Canada* (National Wetlands Working Group 1988). W.W. Pettapiece compiled most of this glossary from the listed sources; many of the permafrost terms are referenced in van Everdingen (2005) and National Research Council (1988).

A horizon – A mineral horizon formed at or near the surface in the zone of removal of materials in solution and suspension, or maximum accumulation of organic carbon, or both.

Ae – A horizon that has been eluviated of clay, iron, aluminum, or organic matter, or all of these.

Ah – A horizon in which organic matter has accumulated as a result of biological activity.

Ap – A horizon markedly disturbed by cultivation or pasture.

abiotic – Describing the nonliving components of an ecosystem.

abundance-dominance – This term expresses the number of individuals of a plant species and their coverage in a phytosociological survey. The scale generally used is that of J. Braun-Blanquet from which stemmed many variations. It is based on the coverage of individuals for classes with a coverage higher than 5% and on the abundance for classes with a lower percentage; frequently, this is also referred to as 'cover-abundance'. See **Braun-Blanquet method**.

acid igneous rock – Describing igneous rock* composed of >66% silica.

Acidic (soil) – Having a pH value of less than 7.0.

active delta marsh – A marsh occupying lowlands on deltas, usually with drainage connections to active river channels. The marsh is subject to inundation at least once during a season, followed by a slow drawdown of the water levels. A high rate of sedimentation may occur in many parts of the marsh.

active layer – The seasonal thaw zone at the surface of permafrost terrain.

advance regeneration – Young trees under existing stands. Regeneration established before logging that has survived the logging operation.

aeolian (eolian) – Referring to mineral particles moved and sorted by wind, usually fine sands and coarse silt.
See dune and loess.

aerobic – Occurring in the presence of oxygen as applied to chemical and biochemical processes; opposite of anaerobic.

aggregate – A group of soil particles cohering in such a way that they behave mechanically as a unit.

albedo – A measurement of reflected energy. Albedo is the coefficient of reflectance, usually applying only to short-wave radiation.

alkaline – Having a pH value of >7.0.

alliance – A vegetation classification level in the Braun-Blanquet system, a collection of associations with similar physiognomy and the same dominant and constant species.
See **Braun-Blanquet method**.

alluvium – Mineral material deposited by flowing water, usually sands, silts and gravels.

alpine – The ecological zone that occurs above an elevational tree line, characterized by a distinct climate and vegetation.

alvar – Swedish term for an unusual landform which occurs when soils are scraped away from bare limestone bedrock by ice, wind, and water. Alvars and associated biota are globally rare features.

anaerobic – Occurring in the absence of oxygen as applied to chemical and biochemical processes.

anthropogenic – Human-made or human-modified materials such that their initial physical properties have been drastically altered.

aquatic – Living or growing in water.

arable land – Land that is cultivated or suitable for cultivation (as opposed to grazing or non-cultivated land).

arctic – The ecological zone north of the latitudinal tree line, characterized by a distinct climate and vegetation.

arid – Describing a soil, climate or region where vegetation may not grow due to a severe lack of water.

aspect – The orientation of a slope face, expressed using a compass direction.

association – 1. A classification level in the Braun-Blanquet system, which is a subdivision of a formation based on floristic composition, an abstract plant community.
2. Sometimes used as a general term for a collection of vegetation stands with similar composition and structure.

avalanche – A form of mass wasting involving snow and ice.

Azonal – Vegetation (or soil) that develops on atypical conditions such as flooded or rapidly drained sites.

B horizon – A subsoil horizon characterized by one of:
a) an enrichment in clay, iron, aluminum, or humus (Bt or Bf).
b) a prismatic or columnar structure that exhibits pronounced coatings or stainings associated with significant amounts of exchangeable sodium (Bn or Bnt).
c) an alteration by hydrolysis, reduction, or oxidation to give a change in color or structure from the horizons above or below, or both (Bm).

basal area – The area occupied by a plant near the ground surface; measured across the stem of a tree 1.3 to 1.5 m above the ground surface, or across a clump in the case of graminoids, usually 2 to 3 cm above the ground surface.

bedrock – The solid rock underlying soils and the regolith or exposed at the surface.

bioclimate – All the climatic conditions (climate factors) of a region that have a fundamental influence on the survival, growth, and reproduction of living organisms.

biocoenosis – A group of interacting organisms including both plants and animals.

biodiversity – Totality of the richness of biological variation, ranging from within-species genetic variation, through subspecies and species, to communities, and the pattern and dynamics of these on the landscape.

Biogeoclimatic Ecosystem Classification (BEC) in British Columbia – A hierarchical ecosystem classification system applied in British Columbia that describes the variation in climate, vegetation, and site conditions throughout the province.

- biogeoclimatic zone** – A level in the British Columbia Biogeoclimatic ecosystem classification system that represents areas with the same regional climate.
See **ecoclimatic region**, **ecoregion**, and **ecological region**.
- biogeocoenosis** – A group of interacting organisms living together in a particular environment, an ecosystem.
- biogeography** – A branch of biology or of geography that deals with the geographical distribution of plants and animals.
- biomass** – The mass of living organisms within a defined space, usually expressed in kg/ha or g/m² of dry matter.
- biome** – Major biotic community composed of all the plants and animals and smaller biotic communities. The smaller communities in a biome possess similarities in gross external appearances (deciduous trees, grasslands, etc.) and gross climatic conditions (desert, tropical, etc.). A particular biome is defined in terms of the characteristic vegetation forms (or life forms).
- Biophysical Land Classification** – An approach to land classification that combines the physical and biological components of the environment. As the precursor to Ecological land classification, the hierarchical classification system originally included four levels. Sometimes the physical components of classification are more heavily weighted than the biological components. The term biophysical was subsequently replaced by "ecological".
- biota** – The living component of an ecosystem.
- biotic** – Pertaining to life.
- Black** – A soil classification Great Group or Subgroup designation indicating a surface (Ah or Ap horizon) color value darker than 3.5 moist and dry, with a chroma less than 2, dry (grassland or parkland soils with generally greater than 4 % organic matter).
- bog** – Ombrotrophic (nutrient poor) peatland that is acidic (generally unaffected by nutrient-rich groundwater) and usually dominated by heath shrubs and *Sphagnum* mosses and that may include open-growing, stunted woodlands of black spruce or other tree species.
- boreal** – (1) Pertaining to the north.
(2) A climatic and ecological zone that occurs south of the subarctic, but north of the temperate hardwood forests of eastern North America, the parkland of the Great Plains region, and the montane forests of the Canadian cordillera.
- boulder** – Rock fragment over 60 cm in diameter. In engineering, practice boulders are over 20 cm in diameter.
- brackish** – Water with a salt content between that of fresh and sea water. Brackish water usually has 5-10 parts of salt per thousand.
- Braun-Blanquet method** – An approach to classifying vegetation that utilizes floristic composition (i.e. characteristic species and associations), developed in central and southern Europe. Includes the ZurichMontpellier School of Phytosociology.
- break of slope** – An abrupt change in slope steepness.
- broadleaved forest** See **deciduous forest**.
- Brown** – A soil classification Great Group or Subgroup designation indicating a surface (Ah or Ap horizon) color value darker than 3.5 moist and 5.5 dry with a chroma less than 3.5 moist (grassland soils with less than about 2% organic matter).
- Brunisol** – A soil of the Brunisolic Order.
- Brunisolic** (1) – An Order of soils whose horizons are developed sufficiently to exclude them from the Regosolic Order but lack the degrees or kinds of horizon development specified for soils

