

A NATIONAL ECOLOGICAL FRAMEWORK FOR CANADA

Written and compiled by:

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Printed and digital copies of the six regional ecodistrict and ecoregion maps at scale of 1:2 million (Atlantic Provinces #CAS010; Quebec #CAS011; Ontario #CAS012; Manitoba, Saskatchewan, and Alberta #CAS013; British Columbia and Yukon Territory #CAS014; and the Northwest Territories #CAS015); and associated databases are available from Canadian Soil Information System (CanSIS), address as above.

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PREFACE

The release of Canada's Green Plan (Government of Canada 1990) in December of 1990 outlined the government's commitment to new policy thrusts to manage our resources prudently and to encourage sensitive environmental decision making. One cornerstone of the Green Plan was the direction to think, act and plan in terms of ecosystems; to move away from an emphasis on individual elements towards a more comprehensive approach to monitoring and reporting on the environment. A nationwide ecological framework was required to provide standardized, multiscale geographical reporting and monitoring units. The use of such a framework of standard ecological units should allow for common communication and reporting between different jurisdictions and disciplines. The federal government has further endorsed the use of an ecosystem approach to manage and report on the sustainability of both the forestry (Forestry Canada 1993) and agriculture (Federal-Provincial Agriculture Committee on Environmental Sustainability 1990) resource sectors.

To this end, in 1991, a collaborative project was undertaken by federal government agencies with a wide range of stakeholders to revise the terrestrial component of a national ecological framework. This national framework has been revised to enhance the capability of both government and nongovernment organizations to assess, and report on, environmental quality and the sustainability of ecosystems in Canada. This classification system has evolved from previous national efforts and is part of an ongoing development of small-scale ecological mapping in Canada. This report: i) integrates the most recent ecological information (maps and reports); ii) contains narrative descriptions of each ecozone and ecoregion, iii) includes a relational database in a structure that facilitates further linking to federal and external databases, and iv) the framework provides a direct link to the Soil Landscapes of Canada digital map series. The national and regional map coverages have been created on a widely used commercial geographic information system with the ability to export to other software.

This spatial framework was built on consultation, collaboration and compromise. As such, not all boundaries of the framework will be to the full satisfaction of all Canadian ecologists. It is presented for use to a wide range of users. National classifications evolve as knowledge is gained and ecological perspectives change. Following use and feedback, it is intended that in the future this framework will again be revised to better reflect our understanding of the Canadian landscape and the sustainability of natural resources.

This report describes the methods used to construct the spatial ecological framework, the concepts of the hierarchical levels of generalization (ecozones, ecoregions and ecodistricts), their linkages to various resource data sources, and some examples of applications of the framework. A copy of the corresponding 1:7 500 000 scale national map and narrative descriptions of each ecozone and ecoregion are also included.

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The update and refinement of the national ecological framework is the product of three years of research and consultation between federal, provincial and territorial agencies. The contribution of Ed Wiken, Director, Ecozone Analysis Branch, State of the Environment Directorate (SOED) must be specially acknowledged for initiating the project, contributing to the map and report revision, and for his continued support and advice throughout the project. There were two core groups who contributed to the development of the final report, maps and databases. These compilations were guided by previous national efforts to characterize the ecosystems in Canada.

A. National Working Group

At the national level the members of the Ecological Stratification Working Group consisted of staff from the Centre for Land and Biological Resources Research (CLBRR), Research Branch, Agriculture and Agri-Food Canada and State of the Environment Directorate, Ecozone Analysis Branch, Environment Canada:

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B. Regional Contributors

Each member of the National Working Group organized valued contributions of many individuals and agencies from the provinces and territories. While the Ecological Stratification Working Group takes responsibility for the final content of the report, maps and databases, we acknowledge that without their efforts and contributions, a revised national framework would not have been possible. The following regional specialists served on regional working groups or were consulted through the years, contributing their time and expertise:

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1. ECOLOGICAL REGIONALIZATION IN CANADA

Reviews of the history and the applications of ecological regionalization in Canada are given by Bailey et al. (1985), Rubec et al. (1988), Ironside (1989), Rowe (1992), Rubec (1992), Marshall et al. (1992), Wiken and Lawton (1995), and Marshall et al. (In press). These overviews and documents show a steady progress towards developing a broadly based ecosystem perspective.

The Canada Committee on Ecological Land Classification (CCELC) was created in 1976 to provide a national forum to encourage the development, both of a uniform national ecological approach to terrestrial ecosystem classification and mapping, and of a sound application of the ecological approach to sustainable resource management and planning. The objective of the approach is to delineate, classify, and describe ecologically distinct areas of the earth's surface at different levels of generalization using various abiotic and biotic factors at each of the levels (Rowe and Sheard 1981; Wiken 1986). The ecological units are defined through the spatial differences in a combination of these factors. The dominance of any one or more of these factors will vary from one place to another. Between 1976 and the mid 1980s a CCELC hierarchical classification evolved with seven levels of generalization. From the broadest to the smallest, they are: ecozones, ecoprovinces, ecoregions, ecodistricts, ecosections, ecosites and ecoelements (Environmental Conservation Service Task Force 1981; Rowe and Sheard 1981; Wiken 1979, 1986; Ironside 1991).

Following the establishment of the CCELC classification framework, and benefiting from previous published scientific reports and maps at various scales, several syntheses of ecological (biophysical) land classification information at the national level were produced. In 1986 a map and report describing terrestrial ecozones (Wiken 1986) was published. In describing ecoregionalization Wiken (1986) stated:

"Ecological land classification is a process of delineating and classifying ecologically distinctive areas of the surface. Each area can be viewed as a discrete system which has resulted from the mesh and interplay of the geologic, landform, soil, vegetative, climatic, wildlife, water and human factors

which may be present. The dominance of any one or more of these factors varies with the given ecological land unit. This holistic approach to land classification can be applied incrementally on a scale-related basis from site-specific ecosystems to very broad ecosystems."

In essence, the individual areas delineated on the earth's surface (i.e. ecozones, ecoprovinces, ecoregions, ecodistricts, etc.) gain their identity through spatial differences in a combination of landscape characteristics. The factors that are important vary from one place to another at all scales. By extending this approach to mapping, a provisional ecoregion map of Canada was produced in 1987 and was eventually published by the National Atlas of Canada (Wiken et al. 1993). This map included the first national approximation of ecozones, ecoprovinces, and ecoregions.

As well, working groups of the CCELC published related thematic studies such as the Wetland Regions of Canada (National Wetlands Working Group 1986) and Ecoclimatic Regions of Canada (Ecoregions Working Group 1989) to provide a specific focus on certain ecosystems or their component parts. The wetland regions represented areas within which similar and characteristic wetlands develop in locations that have similar topography, hydrology, and nutrient regimes. Subdivisions of the wetland regions are based on the distribution and relative abundance of the various kinds of wetlands. In contrast, the ecoclimatic regions recognize areas by emphasizing the roles and influences that climate has had in molding the patterns and inherent qualities of ecosystems. It chose gradients of ecologically effective macroclimate (as expressed by vegetation and soil development) as the defining criteria.

While it was recognized that the levels of generalization as developed by CCELC were conceptually sound, the spatial units which had been proposed (terrestrial ecozones, ecoregions, and ecodistricts) needed updating to reflect new information. The revised material would continue to serve monitoring and reporting needs at regional, national, and international levels.

Specifically, in order for the framework to be used effectively, it was necessary that it:

- be revised in further consultation with the federal, provincial and territorial agencies with environmental resource management responsibilities across the country;
- reflects and relates to the latest efforts in regional ecological classification and mapping;
- provides links to other biophysical and socioeconomic databases, for example the Soil Landscapes of Canada (Shields et al. 1991) and population statistics (Government of Canada 1996);
- includes descriptions of ecozones and ecoregions in an easily retrievable format; and

- be supported by a data model that relates information between different levels of the framework and facilitates linking to external data sources.

To achieve this, a collaborative project was initiated in late 1991 between Environment Canada (State of the Environment Directorate), Agriculture and Agri-Food Canada (Centre for Land and Biological Resources Research) and Natural Resources Canada (Canadian Forestry Service). Project members (the Ecological Stratification Working Group), in consultation with provincial/territorial agencies, revised map unit boundaries and compiled attribute data about key levels of the terrestrial component of the national ecological framework.

2. METHODOLOGY

Map Compilation

The concepts and hierarchy set out by CCELC remained the overall guide for revising three priority levels (ecozone, ecoregion and ecodistrict) of the framework. Map delineations at each level were judged on a case by case basis within and between provinces and territories. These levels were deemed to be the most suitable to report on national issues and regional issues of national significance concerning the environment and sustainability of resources.

A range of stakeholders from federal, provincial, and territorial governments, environmental interest groups, and the private sector, were consulted to incorporate wherever possible, the most recent provincial ecological mapping products to provide seamless national coverage at each level. This involved correlating existing ecological maps and, where needed, revising maps. Regionalization was guided by the previous national terrestrial ecoregion map (Wiken et al. 1993), as well as by other published national map sources, such as the Ecoclimate Regions of Canada (Ecoregions Working Group 1989), and the Physiographic Regions of Canada (Bostock 1970). A pre-existing ecodistrict coverage (Environment Canada 1985), the Soil Landscapes of Canada series of 1:1 million scale soil maps (Shields et al. 1991), and the Northern Land Use Information Series of 1:250 000 scale maps (Environment Canada and Indian and Northern

Affairs Canada 1978–1986) were used in delineating map units at the ecodistrict level of the framework. Finally, the process included the use of LANDSAT imagery as a broad correlation tool to ensure that the defined biological and physical patterns of the landscape were consistently captured across boundaries and between provinces and territories, particularly in northern Canada where detailed ecological information was less available.

Levels of Generalization

Map delineations of three levels of the CCELC hierarchy were refined during this project. They are listed in Table 1 and are also described below. Other levels in the hierarchy less suited to meeting the needs of environmental reporting and monitoring were not utilized.

Ecozones

Ecozones are areas of the earth's surface representative of large and very generalized units characterized by interactive and adjusting abiotic and biotic factors. Canada was first subdivided into 15 ecozones to meet reporting requirements of the first State of the Environment Report for Canada published in 1986 (Wiken 1986). The ecozone lies at the top of the ecological hierarchy as defined by the CCELC (Wiken 1979). In this context, the ecozone defines on a subcontinental scale, the broad mosaics formed by the interaction of macroscale

Table 1 Definitions and examples of criteria used for the highest levels of the Canada Committee on Ecological Land Classification system (adapted from Ironside 1991)

Definitions for the Levels of Generalization.

ECOZONE	-	an area of the earth's surface representative of large and very generalized ecological units characterized by interactive and adjusting abiotic and biotic factors.
ECOREGION	-	a part of a province characterized by distinctive regional ecological factors, including climatic, physiography, vegetation, soil, water, fauna, and land use.
ECODISTRICT	-	a part of an ecoregion characterized by distinctive assemblages of relief, geology, landforms and soils, vegetation, water, fauna, and land use.

Level of Generalization Map Scale*	Geomorphology	Soils**	Vegetation	Climate
	----- examples -----			
ECOZONE 1:7.5 M	Physiographic or macro landforms	Soil order group(s)	Broad physiognomic types	Macro
ECOREGION 1:5 M to 1:2 M	Large-order landforms or assemblages of regional landforms	Great groups or associations thereof	Plant regions or assemblages thereof	Meso or small order macro
ECODISTRICT 1:3 M to 1:1 M	Regional landforms or assemblages thereof	Subgroups or associations thereof	Plant districts or assemblages thereof	Meso or large order micro

* Map scales should not be taken too restrictively, as they vary with settings and objectives. (M = million).

** Terminology according to Agriculture Canada Expert Committee on Soil Survey (1987).

climate, human activity, vegetation, soils, geological, and physiographic features of the country. The former Terrestrial Ecozones of Canada report is being updated and will also include descriptions for the recently developed marine ecozones (Wiken, personal communication 1995).

Modifications were introduced to several ecoregions which affected the boundaries of some parts of ecozones. For example, the Boreal Shield ecozone now includes Lake Melville and Paradise River ecoregions of Labrador in the east, and the Athabasca Plain ecoregion of northern Saskatchewan. The Atlantic Maritime ecozone has been extended to include the Appalachian Mountains of southeastern Quebec. The Boreal Plains ecozone has been revised to extend northward to Great Slave Lake along the Slave River valley. The Boreal Plains ecozone has been withdrawn from the Northwest Territories–Yukon–British Columbia boundary intersection. This area now belongs to the Boreal Cordillera ecozone in recognition of its mountainous condition. Many smaller adjustments have been made to all ecozone boundaries on the revised map (Figure 1), based on input from local Working Group members.

Ecoregions

Ecoregions are subdivisions of the ecozone characterized by distinctive large order landforms or assemblages of regional landforms, small order macro- or mesoclimates, vegetation, soils, water, and regional human activity patterns/uses. In this compilation, ecoregion boundaries which already existed from previous work were refined to reflect more recent detailed provincial studies and knowledge. The ecoregions constitute the major bridge between the subcontinental scale ecozones and the more localized ecodistricts. The revisions to the ecoregions provided the principal basis for the refinement of the original ecozones delineated by Wiken (1986).

Provincial ecoregion maps were incorporated into the national map with only minor modification to original material in Newfoundland (Wiken et al. 1993; after Hirvonen 1984; Damman 1983), Prince Edward Island (Wiken et al. 1993; after Hirvonen 1984), Nova Scotia (Wiken et al. 1993; after Hirvonen 1984; Simmons and Muecke 1984), Labrador (Hirvonen 1984; Meades 1993), Manitoba

(Eilers and Mills 1992), and British Columbia (Demarchi 1993). In New Brunswick the latest developments by Godin and Roberts (1994) were incorporated. In the Yukon, ecoregion boundaries were redrawn based on the earlier work of Oswald and Senyk (1977), Wiken et al. (1981), and Alberta Environmental Protection (1994) and modified to match a recent ecoregion map of Alaska (Gallant et al. 1995). In Alberta, a new map resulted through a consensus review and merger of two existing systems (Achuff et al. 1988; Strong 1992) incorporating concepts published by Pettapiece (1989). In Quebec, existing works of Gilbert et al. (1985) and Ducruc et al. (1994) at the Ministère de l'Environnement et de la Faune (1994) were modified and amalgamated. In Ontario, efforts by a federal/provincial working group modified the ecoregions of Wickware and Rubec (1989) and the site regions of Hills (1976). In Saskatchewan, a similar working group produced a new ecoregion map (Padbury and Acton 1994) incorporating the work of Harris et al. (1989), and Thorpe (1992). In the Northwest Territories, existing ecoregions (Wiken et al. 1993) and regional studies (Weatherall 1985; Wiken et al. 1985) were modified. Recent NOAA/AVHRR imagery provided by the Department of Renewable Resources, Government of the Northwest Territories (GNWT) and data from the recently completed Soil Landscapes of Canada map series were also used in preparing revised ecoregions.

Ecodistricts

Ecodistricts are subdivisions of ecoregions and are characterized by distinctive assemblages of landform, relief, surficial geologic material, soil, water bodies, vegetation, and land uses. The ecodistricts bring together various subregional units which had been defined by Environment Canada, Agriculture and Agri-Food Canada and provincial agencies. Under the sponsorship of the Northern Land Use Information Series (NLUIS) much of the Canadian Territories were mapped and classified according to ecodistricts by Environment Canada. These descriptions are contained on the individually published 1:250 000 NLUIS maps. These maps contain information on soils, landforms, vegetation, wildlife, and water resources in the context of ecodistricts. Another example, is the Centre for Land and Biological Resources Research's development of a subregional unit termed an "agroecological resource area" for land

TERRESTRIAL ECOZONES OF CANADA

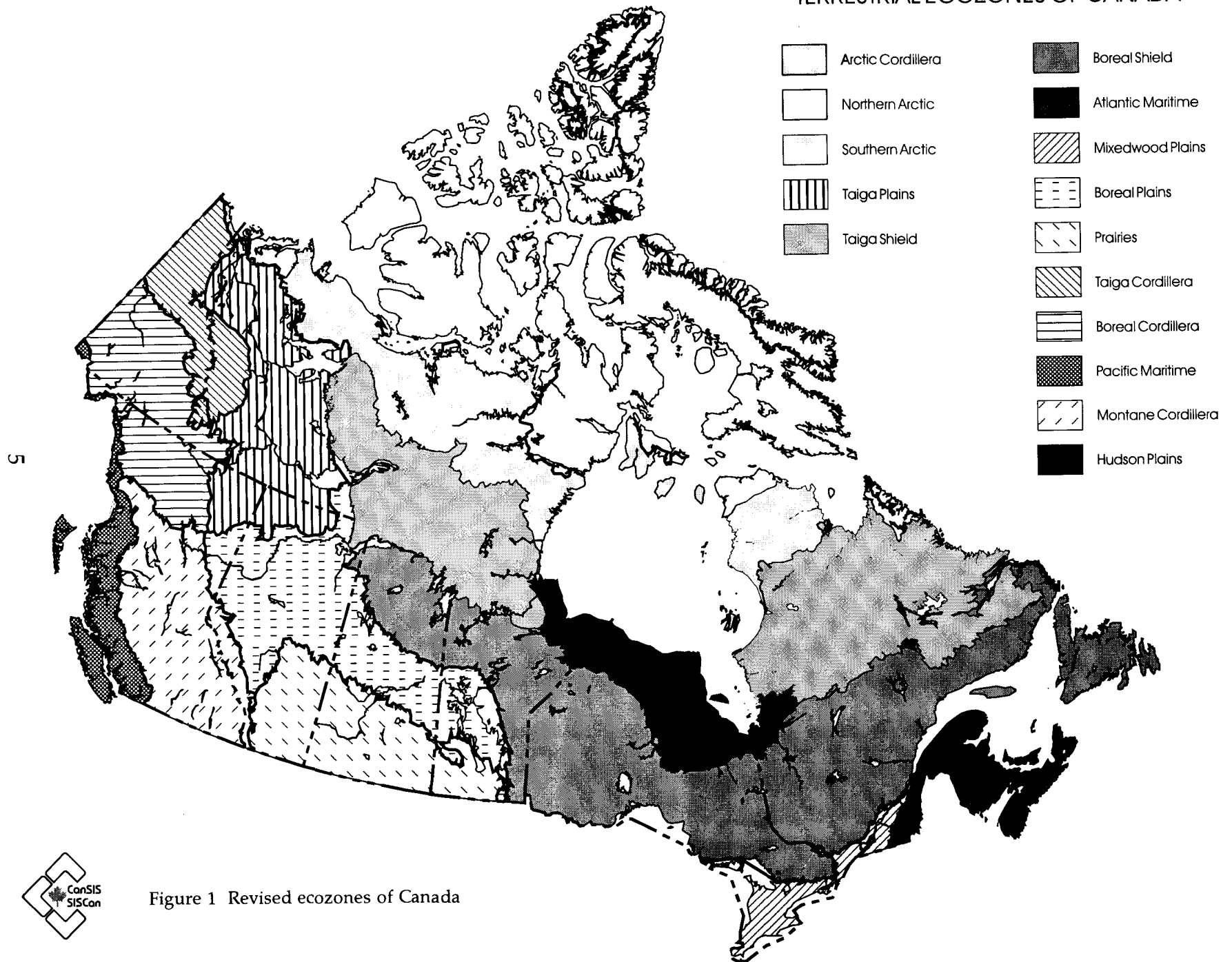


Figure 1 Revised ecozones of Canada

evaluation and modelling purposes. The agroecological resource areas were completed for the agricultural portions of the Prairie Provinces (Dumanski et al. 1993; Pettapiece 1989; Eilers and Mills 1990) and in Nova Scotia (Patterson and Langman 1992). The method of identifying significant separations at this level was, in large part, based on differences in parent material, topography, landform and soil development derived from the Soil Landscapes of Canada. The Soil Landscapes maps represented the most detailed level (1:1 000 000 scale) of national biophysical landscape information available for all of Canada during the compilation of the ecodistrict boundaries.

In addition to the agroecological resource areas, soil landscape units have been used as a basis to refine and define ecodistricts in some nonagricultural areas of Canada. In northern Quebec and the Northwest Territories, units that had been established under the first approximation of ecodistricts (Environment Canada 1985) and through the Northern Land Use Information Series (Environment Canada 1978–1986) were evaluated, revised, correlated and combined to produce a uniform ecodistrict coverage depicted on the Soil Landscape polygon base.

In British Columbia, the province's subregional "ecosections" (Demarchi 1993) were equated to ecodistricts with only minor modifications. In British Columbia, ecoregions were mapped in relation to the biogeoclimatic ecosystem classification (Pojar et al. 1987). Due to the complex nature of climates and landforms within mountainous ecosystems, ecodistricts depict in greater detail the ecological assemblages that are found within the same macroclimatic and physiographic region (i.e. ecoregion). With the Cordilleran ecoregions, ecodistricts tend to contain a greater range of properties than are found in ecodistricts elsewhere in the country.

Data Integration

Digital coverages of ecozones, ecoregions and ecodistricts were compiled on the standard 1:1 million scale map bases of the Soil Landscapes of Canada database, and stored as discrete layers of map polygons within the Canadian Soil Information System (CanSIS) (MacDonald and

Valentine 1992). CanSIS is run on an TMARC/INFO version 6.10 geographic information system, based on TMHewlett Packard Model 735,717 work stations operating under a TMUnix operating system.

All polygon boundaries of the ecological framework are matched to soil landscape polygons. Although not specifically a part of the Ecological Land Classification system of CCELC, the Soil Landscapes of Canada map series provided a suitably detailed digital cartographic information base upon which to aggregate the smaller scale products of ecological regionalization.

A data model has been designed to minimize redundancy and maximize data flexibility (Selby and Santry 1993). This relational data model is composed of an integrated application of seven dBase IV database files (Figure 2). The database files and their structures were designed to relate polygons and their attributes from one level within the framework with those of other levels. The data model was also designed to facilitate the linking of external databases to the framework.

Two categories of databases were established within the application. The first category of files contains the standard data codes, descriptions, and rules (data type definitions) for the entire application. The TYPE_DEF, ATT_CODE, MISC_DEF and RULE_SET files were designed to act as an on-line database manual. The second category of files was designed to contain the data specific to each polygon. These files provide descriptions of map codes (MAP_CODE.DBF), values for ecozone, ecoregion or ecodistrict attributes (MAP_ATT.DBF) and a link to the Soil Landscapes of Canada (SLC) polygons (POLYGON.DBF). Additional files (not shown in Figure 2) are generated by programs for the convenience of users. They are temporary in nature, serving very specific purposes. One of these programs was written to generate a flat file summary of data intended for use by GIS operators for plotting attributes of map polygons.

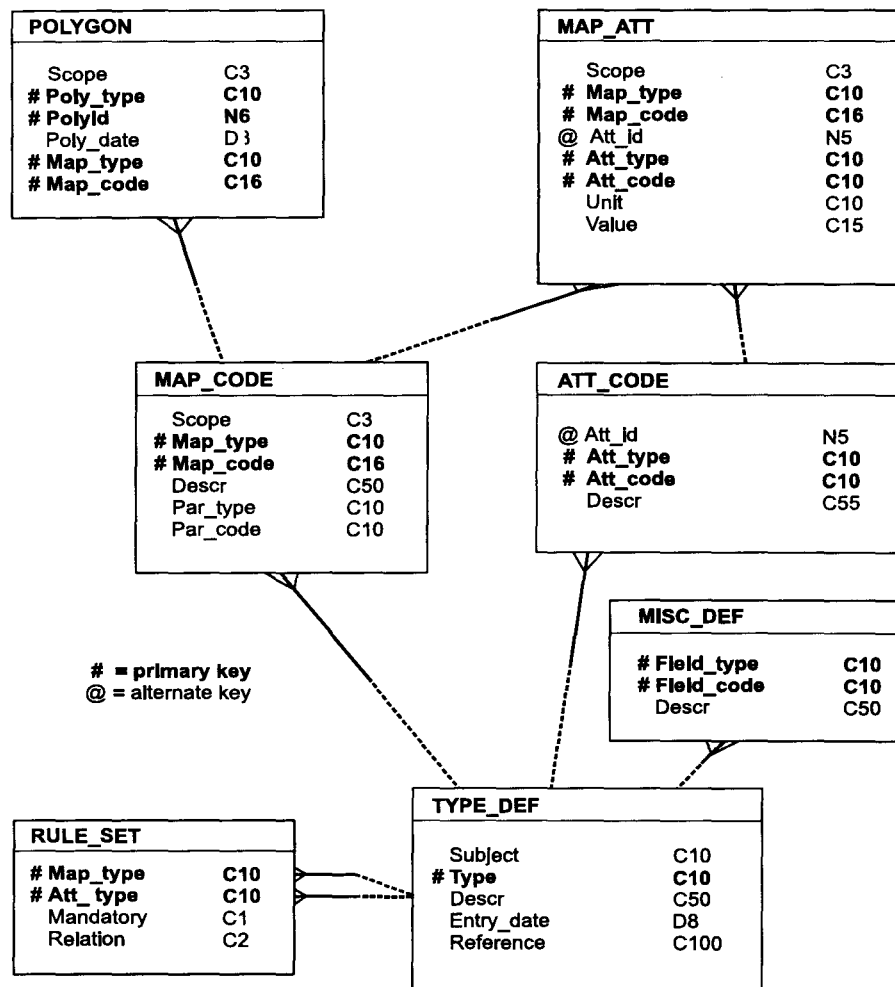


Figure 2 Outline of project data model showing database file structures, and relationships.

3. THE ECOLOGICAL FRAMEWORK

Provisional versions of the Terrestrial Ecozones and Ecoregions of Canada map at 1:7.5 million scale were distributed to provincial collaborators for comment in December 1993 and a revised version was released in May 1994. Ecozone names remain from Wiken (1986). Ecoregion names are generally derived from a centrally located, prominent physiographic feature such as a mountain range, plateau, plain, basin, or lake, within the respective map unit. Ecodistricts are displayed on a separate series of 6 regional map coverages at map scales of 1:2 million in British Columbia and the Yukon, the Prairie Provinces, Ontario, Quebec, and Atlantic Provinces, and 1:3 million in the Northwest Territories. Each ecodistrict is identified by a unique number. It is intended that other levels of the hierarchy, particularly the ecoprovinces, will be revised in future framework developments.