- in other orders. They always have Bm or Btj horizons. The order consists of Melanic, Eutric, Sombric and Dystric Great Groups.
- (2) – A soil classification Subgroup designation indicating the formation of a Bm or Btj horizon within the Ae of a Luvisolic soil (a strongly degraded Luvisol).
- bulk density, soil** – The mass of dry soil per unit bulk volume.
- C horizon** – A mineral horizon comparatively unaffected by the pedogenic processes operative in the A and B horizons except for the process of gleying (Cg) or the accumulation of calcium carbonate (Cca) or other salts (Csa). A naturally calcareous C horizon is designated Ck.
- calcareous soil** – Soil containing sufficient calcium carbonate (often with magnesium carbonate) to effervesce visibly when treated with cold 0.1 N hydrochloric acid.
- C:N ratio** – The ratio of the weight of organic carbon to the weight of total nitrogen in a soil or in an organic material.
- Canadian System of Soil Classification** – Hierarchical soil classification system in which the conceptual classes are based upon the generalization of properties of real bodies of soil. Taxa are defined on the basis of observable and measurable soil properties that reflect processes of soil genesis and environmental factors.
- canopy** – The more or less continuous cover of branches and foliage formed by the crowns of trees.
- canopy closure** – The degree of canopy cover relative to openings.
- capability** – A natural ability to support a selected activity such as agriculture or recreation.
- catchment area** See **drainage basin**.
- channel marsh** – A marsh occurring in well-defined, abandoned channels where stream flow is discontinuous or blocked.
- characteristic species** – (1) A diagnostic species used to separate plant community types within the Braun-Blanquet vegetation classification system.
(2) Characteristic species may occur in more than *one* community, but are significant (e.g. much more abundant) in only one community.
(3) A species with high cover* (abundance) and presence.
- Chernozem** – A soil* of the Chernozemic Order*.
- Chernozemic** – An Order of soils that have developed under xerophytic or mesophytic grasses and forbs, or under grassland-forest transition vegetation, in cool to cold, subarid to subhumid climates. The soils have a dark-colored surface (Ah, Ahe or Ap) horizon and a B or C horizon, or both, of high base saturation. The order consists of Brown, Dark Brown, Black and Dark Gray Great Groups.
- Chinook** – a warm, dry wind characteristic of southern Alberta and northern Montana created by moisture condensation and precipitation on the western side of the mountains and compression as the dry air descends onto the plains. In the Northwest Territories, similar conditions produce Chinook-like winds in the Fort Liard area.
- chroma** – A measure of color strength in the Munsell Soil Color Chart.
- chronosequence** – A chronosequence is a sequence through time. Often, it refers to a secondary successional sequence within a set of plant communities.
- classification** – The systematic grouping and organization of objects, usually in a hierarchical manner.
- clay** – 1. Mineral particles <0.002 mm in diameter.
2. Soil and texture class with approximately a 40 to 60% composition of clay size particles.
- climate** – The accumulated long-term effects of weather that involve a variety of heat and moisture exchange processes between the earth and the atmosphere.

climatic climax See climax.

climatic index – Number indicating a combination of climatic factors, most often temperature and precipitation, in order to describe the vegetation distribution.

climax – Stable, self-perpetuating vegetation that represents the final stage of succession* (89).

climatic climax – Stable, self-perpetuating vegetation developed through succession in

response to long-term climatic conditions, as opposed to edaphic climax. **Edaphic climax** –

Stable, self-perpetuating vegetation developed through succession on azonal sites.

cluster analysis – A multidimensional statistical analysis technique used to group samples according to their degree of similarity.

classification, soil – The systematic arrangement of soils into categories and classes 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 – As a particle-size term: a size fraction mm equivalent diameter.

clod – A compact, coherent mass of soil produced by digging or plowing.

coarse fragments – Rock or mineral particles 2.0 mm in diameter.

coarse texture – The texture exhibited by sands, loamy sands, and sandy loams except very fine sandy loam. A soil containing large quantities of these textural classes.

codominant – Trees with crowns forming the general level of the main canopy in an even-aged stand of trees. Two plant species of similar stature and cover that occur on the same site.

collapse scar – That portion of a peatland where the whole or part of a palsa or peat plateau has thawed and collapsed to the level of the surrounding peatland.

collapse scar bog – A circular or oval-shaped wet depression in a perennially frozen peatland. The collapse scar bog was once part of the perennially frozen peatland, but the permafrost thawed, causing the surface to subside. The depression is poor in nutrients, as it is not connected to the minerotrophic fens in which the palsa or peat plateau occurs.

collapse scar fen – A fen with circular or oval depressions, up to 100 m in diameter, occurring in larger fens, marking the subsidence of thawed permafrost peatlands. Dead trees, remnants of the subsided vegetation of permafrost peatlands, are often evident.

colluvium – Unconsolidated materials moved by gravity, often occurring at the base of a slope.

community – An assemblage of organisms that interact and exist on the same site.

community type – A group of vegetation stands that share common characteristics, an abstract plant community.

companion species – In phytosociology, a species occurring in several associations with relatively the same frequency, or a species characteristic of another association, but having a lower frequency.

competition – The interaction between organisms resulting from common use of a limited resource. Intraspecific competition occurs within the same species, while interspecific competition arises between different species.

conifer – A cone-bearing plant (except for the taxaceous family) belonging to the taxonomic group Gymnospermae.

coniferous forest – A plant community with a cover made up of 75% or more conifers.

consistence – The degree of soil cohesion and adhesion based on its resistance to deformation.

consociation – A classification level within the Scandinavian approach to vegetation classification, a collection of sociations with the same dominant species.

- constant species** – A species occurring more than 80% of the time within a particular plant community type.
- constraint** – A factor that limits the optimal condition, such as steep slopes or cold temperatures, usually associated with land use capability assessments.
- continuous permafrost** – Permafrost occurring everywhere beneath the exposed land surfacethroughout a geographic region with the exception of widely scattered sites, such as newly deposited unconsolidated sediments, where the climate has just begun to impose its influence on the thermal regime of the ground, causing the development of continuous permafrost
- continuous permafrost zone** – The major subdivision of a permafrost region in which permafrost occurs everywhere beneath the exposed land surface with the exception of widely scattered sites.
- control section** – The minimum depth used to classify a soil, usually 1.0 m for mineral soils and 1.6 m for organic deposits.
- cordillera** – An elongated range of mountains.
- corridor** – In a landscape, a narrow strip of land that differs from the matrix on either side. Corridors may be isolated strips, but are usually attached to a patch of somewhat similar vegetation.
- coulee** – A western Canadian term for a steep-sided prairie valley. It may refer to valleys that have a relatively broad bottom, often as a result of a glacial meltwater channel or to v-shaped gullies caused by more recent erosion.
- cover** – The area of ground covered with plants of one or more species, usually expressed as a percentage.
- cover type** – A very general unit of vegetation classification and mapping based on existing plant cover, e.g. closed-canopied deciduous forest, pasture, or native prairie.
- Cryosol** – A soil* of the Cryosolic Order*.
- Cryosolic** – An Order of soils formed in either mineral or organic materials that have perennially frozen material within 1 m of the surface in some part of the soil body (or within 2 m if the pedon has been strongly cryoturbated). The mean annual temperature is less than 0°C. The order consists of Turbic, Static or Organic Great Groups based on degree of cryoturbation and the nature of the soil material.
- cryoturbation** – Irregular structures formed in earth materials by deep frost penetration and frost action processes, and characterized by folded, broken and dislocated beds and lenses of unconsolidated deposits, included organic horizons and even bedrock. Terms such as “frost churning” and “frost stirrings” are not recommended.
- Cumulic** – A soil classification Subgroup designation indicating successive mineral layers that result from deposition of materials (e.g. flood plain deposits).
- Dark Brown** – A soil classification Great Group or Subgroup designation indicating a surface (Ah or Ap horizon) color value darker than 3.5 moist and 4.5 dry with a chroma greater than 1.5, dry (grassland soils with organic matter content in the 2% to 4% range).
- Dark Gray** – A soil classification Great Group or Subgroup designation indicating a surface (Ah or Ap horizon) color value darker than 3.5 moist and 3.5 to 4.5 dry with a chroma of 1.5 or less (transition forest soils with less than about 2% organic matter).
- dbh** – The diameter of a tree at breast height. Diameter is measured at 1.3 to 1.5 m above ground surface.
- deciduous** – Refers to perennial plants from which the leaves abscise and fall off at the end of the growing season.

deciduous forest – A plant community with a cover made up of 75% or more of deciduous trees.

Syn. broadleaved forest.

degree-day – A measure of temperature above or below a reference temperature that is generally added up for a certain period. Thus it is a cumulative measurement of the quantity of energy available for growth that makes it possible to compare growth conditions between regions.

delta – Alluvial deposits at the mouth of a river, usually triangular in outline with low relief.

Deposit See surficial materials.

depression – An area that is lower than the general surrounding landscape, usually less well-drained than the surrounding terrain.

diagnostic species – Plant species used to distinguish plant communities based on their presence or absence and on their abundance.

differential species – A diagnostic species that occurs primarily within one or a few plant community types, but that is less abundant and with lower constancy than characteristic species. It may be present in other communities*, but with lower abundance and constancy.

discontinuous permafrost – Permafrost occurring in some areas beneath the exposed land surface throughout a geographic region where other areas are free of permafrost.

diversity – The richness of species within a given area. Diversity includes two distinct concepts: (1). richness of species.

(2). evenness in the abundance of the species.

domain – Territory including all the regions having the same vegetation or climatic groups on modal sites.

dominant – A plant with the greatest cover and/or biomass within a plant community. The tallest trees within a forest stand, which extend above the general canopy.

drainage – The removal of excess water from soil as a result of gravitational flow. Soil drainage refers to the frequency and duration of periods when the soil is not saturated. Terms used are – excessively, well, moderately, imperfectly and poorly-drained.

drainage basin – Area tributary to or draining to a lake, stream, reservoir or other body of water.

Syn. catchment area See watershed.

drift – A glacial deposit.

droughty soil – A soil with low water supplying capacity (sandy or very rapidly drained soil).

drumlin – A smooth, elongated hill created by flowing glacial ice . The long axis and tapered end are oriented in the direction of glacial ice flow.

dryland farming – The practice of crop production in low-rainfall areas without irrigation.

duff – A general term for the litter and humus layers of the forest floor.

dune – A low hill or ridge of sand that has been sorted and deposited by wind.

Dystric – A soil classification Great Group designation indicating Brunisolic soils with an acidic solum – a pH (0.01M Ca Cl₂) of less than 5.5 for at least 25 cm starting at the top of the B horizon.

dystrophic – Referring to a physical environment very unbalanced from a nutritive standpoint due to an excess or a significant lack of a mineral or organic element.

earth hummock – A hummock having a core of silty and clayey mineral soil which may show evidence of cryoturbation . Earth hummocks are a type of nonsorted circle (see also *patterned ground*) commonly found in the zone of continuous permafrost. They develop in

- materials of a high silt and clay content and/or of high ice content.
- ecoclimatic province** – A broad complex of ecoclimatic regions that have similar climatic conditions as reflected by vegetation. Examples of such units generally approximate continental climatic zones. See **vegetation zone**.
- ecoclimatic region** – An area characterized by a distinctive regional climate as expressed by vegetation. Equivalent to a domain.
- ecodistrict** – A subdivision of an ecoregion based on distinct assemblages of relief, geology, landform, soils, vegetation, water, and fauna. Canadian ecological land classification (ELC) system unit. Scale 1 :500,000 to 1 :125,000. The subdivision is based on distinct physiographic and/or geological patterns. Originally referred to as a land district. See **ecological district**.
- ecological district** – Portion of land characterized by a distinctive pattern of relief, geology, geomorphology, and regional vegetation. See **ecodistrict**.
- ecological factor**. Element of the site that can possibly influence living organisms (e.g. water available for plants). This term is also frequently used to refer to ecological descriptors.
- Ecological Land Classification (ELC)** – The Canadian classification of lands from an ecological perspective, an approach that attempts to identify ecologically similar areas. The original system proposed by the Subcommittee on Biophysical Land Classification in 1969 included four hierarchical levels that are currently called ecoregion, ecodistrict, ecosection, and ecosite. Ecozone, ecoprovince and ecoelement were later added to the upper and lower levels of the hierarchy.
- ecological range** – Interval included between the lower and upper limits of an ecological factor allowing the normal development of a specific organism (or a group of organisms). *Syn.* range of tolerance or ecological amplitude.
- ecological region** – A region characterized by a distinctive regional climate as expressed by vegetation.
- ecological unit** – Very general term used to refer to a mapping or classification unit of any rank and based on ecological criteria.
- ecology** – Science that studies the living conditions of living beings and all types of interactions that take place between living beings on the one hand, and living beings and their environment on the other hand.
- ecoprovince** – A subdivision of an ecozone that is characterized by major assemblages of landforms, faunal realms, and vegetation, hydrological, soil and climatic zones. Canadian ecological land classification (ELC) system unit.
- ecoregion** – An area characterized by a distinctive regional climate as expressed by vegetation. Canadian ecological land classification* (ELC) system unit. Scale 1:3,000,000 to 1:1,000,000. Originally referred to as a land region. See **ecological region** and **biogeoclimatic zone**.
- ecosite** – 1. A subdivision of an ecosection that consists of an area of land with a particular parent material*, having a homogeneous combination of soils* and vegetation. A Canadian ecological land classification (ELC) system mapping unit, usually mapped at a scale of 1 :50,000 to 1 :10000. Originally referred to as a "land type".
2. In Alberta, ecosite is defined as an area with a unique recurring combination of vegetation, soil, landform, and other environmental components.
- ecosystem** – 1. A complex interacting system that includes all plants, animals, and their environment* within a particular area.
2. The sum total of vegetation, animals, and physical environment in whatever size segment