Attributes and their referenced sources are documented for each revised level of the framework in Table 2. The names that appear on the 1:7.5 million map legend are stored as ecozone, ecoregion, and ecodistrict attributes within the framework data model. The hierarchical framework consists of 15 ecozones. Within these are 194 ecoregions, some of which contain more than one map polygon, so there are 217 ecoregion map

polygons in total. For example, the Long Range Mountains ecoregion in Newfoundland is composed of three map polygons (108, 110 and 111). There are 1020 ecodistricts which are directly linked to the approximately 17 000 soil landscape polygons and their associated data stored in CanSIS. All polygons are physically nested and linked by unique polygon numbers at each level (Figure 3). In Alberta, revisions to the soil landscape polygons must first be completed before full nesting is achieved.

The national 1:7.5 million scale map has been produced for this package by digital files and conventional offset printing. Also available are a series of 1:2 and 1:3 million regional coverages showing ecozone, ecoregion, and ecodistrict lines. All maps are available from CanSIS in hard copy or digital form for a variety of GIS systems.

Brief narrative descriptions of each ecozone and ecoregion can be found in the Appendix. These descriptions represent a preliminary first version and provide a cursory overview of the principal attributes of each unit. Enhancements of the database and descriptions with additional biological, socioeconomic, and resource data will be ongoing.

4. APPLICATIONS OF THE FRAMEWORK

The objective in the revision and application of the framework is to facilitate the integration of data that various jurisdictions and agencies maintain in a manner that is useful to as many interests and stakeholders as possible. One way to meet this challenge and evaluate information is to view the framework as a directory and the ecological units as a comprehensive set of information folders. It becomes a common ground to build a profile and understanding of Canada's ecosystems (see Part II: Introduction, Government of Canada 1996). The folders then allow different agencies and jurisdictions as well as individual researchers and managers to contribute to this process. Today's governments and other groups cannot afford to start from scratch to build an ecosystem information base, they have to rely on existing expertise, information holdings and monitoring networks.

For most managers and decision makers, one framework in which to make all decisions would be the ideal, but particular issues and questions will demand the use of other spatial frameworks (Gray et al. 1995; Jarvis et al. 1995). At a minimum, the ecological framework will have to operate closely with administrative/jurisdictional and watershed frameworks.

Applications of the framework at national and regional levels are not new. Earlier versions of ecozones, ecoprovinces, ecoregions and ecodistricts have been used for State of the Environment reporting, assessing and ranking cumulative threats to wildlife habitat, evaluating protected areas, climate change studies, acid rain assessments, distribution of rare and endangered species, and as a framework for ecosystem representativeness (Rubec 1992). Some current applications of the framework, and developments to integrate

Table 2 A list of descriptive attributes contained in the database for each level of the framework

Level	Attributes	Source
Ecozone	name area incorporated ecoregions	Wiken 1986
Ecoregion	parent ecozone name area ecoclimatic region regional physiography land cover mean annual temperature mean winter temperature mean summer temperature mean annual precipitation population	Ecoregions Working Group 1989 Bostock 1970 AVHRR imagery Atmospheric Environment Service 1993 Census of Canada 1991
⁶ Ecodistrict	parent ecoregion area land cover regional landform surface form material soil texture soil development permafrost	AVHRR imagery Soil Landscapes of Canada 1995a, 1995b* Natural Resources Canada 1995

* The Soil Landscapes of Canada maps (1:1 million scale) and data are part of the Canadian Soil Information System (CanSIS).

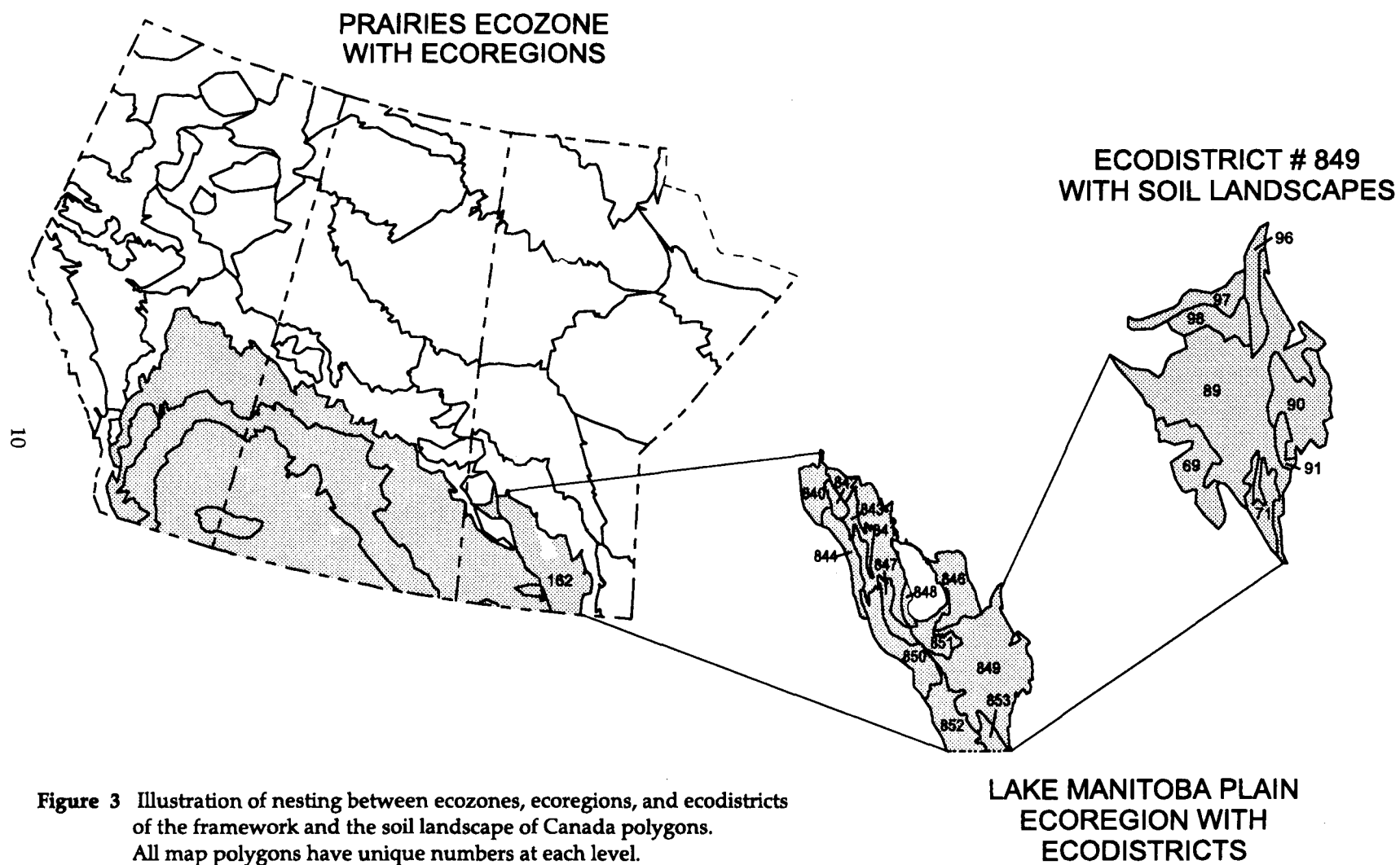


Figure 3 Illustration of nesting between ecozones, ecoregions, and ecodistricts of the framework and the soil landscape of Canada polygons. All map polygons have unique numbers at each level.

important national data sources, are discussed in the following sections of the report.

Reporting Applications

The revised ecozones and ecoregions are being used now to analyze and prepare the contents for the third national State of the Environment Report to be released in 1996 and in some ongoing provincial and territorial reports.

Indicators relative to the terrestrial component of the framework are being developed for forestry and agricultural sectors. Natural Resources Canada (Canadian Forest Service) is employing the framework to develop indicators of forest disturbance and biodiversity as well as the preparation of the annual state of forests report to parliament through the use of the Canadian Forest Inventory (CanFI) database.

The Canadian Forest Inventory (CanFI) database has been integrated through GIS with the terrestrial ecozones and ecoregions (Lowe et al. 1995). CanFI is one of the very few national databases that provide information on forest cover and can in the future incorporate other pertinent forest ecosystem attributes. This recent integration allows CanFI to analyze related or aggregated data by terrestrial ecozone and ecoregion. This extends, but does not replace, CanFI's earlier regional abilities to work by province and territory or by forest region and section (Rowe 1972).

Selected land use attributes in the agricultural census have been linked through the soil landscape polygons to ecodistricts, ecoregions and ecozones. Indicators of soil degradation risk, water contamination risk, changes in agricultural land use and agricultural greenhouse gas balances are currently under development (Acton 1994; McRae and Lombardi 1994). Using these links to census data, model algorithms may be applied at various levels of detail depending on the application, and results can be displayed at any appropriate level of the framework. The census data has been used to characterize the nature and intensity of agricultural land uses within the various levels of the framework in Ontario (Jarvis et al. 1995). Ecoregions have been used to isolate areas for the interpretation of environmental quality (Jarvis et al. 1995). Data from the Soil Landscapes of Canada and the Agriculture census for 1981 and 1991 have been

used to assess two important factors affecting water quality: manure production and pesticide use.

The framework is being used by the Canadian Environmental Assessment Act (CEAA) and Canadian Environmental Protection Act (CEPA) to organize and report information requirements at the broad ecozone level. Under CEAA, all environmental assessment projects that have a federal government interest are recorded in the Public Registry by ecozone (Canadian Environmental Reporting Agency 1994). CEPA requires individuals or companies applying for permits for import and application of microbial pesticides to provide certain information for ecological risk assessments by ecozone.

Protected areas strategies developed by both government and nongovernment organizations are being structured on an ecosystem, rather than political jurisdiction basis. The Canadian Wildlife Service, together with Habitat Canada is using the framework to characterize major habitat areas and to develop strategies to ensure their protection. The Canadian Council on Ecological Areas (CCEA) uses the framework to facilitate the achievement of its goal of establishing and maintaining a comprehensive network of protected areas representative of Canada's ecological biodiversity (Gauthier et al. 1995). Their strategic framework uses the ecoregion as the coarsest scale at which candidate ecological areas should be evaluated (gap analysis) for inclusion in a Canadian system of representative areas (Gauthier 1992).

Monitoring Applications

Monitoring the effects of management practices requires baseline information on ecosystem properties as well as changing conditions of ecosystems. The framework stratifies the country into various levels of ecological uniformity. For monitoring purposes this facilitates the allocation or linking of sites to a standard ecological hierarchy, thereby minimizing sampling variance and increasing our ability to extrapolate results for areas with similar properties.

The Canadian Forest Service has accepted the framework as a template to ensure that its biodiversity network research is representative of broad-scale national diversity. Currently, Environment Canada and the Canadian Forest

Service are working to integrate data from the Acid Rain Network Early Warning System (ARNEWS), the Long Range Transported Airborne Pollutants (LRTAP) monitoring network with the framework to enhance monitoring and interpretation of changes in forest biodiversity. In a related initiative, Environment Canada is working with the federal/provincial CFIC, for which the Canadian Forest Service acts as Secretariat, to catalogue forest permanent sample plots (PSPs) across the country by ecological mapping units. Thousands of these plots exist and are regularly monitored by both industry and provincial and territorial agencies. They are sources of invaluable baseline data useful in the understanding and analysis of forest condition and change.

The Research Branch of Agriculture and Agri-Food Canada operates a network of soil benchmark monitoring sites under representative farming systems in all provinces in Canada. The resultant data are linked to the ecological framework for summary and subsequent modelling applications.

Canada's Green Plan called for the establishment of a long term monitoring and assessment capability to study resources at risk, ecosystem response and the impact of major disruptions to ecosystems (Government of Canada 1990). By 1994 the Ecological Monitoring and Assessment Network (EMAN) was established with a coordinating office supported by Environment Canada (Ecological Monitoring Coordination Office 1994, 1995). The network is decentralized and open to all who want to participate. Participants include organized networks such as the ARNEWS and Soil

Benchmark monitoring sites previously identified. The network is designed to encourage scientists to concentrate their work at specific sites within the ecological framework using an ecosystem approach. Its goals are directed to overcome the lack of continuous, uniform long term measurement records available to assess the sustainability of ecosystems.

Summary

These examples of applications and efforts to integrate information illustrate the value of having a framework that correlates across all political boundaries and provides several levels of generalization nationally. Results of site monitoring, environmental assessment or inventories can be compared with data from similar ecosystems in other parts of the country, and can be reported at a variety of scales. The framework is now being applied to sectoral issues. It provides a neutral ground to allow the integration of data from agencies that have different mandates on diverse aspects of the environment. The framework is a useful strategic tool to plan for assessments, research, structure or modify monitoring networks, reporting and communication of ecological concepts. The process of ecological classification and mapping is iterative. As we learn more about the functions and processes of ecosystems through site-specific monitoring, advances in research and their applications, we improve the framework and thereby the quality of our management responses to problems and issues (Hughes et al. 1994).

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APPENDIX 1. NARRATIVE DESCRIPTIONS OF TERRESTRIAL ECOZONES AND ECOREGIONS OF CANADA

EXPLANATORY NOTES

These descriptions are intended to provide the map user with general comments about the climatic, physical and biological properties of each ecozone and ecoregion. In addition, comments about unique features or those that help to distinguish adjacent ecoregions are included where possible.

The information used to construct the descriptions has come from a variety of national and regional reports on ecological regionalization. In addition, data and expert knowledge from other sources were used. In particular, the following explanatory notes offered about some of the principal technical sources.

Climate All values reported for temperature come from the *Land Potential Database for Canada* (Kirkwood et al. 1983), a compilation of climate normals for 1951–1980, recompiled on an ecoregion map polygon basis. Three values have been provided: mean annual temperature, mean summer temperature (May through August), and mean winter temperature (November through February). Value ranges for precipitation were interpolated from precipitation contour maps based on 1951–1980 climate normals (Environment Canada 1986). A range of values for climate parameters describes the geographic variation in the ecoregion. Additional comments on climate features have been derived from *The Climates of Canada* (Phillips 1990) where appropriate. The terminology and definitions used to describe ecoclimate units come from the *Ecoclimatic Regions of Canada* (Ecoregions Working Group 1989). For the cordilleran ecozones, unless stated otherwise, all climate values are for valley bottom locations.

Geology Rock types and their distribution are derived from the *Geology Map of Canada* (Douglas 1970), 1:5 000 000 map and text. Surface materials, their origin and distribution from the *Surficial Materials of Canada* (Fulton 1995).

Permafrost The extent and nature of permafrost, including estimated ice content and typical ground ice forms are derived from the map "*Canada - Permafrost*" (Natural Resources Canada 1995). References in the text to low, medium and high ice contents correspond to volume percentages of <10%, 10–20% and >20% respectively as presented in the map legend. The extent of permafrost is given as a percentage of land area underlain by permafrost. The five classes of extent are: continuous (90–100%); extensive discontinuous (50–90%); sporadic discontinuous (10–50%); isolated patches (<10%); and no permafrost (0%).

Wetlands The extent and forms of wetlands in each ecoregion are synthesized from three maps, *The Distribution of Wetlands*, *Wetland Regions of Canada* (National Wetlands Working Group 1986), and the *Wetlands of Canada* (National Wetlands Working Group 1988).

Vegetation Local expert knowledge and published national references related to the distribution of vegetation species were used. These references include: *Native Trees of Canada* (Hosie 1969); *Plants from Sea to Sea* (Montgomery 1966); *Forest Regions of Canada* (Rowe 1972); and *The Shrub Identification Book* (Symonds 1963).

Soils Classification of soils follows *The Canadian System of Soil Classification* (Agriculture Canada Expert Committee on Soil Survey 1987). The distribution of soil types is based on *Soil Landscapes of Canada* map series (Shields et al. 1991) supplemented by local information sources where they exist.

Wildlife Local expert knowledge and published national references related to the distribution of wildlife and fish species were used. The references include: *The Mammals of Canada* (Banfield 1974); *The Birds of Canada* (Godfrey 1966); and *Freshwater Fishes of Canada* (Scott and Crossman 1973).

Population and Land Use Values are drawn directly from 1991 Census of Canada data recompiled on an ecoregion map polygon basis by Statistics Canada for State of the Environment Directorate, Environment Canada. Values are reported rounded to the nearest 100 where populations are <1 000 000, and rounded to the nearest 1000 where populations are >1 000 000. Values for agriculture are given as a percent of the ecoregion. Local expert knowledge was used to describe land use.

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ARCTIC CORDILLERA ECOZONE

This ecozone occupies the northeastern fringe of the Northwest Territories and Labrador. This vast mountain chain or "cordillera" of deeply dissected Precambrian crystalline rocks which forms the spine of the ecozone runs along the northeastern flank of Baffin Island, northward over eastern Devon Island and Ellesmere Island as far as Bache Peninsula and southward as far as the Torngat Mountains in Labrador. These represent the only major mountainous ranges of Canada outside the western Cordillera. The zone incorporates vast polar ice fields and has some of the most spectacular alpine glacier scenery in the world.

Climate The climate is extremely cold and dry in the north, while it is somewhat milder and more humid in the southernmost portions of the ecozone. The mean annual temperature ranges from -20°C in the mountains of Ellesmere Island to -6°C in northern Labrador. The mean summer temperature ranges from -2°C to 6°C . Summers are short and cool, and the growing season is enhanced by long periods of daylight. The mean winter temperature ranges from -35°C in the mountains of Ellesmere Island to -16°C in northern Labrador. Mean annual precipitation varies from a low of 200 mm in the north to over 600 mm in the Torngat Mountains of Labrador.

Vegetation Because of the extremely cold, desertlike climate, high winds and lack of soil cover, the higher elevations are largely devoid of plant cover other than lichens and some mosses. The lower mountain slopes and coastal margins provide some vegetative cover, which consists of herbaceous tundra communities in the north and shrub communities in the south.

Landforms and Soils Elevations range from sea level to over 2000 m above sea level (asl). Massive ice fields and valley glaciers cap many of the ecozone's rugged mountains. The northwestern section of the ecozone covers the ice-covered Grantland Mountains and mountains of Axel Heiberg Island. To the northwest, these mountains pass abruptly into a narrow, seaward-sloping plateau, and to the east with decreasing ruggedness into the elevated dissected edge of Eureka Upland. Ice fields and nunataks are common. The ranges and ridges are transected by numerous steep-walled valleys and fjords with glaciers. Valley glaciers extend over much of the area at the foot of the mountains. The U-shaped valleys and deep fjords extend many kilometres inland. The valley walls are rocky or covered with colluvial and morainal debris. Almost 75% of the landscape is ice or exposed bedrock. Continuous permafrost conditions and Cryosolic soils (i.e. those affected by permafrost related processes) prevail.

Wildlife There are few large terrestrial mammals other than muskox, arctic wolf and polar bear associated with this ecozone. Polar bears use some coastal areas during the denning period. Arctic hare, arctic fox, ermine and the collared lemming are among the smaller resident mammals. These are usually in limited numbers, and utilize the more sheltered and productive plant habitats. The marine environment is typified by walrus, ringed and bearded seal, narwhal, and whale. Large concentrations of seabirds congregate in the warmer coastal margins, including the northern fulmar, thick-billed murre, black-legged kittiwake, little ringed plover, hoary redpoll, and snow bunting.

Human Activities This is the most sparsely populated ecozone in Canada. The total population is approximately 1100, found primarily in the communities of Clyde River and Broughton Island. Little human activity takes place. Near settlements along the coast native subsistence hunting and fishing are carried out. There is some ecotourism activities associated with Auyuittuq National Park Reserve. While most of the labour force is employed in subsistence activities there are a few jobs in the service and administration sectors.

1, 2, 3, 4. ELLESMERE AND DEVON ISLANDS ICE CAPS

This rugged, mountainous ecoregion occurs on Axel Heiberg, Ellesmere, and Devon islands and is characterized by very short, cold summers, low species diversity and sparse vegetative cover. Mean annual temperature is approximately -18.5°C . Mean summer temperature is -2°C and mean winter temperature ranges from -30°C to -35°C . Mean annual precipitation ranges 200–300 mm. This ecoregion is classified as having a high arctic ecoclimate. Clumps of moss, lichen, and cold-hardy vascular plants such as sedge and cottongrass are the dominant vegetation. Arctic willow and *Dryas spp.* occur infrequently. The ice-covered Grantland and Axel Heiberg mountains, reaching 2500 m asl, consist mainly of long ridges of folded Mesozoic and Palaeozoic strata with minor igneous intrusions. A belt of deeply dissected Precambrian crystalline rock extends along the eastern flanks of eastern Devon Island and Ellesmere Island south of Bache Peninsula. This ecoregion is underlain by continuous permafrost containing low ice content. Ice fields and nunataks are common. To the northwest, the mountains pass abruptly into a narrow, seaward-sloping plateau, and to the east, with decreasing ruggedness into the elevated dissected edge of Eureka Upland. The ranges and ridges are transected by numerous steep-walled valleys and fjords with glaciers. Regosolic Static and Regosolic Turbic Cryosols are dominant soils that have developed on colluvial, alluvial, and marine sediments. Characteristic wildlife includes arctic hare, arctic fox, lemming, muskox, and caribou. Polar bears are common in coastal areas. Representative birds include the king eider, rock ptarmigan, northern fulmar, ringed plover, hoary redpoll, and snow bunting. Marine mammals include the walrus, seal, and whale.

5. BAFFIN MOUNTAINS

This rugged, mountainous ecoregion of northeastern Baffin Island is characterized by low species diversity and sparse vegetative cover. A humid, extremely cold climate is marked by very short, cold summers. Mean annual temperature is approximately -11.5°C . Mean summer temperature is 1°C and mean winter temperature is -23°C . Mean annual precipitation is 200–400 mm overall with 400–600 mm centering around the Cumberland Peninsula. This ecoregion is classified as having a high arctic ecoclimate. A discontinuous cover of mosses, lichens, and cold-hardy vascular plants such as sedge and cottongrass is the dominant vegetation. Baffin Mountains ecoregion is an elevated belt of deeply dissected crystalline rocks that extend along the northeastern flank of Baffin and Bylot islands. Ice-capped mountainous peaks reach 1525–2135 m asl. Sloping gently westward, the ecoregion's general aspect is one of a broad, gently warped, old erosion surface etched by erosion along joint systems and zones of weakness. Long arms of the sea penetrate as glacier-filled sounds or fjords; some cut through the highlands to Baffin Upland to the east. The ecoregion is underlain by deep, continuous permafrost with low ice content. Bare bedrock is common, and Turbic Cryosols developed on discontinuous colluvial, alluvial, and morainal deposits are the dominant soils. Characteristic wildlife includes arctic hare, arctic fox, lemming, and caribou. Polar bears are common in coastal areas. Representative birds include king eider, rock ptarmigan, northern fulmar, plover, hoary redpoll, and snow bunting. Marine mammals include walrus, seal, and whale. The principal activities include hunting and fishing. The first National Park in Canada above the Arctic Circle, Auyuittuq, was established in 1932 in the southern part of the ecoregion. The largest settlement is Broughton Island, and the population of the ecoregion is approximately 500.

6. BAFFIN ISLAND COASTAL LOWLANDS

This ecoregion, borders on northeastern Baffin Island, has a sparse vegetative cover of mixed low-growing herbs and shrubs, consisting of moss, purple saxifrage, *Dryas spp.*, arctic willow, kobresia, sedge, and arctic poppy. Wet sites can develop up to about 60% cover of wood rush, wire rush, and saxifrage, along with a nearly continuous cover of mosses. A humid, cold, arctic climate is marked by short, cold summers and long winters. Mean annual temperature is approximately -11.5°C . Mean summer temperature is 1°C and mean winter temperature is -22.5°C . Mean annual precipitation ranges 200–300 mm. This ecoregion is classified as

having a high arctic ecoclimate. The ecoregion is up to 40 km wide, and is geologically composed of crystalline Precambrian massive rocks that occur as isolated outliers from peninsulas and fjords that extend out from the Davis Highlands. It is a gently warped, old erosion surface with discontinuous, ridged, and terraced surficial deposits. This ecoregion is underlain by deep, continuous permafrost with low ice content. Bare bedrock is common, and Turbic Cryosols on sandy colluvial, morainal, and marine deposits are the dominant soils. Characteristic wildlife includes arctic hare, arctic fox, lemming, and caribou. Polar bears are common in coastal areas. Representative birds include the king eider, rock ptarmigan, northern fulmar, plover, hoary redpoll, and snow bunting. Marine mammals include walrus, seal, and whale. The largest settlement is Clyde River, and the population of the ecoregion is approximately 600.

7. TORNGAT MOUNTAINS

This mountainous ecoregion in northernmost Labrador has a humid, cold climate and is characterized by relatively short, cool, and moist summers and long, cold winters. Coastal ice and fog persist for longer periods than elsewhere along the Labrador coast. Mean annual temperature is approximately -6°C . The mean summer temperature is 4°C and the mean winter temperature is -16.5°C . Mean annual precipitation is 400–700 mm with the higher values occurring in the high central elevations. This ecoregion is classified as having a low arctic ecoclimate. The region is characterized by a sparse cover of lichen, moss, arctic sedge, grass, and patches of arctic mixed evergreen and deciduous shrubs on sheltered, south-facing valley slopes. Unvegetated rock and tundra (alpine heath made up of lichens, mosses, and sedges) each comprise about 50% of upland surfaces. White birch/willow thickets growing on less stable scree frequently form a transition zone between tundra and very open spruce forests. Arctic black spruce with mixed evergreen and deciduous shrubs, and underlain by moss, is dominant on bogs and poorly drained sites. The ecoregion is composed of massive Archean granitic rocks, that form steep-sided, rounded mountains with deeply incised valleys and fjords along the Labrador sea coast. Glaciation has sculptured cirques, deep U-shaped valleys, and fjords. Hummocky, discontinuous, sandy, bouldery morainal deposits dominate the upland surfaces of the region. Steep slopes covered with talus and associated colluvial fans extend to valley floors. On the Quebec side of the boundary, permafrost is continuous and marked by sporadic ice wedges. On the eastern Atlantic side of the boundary, permafrost is extensive but discontinuous. Acidic rock outcrops and Cryosolic soils are the dominant surface constituents. Turbic Cryosols are associated with patterned ground and boulder fields (felsenmeer). Additionally inclusions of Regosolic soils on colluvial fans, and Turbic and Organic Cryosols on valley floors also occur. The ecoregion provides habitat for small mammals and seasonal habitat for polar bear and caribou. There are no permanent communities.