- of the world is chosen for study.
3. A volume of earth-space that is set apart from other volumes of earth-space in order to study the processes and products of production, particularly those transactions between a community* of organisms and its nonliving environment.
- ecotone** – The transition zone between two adjacent types of vegetation that are different.
- ecotype** – A group of individuals of the same species that are genetically adapted to local ecological conditions.
- ecozone** – An area of the earth's surface representing large and very generalized ecological units characterized by interacting abiotic and biotic factors. The most general level of the Canadian ecological land classification (ELC) system.
- edaphic** – Related to the soil.
- edaphic climax** See climax.
- edaphic grid** – A two-dimensional graphic illustrating the relationship between soil moisture and soil fertility.
- edatopic grid** See **edaphic grid**.
- elevational zone** – Altitudinal zonation of vegetation.
- Elfinwood** See **krummholz**.
- eluviation** – The general process of removing, or leaching of, materials from a soil horizon in solution or suspension.
- emergent vegetation** – Plant species that have a part extending below the normal water level. Such plants are adapted to periodic flooding and include genera such as *Carex*, *Scirpus*, and *Typha*.
- endangered species** – Any indigenous species of fauna or flora whose existence in Canada is threatened with immediate extinction throughout all or a significant portion of its range, owing to the actions of humans.
- endemic** – An organism confined to a certain geographical area.
- environment** – The summation of all living and nonliving factors that surround and potentially influence an organism.
- Eolian** See **aeolian**.
- erosion** – The wearing away of the land surface by running water, wind, ice, or other geological agents, including such processes as gravitational creep.
- Eutric** – A soil classification Great Group designation indicating Brunisolic soils with a relatively high degree of base saturation – a pH (0.01M Ca Cl₂) of 5.5 or higher for 25 cm starting at the top of the B horizon.
- eutrophic** – Refers to nutrient rich status and little or no acid.
- evapotranspiration** – The combined loss of water by evaporation from the soil surface and by transpiration from plants.
- exposure** – Location of a site with respect to an environmental factor such as the sun, rain or wind.
- fan (alluvial fan)** – Unconsolidated materials at the base of a steep slope that were carried and deposited by flowing water; these deposits generally have a conical shape.
- fauna** – (1) A general term for animals.
 (2) A list of the animal species present in an area.
- fen** – A peat-covered or peat-filled wetland with a water table which is usually at or above the surface. The waters are mainly nutrient-rich, minerotrophic waters from mineral soils. The

- vegetation consists mainly of sedges, grasses, reeds and brown mosses with some shrub cover and at times, a scanty tree layer.
- fertility, soil** – The status of a soil with respect to the amount and availability of elements necessary for plant growth.
- field guide** – A field document with keys to identify a plant community, a forest type or a site from biological and physical criteria. These keys may include complete descriptions of plant communities, forest types or forest sites of the region concerned.
- fibric** – An organic layer containing large amounts of weakly decomposed material whose origins are readily identifiable.
- fine texture** – Consisting of or containing large quantities of the fine fractions, particularly of silt and clay.
- fire climax** – Plant community that is maintained by repeated fires.
- flark** – A Swedish term to designate an elongated, wet, and muddy depression in a patterned peatland.
- flat bog** – A bog having a flat, featureless surface and occurring in broad, poorly defined depressions.
- flood plain** – An area adjacent to a stream or river, consisting of alluvial sediments, that is periodically inundated during periods of high stream flow.
- flora** – (1) A general term for plants.
(2) A list of the plant species present in an area.
- fluvial** – Related to stream flow and its associated erosional/depositional processes.
- fluvioeolian** – Referring to sediments that have been deposited or reworked by both fluvial and aeolian processes; the deposits cannot be separated as either fluvial or aeolian.
- fluvio-glacial** See **glacio-fluvial**.
- fluviolacustrine** – Describing lacustrine deposits that have been partially reworked by fluvial processes.
- 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** – Material that has been transported and deposited by streams and rivers (also alluvial).
- foothills** – Low subsidiary hills at the foot of a mountain.
- forb** – "Forb" is only used for herbaceous plants, and is generally used for broad-leaved herbs, regardless of whether they are monocots or dicots (e.g. *Maianthemum* is a forb).
- forest** – A relatively large assemblage of tree-dominated stands.
- forest floor** – Organic layer on soil surface consisting of one or more of L, F, and H horizons.
- forest region** – A major geographical zone characterized by a broadly uniform topography and the same dominant tree species.
- forest site** – 1. Portion of land whose physical and biological characteristics are sufficiently homogeneous to justify a specific silviculture, for a given species, with an expected productivity*falling within known limits.
2. Forest planning unit whose bioclimatic, physical and plant characteristics simply some given silvicultural potential and constraints.
- forest site type** – Summary and synthesis of the characteristics of similar forest sites grouped according to topographic and geomorphological location, nature of soil, floristic composition and vegetation dynamics, etc. It is a classification unit but is often used to name

- a portion of an area as well as a typological unit.
- forest type** – 1. An assemblage of forest sample plots with similar floristic composition, forest productivity, and site properties.
See vegetation type and association.
- forest typology** – Study and classification of forest site (or forest types) according to growing sites, composition and stand evolution.
- formation** – (1) A regional vegetation zone composed of plants with similar physiognomy and environmental conditions.
(2) A primary unit of bedrock in stratigraphy.
- friable** – A consistency term pertaining to the ease of crumbling of soils.
- frost-free period** – Season of the year between the last frost of spring and first frost of fall.
- frost boil** – see **earth hummock**
- genotype** – The genetic constitution of an individual that may be transmitted.
- geomorphology** – The study of landforms and their origin.
- glaciation** – The formation, movement, and recession of glaciers or ice sheets.
- glacier** – A mass of ice that develops as a result of snow and ice accumulation over a long period of time and that moves laterally from the centre of accumulation.
- glacio-fluvial** – Pertaining to the meltwater streams. flowing from wasting glacier ice and especially to the deposits and landforms produced by streams; relating to the combined action of glaciers and streams.
- glacio-lacustrine** – Pertaining to or characterized by glacial and lacustrine conditions. Said of deposits made in lakes affected by glacier ice or by meltwaters flowing directly from glaciers.
- Gleysol** – A soil* of the Gleysolic Order*.
- 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 Gleysol, Humic Gleysol and Luvic Gleysol Great Groups.
- gradient (ecological gradient)** – Continuous and regular variation of one or more ecological factors.
- Graminoid** – A plant that is grass-like; the term refers to grasses and plants that look like grasses, i.e. only narrow-leaved herbs; in the strictest sense, it includes plants belonging only to the family *Poaceae*.
- grassland** – Vegetation consisting primarily of grass species occurring on sites that are arid or at least well-drained.
- gravel** – Rounded rock particles with sizes ranging from 2 mm to 75 mm in diameter. **gravelly** – Containing appreciable or significant amounts of gravel.
- Gray** – A soil classification Great Group designation indicating a surface (Ae or Ap horizon) color value 5 or higher, dry (forest soils with organic matter content less than 2%).
- great group** – A subdivision of a soil order having some properties that reflect differences in the strength of soil-forming processes.
- ground cover** – The overall canopy cover of a plant community without reference to different strata.
- groundwater** – The subsurface water that is below the water table. That portion of the hydrosphere which at any particular time is either passing through or standing in the soil and the underlying strata and is free to move under the influence of gravity.
- growing degree-days** – Accumulated heat units above a threshold temperature of 5°C. See **degree-**

day.

growing season – Number of days where the mean temperature is equal to or above 5°C.

habitat – The place in which an animal or plant lives. The sum of environmental circumstances in the place inhabited by an organism, population or community.

hardwood – A tree with broad leaves such as *Acer*, *Fraxinus*, *Populus*, and *Quercus*.

heath – Uncultivated land generally dominated by shrubs, such as ericaceous ones.

herb (herbaceous) – A nonwoody vascular plant.

hill – A prominence smaller than a mountain, usually <300 m .

hilly – Large landform elements with local relief in the 200 to 500 m range. This includes foothills, dissected plateaus and major uplands.

horizon – The basic unit of soil classification that is a horizontal layer of mineral or organic material having differentiated characteristics as a result of soil-forming processes.

horizontal fen – A fen with a very gently sloping, featureless surface. This type of fen occupies broad, often ill-defined depressions, and may be interconnected with other fens. Peat accumulation is generally uniform.

hue – One of the three variables of color. A color or shade of color in the Munsell Soil Color Chart such as red, green, or blue.

humic – An organic layer of highly decomposed material containing little fibre.

humification – The processes by which organic matter decomposes to form humus.

humus – A general term for partially or completely decomposed plant litter; well decomposed organic matter.

humus form – Group of soil horizons located at or near the surface of a pedon, which have formed from organic residues, either separate from, or intermixed with, mineral materials.

hummocky – A landform characterized by a complex surface of low- to moderate-relief (local relief generally less than 10 m) knolls and mounds of glacial sediments separated by irregular depressions, all of which lack linear or lobate forms (also called knob and kettle). Slopes are generally less than 0.8 km with gradients of greater 5% to 30%.

hydromorphic soil – A general term for soils that develop under conditions of poor drainage in marshes, swamps, seepage areas, or flats.

hydrophyte – A plant growing in water. In some cases, only the inflorescence lives out of the water.

ice-contact deposit – Deposits that occur when in contact with ice, such as kames and eskers.

igneous rock – A type of rock that forms from the solidification of magma.

immature soil – A soil with indistinct or only slightly developed horizons.

impeded drainage – A condition which hinders the movement of water through soils under the influence of gravity.

impervious – Resistant to penetration by fluids or by roots.

inactive delta marsh – A marsh occupying higher portions of a delta, usually some distance from active river channels. The marsh is inundated only during very high flood stages or by wind-driven waves. Shallow water may be impounded for long periods of time.

indicator species – Species, usually plants, used to indicate an ecological condition such as soil moisture or nutrient regime that may not be directly measured.

insolation – Radiant energy received from the sun.

inventory – The systematic survey, sampling, classification, and mapping of natural resources.

irrigation – The artificial application of water to the soil for the benefit of growing crops.

isohyet – Lines of equal precipitation.

isostatic rebound – a general rise in the land surface following the removal of thick glacial ice.

isotherm – Lines of equal temperature.

kame – A conical hill or irregular ridge of sand and gravel that was deposited in contact with glacier ice.

karst – Surface and subsurface features created by the dissolving of soluble rock such as limestone or gypsum, which results in such features as caverns and sinkholes.

kettle – A depression created by the melting of glacial ice that was buried in moraine.

key – A taxonomic tool used to identify unknown objects (e.g. plants or plant communities) through the use of paired questions.

krummholz – Scrubby, stunted growth form of trees, often forming a characteristic zone at the limit of tree growth in mountains.

lacustrine – Material deposited in lake water and later exposed; sediments generally consisting of stratified fine sand, silt, and clay.

landform – 1. A topographic feature.

2. The various shapes of the land surface resulting from a variety of actions such as deposition or sedimentation, erosion, and earth crust movements.

landscape – (1) All the natural features such as fields, hills, forests, water, etc., which distinguish one part of the earth's surface from another part. Usually that portion of land or territory which the eye can comprehend in a single view, including all its natural characteristics.
(2). A heterogeneous land area composed of a cluster of interacting ecosystems that are repeated in similar form throughout. Landscapes can vary in size, down to a few kilometers in diameter.

landscape ecology – 1. A study of the structure, function, and change in a heterogeneous land area composed of interacting ecosystems.

2. The scientific basis for the study of landscape units from the smallest mappable landscape cell to the global ecosphere landscape in their totality as ordered ecological, geographical and cultural wholes.

Rem.: This concept as well as the related works fluctuates greatly from one author to the other. Nevertheless, the concept generally recognizes the importance of interactions between landscape elements, the necessity of a global approach and the importance of human activities. Impact of human activities on the landscape is recognized with the concept but it also recognizes the constraints imparted by the biophysical properties of the landscape.

landscape element – The basic, relatively homogeneous, ecological unit, whether of natural or human origin, on land at the scale of a landscape.

Layer See stratum.

leaching – The removal of soluble materials from a soil horizon by percolating water.

levee – flood-deposited fluvial materials; when floodwaters overflow streambanks, the resulting fluvial deposits accumulate and raise the streambanks above the adjacent floodplain.

level – Refers to land without slope.

limiting factor – Ecological factor that limits the development of an organism by its presence, absence or quantity irrespective of the state of other factors.

lithic – A feature of a soil subgroup which indicates a bedrock contact within the limits of the control section.

litter – The uppermost portion of plant debris on the soil surface, usually not decomposed.

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

lowland – Extended plains or land that occur below a significantly elevated area.

loam – see soil texture. A mixture of sand, silt and clay. It is not related to color.

loose – A soil consistency term.

Luvisol – A soil* of the Luvisolic Order.

Luvisolic – An Order of soils that have eluvial (Ae) horizons, and illuvial (Bt) horizons in which silicate clay is the main accumulation product. The soils developed under forest or forest-grassland transition in a moderate to cool climate. The Order includes Gray Brown Luvisol and Gray Luvisol Great Groups (The latter is the most common in western Canada).

macroclimate – Regional climate related to geographical location and relief.

mapping unit – Unit that allows the definition of a geographical reference context.

marl – soft deposits of calcium carbonate, often associated with calcareous springs and calcium-rich ponds.

marsh – A wetland with a mineral or peat substrate inundated by nutrient rich water and characterized by emergent graminoid* vegetation.

meadow – A moist area usually dominated by grasses or forbs.

meander – Looped pattern of a stream course.

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

meltwater channel – A valley-like feature created by flowing water that originated from the melting of glacial ice.

mesic – (1) Describing the sites that are neither humid (hydric) nor very dry (xeric). Average moisture conditions for a given climate.
(2) An organic layer of intermediately decomposed material (between that of fibric and humic).

mesoclimate – Macroclimate that undergoes local modifications to many of its elements. The climate of a forest or a slope is a mesoclimate.

mesotrophic – Medium nutrient status and moderately acidic.

metamorphic rock – Rock formed from preexistent rock after undergoing natural geological processes such as heat or pressure. It differs from the original rock in terms of its physical, chemical or mineral properties.

microclimate – Localized climatic conditions ranging down to conditions at the stand or even individual plant environment level.

mineral soil – A soil that is largely composed of unconsolidated mineral matter.

minerotrophic – Nourished by mineral water. It refers to wetlands that receive nutrients from mineral groundwater in addition to precipitation by flowing or percolating water.

mixed-wood – Forest stands composed of conifers and angiosperms each representing between 25 and 75% of the cover; for example, trembling aspen and white spruce mixed-wood forests.

modal site – A well to moderately well-drained site without topographic or edaphic extremes that

could reflect the influences of regional climate rather than local site conditions. Also used to describe typical site conditions for an ecosystem unit.

See **normal**, **zonal** and **reference site**.

moder – Partially decomposed litter as a result of soil faunal activity, usually not matted.

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 and fine sized particles. (In soil textural classification, it includes clay loam, sandy clay loam, and silty clay loam).

moisture deficit – A condition that occurs when evaporation and/or transpiration exceeds the available water supply.

moisture regime – Refers to the available moisture supply for plant growth estimated in relative or absolute terms.

mor – Raw plant litter, usually matted, with a distinctive boundary that occurs at the mineral soil surface, in which fungal activity is the primary method of decomposition.

moraine – A mound, ridge, or other distinct accumulation of generally unsorted, unstratified glacial drift, predominantly till, deposited chiefly by direct action of glacier ice, in a variety of topographic landforms that are independent of control by the surface on which the drift* lies (19).

morphology, soil – The physical constitution, particularly the structural properties, of a soil profile as exhibited by the kinds, thickness and arrangement of the horizons and by the structure, consistence and porosity of each horizon.

mountain – Land with large differences in relief, usually refers to areas with more than 600 m of relief.