NORTHERN ARCTIC ECOZONE

The Northern Arctic ecozone extends over most of the nonmountainous areas of the Arctic Islands, and portions of northeastern District of Keewatin and northern Quebec. It incorporates the coldest and driest landscapes in Canada.

Climate The climate is very dry and cold. The mean annual temperature ranges from -17°C in the northern islands to -11°C in northern Quebec. The mean summer temperature ranges from -1.5°C in the north to 4°C in the south, and mean winter temperatures range from -31°C in the north to -20°C in northern Quebec. Winters pass in darkness. The mean annual precipitation ranges 100–200 mm, the lowest in Canada. This ecozone is often referred to as a polar desert. Snow may fall any month of the year and usually persists on the ground for at least 10 months (September to June).

Vegetation A harsh climate, high winds and shallow soils result in sparse and dwarfed plant life. Herb and lichen dominated communities constitute the main vegetative cover. The latter is closely associated with the rock fields and hilly upland areas. Common herbs are purple saxifrage, mountain avens, and arctic poppy, often mixed with shrubs such as arctic willow. The size of shrubs decreases rapidly as one moves north. Vegetative cover tends to be greater on wetter sites confined to coastal lowlands, sheltered valleys and moist nutrient-rich corridors along streams and rivers.

Landforms and Soils The western portion of this ecozone is underlain by flat-lying Palaeozoic and Mesozoic sedimentary bedrock, and consists mostly of lowland plains covered with glacial moraine, marine deposits and bedrock outcrops. East of Prince of Wales and Somerset islands, the terrain is composed mainly of Precambrian granitoid bedrock, and tends to consist of plateaus and rocky hills. The Arctic Islands circumscribe a variety of oceanic conditions. In the northern half of the ecozone, the waters are ice-fast, even through the summer. Towards the south, open waters are more common in the summer, but pack ice usually persists offshore. The permafrost is continuous and may extend to depths of several hundred metres. Cryosolic soils (i.e. those affected by permafrost-related processes) predominate.

Wildlife Mammals include Peary and barren-ground caribou, muskox, wolf, arctic fox, polar bear, arctic hare, and brown and collared lemming. The Peary caribou are found only in the high Arctic Islands. In the spring the ecozone provides a major breeding habitat for migratory birds, including snow goose, brant, Canada goose, eider and oldsquaw duck. Other representative birds include red-throated loon, gyrfalcon, willow and rock ptarmigan, red phalarope, parasitic and long-tailed jaeger, snowy owl, and snow bunting. In the marine environment, typical species include walrus, seal, beluga whale, and narwhal. Marine fauna are most abundant in the eastern and western margins, rather than in the central core of the zone.

Human Activities Hunting, trapping and fishing remain important activities in the local economy. Some areas are targeted for hydrocarbon development, and several mining enterprises are active. Sparsely populated, the total population of the ecozone is just over 16 000. Inuit form about 80% of the population. Iqaluit on Baffin Island is the largest centre with a population of approximately 3600. Other centres with populations over 1000 include Baker Lake, Cambridge Bay, and Pangnirtung.

8, 10. ELLESMERE MOUNTAINS

This ecoregion occurs on Ellesmere and Axel Heiberg islands and is characterized by low species diversity and sparse vegetative cover. Mean annual temperature is approximately -16°C . The mean summer temperature is -0.5°C and the mean winter temperature is -28.5°C . Mean annual precipitation ranges from less than 100 to 200 mm, with the greatest values falling in the Nansen Sound area. This ecoregion is classified as having a high arctic ecoclimate. Clumps of moss, lichen, and cold-hardy vascular plants such as sedge and cottongrass are the dominant vegetation. Arctic willow and *Dryas* spp. occur infrequently. The region occurs as two curving belts of mountainous terrain separated by the more subdued Eureka Upland. The first portion of the ecoregion lies along the northwest coasts of Ellesmere and Axel Heiberg islands (map polygon 8), where ice-covered mountains that can reach 2500 m asl are composed mainly of folded Mesozoic and Palaeozoic strata with minor igneous intrusions. Along the east coast of Ellesmere Island (map polygon 10), the mountains blend with decreasing ruggedness into the elevated dissected edge of Victoria and Albert mountains. The ranges and ridges are transected by numerous steep-walled valleys and fjords with glaciers. Continuous, low ice content permafrost occurs along the north and east coasts of Ellesmere Island. In the southern part of map polygon 8, the permafrost is continuous, and ice wedges and massive ice bodies are common. Regosolic Static and Regosolic Turbic Cryosols are the dominant soils that have developed on colluvial, alluvial, and marine sediments. Characteristic wildlife includes muskox, arctic hare, arctic fox, lemming, and caribou. Polar bears are common in coastal areas. Representative birds include king eider, rock ptarmigan, northern fulmar, plover, hoary redpoll, and snow bunting. Marine mammals include

walrus, seal, and whale. There are no permanent settlements within the ecoregion, however there is some seasonal recreational land use activity associated with Ellesmere Island National Park Reserve.

9. EUREKA HILLS

This ecoregion of modest relief occurs on Ellesmere and Axel Heiberg islands. The mean annual temperature is approximately -16.5°C . The mean summer temperature is 0.5°C and the mean winter temperature is -30.5°C . Mean annual precipitation ranges 50–150 mm. The lowest mean monthly temperature in Canada was recorded at the Eureka weather station in February 1973, as -47.9°C . This ecoregion is classified as having a high arctic ecoclimate. It has a sparse vegetative cover of moss, along with mixed low-growing herbs and shrubs, such as purple saxifrage, *Dryas spp.*, arctic willow, kobresia, sedge, and arctic poppy. Topography is rolling and ridged, and controlled by underlying strata, reaching altitudes of generally less than 1000 m asl. Extensive areas of low, dissected plateaus and gently rolling uplands developed on Mesozoic and Tertiary sandstone and shale are cut by trenchlike depressions, often curving and sinuous, forming great dendritic drainage systems with floors that extend right to the coast. Permafrost is continuous with medium ice content. The dominant soils are Regosolic Static Cryosols and Orthic Turbic Cryosols that have developed on colluvial, alluvial, and marine deposits. Characteristic wildlife includes muskox, arctic hare, arctic wolf, caribou, seal, polar bear, ptarmigan, and seabirds. The largest settlement in the region is Eureka, a weather station operated by the federal government. The northernmost settlement in Canada is the military station at Alert on the northeast coastline of Ellesmere Island, however none of the staff are considered permanent residents.

11. SVERDRUP ISLANDS LOWLAND

This ecoregion, associated with the Sverdrup Islands group (Prince Patrick, Mackenzie King, Ellef Ringnes, and Amund Ringnes islands and several smaller islands), is characterized by low relief and sparse vegetative cover. The mean annual temperature is approximately -18°C , with a summer mean of -1.5°C and a winter mean of -32°C . The mean annual precipitation ranges about 100–150 mm, however, the northern fringes of the ecoregion may receive less than 100 mm of precipitation annually. This ecoregion is classified as having a high arctic ecoclimate. Mosses, lichens, and cold-hardy vascular plants such as sedge and cottongrass are the dominant vegetation. Arctic willow and *Dryas spp.* occur infrequently. The Sverdrup Islands Lowland ecoregion is developed on generally soft, poorly consolidated, and little-deformed Mesozoic rocks. Its surface is a rolling, scarped lowland less than 150 m asl. Local areas of low uplands and dissected plateaus reach 365 m asl; elsewhere, extensive areas of plain, lying only a few metres above sea level, have distinctive dissected domes and ring structures developed on gypsum anhydrite and igneous intrusions. Regosolic Static and Orthic Turbic Cryosols are the dominant soils that have developed on colluvial, alluvial, morainal, and marine deposits, and are intermixed with areas of exposed bedrock. The entire ecoregion is underlain by deep, continuous permafrost with medium ice content, consisting of abundant ice wedges. The exception is the permafrost on Ellef Ringnes Island, and the northwest coastline of Prince Patrick Island, which may have high ice content. Characteristic wildlife includes muskox, arctic hare, arctic fox, caribou, seal, polar bear, ptarmigan, and king eider. The region has high hydrocarbon potential, including some producing wells.

12. PARRY ISLANDS PLATEAU

This ecoregion incorporates the Parry Islands Group (southern Melville, Bathurst, and Cornwallis islands and several smaller islands). The mean annual temperature is approximately -17.5°C with a summer mean of -1.5°C and a winter mean of -31°C . The mean annual precipitation ranges 100–150 mm. This ecoregion is classified as having a high arctic ecoclimate. It has a sparse and discontinuous vegetative cover of moss,

along with mixed low-growing herbs and shrubs such as purple saxifrage, *Dryas spp.*, arctic willow, kobresia, sedge, and arctic poppy. The terrain of this plateau is strongly ridged. The ridges, composed of gently curving folds of Palaeozoic carbonates, shales, and sandstones, are broad, flat-topped, and straight-sided. Their elevations average less than 250 m asl. Separate, flat-floored, longitudinal valleys are transected by rugged, ravinelike cross valleys. On Melville Island, a few hills reach 760 m asl, and cliff-walled fjordlike bays and straits cut deeply into the uplifted plateau. Turbic Cryosols with Static Cryosols are the dominant soils that have developed on morainal and colluvial deposits. This ecoregion is underlain by deep, continuous permafrost with medium ice content, and abundant ice wedges. The exception is the permafrost on the southern tip of Melville Island which has high ice content. Characteristic wildlife includes muskox, caribou, arctic hare, arctic fox, polar bear, seal, whale, seabirds, and waterfowl. The main land use activities include trapping, fishing, and tourism. Other activities include mining, and the Polaris lead-zinc mine on Little Cornwallis Island is the most northerly mine in the world. The largest settlement in the region is Resolute, located on the southern shore of Cornwallis Island. The population of the ecoregion is approximately 200.

13. LANCASTER PLATEAU

This high arctic ecoregion is associated with southeastern Ellesmere Island, Devon Island, northern Somerset Island, and the Brodeur Peninsula of northwestern Baffin Island. The mean annual temperature is approximately -13°C with a summer mean of 2°C and a winter mean of -26.5°C . The mean annual precipitation ranges 100–200 mm. This ecoregion has a sparse vegetative cover of moss, and mixed low-growing herbs and shrubs such as purple saxifrage, *Dryas spp.*, arctic willow, kobresia, sedge, and arctic poppy. The Lancaster Plateau, as part of the Arctic Lowlands, is formed on flat-lying Palaeozoic and late Proterozoic sedimentary rocks and slopes gently southward, ranging about 300–765 m asl. Exposed bedrock is common. Regosolic Turbic and Regosolic Static Cryosols are dominant soils that have developed on colluvial, alluvial, morainal, and marine sediments. Permafrost is deep and continuous with medium ice content. Permafrost in the northwest quarter of Devon Island has less ground ice, composed of occasional occurrences of massive ice bodies. Characteristic wildlife includes caribou, muskox, arctic fox, polar bear, arctic hare, lemming, gyrfalcon, jaeger, snowy owl, ptarmigan, seabirds, and waterfowl. Marine fauna includes the walrus, seal, whale, and narwhal. Land uses in this ecoregion include trapping, hunting, and fishing. There is also a high hydrocarbon potential. The largest settlement is Grise Fiord, the most northerly community in Canada. The population of the ecoregion is approximately 200.

14. BANKS ISLAND COASTAL PLAIN

This ecoregion is located adjacent to the Beaufort Sea on the western coastal plain of Banks Island in the western Arctic. The mean annual temperature is approximately -14°C with a summer mean of 1°C and a winter mean of -29°C . The mean annual precipitation ranges 100–200 mm. This ecoregion's temperatures are moderated by open water during the late summer and early fall, and it is classified as having a low arctic ecoclimate. Vegetation consists of moss, and mixed low-growing herbs and shrubs such as purple saxifrage, *Dryas spp.*, arctic willow, kobresia, sedge, and arctic poppy. This unglaciated coastal plain is underlain by unconsolidated Tertiary or early Pleistocene sands and gravel. It is characterized by low, rolling hills and well-organized drainage. Alluvial plains and low, westward-sloping terraces bordering major stream valleys exhibit several stages of erosion and uplift. Turbic Cryosols with Static Cryosols are the dominant soils, and have developed on a variety of smooth, undulating deposits. The deep, continuous permafrost has high ice content with abundant ice wedges. Wetlands cover 25–50% of this ecoregion, and are characterized either by horizontal fens and low-centre lowland polygon fens with small, elevated peat mound bogs, or by marshes along the coast and shallow waters. Characteristic wildlife includes muskox, caribou, arctic hare, arctic fox, snowy owl, raptors, polar bear, seal, walrus, whale, seabirds, and waterfowl. Land uses in this

ecoregion include trapping, hunting, and fishing. The largest settlement is Sachs Harbour. The population of the ecoregion is approximately 200.

15. BANKS ISLAND LOWLAND

This ecoregion occurs on central Banks Island and has a vegetative cover of moss, and mixed low-growing herbs and shrubs such as purple saxifrage, *Dryas spp.*, arctic willow, kobresia, sedge, and arctic poppy. The mean annual temperature is approximately -16°C with a summer mean of 2°C and a winter mean of -30°C . The mean annual precipitation ranges 100–200 mm. This ecoregion is classified as having a mid-arctic ecoclimate. The terrain of this lowland slopes gently to the southwest and south and is composed of late Proterozoic stratified rocks intruded by gabbro sills that form plateaus capped with flat-lying volcanic rocks. Turbic Cryosols are the dominant soils, and have developed on a variety of smooth, undulating glacial deposits. Permafrost is deep and continuous with high ice content, and abundant ice wedges. Areas of drumlinoid ridges occur on the eastern side of Banks Island; the remainder of the island is largely unglaciated. Wetlands extend over much of the ecoregion, and are characteristically horizontal and low-centre lowland polygon fens with small, elevated peat mound bogs. Marshes are common along the coast and in shallow waters associated with low-lying areas. Characteristic wildlife includes muskox, caribou, arctic hare, arctic fox, snowy owl, raptors, polar bear, seal, whale, seabirds, and waterfowl. Land uses include trapping, hunting, and fishing.

16. AMUNDSEN GULF LOWLANDS

This ecoregion occurs predominantly on southern Victoria Island and to a minor extent on the mainland. The mean annual temperature is approximately -14°C with a summer mean of 2°C and a winter mean of -28.5°C . The mean annual precipitation ranges 100–200 mm. This ecoregion is classified as having a low arctic ecoclimate. It is characterized by a nearly continuous cover of dwarf tundra vegetation, consisting of dwarf birch, willow, northern Labrador tea, *Dryas spp.*, and *Vaccinium spp.* Tall dwarf birch, willow, and alder occur on warm sites; wet sites are dominated by willow and sedge. The terrain of the southern one-third of Victoria Island generally slopes gently to the southwest and is composed of stratified Palaeozoic carbonate rocks. Extensive areas of drumlinoid ridges impart a characteristic grain to the minor topography on the island. Turbic Cryosols are the dominant soils, and have developed on a variety of smooth, undulating glacial deposits. Deep, continuous permafrost with high ice content and abundant ice wedges are characteristic, although an area with continuous low ice content permafrost runs along the coast between Minto Inlet and Prince Albert Sound, west of the Shaler Mountains ecoregion. Characteristic wildlife includes muskox, caribou, arctic hare, arctic fox, snowy owl, raptors, polar bear, seal, seabirds, and waterfowl. Land uses include trapping, hunting, and fishing. Cambridge Bay and Holman are the largest settlements. The population of the ecoregion is approximately 1500.

17. SHALER MOUNTAINS

This ecoregion covers the Shaler Mountains in central Victoria Island and is characterized by a 40–60% vegetative cover mixed with exposed bedrock materials. The mean annual temperature is approximately -15.5°C with a summer mean of 1°C and a winter mean of -29.5°C . The mean annual precipitation ranges 100–200 mm. This ecoregion is classified as having a mid-arctic ecoclimate. Tundra vegetation includes purple saxifrage, *Dryas spp.*, and arctic willow, along with alpine foxtail, wood rush, and other saxifrage. Wet areas have a continuous cover of sedge, cottongrass, saxifrage, and moss. The Shaler Mountains dissect Victoria Island and are composed of late Proterozoic stratified rocks intruded by gabbro sills that form cuestas and are capped by flat-lying volcanic rocks. The centre part of the mountains reaches about 760 m asl. Turbic Cryosols are the dominant soils, developed on undulating to steeply sloping glacial deposits, and

some bare bedrock is apparent. Continuous, low ice content permafrost occurs throughout the ecoregion. Characteristic wildlife includes caribou, polar bear, muskox, arctic hare, arctic fox, snowy owl, other raptors, seal, whale, walrus, seabirds, and waterfowl. Land uses are limited to trapping and hunting.

18. VICTORIA ISLAND LOWLANDS

This ecoregion includes the northern two-thirds of Victoria Island, the southwestern portion of Prince of Wales Island, King William Island, and a small portion of the western side of Boothia Peninsula. This ecoregion is classified as having a mid-arctic ecoclimate. The mean annual temperature is approximately -14°C with a summer mean of 1.5°C and a winter mean of -29°C . The mean annual precipitation ranges 100–150 mm. This ecoregion is characterized by a discontinuous upland vegetative cover dominated by purple saxifrage, *Dryas spp.*, and arctic willow, along with alpine foxtail, wood rush, and other saxifrage. Wet areas have a continuous cover of sedge, cottongrass, saxifrage, and moss. Remaining upland areas are largely devoid of vegetation, a distinguishing characteristic of this ecoregion. Smooth, undulating lowlands are formed on flat-lying Palaeozoic and late Proterozoic carbonate rocks that slope gently to the south and southwest. Extensive areas of drumlinoid ridges impart a characteristic grain to the minor topography on this ancient erosion surface. Elevations lie predominantly below 100 m asl, except in central Victoria Island where elevations rise up to over 200 m asl. This ecoregion is underlain by continuous permafrost with medium to high ice content in the form of ice wedge polygons and massive ice bodies. Turbic Cryosols with Static Cryosols are dominant soils and have developed on a variety of smooth, undulating glacial deposits. Wetland areas are distributed mainly along the east coast of Victoria Island along M'Clintock Channel. These are composed of marshes, horizontal fens and low-centre lowland polygon fens with small, elevated peat mound bogs. Characteristic wildlife includes caribou, muskox, polar bear, arctic hare, arctic fox, snowy owl, other raptors, seal, whale, seabirds, and waterfowl. Land uses in the ecoregion include trapping, hunting, fishing and tourism. The largest settlements are Gjoa Haven on King William Island, and Spence Bay on the Boothia Peninsula. The population of the ecoregion is approximately 1400.

19. PRINCE OF WALES ISLAND LOWLAND

This ecoregion occupies the north half of Prince of Wales Island and has a very sparse vegetative cover of moss, and mixed low-growing herbs and shrubs such as purple saxifrage, *Dryas spp.*, arctic willow, kobresia, sedge, and arctic poppy. The mean annual temperature is approximately -15.5°C with a summer mean of 1°C and a winter mean of -30.5°C . The mean annual precipitation ranges 100–150 mm. This ecoregion is classified as having a high arctic ecoclimate. The terrain of this lowland slopes gently to the southwest and is composed of stratified Palaeozoic carbonate rocks. Extensive areas of drumlinoid ridges impart a characteristic grain to the minor topography on the island. Turbic Cryosols are the dominant soils, and have developed on a variety of smooth, undulating glacial deposits. Continuous permafrost with a high ice content and abundant ice wedges are characteristic. Wildlife includes muskox, caribou, arctic hare, arctic fox, snowy owl, other raptors, polar bear, seal, whale, seabirds, and waterfowl.

20. BOOTHIA PENINSULA PLATEAU

This ecoregion covers uplands on Boothia Peninsula and southern Somerset Island. The mean annual temperature is approximately -12.5°C with a summer mean of 4°C and a winter mean of -28°C . The mean annual precipitation ranges from 100 mm to more than 200 mm with the higher values occurring on the central Boothia Plain. This ecoregion is classified as having a mid-arctic ecoclimate. Vegetation is discontinuous, and dominated by such tundra species as purple saxifrage, *Dryas spp.*, and arctic willow, along with alpine foxtail, wood rush, and other saxifrage. Wet areas have a continuous cover of sedge, cottongrass, saxifrage, and moss. The ecoregion is underlain by crystalline gneiss forming a narrow north-

trending prong of the Precambrian Shield, partly covered by outliers of Palaeozoic strata. In the south, it merges with Wager Plateau at about 760 m asl, which slopes gently northward. Bedrock outcroppings are common, and Turbic Cryosols developed on hummocky, thin, discontinuous sandy moraine are the dominant soils in the ecoregion. Permafrost is continuous and of low ice content. Characteristic wildlife includes caribou, muskox, arctic hare, arctic fox, snowy owl, other raptors, polar bear, seal, walrus, whale, seabirds, and waterfowl. Land uses include trapping, hunting, and fishing.

21. GULF OF BOOTHIA PLAIN

This mid-arctic ecoregion covers the lowland coastal fringes of Somerset Island, Wales Island and the Boothia, Simpson, and Brodeur peninsulas surrounding the Gulf of Boothia. The mean annual temperature is approximately -15°C with a summer mean of 0.5°C and a winter mean of -29°C . The mean annual precipitation ranges 100–200 mm. This ecoregion is classified as having a mid-arctic ecoclimate. It is characterized by discontinuous upland tundra vegetation, dominated by purple saxifrage, *Dryas spp.*, and arctic willow, along with alpine foxtail, wood rush, and saxifrage. Wet areas have a continuous cover of sedge, cottongrass, saxifrage, and moss. The region slopes gently southward, ranging from sea level to about 300 m asl. Its general uniformity from southern Somerset Island to Wales Island is continuous across the wide Gulf of Boothia. Regosolic Turbic Cryosols with Regosolic Static Cryosols are dominant soils that have developed on morainal and marine sediments. Permafrost is continuous with medium ice content and abundant ice wedges. Characteristic wildlife includes caribou, polar bear, muskox, arctic fox, ptarmigan, seabirds, seal, whale, and walrus. Land uses include trapping, hunting, and fishing. The main settlement is Pelly Bay, and the population of the ecoregion is approximately 400.

22. BORDEN PENINSULA PLATEAU

This ecoregion covers the Borden Peninsula of north-central Baffin Island and the southwestern coast of Bylot Island along Navy Board Inlet. The mean annual temperature is approximately -13°C with a summer mean of 1°C and a winter mean of -25°C . The mean annual precipitation ranges from 100 mm to over 200 mm with the higher values falling in the centre of the peninsula. This ecoregion is classified as having a high arctic ecoclimate. It supports a very sparse vegetative cover of moss and mixed low-growing herbs and shrubs such as purple saxifrage, *Dryas spp.*, arctic willow, kobresia, sedge, and arctic poppy. The inland plateau, formed on flat-lying Palaeozoic and late Proterozoic carbonate rocks, slopes gently southward, ranging from about 765 to 300 m asl. Regosolic Turbic Cryosols with Regosolic Static Cryosols are dominant soils that have developed on a variety of undulating glacial deposits. Permafrost is deep and continuous with medium ice content. Characteristic wildlife includes caribou, muskox, polar bear, ptarmigan, arctic fox, seabirds, walrus, seal, and whale. Land uses include trapping, hunting, fishing, and tourism. Other activities include the Nanisivik lead, zinc and silver mine. The main settlements are Nanisivik, Pond Inlet, and Arctic Bay. The population of the ecoregion is approximately 1800.

23. MELVILLE PENINSULA PLATEAU

This large ecoregion includes the western half of Melville Peninsula and much of northwestern coastal Baffin Island as far south as Nettilling Lake. The mean annual temperature is approximately -13°C with a summer mean of 0.5°C and a winter mean of -25°C . The mean annual precipitation ranges 100–200 mm. This ecoregion is classified as having a mid-arctic ecoclimate. Vegetation is discontinuous, and dominated by purple saxifrage, *Dryas spp.*, and arctic willow, along with alpine foxtail, wood rush, and saxifrage. Dry sites are very sparsely vegetated, whereas wet areas have a continuous cover of sedge, cottongrass, saxifrage, and moss. The ecoregion takes in the mainland part of Melville Plateau physiographic region, a broad, gently warped, old erosion surface composed of crystalline Precambrian rocks that rise to about 460–610 m asl. It

also takes in the very similar western portion of the uplands of Baffin Island where drainage begins to flow southwestward towards Foxe Basin. The plateau is divided into the Great Plain of the Koukdjuak with its broad belt of emerged, north-south-trending beaches in the centre, and the Soper Highland, north of Koukdjuak River. Bedrock outcroppings are common, and Turbic Cryosols developed on hummocky, thin, discontinuous sandy moraine are the dominant soils. Organic and Static Cryosolic soils also occur in this ecoregion. Most of the ecoregion is underlain by continuous permafrost with low ice content, although, in the area between Foxe Basin and Borden Peninsula, permafrost with medium ice content bisects the ecoregion north to south. Characteristic wildlife includes caribou, muskox, arctic hare, arctic fox, snowy owl, polar bear, seal, whale, and seabirds. Land uses include trapping, hunting, and fishing.