Munsell color system – A color designation system that specifies the relative degree of the three simple variables of color: hue, value, and chroma. For example: IOYR 6/4 is a color with a hue 10-YR, value -6, and chroma -4. These notations can be translated into several different systems of color names as desired. See chroma, hue, and value.

mull – Decomposed organic matter that has been incorporated with mineral soil; could represent an Ah horizon,

Munsell Soil Color Chart – A booklet of standardized color chips used to describe soil horizon colors.

mycorrhiza – The symbiotic association of fungi with the roots of seed plants.

natural province – Vast land mass (of the order of 100,000 km²) with characteristic features determined by major geological events. There are 3 Natural Provinces recognized in Alberta).

natural region – Extensive land mass (of the order of 20,000 km²) characterized by permanent geographic boundaries (geological, physiographic, etc.) and a certain uniformity and individuality of climatic, topographical, geomorphological and biological conditions.

natural subregion – Large land mass (of the order of 10,000 km²) characterized by permanent geographic boundaries (geological, physiographic, etc.) and a certain uniformity and individuality of climatic, topographical, geomorphological and biological conditions.

neutral soil – A soil having a pH value of approximately 7.0 in the surface horizons.

niche – A unique habitat or set of conditions that allows a species to exist with minimal competition from other species.

nonsoil – rock, water, snow or ice, mineral or organic material <10 cm thick over rock or soil materials displaced by unnatural processes such as earth fill.

normal site – A site with deep loamy soils, with neither a lack nor an excess of soil nutrients, located in welldrained positions in the landscape and neither protected from, nor exposed to, local climatic extremes.

See **zonal**, **modal** and **reference** site.

northern ribbed fen – A fen with parallel, low peat ridges (“strings”) alternating with wet hollows or shallow pools, oriented across the major slope at right angles to water movement. The depth of peat exceeds 1 m.

nutrient – Usually refers to one of a specific set of primary elements found in soil that are required by plants for healthy growth, such as nitrogen, phosphorus, potassium, calcium, magnesium, and sulphur.

nutrient regime – The relative level of nutrient availability for plant growth.

old growth – A stand of mature or overmature trees relatively uninfluenced by human activity.

oligotrophic – A condition of low nutrient status and acidic reaction).

ombrotrophic – An ecological system that derives its nutrients solely (or primarily) from precipitation.

Order – The highest taxonomic level in the Canadian System of Soil Classification, reflecting the nature of soil environment and the effects of dominant soil-forming processes.

Organic (1) – An Order of soils that have developed dominantly from organic deposits. The majority of organic soils are saturated for most of the year, unless artificially drained. The Great Groups include Fibrisol, Mesisol, Humisol and Folisol.

(2) – A soil classification Great Group designation indicating a Cryosolic soil formed in organic materials (e.g. a bog with permafrost).

organic matter – The decomposition residues of biological materials derived from: (a) plant and animal materials deposited on the surface of the soils; and (b) roots and micro-organisms that decay beneath the surface of the soil.

Orthic – A soil classification Subgroup designation indicating the usual or typical (central concept) for the Great Group.

outcrop – Exposure of bedrock at the ground surface.

outwash – Materials washed from a glacier by flowing water and laid down as stratified sorted beds. Generally, it is made up of stratified sand and/or gravel.

overstory – The uppermost continuous layer of a vegetation cover, e.g. the tree canopy in a forest ecosystem or the uppermost layer of a shrub stand.

paralithic – Poorly consolidated bedrock which can be dug with a spade when moist. It is severely constraining but not impenetrable to roots.

palsa – A peaty permafrost mound possessing a core of alternating layers of segregated ice and peat or mineral soil material. Palsas are typically between 1 and 7 m in height and a few meters to 100 m in diameter.

parent material – The unconsolidated and more or less chemically unweathered material from which soil develops by pedogenic processes.

parkland – Relatively open forest at both low and high elevations – very open in nature.

particle size – The size of a mineral particle as measured by sedimentation, sieving, or micrometric methods. Also referred to as grain size.

patterned ground – A general term for circles, polygons, strips, nets, and steps created by frost action.

peat – An accumulation of partially decomposed plant matter under saturated conditions.

peat moss – In scientific literature, peat material is classified on the basis of its botanical composition. The most common moss peat materials are feather moss peat, brown moss peat, *Drepanocladus* moss peat, and *Sphagnum* peat.

peat plateau bog – A bog composed of perennially frozen peat, rising abruptly about 1 m from the surrounding unfrozen fen. The surface is relatively flat and even, and often covers very large areas. The peat was originally deposited in a non-permafrost environment and is often associated with collapse scars or fens.

peaty – A soil classification phase designation indicating an accumulation of 15 cm to 40 cm of surface peat (15 – 60 cm if fibric).

peatland – Peatlands (organic wetlands) are characterized by more than 40 cm peat accumulation on which organic soils (excluding Folisols) develop.

ped – A unit of soil structure such as a prism or granule, which is formed by natural aggregates.

pedogenesis – 1. The mode of origin of the soil, especially the processes or soil-forming factors responsible for the development of the solum.

pedology – The aspects of soil science dealing with the origin, morphology, genesis, distribution, mapping, and taxonomy of soils.

pedon – A real unit of soil, the smallest homogenous, three-dimensional unit that can be considered a soil.

percolation, soil water – The downward movement of water through soil; especially, the downward flow of water in saturated or nearly saturated soil at hydraulic gradients of the order of 1.0 or less.

periglacial – Said of the processes, conditions, areas, climates, and topographic features at the immediate margins of former and existing glaciers and ice sheets, and influenced by the cold temperature of the ice. Permafrost is a periglacial process.

permafrost – Ground (soil or rock and included ice and organic materials) that remain at or below 0°C for at least two consecutive years.

pH – A measure of acidity or alkalinity of a solution, based on hydrogen ion concentration.

phase – judged to meaningfully subdivide the unit, especially for management purposes. The phase is not a formal category in the taxonomy.

phenotype – The observable structural and functional properties of an organism that derive from the interaction between its genotype and its environment.

physiognomy – The general appearance of vegetation by broadly defined life forms, such as forest or grassland.

physiographic region – Topographically similar landscapes with similar relief, structural geology and elevation at a mapping scale of 1:1,000,000 to 1:3,000,000.

physiographic subregion – A subdivision of a physiographic region based on distinct patterns of relief, geology and geomorphology, and drainage pattern and density at a mapping scale of 1:250,000 to 1:1,000,000.

physiography – The study of the genesis and evolution of land forms.

pioneer species – Plant species that initially invade a newly exposed surface.

plain – A relatively large, level, featureless topographic surface.

plant community – A concrete or real unit of vegetation or a stand of vegetation.

plateau – An elevated area with steep-sided slopes and a relatively level surface

platy – Consisting of soil aggregates that are developed predominately along the horizontal axes, laminated; flaky.

plot – A vegetation sampling unit used to delineate a fixed amount of area for the purpose of estimating plant cover, biomass, or density. Plots can vary in their dimensions depending on the purpose of the study and the individual researcher.

polygonal peat plateau bog – A perennially frozen bog, rising about 1 m above the surrounding fen. The surface is relatively flat, scored by a polygonal pattern of trenches that developed over ice wedges. The permafrost and ice wedges developed in peat originally deposited in a non-permafrost environment. Polygonal peat plateaus are commonly found near the boundary between the zones of discontinuous and continuous permafrost.

population – A group that includes all possible members of a species in a territory at a given time.

postglacial – Occurring after glaciation.

potential – General evaluation of the possible biological productivity or carbon production potential of a site resource (or an area) usually expressed in terms of values to an appropriate management regime. It may be generally established or estimated from site components that represent a permanent character (e.g. soil quality).

potential climax – The species or plant community that will form the climax vegetation on a site. The existing species or plant association may be different from the potential climax due to site disturbance and successional stage.

prairie – An extensive area of native upland grass with a semi-arid to arid climate.

precipitation – A collective term for snowfall and rainfall.

primary succession See **succession**.

pristine – An undisturbed natural condition.

productivity – A measure of the physical yield of a particular crop. It should be related to a specified management. Merchantable wood volume productivity is generally expressed in m³/ha/yr. It may be further subdivided into types (gross, net, primary).or allocations (leaves, wood, above ground, below ground).

profile, soil – A vertical section of the soil through all its horizons and extending into the parent material.

proglacial – Pertaining to all observable phenomena on the face of a glacier or just beyond its ablation area.

quadrat – A vegetation sampling unit with specific dimensions and shape.

reaction, soils – The degree of acidity or alkalinity of soil, usually expressed as a pH value.

rare species – Any indigenous species of fauna or flora that, because of its biological characteristics, or because it occurs at the fringe of its range, or for some other reasons, exists in low numbers or in very restricted areas of Canada but is not a threatened species.

reconnaissance – A level of field analysis that involves relatively quick sampling for the purpose of obtaining general information about an area. In some cases, sampling quality may be high, but the intensity of sampling is very low relative to the size of the total area being studied.

reference site – A site that serves as a normal or modal condition, an "average" or benchmark in terms of vegetation, soil and general site conditions.
See **modal**, **normal** and **zonal site**.

regeneration – 1. The renewal of a forest crop by natural or artificial means. Also the new crop so obtained. The new crop is generally less than 1.3 m in height.

Rego – A soil classification Subgroup designation indicating a soil profile with little or no B horizon – an AC profile (often caused by erosion truncation)

regolith – The unconsolidated mantle of weathered rock and soil material overlying solid rock.

Regosol – A soil* of the Regosolic Order*.

Regosolic – An Order of soils having no horizon development or development of the A and B horizons insufficient to meet the requirements of the other orders. Included are Regosol and Humic Regosol Great Groups.

relief – The difference between extreme elevations within a given area (local relief).

remote sensing – The gathering and interpretation of land-based information by indirect methods such as aerial photography or satellite imagery.

residual material – Unconsolidated and partly weathered mineral materials accumulated by disintegration of consolidated rock in place.

residual soil – Soil formed from, or resting on, consolidated rock of the same kind as that from which it was formed and in the same location.

riparian – Refers to terrain, vegetation or simply a position adjacent to or associated with a stream, flood plain, or standing waterbody.

rock – A consolidated mass of mineral matter; a general term for stones.

rolling – A landform characterized by a regular sequence of moderate slopes producing a wavelike pattern of moderate relief (20 m to 100 m). Slope lengths are often 1.6 km or greater with gradients usually greater than 5%.

runnel – a pattern of alternating flow channels and interchannel uplands perpendicular to contour. In permafrost-affected areas, light and dark-striped patterns on hill slopes are runnels; the light stripes are usually sparsely treed, lichen covered interchannel areas with permafrost close to the surface, and the dark stripes are shallow drainage channels vegetated by dwarf birch, willow and other shrubs with a thicker active layer.

runoff (run-off) – The portion of the total precipitation in an area that flows on the surface of the land, without entering the soil, reaches streams, and flows away through stream channels.

saline soil – A nonalkali soil containing soluble salts in such quantities that they interfere with the growth of most crop plants. The conductivity of the saturation extract is greater than 4 dS/m (formerly mmhos/cm), the exchangeable-sodium percentage is less than 15, and the pH is usually less than 8.5.

salinization – The process of accumulation of salts in soils.

sand – A soil particle between 0.05 and 2.0 mm in diameter.

saturation percentage – The amount of water required to saturate a unit of soil (often correlated with sodicity).

silt – A soil separate consisting of particles between 0.05 to 0.002 mm in equivalent diameter.

soil – The unconsolidated mineral material on the immediate surface of the earth that serves as a natural medium for the growth of land plants.

sand – Mineral particles with diameters ranging from 0.05 to 2.0 mm.

saprolite See **residual soil**.

scree See **talus**.

secondary succession See **succession**.

sedimentary rock – A rock formed from materials deposited from suspension or precipitated from solution and usually more or less consolidated.

seepage – The slow movement of water near the soil surface, often occurring above an impermeable subsoil layer or at the boundary between bedrock and unconsolidated material that is exposed at ground surface, usually occurs downslope of the recharge area.

seral – Recognizably different succession stages along a successional path or sere.

seral stage See **successional stage**.

shade tolerant – Plants capable of growing and successfully reproducing beneath the shading canopy of other species.

shield rock – Crystalline Precambrian rock that forms the core of continents.

shrub – A perennial plant usually with a woody stem, shorter than a tree, often with a multi-stemmed base.

shrubland – An area dominated by shrubs, usually individual plants not in contact and with a herbaceous ground cover.

silt – Mineral particles with a diameter of 0.05 to 0.002 mm.

site – 1. The place or the category of places, considered from an environmental perspective, that determines the type and quality of plants that can grow there .
2. All the physical elements of a forest site (climate, deposit, drainage, etc.). It is a relatively homogeneous area in its physical permanent conditions.

site index (SI) – An expression of forest site quality based on the height of dominant and codominant trees at a specific age.

slope – 1. An inclined surface.
2. The steepness of an inclined surface, measured in degrees or percentages from the horizontal.

slope fen – A fen occurring mainly on slowly draining, nutrient enriched seepage slopes. Pools are usually absent, but wet seepage tracks may occur. Peat thickness seldom exceeds 2m.

slough – A Western Canadian term for a shallow prairie pond that largely disappears in late summer, often with a muddy bottom.

softwood – 1. A coniferous tree such as *Pinus* (pine) or *Picea* (spruce).
2. A forest type with a cover made up of 76 to 100% of conifers.

soil – Unconsolidated mineral material or organic material >10 cm thick that occurs at the earth's surface and is capable of supporting plant growth. It is also the zone where the biological, physical, and atmospheric components of the environments interact.

soil map – A map showing the distribution of soil types or other soil mapping units in relation to the prominent physical and cultural features of the earth's surface.

soil moisture – Water contained in the soil.

soil profile – A vertical section of the soil through all its horizons and extending into parent material.

soil structure – The combination or arrangement of primary soil particles into secondary compound units or peds. The secondary units are characterized and classified on the basis of size, shape, and degree of distinctness into classes, types, and grades, respectively. Common terms for kind of structure are – single grain, amorphous, blocky, subangular blocky, granular, platy, prismatic and columnar.

soil survey – The systematic classification, analysis, and mapping of soils within an area.

soil zone – A large area dominated by a zonal soil that reflects the influence of climate and vegetation.

solar radiation See **insolation**.

Solonetz – A soil* of the Solonetzic Order*.