24. BAFFIN ISLAND UPLANDS

This ecoregion in the central uplands of Baffin Island has a very sparse (up to about 15%) vegetative cover of moss, and mixed low-growing herbs and shrubs such as purple saxifrage, *Dryas spp.*, arctic willow, kobresia, sedge, and arctic poppy. Wet sites can develop up to about 60% cover of wood rush, wire rush, and saxifrage, along with a nearly continuous cover of mosses. The mean annual temperature is approximately -11.5°C , although higher elevations are considerably colder than this. Lower elevations within the ecoregion have a mean summer temperature of 1°C and a mean winter temperature of -23°C . This ecoregion gets more precipitation than do surrounding adjacent ecoregions to the southwest, with mean annual precipitation ranging from 200 mm in the north to 400 mm in the south, and 300–400 mm at the southern tip. This ecoregion is classified as having a high arctic ecoclimate. The general aspect of Baffin Upland is one of a broad, gently warped, old erosion surface, shallowly etched by erosion along joint systems and zones of weakness. Its surface slopes gently to the southwest to an elevation of about 915 m asl near Barnes Ice Cap. Bare bedrock is common, and Turbic Cryosols developed on sparse, thin, colluvial and morainal deposits are the dominant soils. The ecoregion is underlain by continuous permafrost with low ice content. Wildlife includes arctic hare, arctic wolf, arctic fox, and caribou. The population of the ecoregion is approximately 50, although there are no main settlements. Land uses are presently limited to include some subsistence trapping and hunting.

25. FOXE BASIN PLAIN

This ecoregion takes in the islands and coastal lowlands surrounding Foxe Basin. The mean annual temperature is approximately -11°C with a summer mean of 2°C and a winter mean of -23°C . The mean annual precipitation ranges from 100 mm in the northwest to 300 mm in the southeast. This ecoregion is classified as having a predominantly mid-arctic ecoclimate. It is characterized by discontinuous tundra vegetation such as purple saxifrage, *Dryas spp.*, and arctic willow, along with alpine foxtail, wood rush, and saxifrage. Wet areas have a continuous cover of sedge, cottongrass, saxifrage, and moss. The ecoregion is composed of the flat-lying, Palaeozoic strata that form a very shallow basinlike area on the old surface of the Precambrian Shield. The Putnam Highland to the south of Koukdjuak River, reaches about 180 m asl in elevation. Turbic and Static Cryosols with some Organic Cryosols developed on marine, discontinuous glacial drift and organic deposits are the dominant soils. Permafrost is continuous with medium ice content. Terrestrial mammals include polar bear, common in coastal areas, as well as arctic hare, arctic fox, lemming, and caribou. Representative birds include king eider, rock ptarmigan, northern fulmar, plover, hoary redpoll, and snow bunting. Marine mammals include the walrus, seal, and whale. Land uses in this ecoregion are limited to trapping, hunting, and fishing. The main settlements are Igloolik and Hall Beach. The population of the ecoregion is approximately 1500.

26. PANGNIRTUNG UPLAND

This ecoregion occupies the lower coastal uplands on Baffin Island surrounding Cumberland Sound. The mean annual temperature ranges approximately from -9°C along the coast to -11.5°C inland. The mean summer temperature varies from 1°C to 2°C . Mean winter temperatures of -20°C occur along the coast, and it is slightly colder inland. The mean annual precipitation ranges from 300 mm to more than 400 mm along the Hall Peninsula. This ecoregion is characterized by a nearly continuous cover of dwarf tundra vegetation consisting of dwarf birch, willow, northern Labrador tea, *Dryas* spp., and *Vaccinium* spp. Tall dwarf birch, willow, and alder occur on warm sites; wet sites are dominated by willow and sedge. The ecoregion rises rapidly from sea level and is a belt of deeply dissected, crystalline Archean rocks. Its general aspect is one of a broad, gently warped, old erosion surface etched by erosion along joint systems and zones of weakness. Long arms of the sea penetrate the ecoregion as glacier-filled sounds or fjords. Bare bedrock is common, and Static Cryosols with some Turbic and some Organic Cryosols, developed on discontinuous morainal, organic, and marine deposits, are the dominant soils in the ecoregion. Characteristic wildlife includes caribou, muskox, arctic hare, arctic fox, polar bear, raptors, rock ptarmigan, seal, walrus, whale, gulls, seabirds, and waterfowl. Land uses include trapping, hunting, fishing, and tourism. Recently, recreation and tourism activities have also become increasingly important. The main settlement is Pangnirtung. The population of the ecoregion is approximately 1100.

27. HALL PENINSULA UPLAND

This ecoregion occurs at the upper elevations of the interior portion of Hall Peninsula on southern Baffin Island. The mean annual temperature is approximately -11.5°C with a summer mean of 1°C and a winter mean of -22.5°C . The mean annual precipitation ranges 300–500 mm. This ecoregion is classified as having a mid-arctic ecoclimate. Vegetation is discontinuous, and dominated by such low shrub tundra vegetation as purple saxifrage, *Dryas* spp., and arctic willow. The ecoregion's general physiographic aspect is one of a broad, gently warped, old erosion surface etched by erosion along joint systems and areas of weakness. The ecoregion reaches about 1160 m asl and slopes southward and eastward towards the Labrador Sea. Its dissected, steep-sided, glacier-filled valleys and hummocky surface are sparsely covered by sandy glacial till. Bedrock outcrops are common, and Turbic Cryosols are the dominant soils in the ecoregion. Permafrost is deep and continuous with low ice content. The ecoregion supports low populations of terrestrial mammals, including arctic hare, arctic fox, arctic wolf, and caribou. Representative birds include the king eider, rock ptarmigan, northern fulmar, plover, hoary redpoll, and snow bunting.

28. META INCOGNITA PENINSULA

This ecoregion includes the coastal uplands of Baffin Island along Frobisher Bay and Hudson Strait, and stretches inland to include Amadjuak Lake. The mean annual temperature is approximately -11.5°C with a summer mean of 1°C and a winter mean of -22.5°C . The mean annual precipitation ranges 200–400 mm. This ecoregion is classified as having a low arctic ecoclimate. The landscape is covered by nearly continuous shrub tundra vegetation, consisting of dwarf birch, willow, northern Labrador tea, *Dryas* spp., and *Vaccinium* spp. Tall dwarf birch, willow, and alder occur on warm microsites; wet sites are dominated by willow and sedge. Irregular terrain extending westward from Frobisher Bay to Foxe Peninsula reaches elevations of about 400–500 m asl. Rock outcroppings interspersed with sandy morainal veneers and frozen organic deposits are the dominant surficial materials in the ecoregion, and Static Cryosols with Turbic and Organic Cryosols are the dominant soils. Continuous permafrost with low ice content runs from just south of Amadjuak Lake, north to Nettilling Lake, and the rest of the ecoregion is underlain by continuous permafrost with medium ice content. Characteristic wildlife includes caribou, muskox, hare, arctic wolf, fox, polar bear, raptors, walrus, seal, whale, shorebirds, and waterfowl. Land uses include trapping, hunting, and fishing. The region includes Iqaluit, the largest community in the eastern arctic, as well as the

communities of Lake Harbour on Hudson Strait, and Cape Dorset on Foxe Peninsula. The population of the ecoregion is approximately 5000.

29. BAFFIN UPLAND

This ecoregion consists of the upper-elevation interior portions of Meta Incognita Peninsula on southern Baffin Island. The mean annual temperature is approximately -12°C with a summer mean of 1°C and a winter mean of -22.5°C . The mean annual precipitation ranges from 300 mm to more than 500 mm. This ecoregion is classified as having a low arctic ecoclimate, although higher elevations experience more severe climatic conditions. The landscape is covered by discontinuous dwarf tundra vegetation, consisting of dwarf birch, willow, northern Labrador tea, *Dryas* spp., and *Vaccinium* spp. Wetter sites are dominated by willow and sedge. Lichen-covered rock outcroppings are prominent. The upland rises abruptly above the sea to about 915 m asl and drains southward towards Hudson Strait. The surface of the upland is thinly covered with discontinuous, sandy morainal veneers. Bare rock outcroppings are common, and Static Cryosols are the dominant soils in the ecoregion. Permafrost is continuous with low ice content. Characteristic wildlife includes caribou, muskox, hare, lemming, arctic wolf, fox, ermine, polar bear, and raptors. Land uses are limited to trapping and hunting.

30. WAGER BAY PLATEAU

This large ecoregion covering the northeastern District of Keewatin extends westward from the northern portion of Southampton Island on Hudson Strait to Chesterfield Inlet in the south, and as far west as Back River. The mean annual temperature is approximately -11°C with a summer mean of 4.5°C and a winter mean of -26.5°C . The mean annual precipitation ranges 200–300 mm. This ecoregion is classified as having a low arctic ecoclimate. It is characterized by a discontinuous cover of tundra vegetation, consisting of dwarf birch, willow, northern Labrador tea, *Dryas* spp., and *Vaccinium* spp. Taller dwarf birch, willow, and alder occur on warm sites; wet sites are dominated by willow and sedge. Lichen-covered rock outcroppings are prominent throughout the ecoregion, and towards the south the vegetation becomes a mix of tundra vegetation and open, dwarf coniferous forest. This ecoregion is composed of massive Archean rocks of the Canadian Shield that form broad, sloping uplands, plains, and valleys. It rises gradually westward from Chesterfield Inlet to 600 m asl elevation, where it is deeply dissected. Turbic and Static Cryosols developed on discontinuous, thin, sandy moraine and alluvial deposits are the dominant soils in the ecoregion, while large areas of Regosolic Static Cryosols are associated with marine deposits along the coast. Permafrost is continuous with low ice content. Characteristic wildlife includes caribou, muskox, wolverine, Arctic hare, fox, walrus, seal, whale, polar bear, raptors, shorebirds, and waterfowl. Land uses include trapping, hunting, and fishing. Repulse Bay and Baker Lake are the main settlements. The population of the ecoregion is approximately 1700.

31. NORTHERN UNGAVA PENINSULA

This ecoregion takes in the northern tip of Ungava Peninsula, including the Povungnituk Hills in northern Quebec. The mean annual temperature is approximately -8.5°C with a summer mean of 3°C and a winter mean of -20°C . Winter temperatures of -50°C are not uncommon on the plateau. Coastal ice and fog persist for long periods in the summer. The mean annual precipitation ranges 200–300 mm. This ecoregion is classified as having a low arctic ecoclimate. Its short growing season limits vegetative growth, which is characterized by a nearly continuous cover of dwarf tundra vegetation, including dwarf birch, willow, northern Labrador tea, *Dryas* spp., and *Vaccinium* spp. Tall dwarf birch, willow, and alder occur on warm sites; wet sites are dominated by willow and sedge. Bedrock geology consists of foliated granite and granitic gneiss. These folded strata form a series of east–west ridges and valleys with a relatively high relief in the

west, but a more subdued character in the east where the summit surface of the hills virtually merges with Larch and Sugluk plateaus. In the Povungnituk Hills, the surface is covered by frost-shattered bedrock and glacially derived deposits, including a few eskers and patches of thin till. Raised beaches occur along the coast, covered by late Pleistocene marine incursions. Inland, the undulating surface averages 100 m asl and rises towards the north, where elevations can reach about 520 m asl. Turbic Cryosols developed on loamy marine sediments along the coast and on thin, discontinuous glacial drift deposits inland, are the dominant soils in the ecoregion. Inclusions of Organic Cryosols and a dominant occurrence of rock outcrops are also present. Permafrost is continuous with low ice content. Characteristic wildlife includes caribou, wolverine, Arctic hare, fox, polar bear, raptors, shorebirds, and waterfowl. Marine mammals include walrus, seal, and whale. Land uses include subsistence trapping and hunting, and mineral exploration is ongoing. The main settlements are Salluit and Ivujivik. The population of the ecoregion is approximately 1500.

SOUTHERN ARCTIC ECOZONE

This ecozone is split by Hudson Bay into east and west portions with over 80% of the land area in the western portion. It covers northern mainland Canada from the Richardson Mountains in the Yukon to Ungava Bay in northern Quebec. Originally viewed as "barren lands" by the first European visitors, spring and summer bring a sudden greening of the landscape. Of the three arctic ecozones, this one has the most extensive vegetative cover and highest diversity of species.

Climate This ecozone experiences long, cold winters, and short, cool summers. Mean annual temperature ranges from -11°C in the northwest to -7°C in Quebec. Mean summer temperatures range from 4°C to 6°C , producing a short growing season with up to 750 growing degree-days, and enhanced by long periods of daylight. The mean winter temperature ranges from -28°C in the northwest to -17.5°C in Quebec. The mean annual precipitation varies from 200 mm in the northwest to 500 mm in northern Quebec.

Vegetation This ecozone represents a major area of vegetative transition between the taiga forest to the south and the treeless arctic tundra to the north. It is characterized by dwarf shrubs that decrease in size to the north. Typical shrubs include dwarf birch, willow, and heath species; these are commonly mixed with various herbs and lichens. Major river valleys, such as the Thelon River, can support scattered clumps of stunted spruce trees. Wetlands are common in the low-lying areas, and mainly support sedge-moss vegetation.

Landforms and Soils Underlain for the most part by Precambrian granitic bedrock, the terrain consists largely of broadly rolling uplands and lowlands. Much of it is mantled by discontinuous morainal deposits, except near the coasts, where fine-textured marine sediments cover the surface. Throughout the ecozone, there are exposures of bedrock. Cretaceous shales covered by thick glacial drift deposits characterize its westernmost section from Great Bear Lake to the Firth River on the Yukon coast. Strung out across the landscape are long, sinuous eskers reaching lengths of up to 100 km in places. A small part of the ecozone west of the Firth River is unglaciated. The undulating landscape is studded with innumerable lakes, ponds and wetlands. Cryosols are the dominant soils, and are underlain by continuous permafrost with active (thaw) layers that are usually moist or wet throughout the summer.

Wildlife A wide variety of mammals can be found living in this ecozone. It includes the major summer range and calving grounds for Canada's largest caribou herds, the barren-ground caribou in the west and the woodland caribou in the east. Other mammals include grizzly bear, black bear in northern Quebec, polar bear in coastal areas, wolf, moose, arctic ground squirrel, and brown lemming. This ecozone is also a major breeding and nesting ground for a variety of migratory birds. Representative species include the yellow-billed, arctic, and red-throated loon, whistling swan, snow goose, oldsquaw, gyrfalcon, willow and

rock ptarmigan, northern phalarope, parasitic jaeger, snowy owl, hoary redpoll, and snow bunting. In the marine environment, typical species include walrus, seal, beluga whale, and narwhal.

Human Activities This ecozone is sparsely populated. The total population of approximately 10 300 is scattered in 17 communities, including Tuktoyaktuk, Paulatuk, and Coppermine in the west, Chesterfield Inlet, Rankin Inlet, and Eskimo Point on the coast of Hudson Bay, and Kangirsuk on Ungava Bay. Rankin Inlet is the largest centre with a population of 1706. Much of the local economy is based on subsistence hunting, trapping, and fishing. Inuit form over 80% of the population. The mineral and hydrocarbon potential of the zone has also led to increased exploration and some extraction activity. Construction, some tourism, and government services are the other principal activities.

32. YUKON COASTAL PLAIN

This ecoregion occurs west of the Mackenzie River along the coast of the Beaufort Sea. The mean annual temperature is approximately -11°C with a summer mean of 4.5°C and a winter mean of -24°C . The mean annual precipitation ranges from less than 200 to 300 mm. This ecoregion is classified as having a low arctic ecoclimate. It supports a nearly continuous cover of shrubby tundra vegetation, consisting of dwarf birch, willow, northern Labrador tea, *Dryas spp.*, and sedge tussocks. Tall dwarf birch, willow, and alder occur on warm sites; wet sites are dominated by arctic willow, sphagnum moss, and tussock-forming sedge. The Yukon Coastal Plain is largely an erosion surface cut into Tertiary sandstone and shale that is covered with a thin veneer of recent sediments. The plain decreases in elevation towards the west and is drift- or lake-covered along the coast to near Herschel Island. Coalesced deltas and alluvial fans built by streams from the British Mountains and coastal lagoons form the unglaciated plain west of the island. Turbic Cryosols developed on level to rolling, morainal, fluvioglacial, colluvial and marine deposits are the dominant soils in the ecoregion, while Static Cryosols are found on alluvial and eolian sediments primarily in the unglaciated portion. Permafrost is continuous with high ice content, and abundant ice wedges. Characteristic wetlands that account for 25–50% of the area are lowland polygon fens, both the low- and high-centre varieties. This ecoregion covers parts of the calving and summer range for the Porcupine caribou herd. Other species found here include muskox, snowshoe and arctic hare, red and arctic fox, wolf, and arctic ground squirrel. A variety of birds are present, including raptors, songbirds, ptarmigan, snowy owl, waterfowl, and shorebirds. In the marine environment, species present include walrus, seal, beluga whale, polar bear, and arctic char. Land uses include native subsistence trapping, hunting, and fishing, and recreation activities associated with Ivvavik National Park on the mainland and Herschel Island Territorial Park in the Beaufort Sea. There is high hydrocarbon potential off the coastal plain.

33. TUKTOYAKTUK COASTAL PLAIN

This ecoregion covers the outer Mackenzie River delta and Tuktoyaktuk Peninsula bordering the Beaufort Sea. Much of the ecoregion is covered by small lakes. The mean annual temperature is approximately -11.5°C with a summer mean of 4.5°C and a winter mean of -26.5°C . The mean annual precipitation ranges 125–200 mm with higher values for more southerly locations. This ecoregion is classified as having a low arctic ecoclimate. It is characterized by a continuous cover of shrubby tundra vegetation, consisting of dwarf birch, willow, northern Labrador tea, *Dryas spp.*, and sedge tussocks. Tall dwarf birch, willow, and alder occur on warm sites; wet sites are dominated by sphagnum moss and sedge. Much of the ecoregion is composed of distinctive delta landforms at the mouth of the Mackenzie River. These include wetlands, active alluvial channels, and estuarine deposits. Characteristic wetlands which cover 25–50% of the area are lowland polygon fens, both the low- and high-centre varieties. On the peninsula, innumerable lakes and pingos, some very large, form unique and outstanding features of the landscape. The region is underlain by continuous permafrost with high ice content in the form of ice wedges and pingos. Organic and Turbic Cryosols developed on level to rolling organic, morainal, alluvial, fluvioglacial, and marine deposits are the dominant soils of the ecoregion. Regosolic Static Cryosols are the dominant soils in the active delta portion

of the ecoregion. Characteristic wildlife includes caribou, muskox, snowshoe and arctic hare, red fox, wolf, and arctic ground squirrel. A variety of birds are present, including raptors, songbirds, ptarmigan, snowy owl, waterfowl, and shorebirds. In the marine environment, species present include walrus, seal, beluga whale, and polar bear. Land uses include subsistence trapping, hunting and fishing, and tourism-related recreation. Considerable hydrocarbon exploration has occurred in this ecoregion, which acted as the staging point and main base for the Beaufort Sea exploration program. The main settlement is Tuktoyaktuk and the population of the ecoregion is approximately 1000.

34. ANDERSON RIVER PLAIN

This ecoregion occurs on the coastal mainland of the Northwest Territories south of Franklin Bay and the Tuktoyaktuk Plain, and encompasses the lower Anderson and Horton rivers. The mean annual temperature is approximately -11.5°C with a summer mean of 4.5°C and a winter mean of -26°C . The mean annual precipitation ranges 150–250 mm. This ecoregion is classified as having a low arctic ecoclimate. The nearly continuous cover of shrubby tundra vegetation consists of dwarf birch, willow, northern Labrador tea, *Dryas spp.*, and sedge tussocks. Tall dwarf birch, willow, and alder occur on warm sites; poorly drained sites usually support tussocks of sedge, cottongrass, and sphagnum moss. Underlain by flat-lying Cretaceous shale, this ecoregion is covered by undulating glacial drift and outwash deposits. Portions of the entrenched Anderson and Horton river channels lie some 60–150 m below the surrounding surface. Turbic and Static Cryosols developed on loamy morainal deposits, and Organic Cryosols formed on high-centred polygons, are the dominant soils. The ecoregion is underlain by continuous permafrost with high ice content in the form of ice wedges and pingos. Characteristic wildlife includes caribou, snowshoe hare, red fox, wolf, arctic hare, and arctic ground squirrel. A variety of birds are present, including raptors, songbirds, ptarmigan, snowy owl, waterfowl, and shorebirds. In the marine environment, species present include walrus, seal, beluga whale, and polar bear. Land uses include trapping, hunting, and fishing.

35. DEASE ARM PLAIN

This expansive ecoregion covers the upland from just east of the Mackenzie Delta to Dease Arm of Great Bear Lake. The mean annual temperature is approximately -11°C with a summer mean of 5°C and a winter mean of -26°C . The mean annual precipitation ranges 200–300 mm. This ecoregion is classified as having a high subarctic ecoclimate. Tall shrub tundra, usually consisting of dwarf birch and willow, is the most common vegetative cover. The southern boundary of the ecoregion encompasses the area of tundra and subarctic forest transition, where open, very stunted stands of black spruce and tamarack with secondary quantities of white spruce and ground cover of dwarf birch, willow, ericaceous shrubs, cottongrass, lichen, and moss, are predominant. This ecoregion's rolling surface, which is generally below about 300 m asl elevation, is covered by glacial drift and outwash. A number of hills reach about 460 m asl. A wide range of Cryosolic soils, as well as Eutric and Dystric Brunisolic soils, have formed on hummocky to undulating, loamy glacial till. Organic landforms are usually high-centred lowland polygons. Permafrost is continuous throughout the ecoregion with high ice content and abundant ice wedges in the northern half, and low to medium ice content in the southernmost quarter along Great Bear Lake. Characteristic mammals include caribou, moose, black and grizzly bear, lynx, red and arctic fox, and snowshoe hare. Representative birds include sparrow, songbirds, spruce grouse, osprey, and waterfowl. Land use is limited to trapping, hunting, and fishing. Mineral exploration activities are common. Paulatuk is the main settlement and the population of the ecoregion is approximately 300.

36. CORONATION HILLS

This ecoregion occurs between Amundsen and Coronation gulfs and the northeast shore of Great Bear Lake. The mean annual temperature is approximately -11°C with a summer mean of 5°C and a winter mean of -26°C . The mean annual precipitation ranges from 200 mm in the northern portion of the ecoregion to 300 mm in southern portions. This ecoregion is classified as having a low arctic ecoclimate. The nearly continuous cover of shrub tundra vegetation consists of dwarf birch, willow, northern Labrador tea, *Dryas* spp., and sedge tussocks. Tall dwarf birch, willow, and alder occur on warm sites; wet sites are dominated by willow and sedge. The southern boundary of the region has a mix of tundra vegetation and open, dwarf coniferous forest. The ecoregion is composed of large, rounded, low hills and lowlands consisting of Palaeozoic carbonates and stratified, down-faulted, and folded Proterozoic sediments. Surfaces range in elevation 200–600 m asl in Coronation Hills. Turbic and Static Cryosols developed on undulating to ridged glacial tills, fluvioglacial, and marine deposits are the dominant soils in the ecoregion. Organic Cryosols are associated with organic materials composing peat plateaus and high centre polygons. The northern two-thirds of this ecoregion is underlain by permafrost with medium to high ice content in the form of ice wedges, while the southern one-third adjacent to Coronation Gulf is underlain by permafrost with low to medium ice content. Characteristic wildlife includes caribou, moose, grizzly bear, snowshoe hare, fox, wolf, coyote, raptors, seabirds, and waterfowl. Marine species include walrus, seal, polar bear, and whale. Land uses include trapping, hunting, and fishing. Coppermine is the main settlement in the region, and the population of the ecoregion is approximately 1100.

37. BLUENOSE LAKE PLAIN

This ecoregion occurs in the relatively subdued topography of the Horton and Hornaday river plains. The mean annual temperature is approximately -11°C with a summer mean of 5°C and a winter mean of -26°C . The mean annual precipitation ranges 200–300 mm. This ecoregion is classified as having a low arctic ecoclimate. Shrub tundra vegetation forms a nearly continuous cover, consisting of dwarf birch, willow, northern Labrador tea, *Dryas* spp., and *Vaccinium* spp. Tall dwarf birch, willow, and alder occur on warm sites; wet sites are dominated by sphagnum moss and sedge. Much of the ecoregion is underlain by nearly flat-lying, Paleozoic carbonates and late Proterozoic sediments. The landscape surface reaches elevations of 365–610 m asl, the higher parts being in the south. The western portion of the region is rocky where exposed bedrock outcroppings are common. Eastern sections are covered by rolling to undulating glacial drift. With few exceptions, lakes are small and scattered. Streams gather size northward and become entrenched 60–120 m below the surface. Turbic Cryosols developed on rolling glacial moraine are the dominant soils, and are underlain by continuous permafrost with medium to high ice content in the form of ice wedges. The ecoregion is home to the barren-ground caribou (Bluenose herd). Other wildlife includes moose, grizzly bear, snowshoe hare, red fox, wolf, and a variety of migratory waterfowl. Land uses include trapping, hunting and fishing.

38. BATHURST HILLS

This ecoregion occurs along the mainland shore of Coronation Gulf and along the shores of Bathurst Inlet and adjacent offshore islands. The mean annual temperature is approximately -12.5°C with a summer mean of 4°C and a winter mean of -28°C . The mean annual precipitation ranges 125–200 mm. Coastal portions of the ecoregion, particularly the islands, are moderated by open water during the late summer and early fall. This ecoregion is classified as having a low arctic ecoclimate. It is characterized by a nearly continuous cover of shrub tundra vegetation. Dwarf birch, willow, and alder occur on warm, dry sites; poorly drained sites are dominated by sphagnum moss and sedge tussocks. Bathurst Hills are composed of down-faulted, folded sediments and sills that lie within, and extend south from Bathurst Inlet between higher upland areas of massive granite rocks. The softer rocks have been eroded and in many places lie submerged beneath bays

and channels, leaving the harder members more than 300 m asl in elevation. Marine silts and reworked deposits from the marine overlap mantle some of the lower parts along the coast. Some rugged peaks reach 610 m in elevation, standing as much as 185 m above nearby lakes. Rock outcrops and Turbic and Static Cryosolic soils (developed on thin sandy glacial tills) are characteristic of the region. Permafrost is continuous with low to medium ice content, except in the northeastern part of the ecoregion on the Kent Peninsula, where it has medium to high ice content in the form of ice wedges. This ecoregion provides important summer range for caribou and breeding habitat for snow and Canada goose and other waterfowl. Other characteristic wildlife includes moose, red and arctic fox, snowshoe hare, arctic ground squirrel, masked shrew, lemming, wolf, lynx, weasel, snowy owl, shorebirds, seabirds, raptors, seal, whale, walrus, and polar bear. Land uses include fishing, trapping, hunting, and tourism. There are no sizable permanent settlements in the ecoregion, however a total population of 18 is reported.