Solonetzic – An Order of soils developed mainly under grass or grass-forest vegetative cover in semiarid to subhumid climates. The soils have a stained brownish or blackish solonetzic B (Bn, Bnt) horizon that can be very hard when dry and a saline C horizon. The order includes the Solonetz, Solodized Solonetz and Solod Great Groups.

solum – 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.

species – A group of organisms having a common ancestry that are able to reproduce only among themselves.

Spring fen – A fen nourished by a continuous discharge of groundwater. The surface is marked by pools, drainage tracks and occasionally somewhat elevated “islands”. The nutrient level of water is highly variable between locations.

stand – A collection of plants having a relatively uniform composition and structure, and age in the case of forests.

stand density – A quantitative measure of tree cover on an area in terms of biomass, crown closure, number of trees, basal area, volume, or weight

stand structure – The distribution of trees in a stand or group by age, size, or crown classes.

string bog – a pattern of narrow (2-3 m wide), low (less than 1 m deep) ridges oriented at right angles to the direction of drainage. Wet depressions or pools occur between the ridges. The water and peat are very low in nutrients, as the water has been derived from ombrotrophic wetlands. Peat thickness exceeds 1 m.

stone – Rock fragment with a diameter ranging from 25 to 60 cm.

story – A horizontal stratum or layer in a plant community; in forest appearing as one or more canopies.

subalpine – A zone in the mountains that occurs below the alpine.

subarctic – A zone immediately south of the arctic characterized by stunted, open-growing spruce vegetation.

subclimax – Successional stage of a plant community preceding the climax.

subgroup – A subdivision of a soil great group, differentiated on the basis of the kind and arrangement of horizons that indicate conformity to the central concept of the great group, intergrading towards soils of another order, or other special features.

subsoil – A general term referring to the underlying part of the soil itself and that is often considered as being located under the A horizon.

substrate – The medium on which a plant grows.

succession – The progression within a community whereby one plant species is replaced by another until a stable assemblage for a particular environment is attained. **Primary succession** occurs on newly created surfaces, while **secondary succession** involves the development or replacement of one stable successional species by another on a site having a developed soil. Secondary succession occurs on a site after a disturbance (fire, cutting, etc.) in existing communities.

successional stage – Stage in a vegetation chronosequence in a given site. Syn. seral stage.

surficial materials – Unconsolidated materials that occur on the earth's surface.

swamp – A mineral-rich wetland characterized by a dense cover of deciduous or coniferous trees, or shrubs.

taiga – Refers to a coniferous boreal forest. Often, this term is used to refer to the vegetation zone of

- transition between boreal forest and tundra. This vegetal formation corresponds to a forest-tundra.
- talus** – A collection of fallen disintegrated material that has formed a pile at the foot of a steep slope.
- terrace** – Relatively level benches that are created and occur adjacent to streams or rivers, sometimes sharp or low breaks occur between individual terrace surfaces. These features are formed during a period of fluvial stability followed by a period of down cutting by a stream.
- terrain** See **topography**.
- terrestrial** – Pertaining to land as opposed to water.
- Terric** – A soil classification Subgroup designation indicating a mineral substrate within 40 cm to 140 cm of the surface (shallow peat).
- texture** – The relative proportions of sand, silt and clay (the soil separates) and coarser materials in a mineral sample. It is described in terms such as sand, loamy sand, sandy loam, loam, silt loam, clay loam, silty clay loam and clay that are often grouped into classes according to specific needs (fine texture, medium texture, moderately coarse texture, etc.).
- thermokarst** – The process by which characteristic landforms result from the thawing of ice-rich permafrost or the melting of massive ice.
- thermokarst lake** – A lake occupying a closed depression formed by settlement of the ground following thawing of ice-rich permafrost or the melting of massive ice.
- threatened species** – Any indigenous species of fauna or flora that is likely to become endangered in Canada if the factors affecting its vulnerability are not reversed.
- till (glacial till)** – Unstratified drift, deposited directly by a glacier without being reworked by meltwater. See also **moraine**
- topography** – The physical features of an area such as land shape and relief.
- toposequence** – A sequence of related soils that differ one from the other primarily because of topography and its influence on soil-forming processes. The relationship between soil and vegetation types, primarily a response to different relief.
- tree** – A woody plant usually with a single main stem.
- tree line** – The uppermost elevation or northern limit of tree growth, usually on upland sites.
- tundra** – A level to undulating, treeless plain characteristic of arctic or alpine regions. For most of the year, the mean monthly temperature is below the freezing point.
- undergrowth** – All the shrubs, herbaceous plants and mosses growing under a canopy.
- understory** – Vegetation growing beneath taller plants such as trees or tall shrubs.
- undulating** – A landform with a regular sequence of gentle slopes producing a wavelike pattern of low local relief. Slopes are generally less than 0.8 km long with gradients of less than 5%.
- uneven-aged** – Of a forest, stand, or forest type in which intermingling trees differ markedly in age.
- upland** – (1) A general term for an area that is elevationally higher than the surrounding area, but not a plateau.
(2) An area that is not a wetland and that is also not imperfectly or poorly-drained.
- valley** – Any hollow or low-lying area bounded by hill or mountain ranges, and usually traversed by a stream.
- Value, color** – One of the three variables of color. A Munsell Soil Color Chart notation that indicates the lightness of a color.
- vegetation** – The general cover of plants growing on the landscape.

vegetation structure – The vertical stratification associated with a plant community.

vegetation type – 1. An abstract vegetation classification unit, not associated with any formal system of classification.

2. In phytosociology, the lowest possible level to be described.

See **forest type** and **association**.

vegetation zone – A naturally occurring band of vegetation that occupies a particular environment such as an elevational zone (e.g. subalpine zone).

veneer – A thin layer of unconsolidated material between 10- and 100-cm thick that does not mask the topographic character of the underlying terrain.

veneer bog – A bog occurring on gently sloping terrain underlain by generally discontinuous permafrost. Although drainage is predominantly below the surface, overland flow occurs in poorly defined drainage ways during peak runoff. Peat thickness is generally less than 1.5 m.

Typic – A soil classification Subgroup designation indicating a depth of more than 140 cm of organic material.

von Post humification scale – A manual method for estimating degree of decomposition of peat materials. It is a 10 point scale with assessment based on color of drained water and structure of hand squeezed material.

watershed – All lands enclosed by a continuous hydrologic-surface drainage divide and lying upslope from a specified point on a stream.
See drainage basin.

water table – The upper surface of groundwater or that level below which the soil is saturated with water.

weathering – The physical and chemical disintegration, alteration and decomposition of rocks and minerals at or near the earth's surface by atmospheric agents.

wetland – Land that is saturated with water long enough to promote hydric soils or aquatic processes as indicated by poorly-drained soils*, hydrophytic vegetation, and various kinds of biological activity that are adapted to wet environments.

wildlife – Natural fauna, usually limited to macro-organisms such as mammals, birds, reptiles, and amphibians.

windfall – A tree uprooted or broken off by wind, and areas containing such trees.

woodland – woody plants 2-8 m tall growing somewhat closely spaced.

xeric – Describes a dry site.

zonal – Describing a soil that reflects the influence of climate and climactic vegetation (e.g. Luvisol).

zonal site – Site with conditions that could potentially support climatic climax plant communities and their associated soils and thus reflect the regional climate.
See **normal**, **modal** and **reference** site.

zonation – The natural stratification of the landscape in response to significant area differences.