39. QUEEN MAUD GULF LOWLAND

This ecoregion extends eastward along the arctic slope from Bathurst Inlet to near Chantrey Inlet and is associated with the lowlands south of Queen Maud Gulf. The mean annual temperature is approximately -11°C with a summer mean of 5.5°C and a winter mean of -27°C . The mean annual precipitation ranges 125–200 mm in the southern edge of the ecoregion. This ecoregion is classified as having a low arctic ecoclimate. It is characterized by a cover of shrub tundra vegetation, consisting of dwarf birch, willow, northern Labrador tea, *Dryas spp.*, and *Vaccinium spp.* Tall dwarf birch, willow, and alder occur on warm sites; wet sites are dominated by sphagnum moss and sedge tussocks. The region is composed of massive Archean rocks that form broad, sloping uplands that reach about 300 m asl in elevation in the south, and subdued undulating plains near the coast. The coastal areas are mantled by silts and clay of postglacial marine overlap. Bare bedrock is common, and Turbic and Static Cryosols developed on discontinuous, thin, sandy moraine, level alluvial, and marine deposits are the dominant soils in the ecoregion. Permafrost is continuous and deep with low ice content. The Queen Maud Gulf Bird Sanctuary covers most of the ecoregion. The sanctuary is an important migratory bird (duck, goose and shore) habitat. Additional wildlife includes caribou, muskox, polar bear, moose, wolverine, hare, fox, raptors, walrus, seal, and whale. The main settlement in the area is Bathurst Inlet and the population of the ecoregion is approximately 50.

40. CHANTREY INLET LOWLAND

This ecoregion is associated with lowlands surrounding Chantrey Inlet and Adelaide Peninsula. The mean annual temperature is approximately -12°C with a summer mean of 4.5°C and a winter mean of -28°C . The mean annual precipitation ranges 125–200 mm. This ecoregion is classified as having a low arctic ecoclimate. It is characterized by large areas of exposed, sparsely vegetated bedrock, in association with shrub tundra vegetation consisting of dwarf birch, willow, northern Labrador tea, *Dryas spp.*, and *Vaccinium spp.* Tall dwarf birch, willow, and alder occur on warm sites; wet sites are dominated by sphagnum moss and sedge tussocks. Near the coast, the surface is mantled by silts and clay of postglacial marine overlap, and is underlain by massive Archean rocks that form a level to undulating plain that reaches about 300 m asl in elevation in its southern section. Turbic and Static Cryosols developed on discontinuous, thin, sandy moraine, level alluvial, and marine deposits are the dominant soils in the ecoregion. The east and west sides of Chantrey Inlet are underlain by continuous permafrost with low ice content. The northern half of the Adelaide Peninsula is characterized by continuous permafrost with medium to high ice content in the form of ice wedges and massive ice bodies. Characteristic wildlife includes caribou, polar bear, wolf, fox, hare, raptors, shorebirds, waterfowl, walrus, seal, and whale. Land uses include trapping, hunting, and fishing.

41. TAKIJUQ LAKE UPLAND

This ecoregion takes in the eastern half of the Bear–Slave Upland south of Coronation Gulf. Much of the upland surface is composed of unvegetated rock outcrops that are common on the Canadian Shield. The mean annual temperature is approximately -10.5°C with a summer mean of 6°C and a winter mean of -26.5°C . The mean annual precipitation ranges 200–300 mm. This ecoregion is classified as having a low arctic ecoclimate. Numerous lakes fill its lowlands. Vegetative cover is characterized by shrub tundra, consisting of dwarf birch, willow, northern Labrador tea, *Dryas spp.*, and *Vaccinium spp.* Depressional sites are dominated by willow, sphagnum moss, and sedge tussocks. Scattered stands of spruce occur along the southern boundary of the ecoregion. The region consists mainly of massive Archean rocks that form broad, sloping uplands, plateaus, and lowlands. Bathurst Hills form a prong of rugged ridges that reach about 610 m asl and stand as much as 185 m above nearby lakes. Turbic and Static Cryosols have formed on thin discontinuous sandy morainal and fluvioglacial materials, and in association with rock outcrops, dominate the uplands. Organic Cryosols are the dominant soils in the lowlands. Permafrost is deep and continuous with low ice content throughout the majority of the region, although the ice content along the west side of Bathurst Inlet is low to medium. The ecoregion has high mineral development potential and considerable exploration activity has taken place. Characteristic wildlife includes caribou, muskox, grizzly bear, hare, fox, wolf, raptors, shorebirds, seabirds, and waterfowl. Land uses include subsistence trapping and hunting.

42. GARRY LAKE LOWLAND

This ecoregion extends across a vast area of massive granitic Archean rocks, forming a broad, level to gently sloping plain that reaches about 300 m asl in elevation. The mean annual temperature is approximately -10.5°C with a summer mean of 5.5°C and a winter mean of -26.5°C . The mean annual precipitation ranges 200–275 mm. This ecoregion is classified as having a low arctic ecoclimate. The characteristic vegetation is shrub tundra. Dwarf birch, willow, and alder occur on warm, dry sites; poorly drained sites are dominated by willow, sedge, and moss. The lowland is composed of Turbic and Static Cryosols developed on discontinuous, thin, sandy moraine with Organic Cryosolic soils on level high-centre peat polygons. Permafrost is continuous with low ice content throughout the ecoregion. This ecoregion provides important summer range for caribou and breeding habitat for snow and Canada goose, and other waterfowl. Other wildlife includes moose, red and arctic fox, snowshoe hare, arctic ground squirrel, masked shrew, lemming, wolf, lynx, weasel, snowy owl, shorebirds, and other raptors. Land uses include fishing, trapping, and hunting. The ecoregion has high mineral potential.

43. BACK RIVER PLAIN

This ecoregion occurs in central District of Keewatin, from the Back River south to Aberdeen Lake. The ecoregion is characterized by relatively level terrain, unlike adjacent ecoregions which tend to have greater relief. The mean annual temperature is approximately -10.5°C with a summer mean of 5.5°C and a winter mean of -26.5°C . The mean annual precipitation ranges 200–300 mm. This ecoregion is classified as having a low arctic ecoclimate. The vegetation is characterized as shrub tundra, consisting of dwarf birch, willow, northern Labrador tea, *Dryas spp.*, and *Vaccinium spp.* Well-drained upper slopes tend to have a discontinuous vegetative cover. Tall dwarf birch, willow, and alder occur on warm sites; wet sites are dominated by willow, moss, and sedge tussocks. Clumps of dwarf black and white spruce and tamarack occur at lower elevations along the Thelon River in the southwest portion. The ecoregion includes areas of nearly flat-lying sandstones and volcanic rocks that are characteristically expressed on the surface by sandy flats sparsely covered with vegetation. Turbic Cryosols developed on level to undulating, discontinuous veneers of sandy morainal and fluvioglacial material are the dominant soils in the ecoregion; Organic Cryosols are associated with polygonal wetlands. Permafrost is continuous with low ice content throughout the ecoregion. The ecoregion has high mineral potential. Characteristic wildlife includes caribou, muskox,

moose, arctic hare, arctic fox, raptors, rock ptarmigan, gulls, and waterfowl. Land uses include trapping, hunting, and fishing.

44. DUBAWNT LAKE PLAIN/UPLAND

This ecoregion lies south and west of Chesterfield Inlet and incorporates the terrain around Mallery, Wharton and Dubawnt lakes. The mean annual temperature is approximately -10.5°C with a summer mean of 6°C and a winter mean of -26.5°C . The mean annual precipitation ranges 225–300 mm. This ecoregion is classified as having a low arctic ecoclimate. It is characterized by a nearly continuous cover of shrub tundra vegetation, consisting of dwarf birch, willow, northern Labrador tea, *Dryas* spp., and *Vaccinium* spp. Tall dwarf birch, willow, and alder occur on warm sites; wet sites are dominated by willow, sedge, and moss. Composed of nearly flat-lying sandstones and volcanic rocks, most of the surface of the ecoregion is characterized by sandy flats sparsely covered with vegetation. Its southwestern section consists of rolling terrain composed of massive Archean rocks forming broad, sloping uplands and lowlands, where small and medium sized lakes are common. Turbic and Static Cryosols developed on level to undulating discontinuous veneers of sandy morainal and fluvioglacial deposits are the dominant soils. Permafrost is continuous with low to medium ice content in the eastern half of the region, and continuous with a low ice content in the western half. The ecoregion has high mineral potential. Characteristic wildlife includes caribou, grizzly bear, muskox, moose, arctic hare, arctic fox, wolf, wolverine, weasel, otter, raptors, and waterfowl. Land uses in the interior are limited to some trapping, hunting, and fishing.

45. MAGUSE RIVER UPLAND

This large ecoregion covers the uplands south of Chesterfield Inlet and extends as far south as Churchill and includes much of the northwest coast of Hudson Bay. The mean annual temperature ranges from approximately -8°C in the south to -11°C in the north. A mean summer temperature of 6°C and mean winter temperature of -24°C occur for the entire ecoregion. The mean annual precipitation ranges 250–400 mm with more than 400 mm occurring south of Eskimo Point. Temperature and precipitation increase to the south of the ecoregion. Coastal climate is moderated by the open waters of Hudson Bay during the late summer and early fall prior to freeze-up when damp foggy weather is common. The ecoregion is classified as having a low arctic ecoclimate. It is characterized by a cover of shrub tundra vegetation. Dwarf birch, willow, and alder occur on warm, dry sites; poorly drained sites are dominated by willow, sphagnum moss, and sedge. The region is associated with areas of continuous permafrost with medium ice content and with Turbic Cryosolic soils. Unfrozen Organic (Mesisol) and Regosolic soils also occur in this ecoregion. Crystalline Archean massive rocks form broad, sloping uplands and lowlands. Hummocky bedrock outcrops covered with discontinuous acidic, sandy, granitic tills are dominant. Prominent fluvioglacial ridges (eskers) also occur. Wetlands make up 25–50% of the land area and are characteristically lowland low- and high-centred polygon fens. Wildlife includes barren-ground caribou, arctic fox, weasel, arctic ground squirrel, and lemming. Bird species include willow ptarmigan, snowy owl, and rough-legged hawk. Waterfowl, particularly sea ducks, snow geese, swans, Canada geese and shorebirds are common in the coastal areas. White whale and seals inhabit coastal waters. Land uses include subsistence fishing, trapping, and hunting. Most of the human population and land use is along the coast. The main settlements in the region are Chesterfield Inlet, Eskimo Point, and Rankin Inlet. The population of the ecoregion is approximately 3600.

46. SOUTHAMPTON ISLAND PLAIN

This ecoregion includes the southern portion of Southampton Island as well as Coats and Mansel islands in the mouth of Hudson Bay. The mean annual temperature is approximately -11°C with a summer mean of 3°C and a winter mean of -24.5°C . The mean annual precipitation ranges 200–300 mm. This ecoregion is classified as having a low arctic ecoclimate. It is characterized by a nearly continuous cover of low arctic shrub tundra vegetation, consisting of dwarf birch, willow, northern Labrador tea, *Dryas spp.*, and *Vaccinium spp.*; wet sites are dominated by willow, sedge, and moss. The region is composed of the partly submerged blanket of flat-lying Palaeozoic carbonate rocks and is generally less than 90 m asl in elevation. Bedrock outcrops are common. Static and Turbic Cryosols developed on level to undulating morainal and marine deposits are the dominant soils. The maritime influence is limited to the late summer and early fall. Coastal ice and fog persist for long periods in the summer when the sea ice is absent. The ecoregion is underlain by continuous permafrost with medium ice content composed of ice wedges. Characteristic wildlife includes polar bear, arctic hare, fox, wolf, weasel, wolverine, ermine, caribou, raptors, rock ptarmigan, gulls, seabirds, waterfowl, seal, walrus, and whale. Land uses include trapping, hunting, and fishing. Coral Harbour is the largest settlement. The population of the ecoregion is approximately 600.

47. CENTRAL UNGAVA PENINSULA

This large ecoregion extends from the eastern coast of Hudson Bay to Ungava Bay south of the Povungnituk Hills in northern Quebec. The mean annual temperature is approximately -7°C with a summer mean of 3.5°C and a winter mean of -17.5°C . The mean annual precipitation ranges 400–500 mm. This ecoregion is classified as having a low arctic ecoclimate. It is characterized by a nearly continuous cover of low arctic shrub tundra vegetation, consisting of dwarf birch, willow, northern Labrador tea, *Dryas spp.*, and *Vaccinium spp.* The southern portion of the region has a mix of tundra vegetation and open, dwarf coniferous forest. Much of the ecoregion lies above 200 m asl and has an undulating surface with elevations that can reach about 500 m asl. Massive Archean granites and gneisses are widely exposed, and thin, discontinuous veneers of glacial drift are common over most of its surface. Occasional beach and marine deposits occur in coastal areas previously occupied by postglacial seas. Abundant small lakes cover approximately 20% of the area. A large portion of the region drains eastward to Ungava Bay via the aux Feuilles and Arnaud rivers, as well as westward to Hudson Bay by the Povungnituk and Kogaluc rivers. Bare rock outcroppings are common in the ecoregion, and Turbic Cryosols are the dominant soils along with inclusions of Organic Cryosols. Permafrost is continuous with low ice content. Drift ice and fog persist for long periods in the summer along both the Hudson Bay and Ungava Bay coasts. Characteristic wildlife includes caribou, wolverine, snowshoe hare, fox, walrus, seal, whale, polar bear, raptors, shorebirds, and waterfowl. Dominant land uses include trapping, hunting, and fishing. Settlements include Inukjuak, Aupaluk, and Povungnituk. The population of the ecoregion is approximately 3300.

48. OTTAWA ISLANDS

The ecoregion covers the Ottawa Islands and other smaller islands (Farmer, Hopewell, Sleeper, and King George islands) that occur off the eastern coast of Hudson Bay between 57°N and 60°N latitude. The mean annual temperature is approximately -9°C with a summer mean of 3°C and a winter mean of -20°C . The mean annual precipitation is about 300 mm. Both temperature and precipitation increase to the south. Drizzle and fog persist for long periods in the summer when sea ice is absent. This ecoregion is classified as having a low arctic ecoclimate. The vegetation of the islands is characterized by shrub tundra communities. Dwarf birch, willow, and alder occur on warm, dry sites; poorly drained sites are dominated by willow and sedge. The region is associated with areas of extensive discontinuous permafrost. The islands are composed of resistant Proterozoic sedimentary and volcanic rocks elaborately folded into long, curved, hairpin-shaped structures. Higher summits reach about 122 m asl in elevation and are truncated by an old erosion surface.

Bedrock outcrops are common, and Turbic and Static Cryosols developed on level to undulating morainal and marine deposits are the dominant soils in the ecoregion. Characteristic wildlife includes seal, walrus, whale, polar bear, arctic hare, fox, wolf, weasel, raptors, rock ptarmigan, gulls, seabirds, and waterfowl.

49. BELCHER ISLANDS

This ecoregion covers the Belcher Islands which occur off the coast of Quebec in Hudson Bay. The mean annual temperature is approximately -5.5°C with a summer mean of 5.5°C and a winter mean of -18.5°C . The mean annual precipitation is approximately 500 mm. This ecoregion is classified as having a high subarctic ecoclimate. The ecoregion falls along the latitudinal limits of tree growth. Open, very stunted stands of black spruce and tamarack with secondary quantities of white spruce and ground cover of dwarf birch, willow, ericaceous shrubs, cottongrass, lichen, and moss, are predominant. Poorly drained sites usually support tussocks of sedge, cottongrass, and sphagnum moss. Tall shrub tundra, usually consisting of dwarf birch and willow, is also common. The ecoregion is formed by a range of hills projecting through the waters of Hudson Bay. The hills are composed of resistant Proterozoic sedimentary and volcanic rocks elaborately folded into long, curved, hairpin-shaped structures. Higher summits reach about 122 m asl in elevation and are truncated by an old erosion surface. Bedrock outcrops are common, and Turbic and Static Cryosolic soils developed on level to undulating morainal and marine deposits occur in the ecoregion. Permafrost is extensive and discontinuous with low to no ice content. Characteristic wildlife includes caribou, moose, black and polar bear, wolf, red fox, snowshoe hare, beaver, raven, osprey, shorebirds, seabirds, waterfowl, seal, walrus, and whale. Land uses include hunting and fishing. The major community of the Belcher Islands is Sanikiluaq. The population of the ecoregion is approximately 500.

TAIGA PLAINS ECOZONE

The Taiga Plains are located mainly in the southwesterly corner of the Northwest Territories, northeastern British Columbia, and northern Alberta. Taiga, a Russian word, refers to the northern edge of the boreal coniferous forest, that land of little sticks which spans from the subarctic of Labrador to Alaska and beyond, from Siberia to Scandinavia. The ecozone is dominated by Canada's largest river, the mighty Mackenzie, and its tributaries. It is bordered in the west by cordilleran mountain ranges, to the east by two huge lakes - the Great Slave and Great Bear, to the north by extensive Mackenzie Delta, and to the south by the closed forests of the Boreal Plains ecozone.

Climate The climate is marked by short, cool summers and long, cold winters. Cold arctic air influences the area for most of the year. The mean annual temperature ranges between -10°C in the Mackenzie Delta region to -1°C in Alberta and British Columbia. From north to south, the mean summer temperature ranges from 6.5°C to 14°C . The mean winter temperature ranges from -26°C in the north to -15°C in the south of the ecozone. Snow and freshwater ice persist for six to eight months of the year. The mean annual precipitation is low, ranging 200–500 mm.

Vegetation The ecozone is characterised by an open, generally slow growing, conifer dominated forests of predominantly black spruce. The shrub component is often well developed and includes dwarf birch, Labrador tea, and willow. Bearberry, mosses, and sedges are dominant understory species. Upland and foothill areas and southerly locales tend to be better drained, are warmer, and support mixedwood forests characterized by white and black spruce, lodgepole pine, tamarack, white birch, trembling aspen, and balsam poplar. Along the nutrient-rich alluvial flats of the larger rivers white spruce and balsam poplar grow to sizes comparable to the largest in the boreal forests to the south.

Landforms and Soils This ecozone is the northern extension of the flat Interior Plains which dominate the Prairie and Boreal Plains ecozones to the south. The subdued relief of broad lowlands and plateaus are incised by major rivers, the largest of which can show elevational differences of several hundred metres. Underlain by horizontal sedimentary rock — limestone, shale and sandstone — the nearly level to gently rolling plain is covered with organic deposits and, to a lesser degree, with undulating to hummocky morainal and lacustrine deposits. Alluvial deposits are common along the major river systems, including braided networks of abandoned channels. Low-lying wetlands cover 25–50% of the zone. A large portion of the area is underlain by permafrost, and this acts to perch the surface water table and promote a regional overland seepage system. When combined with low-angle slopes, it creates a landscape that is seasonally waterlogged over large areas. Patterned ground features are common. The region's widespread permafrost and poor drainage create favourable conditions for Cryosolic, Gleysolic, and Organic soils.

Wildlife Characteristic mammals include moose, woodland caribou, wood bison, wolf, black bear, marten, lynx, and arctic ground squirrel. Barren-ground caribou overwinter in the northwest corner of the ecozone. Common bird species include the common redpoll, gray jay, common raven, red-throated loon, northern shrike, sharp-tailed grouse, and fox sparrow. Fish-eating raptors include the bald eagle, peregrine falcon, and osprey. The Mackenzie Valley forms one of North America's most travelled migratory corridors for waterfowl (ducks, geese, and swans) breeding along the Arctic coast.

Human Activities The population of 21 400 is approximately 60% aboriginal. The major communities include Fort Nelson, Inuvik, Hay River, Fort Smith, and Fort Simpson. Hunting, trapping, and fishing are the primary subsistence activities in the local economy. Mining, oil and gas extraction, and some forestry and tourism are the main activities in the ecozone.

50. MACKENZIE DELTA

This ecoregion is composed of the southern two-thirds of the distinctive Mackenzie River delta. The ecoregion is marked by very cold winters and cool summers. The mean annual temperature is approximately -9.5°C . The mean summer temperature is 8.5°C and the mean winter temperature is -26.5°C . Mean annual precipitation ranges from 200 mm to less than 275 mm. The ecoregion is classified as having a high subarctic ecoclimate. The predominant vegetation consists of open, very stunted stands of black spruce and tamarack with secondary quantities of white spruce, and a ground cover of dwarf birch, willow, ericaceous shrubs, cottongrass, lichen, and moss. Poorly drained sites usually support tussocks of sedge, cottongrass, and sphagnum moss. Low shrub tundra, usually dwarf birch and willow, is also common. The delta is a complex area of peat-covered deltas and fluvial marine deposits. The present delta is remarkable for its multitude of lakes and channels. Wetlands extend over 50% of the ecoregion, and are characteristically polygonal peat plateau bogs with ribbed fens. Regosolic Static and Gleysolic Static Cryosols with Organic Cryosols developed on level fluvioglacial, organic, and marine deposits are the dominant soils. Extensive discontinuous permafrost with low to medium ice content is prevalent throughout the ecoregion, and is characterized by sparse ice wedges. Characteristic wildlife includes muskrat, beaver, mink, and waterfowl. Land uses are limited to trapping, hunting, recreation, and tourism. Major communities include Aklavik and Inuvik. The population of the ecoregion is approximately 4000.

51. PEEL RIVER PLATEAU

This ecoregion spans the Yukon and Northwest Territories border between the Peel and Arctic Red rivers along the foothills of the Mackenzie and Richardson mountains. The ecoregion is marked by long, very cold winters and short cool summers. The mean annual temperature is approximately -6°C . The mean annual summer temperature is 10°C and the mean winter temperature is -22.5°C . Mean annual precipitation ranges 200–275 mm. The ecoregion is classified as having a high subarctic ecoclimate. The predominant vegetation

consists of open, very stunted stands of black spruce and tamarack with secondary quantities of white spruce, and a ground cover of dwarf birch, willow, ericaceous shrubs, cottongrass, lichen, and moss. Poorly drained sites usually support tussocks of sedge, cottongrass, and sphagnum moss. Low shrub tundra, consisting of dwarf birch and willow, is also common. The surface of this ecoregion is characterized by truncated and upturned edges of Palaeozoic and Mesozoic strata, forming terraces, and rounded plateaus. Some portions of the ecoregion in the southwest are unglaciated, but most of its surface is covered by thin, discontinuous, hummocky to dissected glacial drift and organic deposits. Wetlands are present on over 25% of the ecoregion, characterized by peat plateau bogs, and ribbed and horizontal fens. Permafrost is continuous, and characterized by sparse ice wedges and massive ground ice bodies, with high to medium ice content in the northern part of the ecoregion above Mountain River, and extensive discontinuous permafrost with medium to low ice content below the river. Turbic and Organic Cryosols with some Eutric Brunisols and Static Cryosols are the dominant soils in the ecoregion. Characteristic wildlife includes caribou, moose, grizzly and black bear, wolf, red fox, snowshoe hare, and beaver. Common birds include raven, osprey, spruce grouse, and waterfowl. Land use activities include trapping, hunting, and fishing, with some recreation and tourism. There are no permanent communities in this ecoregion.

52. GREAT BEAR LAKE PLAIN

This ecoregion extends southward from the Mackenzie River delta to Great Bear Lake, including some of the terrain surrounding the southern shore of the lake. It is marked by short, cool summers and long, very cold winters. The mean annual temperature is approximately -9°C . The mean summer temperature is 8°C and the mean winter temperature is -25.5°C . Mean annual precipitation ranges 200–300 mm. The ecoregion is classified as having a high subarctic ecoclimate. The latitudinal limits of tree growth are reached along its northern boundary. The predominant vegetation consists of open, very stunted stands of black spruce and tamarack with secondary quantities of white spruce and a ground cover of dwarf birch, willow, ericaceous shrubs, cottongrass, lichen, and moss. Poorly drained sites usually support tussocks of sedge, cottongrass, and sphagnum moss. Low shrub tundra, consisting of dwarf birch and willow, is also common. Composed of flat-lying Cretaceous shale and Devonian limestone strata, the surface of this ecoregion is generally below 310 m asl. As elevations gradually increase southward, entrenched river channels lie some 60–150 m below the surrounding surface. The ecoregion is generally covered by undulating glacial drift and outwash deposits. Turbic Cryosols with Static and Organic Cryosols developed on organic deposits with deep permafrost are the dominant soils. Unfrozen Organic and Brunisolic soils also occur. Permafrost is extensive and discontinuous with low to medium ground ice content, and is characterized by sparse ice wedges. Wildlife includes caribou, moose, black bear, wolf, red fox, snowshoe hare, and beaver. Common birds include spruce grouse, raven, osprey, and waterfowl. Land use activities include trapping, hunting, fishing, recreation, and tourism. There are no permanent communities in this ecoregion.

53. FORT MCPHERSON PLAIN

This ecoregion spans the Yukon and Northwest Territories' borders and extends from Fort McPherson to the Mackenzie and Ramparts rivers. The climate is marked by short cool summers and long very cold winters. The mean annual temperature is approximately -8°C . The mean summer temperature is 9.5°C and the mean winter temperature is -25°C . Mean annual precipitation ranges between 250 mm in the eastern portion of the ecoregion to 350 mm in the west. The ecoregion is classified as having a high subarctic ecoclimate. The predominant vegetation consists of open, very stunted stands of black spruce and tamarack with secondary quantities of white spruce, and a ground cover of dwarf birch, willow, ericaceous shrubs, cottongrass, lichen, and moss. Poorly drained sites usually support tussocks of sedge, cottongrass, and sphagnum moss. Low shrub tundra, consisting of dwarf birch and willow, is also common. This ecoregion is underlain by Cretaceous shale, and incorporates a broad, shallow basin in its southwestern section at about 120 m asl. Some parts of the ecoregion have numerous lakes, and others are without. In the northeast,

isolated hills rise to about 460 m asl, where it consists of Palaeozoic carbonate rocks. Both the Arctic Red and the Ontonagon rivers follow deeply incised valleys through this ecoregion to the Mackenzie River. Permafrost is continuous with medium to high ice content, and is characterized by sparse ice wedges. Turbic and Organic Cryosols with some Static Cryosols developed on level to undulating morainal and organic deposits are the dominant soils. Unfrozen Dystric and Eutric Brunisolic soils also occur. Wetlands cover over 25% of the area in the north of the ecoregion, over 50% of the area in the south. Characteristic wildlife includes caribou, moose, black bear, wolf, red fox, snowshoe hare, beaver, spruce grouse, raven, osprey, and waterfowl. Land use activities are limited to trapping, hunting, fishing, recreation, and tourism. Major communities include Fort McPherson and Arctic Red River. The population of the ecoregion is approximately 900.

54. COLVILLE HILLS

This ecoregion lies north of the Smith Arm of Great Bear Lake and encompasses Aubry and Colville lakes, and lacs des Bois and Maunoir. It is marked by short, cool summers and long, very cold winters. The mean annual temperature is approximately -10°C . The mean summer temperature is 6.5°C and the mean winter temperature is -25.5°C . Mean annual precipitation ranges 200–300 mm. The ecoregion is classified as having a high subarctic ecoclimate. The predominant vegetation consists of open, very stunted stands of black spruce and tamarack with secondary quantities of white spruce, and a ground cover of dwarf birch, willow, ericaceous shrubs, cottongrass, lichen, and moss. Poorly drained sites usually support tussocks of sedge, cottongrass, and sphagnum moss. Low shrub tundra, consisting of dwarf birch and willow, is also common. This ecoregion embraces several ridges of Palaeozoic carbonate strata that stand above the surrounding plains. The hills and ridges enclose basins which contain several large lakes in a netlike pattern with meshes of 15 km or more across. The lowlands lie at about 245–300 m asl, whereas sinuous ridges reach elevations of 670 m asl. This hummocky to undulating plain is also characterized by extensive polygonal peat plateaus. Organic and Turbic Cryosols and Dystric Brunisols are the dominant soils in the ecoregion. Permafrost is continuous with low to medium ice content. It is characterized by sparse ice wedges in the southern half of the ecoregion, and by abundant ice wedges, massive ground ice and pingo ice in the north. Characteristic wildlife includes caribou, moose, grizzly and black bear, wolf, red fox, snowshoe hare, beaver, muskrat, spruce grouse, raven, osprey, and waterfowl. Land uses include trapping, hunting, fishing, recreation, and tourism. The principal community is Colville Lake, and the population of the ecoregion is approximately 70.

55. NORMAN RANGE

This ecoregion extends from Fort Good Hope on the east side of the Mackenzie River to Willowlake River south of Great Bear Lake. It is marked by cool summers and long, very cold winters. The mean annual temperature is approximately -6.5°C . The mean summer temperature is 10.5°C and the mean winter temperature is -23.5°C . The mean annual precipitation ranges from 225 mm in the eastern portion of the ecoregion to less than 400 mm in the west. The ecoregion is classified as having a low subarctic ecoclimate. Vegetation is dominated by open stands of black spruce with an understory of dwarf birch, Labrador tea, lichen, and moss. Drier and warmer sites tend to have more white spruce, paper birch, and some aspen. Wet sites are usually covered with bog–fen vegetation such as dwarf black spruce, Labrador tea, ericaceous shrubs, and mosses. The Norman Range forms a series of north–south-trending, linear, relatively low ridges, largely of resistant Palaeozoic carbonates, and reaching elevations of about 1040 m asl. Great Bear Plain, composed of Cretaceous strata, has a rolling surface generally below 500 m asl. The surface of the ecoregion is covered with steeply sloping to undulating glacial drift, colluvium, and organic deposits in the form of polygonal peat plateaus. Turbic and Organic Cryosols, as well as Eutric Brunisols, are the dominant soils. Permafrost is extensive and discontinuous with low to medium ice content, and is characterized by sparse ice wedges. In the area northeast of Fort Good Hope, ice wedges and pingo ice are more abundant. Characteristic wildlife includes caribou, moose, grizzly and black bear, wolf, coyote, beaver, snowshoe hare,

muskrat, and red fox. Common birds include spruce grouse, raven, and osprey. Land uses include hunting, trapping, recreation, and tourism. The principal communities are Fort Good Hope and Deline. The population of the ecoregion is approximately 1200.

56. MACKENZIE RIVER PLAIN

This ecoregion extends from north of Fort Good Hope on the west side of the Mackenzie River to Wrigley. It is a narrow northern extension of the boreal forest along the east side of the Mackenzie River. The ecoregion is marked by cool summers and very cold winters. The mean annual temperature is approximately -6.5°C . The mean summer temperature is 11.5°C and the mean winter temperature is -24.5°C . The mean annual precipitation ranges 300–400 mm. The ecoregion is classified as having a subhumid high boreal ecoclimate. The ecoregion is a broad, rolling, drift-covered plain lying between Mackenzie and Franklin mountains, into which the Mackenzie River is entrenched for part of its course. Native vegetation consists predominantly of medium to tall, closed stands of black spruce and jack pine with an understory of feathermoss, bog cranberry, blueberry, Labrador tea, and lichens. White spruce, balsam fir, and trembling aspen occur in the warmer, more moist sites in the southern section of the region. Drier sites have more open stands of black spruce and jack pine. Low, closed and open stands of black spruce, ericaceous shrubs, and sphagnum mosses dominate poorly drained, peat-filled depressions. Wetlands cover 25–50% of the ecoregion, and are characteristically peat plateau bogs, and ribbed and horizontal fens. Permafrost is extensive and discontinuous with medium ice content, and is characterized by sparse ice wedges. Dominant soils in the ecoregion are Organic and Turbic Cryosols and Eutric and Dystric Brunisols with some Regosols that have developed on terraced to rolling morainal, alluvial, lacustrine, and organic deposits. Characteristic wildlife includes moose, black bear, beaver, fox, wolf, hare, raven, grouse, and waterfowl. Limited forestry, oil production near Norman Wells, hunting, and trapping are the principal land use activities. The main communities include Norman Wells and Fort Norman. The population of the ecoregion is approximately 1200.

57. GRANDIN PLAINS

This ecoregion occurs between the Dease and McTavish arms at the northeast corner of Great Bear Lake. It is marked by cool summers and very cold winters. The mean annual temperature is approximately -7.5°C . The mean summer temperature is 10°C and the mean winter temperature is -25°C . The mean annual precipitation is 200–300 mm. The ecoregion is classified as having a high subarctic ecoclimate. The latitudinal limits of tree growth are reached along its eastern boundary. The predominant vegetation consists of open, very stunted stands of black spruce and tamarack with secondary quantities of white spruce, and a ground cover of dwarf birch, willow, ericaceous shrubs, cottongrass, lichen, and moss. Low shrub tundra consisting of dwarf birch and willow is also common, and poorly drained sites usually support tussocks of sedge, cottongrass, and sphagnum moss. Wetlands cover approximately 25% of the ecoregion, and are characteristically peat plateau bogs, and ribbed and horizontal fens. The ecoregion also includes a small portion of Great Bear Plain that is largely composed of Cretaceous shale. The ecoregion is covered by undulating glacial drift, raised beaches, and outwash deposits. Turbic Cryosols with Static and Organic Cryosols developed on loamy morainal and organic deposits are the dominant soils. Permafrost is continuous with low to moderate ice content, and is characterized by sparse ice wedges. Brunisolic soils have developed on unfrozen materials. Characteristic wildlife includes moose, black bear, beaver, fox, wolf, snowshoe hare, raven, and spruce grouse. Land uses include hunting, trapping, and fishing.

58. FRANKLIN MOUNTAINS

This ecoregion occupies the Franklin Mountains from Norman Wells to Wrigley along the east side of the Mackenzie River in the District of Mackenzie. It is marked by cool summers and very cold winters. The mean annual temperature is approximately -5.5°C . The mean summer temperature is 10°C and the mean winter temperature is -25°C . Mean annual precipitation ranges 200–300 mm. The ecoregion is classified as having a low subarctic ecoclimate. The predominant vegetation consists of open stands of black spruce with an understory of dwarf birch, Labrador tea, lichen, and moss. Drier and warmer sites tend to have more white spruce, paper birch, and some aspen. Wet sites are usually covered with bog–fen vegetation such as dwarf black spruce, Labrador tea, ericaceous shrubs, and mosses. The Franklin Mountains form a series of linear, relatively low ranges and ridges, largely composed of resistant carbonates, that reach elevations of about 1525 m asl. This ecoregion's surface is covered with steeply sloping glacial drift, colluvium, and organic deposits in the form of polygonal peat plateaus. Turbic Cryosols, Eutric Brunisols, and Organic Cryosols are the dominant soils. Permafrost is extensive and discontinuous with low to moderate ice content, and is characterized by sparse ice wedges. Characteristic wildlife includes caribou, moose, grizzly and black bear, wolf, coyote, beaver, snowshoe hare, muskrat, red fox, spruce grouse, raven, and osprey. Hunting, trapping, outdoor recreation, and tourism are the main land use activities.

59. KELLER LAKE PLAIN

This ecoregion encompasses Johnny Hoe River and lacs Taché and Grandin south of the McVicar Arm of Great Bear Lake. It is marked by cool summers and very cold winters. The mean annual temperature is approximately -7°C . The mean summer temperature is 11°C and the mean winter temperature is -25°C . The mean annual precipitation ranges 225–300 mm. The ecoregion is classified as having a low subarctic ecoclimate. The predominant vegetation consists of open stands of black spruce with an understory of dwarf birch, Labrador tea, lichen, and moss. Drier and warmer sites tend to have more white spruce, paper birch, and some aspen. Wet sites are usually covered with bog–fen vegetation such as dwarf black spruce, Labrador tea, ericaceous shrubs, and mosses. Wetlands cover over 25% of this ecoregion, which also includes the southeastern portion of Great Bear Plain and the northern section of Great Slave Plain. Composed of Cretaceous shale, its surface is generally below 310 m asl and is covered by undulating, peat-covered glacial drift and outwash deposits. Turbic and Organic Cryosols developed on organic and loamy morainal deposits are the dominant soils in the ecoregion. Permafrost is extensive and discontinuous with low to moderate ice content, and is characterized by occasional ice wedges. Characteristic wildlife includes caribou, moose, black bear, wolf, red fox, coyote, beaver, snowshoe hare, muskrat, spruce grouse, raven, and waterfowl. Hunting and trapping are the main land use activities.

60. GREAT SLAVE LAKE PLAIN

This ecoregion extends northward from the North Arm of Great Slave Lake to Lac la Martre. It includes the northeastern one-third of Great Slave Plain, which is composed of low-relief Palaeozoic carbonates. Low scarps of resistant carbonate rock and shallow lakes are characteristic of its surface below about 300 m asl elevation. The mean annual temperature is approximately -6°C . The mean summer temperature is 11.5°C and the mean winter temperature is -25°C . The mean annual precipitation ranges 225–300 mm. The ecoregion is classified as having a low subarctic ecoclimate. It is dominated by open stands of black spruce with an understory of dwarf birch, Labrador tea, lichen, and moss. Drier and warmer sites tend to have more white spruce, paper birch, and some aspen. Wet sites are usually covered with bog–fen vegetation such as dwarf black spruce, Labrador tea, ericaceous shrubs, and mosses. Wetlands cover over 50% of the region. Turbic and Organic Cryosols with some Organic (Fibrisols), Luvisols, and Dystric Brunisols developed on level to hummocky morainal and organic deposits are the dominant soils. Permafrost is discontinuous throughout the ecoregion. Characteristic wildlife includes caribou, moose, black bear, red and

arctic fox, snowshoe hare, muskrat, spruce grouse, raven, and waterfowl. Hunting and trapping, outdoor recreation, and tourism are the main land use activities. The principal community is Lac la Martre. The population of the ecoregion is approximately 400.

61. NAHANNI PLATEAU

This ecoregion at the southern foothills of the Mackenzie Mountains encompasses the South Nahanni River and Nahanni National Park. It has cool summers and very cold winters. The mean annual temperature is approximately -5°C . The mean summer temperature is 9°C and the mean winter temperature is -19.5°C . The mean annual precipitation ranges from over 400 mm in the east to 500 mm in the west. This ecoregion is classified as having a low subarctic ecoclimate. It is dominated by open stands of black spruce with an understory of dwarf birch, Labrador tea, lichen, and moss. Drier and warmer sites tend to have more white spruce, paper birch, and some aspen. Wet sites are usually covered with bog-fen vegetation such as dwarf black spruce, Labrador tea, ericaceous shrubs, and mosses. The ecoregion is underlain by Palaeozoic carbonates, and is incised by deep and narrow valleys. Many summits and hills are flat because of the attitude of the strata, but extensive remnants of former erosion surfaces are evident. Elevations are usually less than 1372 m asl, but some reach over 1800 m asl. Permafrost is extensive and discontinuous with low ice content, and some ice wedges are found along the southern border of the ecoregion. Dystric Brunisols, Turbic Cryosols, and Organic Cryosols are the dominant soils. This ecoregion provides important summer range for caribou, and breeding habitat for snow and Canada geese and other waterfowl. Other characteristic wildlife includes moose, grizzly and black bear, red fox, snowshoe hare, ground squirrel, wolf, lynx, weasel, and snowy owl. Land uses are limited to fishing, trapping, hunting, outdoor recreation, and tourism.

62. SIBBESTON LAKE PLAIN

This ecoregion lies in the southwest corner of the Northwest Territories. It is bisected by the southern extension of the Franklin Mountains west of the Mackenzie River, and forms a series of linear, relatively low ranges and ridges (about 1650 m) consisting largely of resistant carbonates. The southern extension of the Mackenzie Plain, a broad, rolling, drift- and tree-covered plain lies to the west of the Franklin Mountains, and part of the Great Slave Plain lies to the east. The Great Slave Plain has generally little relief, and the surface below 300 m is characterized by low scarps of resistant carbonates and small shallow lakes. The narrow western extension of the ecoregion is composed of part of the Liard Plateau between the South Nahanni and Liard rivers. It is characterized by tree and alpine tundra covered hills (less than 1500 m), which are underlain mainly by Cretaceous shale and sandstone. The mean annual temperature is approximately -5°C . The mean winter temperature is -1°C and the mean summer temperature is 10°C . The mean annual precipitation ranges from 200 mm in the east to 350 mm in the west. This ecoregion is classified as having a low subarctic ecoclimate. It is dominated by open stands of black and white spruce, paper birch, and some aspen. There is an altitudinal transition from forest to alpine tundra, which occurs between 1050–1150 m. Wetlands cover approximately 50% of the ecoregion. Wet sites are usually covered with bog-fen vegetation such as dwarf black spruce, Labrador tea, ericaceous shrubs, and mosses. The ecoregion's surface materials consist of steeply sloping glacial drift, colluvium, and organic deposits in the form of peat plateaus, palsas, and fens. Dystric and Eutric Brunisols and Turbic Cryosols are the dominant soils. Permafrost is extensive and discontinuous with moderate to low ice content, and is characterized by sparse ice wedges. Characteristic wildlife includes caribou, moose, grizzly and black bear, wolf, coyote, beaver, snowshoe hare, muskrat, red fox, spruce grouse, raven, and osprey. Land uses include hunting, trapping, recreation, and tourism.

63. HORN PLATEAU

This ecoregion extends from the Horn River west along the Willowlake River to the Mackenzie River. To the northeast and south, the plateau (300–900 m asl) rises abruptly above the flat-lying terrain of the surrounding Great Slave Lake Plain and the Hay River Lowland ecoregions (generally less than 300 m asl). The plateau slopes more gently to the west. The ecoregion is marked by cool summers and very cold winters. The mean annual temperature is approximately -5.5°C . The mean summer temperature is 12°C and the mean winter temperature is -21°C . Mean annual precipitation ranges from 250 mm in the east to 400 mm in the west. The ecoregion is classified as having a high boreal ecoclimate. Native vegetation consists predominantly of low to medium, closed stands of black spruce and jack pine with an understory of feathermoss, bog cranberry, blueberry, Labrador tea, and lichens. White spruce, balsam fir, and trembling aspen occur in the warmer, moister sites in the southern section of the region. Black spruce is the climatic climax species. Drier, colder sites have more open stands of black spruce and jack pine. Low, closed and open stands of black spruce, Labrador tea, blueberry, bog rosemary, and sphagnum mosses dominate poorly drained, peat-filled depressions. Wetlands cover approximately 50% of the ecoregion and are characterized by peat plateau bogs, palsas and fens. There is extensive discontinuous permafrost with low to moderate ice content, characterized by sparse ice wedges. The ecoregion is underlain by Cretaceous shale and Devonian limestone bedrock, and is characterized by a smooth, level to undulating surface covered with loamy glacial till and organic deposits. Organic and Turbic Cryosols with some Eutric Brunisols are the dominant soils. Characteristic wildlife includes moose, black bear, fox, wolf, hare, raven, grouse, and waterfowl. Land use activities include forestry, and the hunting and trapping of wildlife.

64. HAY RIVER LOWLAND

This ecoregion is the broad, level lowland plain that is drained by the Fort Nelson and Liard rivers in northeastern British Columbia, and the Hay River in northwestern Alberta, which all ultimately flow into the Mackenzie River in the Northwest Territories. The ecoregion is marked by short, warm summers and long, cold winters. The mean annual temperature is approximately -2.5°C . The mean summer temperature is 13°C and the mean winter temperature is -19°C . The mean annual precipitation ranges 350–450 mm. This ecoregion is classified as having a subhumid mid-boreal ecoclimate. It is characterized by closed mixed stands of trembling aspen, balsam poplar, white spruce, balsam fir, and black spruce on drier sites. Poorly drained fens and bogs, about 30% of the ecoregion, are covered with tamarack and black spruce. The ecoregion is composed of low-relief, flat-lying Palaeozoic strata near Great Slave Lake, and Cretaceous shale in its western section. Surface deposits are predominantly peat-covered clayey lacustrine and glacial till on nearly level to gently rolling topography. Gleysolic and Organic soils with some Organic Cryosols are dominant in the lowlands. Luvisols are the dominant upland soils. Sporadic discontinuous permafrost with low ice content is confined to organic deposits, and is characterized by sparse ice wedges. Characteristic wildlife includes moose, black bear, wolf, beaver, and snowshoe hare. Woodland caribou are found in some areas. The most species-rich habitats are the mixed woods and shrublands associated with the fens, bogs, ponds, streams, and lakes. Some pulpwood and local sawlog forestry, oil and gas extraction and exploration, water-oriented recreation, and wildlife trapping and hunting are the dominant uses of land in this region. The major communities include Hay River, Fort Simpson, and Fort Providence. The population of the ecoregion is approximately 13 200.

65, 67. NORTHERN ALBERTA UPLANDS

This ecoregion includes the flat-topped Caribou Mountains in northern Alberta (67) and the Cameron Hills uplands that span the border with British Columbia and the Northwest Territories (65). Composed of Cretaceous shales, the uplands rise some 400–500 m above the surrounding lowlands with steep scarps on their eastern sides. The ecoregion is marked by cool summers and very cold winters. The mean annual

temperature ranges from -2°C to -2.5°C . The mean summer temperature ranges from 13°C to 14°C , and the mean winter temperature from -18°C to -20°C . The mean annual precipitation ranges 350–500 mm. The ecoregion is classified as having a subhumid high boreal ecoclimate. Between 50–70% of the ecoregion is covered by wetlands. Undulating to rolling morainal surfaces are covered with organic deposits supporting open stands of stunted black spruce and some birch and shrubs. Sporadic discontinuous permafrost with low ice content is common in these Organic Cryosolic soils. Upland slopes free of organic blankets are mainly loamy glacial till supporting a white spruce, balsam fir, and aspen mixedwood forest. Exposed mineral soils are mainly Gray Luvisols with some Brunisols. Characteristic wildlife includes woodland caribou, moose, black bear, wolf, beaver, snowshoe hare, red squirrel, raven, and waterfowl. One of the largest concentrations of nesting bald eagles occurs in the Cameron Hills around Bistcho Lake. Land use is mainly limited to hunting and trapping, and oil and gas exploration. The main communities include Fort Liard and Trout Lake. The population of the ecoregion is approximately 600.

66. MUSKWA PLATEAU

This ecoregion occurs along the foothills of the Rocky Mountains in northeastern British Columbia, spanning the border with the Northwest Territories. Climate is marked by long cold winters and short cool summers. Mean annual temperature is approximately -1°C . Mean summer temperature is 12°C and mean winter temperature is -15°C . Mean annual precipitation ranges 400–500 mm. This ecoregion's forests are characterized mainly by closed, medium to tall stands of lodgepole pine. Poorly drained sites support black spruce and some white spruce. White and black spruce are also the climatic climax species in the ecoregion. The ecoregion is underlain by Cretaceous shales and sandstones with elevations ranging 760–975 m asl. The southern section is a smooth upland, whereas the northern section forms part of the wide Fort Nelson Lowland. Gray Luvisols and Dystric Brunisols with Gleysols developed on loam to clay loam textured glacial till and lacustrine deposits are the dominant soils. Organic Cryosolic soils are common on peat plateau bogs, palsa bogs and some veneer bogs, and 25–50% of the ecoregion is wetland. There is extensive discontinuous permafrost with low to medium ice content, which takes on a sporadic discontinuous pattern in the very north of the ecoregion. Characteristic wildlife includes woodland caribou, moose, lynx, grizzly and black bear, wolf, snowshoe hare, grouse, waterfowl, and some deer and elk. Principal activities include forestry, hunting, trapping, recreation, and tourism. There are no major communities in the ecoregion.

TAIGA SHIELD ECOZONE

This ecozone lies on either side of Hudson Bay. The eastern segment occupies the central part of Quebec and Labrador, and the western segment occupies portions of northern Manitoba, Saskatchewan, Alberta, and the Northwest Territories. The ecozone is largely defined by two very large biophysical features, the Taiga Forest and the Canadian Shield. The world's oldest rocks are found on the Taiga Shield north of Great Slave Lake.

Climate The subarctic climate is characterized by relatively short summers with prolonged periods of daylight and cool temperatures, and winters that are long and very cold. Mean annual temperatures range from -8°C west of Hudson Bay to 0°C in parts of Labrador. In Quebec and Labrador mean annual temperatures usually range between -1°C to -5°C . The cold south flowing Labrador current reduces the moderating effect of the Atlantic Ocean on the climate of the eastern Taiga Shield. Mean summer temperatures range between 6°C and 11°C , and mean winter temperatures range between -11°C and -24.5°C . Mean annual precipitation ranges 200–500 mm west of Hudson Bay. East of Hudson Bay it ranges 500–800 mm, except near the Labrador coast where it can locally exceed 1000 mm a year.

Vegetation The pattern is one of innumerable lakes, wetlands and open forests interwoven with shrublands and meadows more typical of the arctic tundra. The forest stands form lichen woodlands that merge into areas of open arctic tundra. It is along the northern edge of this ecozone that the latitudinal limits of tree growth are reached. Latitudinally, the central portion of the zone contains open, stunted black spruce and jack pine, accompanied by alder, willow, and tamarack in the fens and bogs. Open, mixedwood associations of white spruce, balsam fir (in the Quebec portion), trembling aspen, balsam poplar, and white birch are found on upland sites and along rivers and streams.

Landforms and Soils Most of this ecozone consists of broadly rolling terrain composed of a mosaic of uplands and associated wetlands. It is dominated by Precambrian bedrock outcrops and discontinuous hummocky and ridged morainal deposits. Some lacustrine and marine deposits are also present. A characteristic of the ecozone is the largest concentration of long, sinuous eskers in Canada. Dominating the Precambrian landscape are thousands of lakes and wetlands in glacially carved depressions. Lowlands are covered with peatlands and are commonly waterlogged or wet for prolonged periods. Permafrost is discontinuous but widespread. Brunisolic and Humo-Ferric Podzolic soils are dominant in the southern portion, and Cryosols in the northern portion with a mix of these in the latitudinal centre of the ecozone. Gleysols and Organic Cryosols occur mainly in the lowlands.

Wildlife Characteristic mammals include barren-ground caribou which migrate south to winter in the taiga forest and some woodland caribou, moose, wolf, snowshoe hare, arctic fox, beaver, black and grizzly bear, and lynx. There are about fifty species of mammals that inhabit the ecozone. The abundance of water in the Taiga Shield attracts hundreds of thousands of birds (e.g. ducks, geese, loons and swans) which come to nest or rest and feed on their way to arctic breeding grounds. Representative birds include arctic and red-throated loon, northern phalarope, northern shrike, tree sparrow, and gray-cheeked thrush. Along the marine coasts of the ecozone representative species include walrus and seal.

Land Use The total population of the ecozone is approximately 33 600. The major centres include Yellowknife, Labrador City, Uranium City, and Churchill Falls, all of which are associated with mining or hydroelectric developments. The ecozone is still an active exploration and development area for metals and diamonds. A little tourism, recreation, and forestry are the main activities. Despite almost a third of the population being found in resource towns, subsistence hunting, fishing, and trapping remain important land uses.

68. COPPERMINE RIVER UPLAND

This ecoregion extends from the McTavish Arm of Great Bear Lake to Howard Lake in the central District of Mackenzie in the Canadian Shield. It is marked by short, cool summers and very cold winters. The mean annual temperature is approximately -7.5°C . The mean summer temperature is 9°C and the mean winter temperature is -24.5°C . The mean annual precipitation ranges 200–300 mm. The ecoregion is classified as having a predominantly high subarctic ecoclimate. It is part of the tundra and boreal forest transition, where the latitudinal limits of tree growth are reached. The predominant vegetation consists of open, very stunted stands of black spruce and tamarack with secondary quantities of white spruce and a ground cover of dwarf birch, willow, ericaceous shrubs, cottongrass, lichen, and moss. Poorly drained sites usually support tussocks of sedge, cottongrass, and sphagnum moss. Low shrub tundra, consisting of dwarf birch and willow, is also common. This ecoregion includes the western half of the Bear-Slave Upland, which consists mainly of massive Archean rocks that form broad, sloping uplands, plateaus, and lowlands. The surface is typical of the bare rock parts of the Shield. Numerous lakes fill the lowlands, and rounded rocky hills reach 490 m asl in elevation. Bare rock outcrops are common, and Dystric Brunisols with some Turbic, Static, and Organic Cryosols are the dominant soils in the ecoregion. The soils have formed on discontinuous veneers and blankets of hummocky to rolling, sandy morainal, fluvioglacial, and organic deposits. Permafrost ranges from continuous in the east to extensive discontinuous in the west half of the ecoregion, with low to

moderate ice content and sparse ice wedges. Characteristic wildlife includes caribou, moose, grizzly and black bear, snowshoe hare, fox, wolf, beaver, muskrat, osprey, raven, spruce grouse, and waterfowl. Land uses include hunting and trapping, fishing, and tourism. Diamond exploration is a more recent activity along the northern boundary of the region. Principal communities include Snare Lakes and Rae Lakes. The population of the ecoregion is approximately 500.

69. TAZIN LAKE UPLAND

This ecoregion stretches north from Lake Athabasca to beyond the east arm of Great Slave Lake. It is marked by cool summers and very cold winters, and has a subhumid, high boreal ecoclimate. The mean annual temperature is approximately -5°C . The mean summer temperature is 11°C and the mean winter temperature is -21.5°C . The mean annual precipitation ranges 200–375 mm. Yellowknife, on the north shore of Great Slave Lake, has the lowest mean annual temperature of all Canadian cities (-5°C) and the lowest average nighttime winter temperature (-30°C). Vegetation in the ecoregion is characterized by medium to tall, closed stands of trembling aspen and balsam poplar with white spruce, balsam fir, and black spruce occurring in late successional stages. Poorly drained fens and bogs are covered with low, open stands of tamarack and black spruce and have localized permafrost. North of the East Arm Hills, and in the southern one-third of the ecoregion, ridged to hummocky crystalline bedrock forms broad, steeply sloping terrain. The East Arm Hills, formed of down-faulted and folded, differentially eroded sediments and gabbro sills, dip southerly, forming broad cuestas as much as 275 m above Great Slave Lake, the surface of which is about 150 m asl in elevation. The intervening valleys are flooded by arms of Great Slave and other lakes. Upland elevations are dominated by bedrock exposures with discontinuous veneers of sandy till, whereas the lowlands are covered by level to gently undulating organic deposits. The ecoregion contains numerous small lakes, often linked by fast-flowing streams that eventually drain into Great Slave Lake. Strongly glaciated rock outcrops are common, and Dystric Brunisols are the dominant soils. Significant inclusions are Turbic Cryosols on permanently frozen sites and Organic Cryosols in poorly drained, peat-filled depressions. Permafrost is extensive and discontinuous with low ice content and sparse ice wedges throughout most of the ecoregion, with the exception of the west side between Lake Athabasca and Great Slave Lake towards the Slave River. Wildlife includes moose, black bear, woodland caribou, wolf, beaver, muskrat, snowshoe hare, and spruce grouse. Land uses include limited local sawlog forestry, outdoor recreation, wildlife trapping and hunting, and fishing. Major communities include Yellowknife, Uranium City, Reliance, Rae, Edzo, and Fort Chipewyan. The population of the ecoregion is approximately 18 100.

70. KAZAN RIVER UPLAND

This ecoregion stretches westward from Seal River in Manitoba to near the East Arm Hills in the Northwest Territories. It is marked by cool summers and very cold winters. The mean annual temperature is approximately -8°C . The mean summer temperature is 8°C and the mean winter temperature is -24.5°C . The mean annual precipitation ranges from over 200 mm in the north to over 400 mm in northern Manitoba. The ecoregion is classified as having a high subarctic ecoclimate. It is part of the broad area of tundra and boreal forest transition extending from Labrador to Alaska. The predominant vegetation consists of open, very stunted stands of black spruce and tamarack with secondary quantities of white spruce, a shrub layer of dwarf birch, willow, and ericaceous shrubs, and a ground cover of cottongrass, lichen, and moss. Drier sites can be dominated by open stands of white spruce, ericaceous shrubs, and a ground cover of mosses and lichens. Poorly drained sites usually support tussock vegetation of sedge, cottongrass, and sphagnum moss. Low shrub tundra vegetation, consisting of dwarf birch and willow, is also common. Crystalline, massive Archean rocks form broad, sloping uplands and lowlands. Ridged to hummocky bedrock outcrops covered with discontinuous acidic, sandy, granitic till are characteristic. Prominent eskers and small to medium-sized lakes are common. Dystric Brunisols commonly occurring on sandy eskers are the dominant soils. Turbic Cryosolic soils are common in permanently frozen sites. Organic Cryosols are typical of

wetlands. Patterned ground is widespread, and mineral soils exhibit discontinuous or distorted soil horizon development. Permafrost is almost continuous and has low to medium ice content. It is only in the very southern margins of the ecoregion that it grades into extensive discontinuous permafrost. Ice wedges are sparse throughout. Characteristic wildlife includes barren-ground caribou, arctic fox, wolf, wolverine, weasel, otter, mink, snowshoe hare, and brown lemming. Bird species in the region include rock and willow ptarmigan, sandhill crane and waterfowl. Land use activities are limited to fishing, trapping and hunting, some recreation and tourism.

71. SELWYN LAKE UPLAND

This ecoregion extends northwest from Churchill River in Manitoba to the East Arm Hills at the eastern end of Great Slave Lake. Most of the ecoregion is above 500 m asl. At the Saskatchewan/Manitoba border the surface gently slopes towards the Hudson Plains ecozone at 150 m asl. This ecoregion is marked by cool summers and very cold winters. The mean annual temperature is approximately -5°C . The mean summer temperature is 11°C and the mean winter temperature is -21.5°C . The mean annual precipitation ranges 250–400 mm. The ecoregion is classified as having a low subarctic ecoclimate. It is part of the tundra and boreal forest transition extending from Labrador to Alaska. Black spruce is the climatic species, and open stands of low, stunted black spruce with dwarf birch and Labrador tea, and a ground cover of lichen, and moss, are characteristic. Bog–fen sequences composed of stunted black spruce, ericaceous shrubs, and mosses dominate poorly drained wetlands. Wetlands cover 25–50% of the southeastern part of the ecoregion in Manitoba. Ridged to hummocky crystalline, massive rocks that form broad, sloping uplands and lowlands are covered with discontinuous acidic, sandy tills. Significant shallow, clayey lacustrine deposits occur at lower elevations. Prominent sinuous esker ridges and lakes are common throughout the region. Permafrost is extensive and discontinuous with low to medium ice content and sporadic ice wedges throughout most of the ecoregion, but grades to sporadic discontinuous with low ice content along the southern edges. Dystric Brunisols and Organic Cryosols are the most widely distributed soil types. Gray Luvisols occur as inclusions on exposed clayey sediments. Characteristic wildlife includes barren-ground caribou, black bear, wolverine, marten, timber wolf, arctic fox, mink, snowshoe hare, and red-backed vole. Upland game birds are spruce grouse and willow ptarmigan, and other bird species include sandhill crane, waterfowl and shorebirds. Land use activities are limited to trapping and hunting, and recreation. The major communities include Wollaston Lake, Lac Brochet, and Brochet. The population of the ecoregion is approximately 1600.

72. LA GRANDE HILLS

This ecoregion extends over 450 km eastward from James Bay in northern Quebec, between the Grande rivière de la Baleine in the north and the rivière Eastmain to the south. It is marked by cool summers and very cold winters. The mean annual temperature is approximately -4°C . The mean summer temperature is 8.5°C and the mean winter temperature is -16.5°C . The mean annual precipitation ranges from less than 600 mm along Hudson Bay to 800 mm in the southeast. The ecoregion is classified as having a low subarctic ecoclimate. Its open coniferous forests are transitional to tundra and alpine tundra vegetative communities to the north and the closed cover of typical coniferous boreal forests to the south. Open stands of lichen–black/white spruce woodland with an understory of feathermoss are dominant. Black spruce is the climax species. Less rugged than Lake Plateau to the east, the southern section of Larch Plateau has a hummocky surface with elevations ranging from 150 m asl near the coast to 450 m asl in the vicinity of the Caniapiscau Reservoir in the east. This ecoregion is composed predominantly of massive Archean granites, granitic gneiss, and acidic intrusives with localized occurrences of sedimentary rock found on the coast. Hummocky and drumlinized, sandy, bouldery, morainal surface deposits dominate the upper surfaces, and deposits occur up to 70 m thick in the eastern part of the ecoregion. Dystric Brunisols are the dominant soils with significant inclusions of Humo-Ferric Podzols and Organic (Mesisol and Fibrisol) soils. Permafrost has

little to no ice content, and is limited to isolated patches, mainly wetlands. The highest concentration of wetlands occurs in the area extending 75–150 km inland from James Bay. This ecoregion provides habitat for caribou, moose, black bear, wolf, red and arctic fox, snowshoe hare, grouse, osprey, raven, and waterfowl. Hydroelectric development, hunting, and trapping are the main land use activities. The region contains the largest hydroelectric power development in Canada, the James Bay project. The project contains 5 reservoirs covering 11 900 km², an area half the size of Lake Ontario. The main communities are Chisasibi and Kuujuaarapik. The population of the ecoregion is approximately 5300.

73. SOUTHERN UNGAVA PENINSULA

This ecoregion includes Minto Lake, the Rivière aux Feuilles plateau and valley, and the Lac à l'Eau Claire plateau from Hudson Bay to near Fort-Chimo on the Koksoak River in northern Quebec. The mean annual temperature is approximately –6°C. The mean summer temperature is 6°C and the mean winter temperature is –18°C. The mean annual precipitation ranges from north to south 475–650 mm. The ecoregion is classified as having a mid to high subarctic ecoclimate. The predominant vegetation consists of open, very stunted stands of black spruce and tamarack with secondary quantities of white spruce and a ground cover of dwarf birch, willow, ericaceous shrubs, cottongrass, lichen, and moss. Poorly drained sites usually support tussocks of sedge, cottongrass, and sphagnum moss. Low shrub tundra, consisting of dwarf birch and willow, is also common. The ecoregion's northern boundary is where the limit of trees is reached in Quebec. This ecoregion includes the south–central section of Larch Plateau and Richmond Hills. Larch Plateau has a hummocky to undulating surface with elevations that reach about 500 m asl. The generally hummocky surface includes highlands in the western part of the ecoregion, where cuestas dip steeply into Hudson Bay. Coastal areas near Hudson Bay are covered by postglacial marine sediments. Massive Archean granites and gneisses are widely exposed, and thin, discontinuous veneers of glacial drift are common over most of the ecoregion's surface. Richmond Hills are mainly east-facing cuestas of Proterozoic sedimentary and volcanic rocks. A large portion of the ecoregion drains eastward to Ungava Bay via the Du Gué and Mélézes rivers, as well as westward to Hudson Bay by Petite rivière de la Baleine. Small and generally shallow lakes are numerous and cover about 20% of the ecoregion. Permafrost is extensive and discontinuous with low to medium ice content in the northern two-thirds of the ecoregion, and sporadic discontinuous in the southern one-third. The ecoregion has an undulating surface with elevations ranging 100–300 m asl. Local relief rarely exceeds 30 m. Areas near Hudson Bay on its west side are covered by postglacial marine sediments. Closer to Ungava Bay, surficial deposits include palsa bogs. A large portion of the region drains eastward to Ungava Bay via Rivière aux Feuilles. Turbic Cryosolic and Dystric Brunisolic soils with significant inclusions of Humo-Ferric Podzols, Organic Cryosols, and bare rock outcroppings are dominant in the region. Characteristic wildlife includes caribou, wolverine, snowshoe hare, fox, wolf, coyote, black bear, and waterfowl. Land uses are limited to wildlife trapping, hunting, and recreation. The total population is approximately 300.

74. NEW QUEBEC CENTRAL PLATEAU

This ecoregion in north–central Quebec is comprised of the Kaniapiskau Plateau and a large part of Lake Plateau to the south and east. It is marked by cool summers and very cold winters. The mean annual temperature is approximately –4.5°C. The mean summer temperature is 8.5°C and the mean winter temperature is –18°C. The mean annual precipitation ranges from 600 mm in the north to 900 mm in the south. The ecoregion is classified as having a predominantly mid to low subarctic ecoclimate. It is characterized by open (less than 50% cover) stands of black spruce, dwarf birch, northern Labrador tea, and lichens. The shrub component usually comprises about 50% of the ground cover. Vegetative cover is reduced on colder, dry sites; poorly drained sites support Labrador tea, sedge, and sphagnum moss. Kaniapiskau Plateau forms the core of Lake Plateau and is composed of rugged hills of massive granulite and charnockite Archean rocks in which fracture systems are conspicuously etched. Portions of the plateau

reach elevations of 915 m asl. Its eastern border forms an escarpment overlooking Labrador Hills, but elsewhere its surface merges with Lake Plateau, sloping north and west from over 750 m asl to 350 m asl. Sporadic discontinuous permafrost with low ice content is prevalent throughout the northern and southeastern parts of the ecoregion. Only isolated patches are present in the southwest. Bare rock outcroppings are common and Dystric Brunisols and Turbic Cryosols with Organic Cryosols are the dominant soils in the ecoregion. Characteristic wildlife includes caribou, wolverine, snowshoe hare, fox, wolf, coyote, black bear, and waterfowl. Land uses are limited to wildlife trapping and hunting, recreation, and tourism. There are no major communities, and the population of the ecoregion is approximately 50.

75. UNGAVA BAY BASIN

This ecoregion extends northward from Schefferville to the mouth of the Rivière aux Feuilles at Ungava Bay and encompasses most of the Labrador Hills in northeastern Quebec. It is marked by cool summers and very cold winters. The mean annual temperature is approximately -4.5°C . The mean summer temperature is 8.5°C and the mean winter temperature is -16°C . The mean annual precipitation ranges 300–400 mm around Ungava Bay to 750 mm in the south of the ecoregion. The ecoregion is classified as having a mid to high subarctic ecoclimate. It is dominated by open to very open (less than 50% cover) stands of black spruce, dwarf birch, northern Labrador tea, and lichens. The shrub component usually comprises about 50% of the ground cover. Vegetative cover is reduced on dry sites; poorly drained sites support open black spruce, Labrador tea, sedge, and sphagnum moss. Vegetative cover becomes more sparse and more open as it approaches Ungava Bay. The Labrador Hills are composed of folded Precambrian sedimentary and volcanic rocks. Their surfaces are in the form of sinuous ridges and valleys formed by down-warped, folded, and faulted strata. Summit elevations range from about 730 m asl in the south and central parts to about 360 m asl in the northern part. Valleys are generally floored with tills, drumlins, and sands. The Rivière à la Baleine lowlands to the east are a broad, irregular, drift-covered old erosion surface composed of massive granites and gneisses, with ridges and hills ranging from 150 m asl in the north to about 600 m asl in the south. Glaciation has resulted in a rolling, morainal plain with numerous lakes. Hummocky and drumlinized upper surfaces of the ecoregion are covered by thick deposits of glacial sediments. Drumlins and ribbed moraines are common. Depressions are partly filled with peat accumulations. Rock outcrops are common, and Dystric Brunisols and Turbic Cryosols are the dominant soils in the ecoregion. Significant inclusions are Humo-Ferric Podzols, Mesisols, and Organic Cryosols. Sporadic discontinuous permafrost with medium ice content is present over most of the ecoregion, mainly in wetlands. Around Ungava Bay there is extensive discontinuous permafrost with sparse ice wedges. The ecoregion provides habitat for caribou, small mammals, waterfowl, and other birds. Resources and the region's physiography provide opportunities for hunting and trapping, and outdoor recreation. Major communities include Schefferville, Tasiujaq, and Kuujuaq. The population of the ecoregion is approximately 2700.

76. GEORGE PLATEAU

This ecoregion takes in the hilly highlands surrounding the George River, which drains into Ungava Bay in northeastern Quebec. The mean annual temperature is approximately -5°C . The mean summer temperature is 5.5°C and the mean winter temperature is -15.5°C . The mean annual precipitation ranges from 400 mm in the north to 700 mm in the south. The ecoregion is classified as having a mid to high subarctic ecoclimate. The predominant vegetation consists of open (approximately 25% tree cover), very stunted stands of black spruce and tamarack with secondary quantities of white spruce and a ground cover of dwarf birch, willow, ericaceous shrubs, cottongrass, lichen, and moss. Poorly drained sites usually support tussocks of sedge, cottongrass, and sphagnum moss. Low shrub tundra, consisting of dwarf birch and willow, is also common. The general aspect of this ecoregion is that of a broken old erosion surface composed of massive Archean granites, granitic gneiss, and acidic intrusives. Glaciation has resulted in a rolling, morainal upland. Hummocky, drumlinized upper surfaces are covered by discontinuous, bouldery, sandy morainal veneers,

and peat accumulations partly fill depressions. In the north of the ecoregion, below the marine submergence limit, the upper sandy layer is often reworked. In the south, deep sandy terraces occur in the valleys. Bare acidic rock outcrops are prominent in this ecoregion, and significant soil inclusions are Lithic Regosols, Dystric Brunisols, Humo-Ferric Podzols, and Turbic and Organic Cryosols. Permafrost is extensive and discontinuous with low to medium ice content and sparse ice wedges, and becomes more continuous along the western edge of the ecoregion. This ecoregion provides important habitat for caribou and small mammals. Hunting, trapping, and outdoor recreation are important land use activities. The main community is Kangiqsualujjuaq. The population of the ecoregion is approximately 500.

77, 81. KINGURUTIK–FRASER RIVERS

This ecoregion includes the southern continental tundra covering the George Plateau and several other mountainous outcrops, including the Mealy Mountains (81), south of Lake Melville. It is marked by cool summers and very cold winters. The mean annual temperature is approximately -4°C . The mean summer temperature is 6.5°C and the mean winter temperature is -15°C . The mean annual precipitation ranges from 600 mm in the east up to 800 mm in the west. In the Mealy Mountains the maritime influence provides a slightly warmer and more moist climate; precipitation can exceed 1000 mm annually and temperatures are approximately 2°C higher. This ecoregion is classified as having a high subarctic ecoclimate. It is part of an old erosion surface that is composed of massive Archean granites, granitic gneiss, and acidic intrusives. Hummocky and drumlinized upper surfaces are covered by discontinuous, bouldery, sandy morainal veneers. Significant soil inclusions are Ferro-Humic Podzols, Organic Mesisols, and Turbic and Organic Cryosols. Permafrost is extensive and discontinuous with low to moderate ice content in the northern third of the ecoregion, and grades southward to a sporadic discontinuous pattern near the Smallwood Reservoir. Continuous vegetation occurs only in depressions where snow accumulates and provides moisture throughout the growing season. Shallow fen palsas with permanently frozen peat in the control section occupy rounded and fluted microtopography on the plateau. Bare rock and tundra, and alpine heath of lichens, mosses, and sedges, each comprise about 50% of the upper surfaces. White birch/willow thickets growing on less stable scree frequently form a transition zone between tundra and very open spruce forests. Dwarf, open black spruce, dwarf mixed evergreen deciduous shrubs, and moss are dominant on bogs and poorly drained sites. This ecoregion provides important habitat for caribou, small mammals, waterfowl, and other birds. Resources provide opportunities for hunting and trapping, and recreation.

78. SMALLWOOD RESERVOIR–MICHIKAMAU

The largest part of this ecoregion lies east and south of the Smallwood Reservoir, spanning the Labrador–Quebec boundary in southwestern Labrador. The second part extends across central Labrador from the Smallwood Reservoir in the west to Postville near the Coastal Barrens ecoregion. This ecoregion is marked by cool summers and very cold winters. The mean annual temperature is approximately -3.5°C . The mean summer temperature is 9°C and the mean winter temperature is -16°C . The mean annual precipitation ranges from 700 mm in the north to 1000 mm along the Quebec/Labrador border in the south. The ecoregion is classified as having a low subarctic ecoclimate. Its open coniferous forests are transitional, both to tundra and alpine tundra vegetation communities to the north, and to the closed cover of typical coniferous boreal forests to the south. Open stands of lichen–black/white spruce woodland with an understory of feathermoss, are dominant. The general aspect of the region is that of a rolling plain with numerous lakes and isolated rugged hills composed of Archean granites, gneisses, and acidic intrusives that stand about 150 m above the general surface. Humo-Ferric Podzolic soils are dominant with significant inclusions of Ferro-Humic Podzols, Mesisols, and Organic Cryosols. Permafrost occurs in isolated patches, mainly in wetlands. This ecoregion provides habitat for caribou, moose, small mammals, waterfowl, and other birds. Hunting, trapping, fishing, and outdoor recreation are the principal land use activities. Postville is the main community. The population of the ecoregion is approximately 200.

79. COASTAL BARRENS

This ecoregion in Labrador forms a coastal strip of exposed headlands, sheltered inlets, and islands from Napaktok Bay south to the Strait of Belle Isle. The climate of the region is influenced by the Atlantic Ocean and is characterized by relatively short, cool, and moist summers and long, very cold winters. The mean annual temperature is approximately -3.5°C . The mean summer temperature is 7°C and the mean winter temperature is -13.5°C . The mean annual precipitation ranges from 600 mm near the Okak Islands in the north to 800 mm around Groswater Bay. South of Groswater Bay precipitation increases to over 1000 mm annually. The ecoregion is classified as having an Atlantic low subarctic ecoclimate. A low, closed to open white spruce forest with a moss understory is generally found on moist, sheltered, upper and lower valley slopes. However, coastal heath dominates the ecoregion along headlands and ridges. Cliff summits are mostly exposed bedrock with mosses and lichens limited to small cracks and sheltered lee slopes. Frequent forest fires commonly reduce woodlands to scrubland dominated by alder, dwarf birch, and Labrador tea. Salt marshes or plateau bogs are common on large marine terraces. Composed of massive Archean granites, granitic gneiss, and acidic intrusives, this ecoregion includes steep-sided, rounded mountains with deeply incised U-shaped valleys and fjords extending well inland along the Labrador Sea coast. Discontinuous, sandy, bouldery morainal veneers dominate its surfaces. Steep slopes covered with talus and associated colluvial fans extend to valley floors. Morainal deposits interspersed with marine deposits of varying thickness and alluvial and fluvio-glacial material form a mantle on larger valley floors and inlets. Moraines are more continuous in the south. Scattered sizable bogs occur south of Davis Inlet, and salt marshes are common on large marine terraces. Acidic rock outcrops are prominent, and significant soil inclusions are Humo-Ferric Podzols and Ferro-Humic Podzols, Regosols, and Turbic and Organic Cryosols. Permafrost is sporadic. The shore and islands south of Groswater Bay provide habitat for caribou. The region forms part of the Atlantic migratory flyway and provides important habitat for seabird colonies, as well as seal whelping areas. Land use activities include hunting, trapping, and outdoor recreation. Small coastal settlements provide bases for fishing, and oil and mineral exploration. The main communities include Nain, Makkovik, Hopedale, Cartwright, Davis Inlet, and Voisey's Bay, the site of one of the largest nickel deposits in Canada. The population of the ecoregion is approximately 3500.

80, 83, 86. MECATINA RIVER

The major part of this ecoregion (86) spans the southern Labrador border with Quebec and extends northwest to the southern boundary of the Smallwood Reservoir. It contains the headwaters of the Alexis River and lies south of the vast bog terrain of the Eagle Plateau. The two smaller but separate areas of the ecoregion lie north (80) and west (83) of Lake Melville. The mean annual temperature is approximately -1°C for the ecoregion; it ranges between -2°C and -3°C in the areas north and west of Lake Melville. The mean summer temperature for the ecoregion is 10°C , and the mean winter temperature is -13°C . Mean annual precipitation increases from north to south in the range of 800–1000 mm. The ecoregion is classified as having a low subarctic ecoclimate. The predominant vegetation includes low, open and sometimes closed cover patches of black spruce with an understory of dwarf birch, Labrador tea, lichens, and mosses. The forests in this ecoregion are transitional, both to tundra and alpine tundra vegetative communities to the north, and to the closed cover of typical coniferous boreal forests to the south. Black spruce is the climatic climax species in this ecoregion, trembling aspen reaches its northern limit, and balsam fir is restricted to rare sites of medium-textured materials. This ecoregion is composed of massive Archean granites, granitic gneisses, and acidic intrusives. It is rough and undulating and rises to elevations of about 215–600 m asl. The surface is covered with sandy morainal deposits of variable thickness. Fluvio-glacial deposits are sporadically distributed in the form of eskers and river terraces. Humo-Ferric Podzolic soils are dominant with significant inclusions of Ferro-Humic Podzols, Dystric Brunisols, Organic Fibrisols and Mesisols, and Organic Cryosols in wetlands. Permafrost occurs in isolated patches, mainly in wetlands. The region is only slightly affected by the Atlantic Ocean and provides habitat for caribou, moose, black bear, red fox, lynx,

other small mammals, waterfowl, and other birds. Land use activities include hunting, trapping, and outdoor recreation. The principal community is Churchill Falls. The population of the ecoregion is approximately 800.

82. EAGLE PLATEAU

This ecoregion occurs south of Lake Melville and the Mealy Mountains in southern Labrador. The climate is continental and is not affected by the Atlantic Ocean. The mean annual temperature is approximately 1°C. The mean summer temperature is 8.5°C and the mean winter temperature is -11°C. The mean annual precipitation ranges 900–1150 mm. The ecoregion is classified as having a low subarctic ecoclimate. Extensive string bogs with much open water dominate this ecoregion (25–50%). Open pools are surrounded by fen vegetation, dominated by sedges, brown mosses, and sphagnum mosses. String bogs are dominated by open, dwarf black spruce, some tamarack, Labrador tea, and feathermoss. Low, open and sometimes closed cover patches of black spruce with an understory of dwarf birch, Labrador tea, lichens, and mosses are found only on bedrock-controlled slopes approaching the Mealy Mountains. Black spruce is the climax species. Alder thickets are common along riverbanks and drainageways. This ecoregion is basically a level to gently undulating peatland area interrupted only by a few conspicuous eskers, exposed bedrock highs, and shallow rivers. Underlain by massive Archean granites, gneisses, and acidic intrusives, the surface is thinly covered by hummocky, bouldery, sandy morainal veneers. Mesisols and Fbrisols are the dominant soils with significant inclusions of Ferro-Humic Podzols, Dystric Brunisols, and Organic Cryosols. Permafrost is sporadically distributed, and occurs mainly in peatlands. This ecoregion provides habitat for caribou, moose, black bear, red fox, lynx, and waterfowl. Opportunities exist for hunting, trapping, salmon fishing, and water-oriented recreation.

84. WINOKAPAU LAKE NORTH

This is a small elongated ecoregion extending northeast from Winokapau Lake and bordering the western extensions of the Lake Melville ecoregion (105). It is marked by cool summers and very cold winters. The mean annual temperature is approximately -2.5°C. The mean summer temperature is 9.5°C and the mean winter temperature is -15.5°C. The mean annual precipitation ranges 700–900 mm. The ecoregion is classified as having a low subarctic ecoclimate. Its forests are transitional, both to tundra and alpine tundra vegetative communities to the north, and to the closed cover of typical coniferous boreal forests to the south. Open stands of lichen-black/white spruce woodlands are dominant. Black spruce is the climatic climax species, and trembling aspen reaches its northern limit in this ecoregion. Balsam fir is restricted to rare medium-textured sites. The ecoregion is primarily a rolling plain of exposed bedrock with numerous lakes. Some isolated rugged hills stand above the general surface with elevations ranging 310–650 m asl. Composed of exposed massive Archean granites, granitic gneiss, and acidic intrusives, a sparse cover of hummocky, discontinuous morainal veneers dominates the upper surfaces of the ecoregion. Bare bedrock outcroppings are common, and Humo-Ferric Podzols are the dominant soils with significant inclusions of Ferro-Humic Podzols, Mesisols, and Organic Cryosols. Permafrost is found in isolated patches with low ice content, mainly in wetlands. This ecoregion provides habitat for caribou, small mammals, waterfowl, and other birds. Land use activities include hunting and trapping, fishing, and outdoor recreation.

85. GOOSE RIVER WEST

This ecoregion occurs west of Lake Melville in southern Labrador. The climate is continental and is not affected by the Atlantic Ocean. The mean annual temperature is approximately -3.5°C . The mean summer temperature is 9.5°C , and the mean winter temperature is -16.5°C . The mean annual precipitation ranges 750–1000 mm. The ecoregion is classified as having a low subarctic ecoclimate. The predominant vegetation consists of low, open and sometimes closed cover patches of black spruce with an understory of dwarf birch, Labrador tea, lichens, and moss. Balsam fir occurs only on moist slopes. Black spruce is the climax species. Frequent fires commonly reduce the tree cover to scrubland, dominated by dwarf birch, ericaceous shrubs, and lichens. Exposed rocky positions tend to be lichen-covered. This ecoregion is basically an undulating to dissected plain, where broad river valleys and rolling hills may range in elevation 365–600 m asl. Underlain by massive Archean granites, gneisses, and acidic intrusives, its surface is covered by hummocky to drumlinized, sandy morainal deposits of variable thickness. Fluvioglacial kames and terraces occupy many of the valley floors. Peatlands dominate poorly drained areas. Humo-Ferric Podzols are the dominant soils with significant inclusions of Ferro-Humic Podzols, Dystric Brunisols, Organic Fibrisols, and Organic Cryosols. Permafrost is found in isolated patches, mainly in peatlands. This ecoregion provides habitat for caribou, moose, black bear, red fox, and lynx. Land use activities include hunting, trapping, and outdoor recreation.

BOREAL SHIELD ECOZONE

The largest ecozone, the Boreal Shield, is a broad, U-shaped zone that extends from northern Saskatchewan east to Newfoundland, passing north of Lake Winnipeg, the Great Lakes, and the St. Lawrence River. The Boreal Shield still presents the dominant image of an endless stretch of trees, flashing waters, and bedrock. Despite the fact that highways, railroads, and airports have made much of this ecozone accessible, there is still much that remains in a wilderness condition.

Climate Generally this ecozone has a strongly continental climate characterized by long cold winters and short warm summers but is modified by maritime conditions in its coastal margins in Atlantic Canada. The mean annual temperature ranges between -4°C in northern Saskatchewan to 5.5°C in the Avalon Peninsula of Newfoundland. Mean summer temperatures generally range between 11°C to 15°C with the exception of a few areas in Labrador and western Newfoundland. Mean winter temperatures range between -20.5°C in the west to -1°C in the east. Mean annual precipitation 400 mm in northern Saskatchewan to 1000 mm in eastern Quebec and Labrador. The maritime influence on Newfoundland results in a higher level of precipitation ranging 900–1600 mm. The Great Lakes also have a moderating effect on the climate of Boreal Shield areas of central Ontario, warming them in winter and cooling in summer.

Vegetation Over 80% forested, the ecozone is represented by closed stands of conifers, largely white and black spruce, balsam fir, and tamarack. Towards the south, there is a wider distribution of broadleaf trees, such as white birch, trembling aspen, and balsam poplar, and needle-leaf trees, such as white, red, and jack pine. Throughout the contrasting areas of exposed bedrock, this mosaic of soils and rock tends to be covered with a range of communities, dominated by lichens, shrubs, and forbs.

Landforms and Soils The ecozone is dominated by broadly rolling mosaic of uplands and associated wetlands. Precambrian granitic bedrock outcrops interspersed with ridged to hummocky, deposits of glacial moraine, fluviglacial material (including numerous eskers), and colluvium are characteristic of its surface materials. Soils range from Humo-Ferric Podzols in the south to Brunisols in the north. Luvisols are found in limited areas of finer textured silts and clays. Like the Taiga Shield ecozone to the north, the landscape of the Boreal Shield ecozone is dotted with numerous small to medium-sized lakes. Peatlands with Organic

soils are common in wetland areas and are particularly extensive in central Manitoba, northwest Ontario, and Newfoundland. The zone includes the headwaters of numerous large drainage basin systems, such as the Nelson/Churchill rivers in Manitoba, the St. Lawrence River in Ontario, the Eastmain, Rupert, Nottaway and Broadback rivers in Quebec.

Wildlife Characteristic mammals include woodland caribou, white-tailed deer, moose, black bear, raccoon, marten, fisher, striped skunk, lynx, bobcat, and eastern chipmunk. Representative birds include boreal and great horned owl, common loon, yellow rumped warbler, blue jay, and evening grosbeak.

Human Activities The total population of the ecozone is approximately 2 832 000 which is roughly 11.5% of Canada's population. Almost 60% live in larger urban centres, including St. John's, Chicoutimi, Rouyn-Noranda, Timmins, Sudbury, Thunder Bay, Sault Ste. Marie, and Flin Flon. These towns have developed around the rich natural resource base of the ecozone. Mining, forestry, hydropower, water-oriented recreation and tourist attractions, along with commercial and subsistence hunting, trapping, and fishing are the principal activities. Agriculture is limited to the few areas where the soil quality and microclimate are suitable. In terms of employment, the service, public administration and, wholesale and retail sectors account for close to 60% of employment in the zone.

87. ATHABASCA PLAIN

This ecoregion extends south from Lake Athabasca to Cree Lake in northwestern Saskatchewan, and is roughly coincident with the flat-lying Proterozoic sandstones. It is marked by short cool summers and very cold winters. The mean annual temperature is approximately -3.5°C . The mean summer temperature is 12°C and the mean winter temperature is -20.5°C . The mean annual precipitation ranges 350–450 mm. This ecoregion is classified as having a subhumid high boreal ecoclimate. It forms part of the continuous coniferous boreal forest that extends from northwestern Ontario to Great Slave Lake in the Northwest Territories. Stands of jack pine with an understory of ericaceous shrubs and lichen are dominant. Some paper birch, white spruce, black spruce, balsam fir, and trembling aspen occur on warmer, south-facing sites. Forest fires are common in this ecoregion, and most coniferous stands tend to be young and stunted. Bedrock exposures have few trees and are covered with lichens. Permafrost occurs sporadically throughout the ecoregion. The plain is covered with undulating to ridged fluvioglacial deposits and sandy, acidic till. Sandy Dystric Brunisols are dominant, whereas Organic Fibrisols and Organic Cryosols are associated with peat plateaus, palsas and organic veneers. Wetlands are extensive in the western third of the ecoregion. Local areas of eolian sandy Regosols occur along the southern shore of Lake Athabasca. The plain slopes gently and drains northwestward via Lake Athabasca, Slave River, and a network of tributary secondary streams and drainageways. Small to medium-sized lakes are more numerous to the northeast. Wildlife includes moose, black bear, woodland caribou (important winter range), lynx, wolf, beaver, muskrat, snowshoe hare, waterfowl (including ducks, geese, pelicans, sandhill cranes), grouse, and other birds. Resources in the southern section of the ecoregion are used for local sawlog forestry. Trapping, hunting, fishing, and industrial activities associated with uranium mining are the dominant uses of land in this ecoregion. Stony Rapids and Cree Lake are the main communities. The population of the ecoregion is approximately 1100.

88. CHURCHILL RIVER UPLAND

This ecoregion is located along the southern edge of the Precambrian Shield in north-central Saskatchewan and Manitoba. It is marked by cool summers and very cold winters. The mean annual temperature is approximately -2.5°C . The mean summer temperature is 12.5°C and the mean winter temperature is -18.5°C . The mean annual precipitation ranges 400–500 mm. This ecoregion is classified as having a subhumid high boreal ecoclimate. It forms part of the continuous coniferous boreal forest that extends from

northwestern Ontario to Great Slave Lake in the southern Northwest Territories. The predominant vegetation consists of closed stands of black spruce and jack pine with a shrub layer of ericaceous shrubs and a ground cover of mosses and lichens. Black spruce is the climatic climax species. Depending on drainage, surficial material and local climate, trembling aspen, white birch, white spruce, and to a lesser extent balsam fir, occupy significant areas, especially in the eastern section. Bedrock exposures have fewer trees and are covered with lichens. Closed to open stands of stunted black spruce with ericaceous shrubs and a ground cover of sphagnum moss dominate poorly drained peat-filled depressions. Permafrost is distributed throughout the ecoregion, but is only widespread in organic deposits. Although local relief rarely exceeds 25 m, ridged to hummocky, massive Archean rocks form steeply sloping uplands and lowlands. Small to large lakes, comprising 30–40% of the ecoregion drain northeastward via the Churchill, Nelson and Seal river systems. In the western part of the ecoregion, uplands are covered with discontinuous sandy acidic tills, whereas extensive thin clayey lacustrine deposits, and locally prominent, sandy fluvioglacial uplands, are common in the eastern section. Exposed bedrock occurs throughout the ecoregion and is locally prominent. Dystric and Eutric Brunisols are associated with sandy uplands, whereas Gray Luvisols occur on clayey lacustrine uplands and loamy to silty fluvioglacial deposits. On level and in depressional areas, Gleysolic soils are associated with clayey sediments, whereas Mesisols and Organic Cryosols are associated with shallow to deep peatlands. A pulpwood and dimension lumber industry operates to a limited extent in the southern part of the ecoregion. Wildlife includes barren-ground caribou, moose, black bear, lynx, wolf, beaver, muskrat, snowshoe hare and red-backed vole. Bird species include raven, common loon, spruce grouse, bald eagle, gray jay, hawk owl, and waterfowl, including ducks and geese. Trapping, hunting, fishing, and tourism are the dominant uses of land in this region. The major communities include Flin Flon and La Ronge. The population of the ecoregion is approximately 28 000.

89. HAYES RIVER UPLAND

This ecoregion lies northeast of Lake Winnipeg and extends east into northwestern Ontario. It is marked by cool summers and very cold winters. The mean annual temperature is approximately -4°C . The mean summer temperature is 11.5°C and the mean winter temperature is -20°C . The mean annual precipitation ranges from 400 mm in the northwest to 600 mm in the southeast. This ecoregion is classified as having a subhumid high boreal ecoclimate. Black spruce is the climatic climax tree species, but stands consist predominantly of medium to tall, closed stands of black spruce and jack pine with some paper birch. The shrub layer is dominated by ericaceous shrubs, willow, and alder. The ground cover consists of mosses and lichens, low ericaceous shrubs, and some herbs. Depending on drainage, surficial material, and local climate, trembling aspen, white birch, white spruce and to a lesser extent balsam fir, occupy significant areas, especially in the southern section. Bedrock exposures have fewer trees and are covered with lichens. Closed to open stands of stunted black spruce with ericaceous shrubs and a ground cover of sphagnum moss dominate poorly drained peat-filled depressions. Permafrost is found throughout the ecoregion, but is only widespread in organic deposits. Archean granites and gneisses form locally steeply-sloping uplands. Upland surfaces are covered with discontinuous deposits of ridged to hummocky till in the southern section and with calcareous, loamy till in the northern section. Thin clayey lacustrine deposits cover a large part of the till deposits, especially in low-lying areas. These lacustrine deposits are, in turn, often overlain by shallow to deep peat materials. Fluvioglacial moraines and eskers are locally prominent. Gray Luvisols are associated with upland clayey lacustrine and, to some extent, loamy till deposits. However, Eutric Brunisols are dominant on calcareous loamy till and calcareous sandy deposits, whereas Dystric Brunisols are associated with noncalcareous fluvioglacial materials. The dominant peatland soils are Mesisols and Organic Cryosols. Many small, rock-bound lakes and medium to large lakes, linked by the primary drainageways of the Nelson, Stupart, Hayes, and Gods rivers are a prominent feature of this ecoregion. Wildlife in the ecoregion includes wolf, lynx, otter, marten, beaver, moose, black bear, woodland caribou, snowshoe hare, red squirrel, short-tailed weasel, red-backed vole, and least chipmunk. Bird species found in the region include spruce grouse which is an important upland game bird, sharp-tailed grouse, willow ptarmigan, common nighthawk, raven, gray jay, bald eagle, hawk owl, and numerous passerine and waterfowl species. Wildlife trapping and hunting, water-oriented recreation and tourism are the dominant uses of the land.

Some pulpwood and local sawlog forestry occur in the southern section. The major communities include Thompson, Norway House, Sandy Lake, Gillam, and Gods Lake Narrow. The population of the ecoregion is approximately 33 800.

90. LAC SEUL UPLAND

This ecoregion extends eastward from Lake Winnipeg in Manitoba to the Albany River in northwestern Ontario. It is marked by warm summers and very cold winters. The mean annual temperature is approximately 0.5°C. The mean summer temperature is 14°C and the mean winter temperature is -14.5°C. The mean annual precipitation ranges from 450 mm in the northwest to 700 mm in the southeast. This ecoregion is classified as having a subhumid mid-boreal ecoclimate. The dominant land cover is coniferous forest with some limited areas of mixed forest. Characteristic vegetation includes white spruce, balsam fir, and black spruce with some trembling aspen and balsam poplar, although jack pine and black spruce are more common on moderately well- to imperfectly drained sites. Poorly drained areas are covered by fens and bogs and are dominated by black spruce. Wetlands cover over 25% of the ecoregion. The ecoregion is underlain with acidic, crystalline, Archean bedrock of the Canadian Shield that forms broadly sloping uplands and lowlands. Hummocky bedrock outcrops covered with discontinuous acidic, sandy, granitic tills dominate the landscape. However, portions of the central part of the ecoregion are dominated by undulating glaciolacustrine deposits with occasional hummocky bedrock ridges and knolls. Dystric Brunisolic soils are dominant, and Gray Luvisolic and Gleysolic soils occur on finer glaciolacustrine sediments. The western portion of the ecoregion is rockland-dominated with organic Mesisols and Fbrisols occurring to a lesser extent. Wildlife includes wolf, lynx, ermine, fisher, mink, moose, black bear, woodland caribou, red squirrel and snowshoe hare. Bird species include the spruce grouse, herring gull, and double-crested cormorant, as well as bald eagle, great horned owl, red-tailed hawk, and waterfowl. Forestry, recreation, and hunting are the major land uses in this region. The main communities include Red Lake and Sioux Lookout. The population of the ecoregion is approximately 18 400.

91. LAKE OF THE WOODS

This ecoregion extends from the south end of Lake Winnipeg to the east side of Rainy Lake on the Canada-United States border. It is more closely identified with the warmer, more humid southeastern mixed forest region, than with the colder, drier boreal regions to the north. It is marked by warm summers and cold winters. The mean annual temperature is approximately 1.5°C. The mean summer temperature is 15°C and the mean winter temperature is -13°C. The mean annual precipitation ranges from 500 mm in the western portion, to 700 mm in the east. Characteristic vegetation includes a succession from trembling aspen, paper birch, and jack pine to white spruce, black spruce, and balsam fir. Warmer portions of the ecoregion support red and eastern white pine. Cooler and wetter sites support black spruce and tamarack. This is the western limit in Canada for red and eastern white pine. The ecoregion is underlain by massive, crystalline, acidic, Archean bedrock, forming hummocky, broadly sloping uplands and lowlands. Lacustrine deposits forming level to undulating clay plains occur in lowlands. The ecoregion is also interspersed with areas of fluvio-glacial outwash deposits. Bare rock outcrops are common, and Dystric Brunisols are the dominant soil on sandy morainal veneers and blankets. Significant inclusions are Mesisolic and Fbrisolic Organic soils and Gray Luvisolic soils on exposed clay deposits. The extent of wetlands is variable, being most extensive in the vicinity of Lake of the Woods. Treed bowl bogs and peat margin swamps are the predominant wetland forms. Forestry, recreation, and hunting are the major land uses in this region. Characteristic wildlife includes moose, black bear, wolf, lynx, snowshoe hare, and woodchuck. Bird species include ruffed grouse, hooded merganser, pileated woodpecker, bald eagle, turkey vulture, herring gull, and waterfowl. Forestry, recreation, and hunting are the major land uses in this region. Major communities include Kenora and Dryden. The population of the ecoregion is approximately 52 700.

92. RAINY RIVER

This ecoregion is very limited in extent near the international border, lying between the Lake of the Woods and Rainy Lake in Ontario. It correlates with the Northern Minnesota Wetlands Ecoregion in the United States. It is marked by warm, moist summers and cold winters. The mean annual temperature is approximately 2°C. The mean summer temperature is 15.5°C and the mean winter temperature is -12.5°C. The mean annual precipitation ranges 600–700 mm. This mixed forest includes a succession from trembling aspen, paper birch, and jack pine to white spruce, black spruce, and balsam fir. Warmer portions of the ecoregion support red and sugar maple, and white pine. The ecoregion takes in a portion of the Severn Upland, which is underlain by massive, crystalline, acidic, Archean bedrock that forms broad, sloping uplands and lowlands. Bedrock outcroppings and Dystric Brunisols occur on ridged to hummocky, discontinuous, sandy morainal deposits on uplands. Lowlands are covered by rock-bound lakes, fine, carbonate-rich sediments, and deep organic deposits. Significant inclusions are Mesisols, Fibrisols, and clayey Gray Luvisols. Wetlands are widespread and characterized by bowl bogs that are treed and often surrounded by peat margin swamps. Characteristic wildlife includes moose, black bear, wolf, lynx, snowshoe hare, and woodchuck. Bird species include the pileated woodpecker, hooded merganser, and other waterfowl. The major land uses are forestry, water-oriented recreation, and tourism. Over 30% of the ecoregion is in mixed farming or grazing. The major community is Fort Frances. The population of the ecoregion is approximately 16 800.

93. THUNDER BAY–QUETICO

This ecoregion extends westward from Thunder Bay to Sioux Lookout and Rainy Lake in northwestern Ontario. It is marked by warm summers and cold winters. The mean annual temperature is approximately 1°C, but can rise up to 2°C near Lake Superior. The mean summer temperature is 14°C and the mean winter temperature is -13°C. The mean annual precipitation ranges 700–800 mm. This ecoregion is classified as having a moist low boreal ecoclimate. The dominant vegetation is a combination of coniferous and mixed forests with coniferous forests dominant in the western portion of the ecoregion. Characteristic species of the coniferous forests are white spruce, balsam fir, and eastern white pine. Subdominant species include trembling aspen, paper birch, and jack pine. Warmer sites, dominated by mixed forests, are characterized by red and sugar maple, and yellow birch. Warmer and drier sites are dominated by jack and red pine, and paper birch. Poorly drained sites are characterized by black and white spruce, balsam fir, tamarack, eastern red cedar, and willow. The ecoregion is underlain by massive, crystalline, acidic, Archean bedrock forming hummocky, broadly sloping uplands and lowlands. It includes southern Port Arthur Hills, formed of Proterozoic sills and sediments tilted to the south, forming dissected cuestas and ridges. Sandy fluvioglacial and clayey lacustrine deposits occur throughout. Small to medium-sized rock-bound lakes are more numerous in its western section, and many are linked by bedrock-controlled networks of streams and drainageways flowing westward into the Lake of the Woods. Bedrock outcroppings are common, and Dystric Brunisols are the dominant soils on discontinuous, sandy morainal deposits in the uplands. Significant inclusions are Gray Luvisols on the fine-textured sediments and Mesisols and Fibrisols on peat-covered, poorly drained lowlands. Characteristic wildlife includes moose, black bear, lynx, snowshoe hare, wolf, and white-tailed deer. Bird species abound, including the American black duck, wood duck, hooded merganser, and pileated woodpecker. Major land uses include forestry, water-oriented recreation, and tourism. There is mixed farming in the southeast near Thunder Bay. The major communities include Thunder Bay and Atikokan. The population of the ecoregion is approximately 135 800.

94. LAKE NIPIGON

This ecoregion surrounds Lake Nipigon and extends westward from the north shore of Lake Superior to Lake St. Joseph in northwestern Ontario. The ecoregion is marked by warm summers and cold, snowy winters. The mean annual temperature is approximately 1.5°C. The mean summer temperature is 14°C and the mean winter temperature is -13°C. The mean annual precipitation ranges 700–800 mm. The dominant vegetation is mixed forest, characterized by stands of white and black spruce, balsam fir, jack pine, trembling aspen, and paper birch. Dry sites are dominated by jack pine with secondary quantities of black spruce. In warmer locations, red and white pine occur. Wet sites contain tamarack and black spruce with a ground cover of moss and lichen. Wetlands are prevalent along the west and north shores of Lake Nipigon. This ecoregion is underlain by the acidic, Archean bedrock of the Canadian Shield. Hummocky bedrock outcrops covered with thin acidic morainal deposits and fluvial and lacustrine silts and sands dominate the landscape. Dystric Brunisolic soils dominate the western half, and Humo-Ferric Podzolic soils dominate the eastern half of the ecoregion. Significant inclusions are Gleysolic, Fibrisolic, Mesisolic, and Gray Luvisolic soils on limited areas of finer-textured deposits, some of which are peat-covered. Characteristic wildlife includes moose, black bear, lynx, snowshoe hare, wolf, and caribou. Bird species include the sharp-tailed grouse, American black duck, and wood duck. Forestry, mining, and recreation are the major land uses in this ecoregion. The main communities include Nipigon and Geraldton. The population of the ecoregion is approximately 22 550.

95. BIG TROUT LAKE

This ecoregion extends eastward from Manitoba to the north-central portion of Ontario. It is marked by cool summers and cold winters. The mean annual temperature is approximately -2°C. The mean summer temperature is 12.5°C and the mean winter temperature is -17°C. The mean annual precipitation ranges from 550 mm in the northeast to 775 mm in the southeast. The ecoregion is classified as having a moist high boreal ecoclimate. Its dominant vegetation is coniferous forest, characterized by a closed canopy of black spruce along with some white spruce, balsam fir, and trembling aspen. Drier sites are typified by open stands of jack pine, trembling aspen, and paper birch with some black and white spruce. Low, closed and open stands of black spruce, Labrador tea, blueberry, bog rosemary, and sphagnum mosses dominate poorly drained, peat-filled depressions. The ecoregion is underlain by crystalline Archean bedrock, which forms broad, sloping uplands and lowlands. Ridged to hummocky bedrock outcrops covered with thin discontinuous acidic sandy till are found in the south, and calcareous, sandy to loamy, cobbly mixed glacial till in the north. Bog veneers, flat bogs, and gently sloping clayey lacustrine deposits are significant inclusions, as are areas of prominent fluvio-glacial deposits in the south. More than 50% of the ecoregion is covered by wetlands. Sporadic discontinuous to isolated patches of permafrost with low ice content are found in the northern half of the ecoregion. Bare rock outcrops are common, and Eutric Brunisols with significant inclusions of Dystric Brunisols and Organic Cryosols are the dominant soils. Gray Luvisols are more commonly found in the southwestern section of the region. Characteristic wildlife includes caribou, black bear, wolf, moose, lynx, and snowshoe hare. Birds include the Canada goose, sharp-tailed grouse, and American black duck. Land uses include mining and hunting. Forestry is a minor use in the extreme southern part of the ecoregion. The population of the ecoregion is approximately 3300.

96. ABITIBI PLAINS

This ecoregion borders the southern boundary of the James Bay Lowland ecoregion and extends from the western edge of the northern clay belt in Ontario to east of the Nottaway River and Lac au Goéland in western Quebec. The ecoregion is marked by warm summers and cold snowy winters. The mean annual temperature is approximately 1°C. The mean summer temperature is 14°C and the mean winter temperature is -12°C. The mean annual precipitation ranges from 725 mm in the west to 900 mm in the east.

This ecoregion is classified as having a humid mid-boreal ecoclimate. Its mixed forest is characterized by stands of white spruce, balsam fir, paper birch, and trembling aspen. Drier sites may have pure stands of jack pine or mixtures of jack pine, paper birch, and trembling aspen. Wet sites are characterized by black spruce and balsam fir. Understory is typically moss, as well as lichen in cold and wet sites. The ecoregion is underlain by Archean granitic intrusives and volcanic rocks. It is bounded on the north by Palaeozoic bedrock of the Hudson Basin, a source of carbonate-bearing glacial materials. The landscape is dominated by fine-textured, level to undulating lacustrine deposits. Intermixed within these deposits are bedrock outcrops and organic deposits. Occurrences of organic soils increase towards the north as elevation decreases, and rock outcrops become more numerous in the south and west of the ecoregion as the elevation increases. Domed, flat, and basin bogs are the characteristic wetlands found in over 50% of the ecoregion with concentrations increasing towards the northern half. Gray Luvisols and Gleysols found on the clayey lacustrine and loamy tills are the dominant soils in the ecoregion. Although level, poorly drained areas are characterized by Mesisols and Fibrisols, Humo-Ferric Podzols occur on sandy deposits in the southern part of the ecoregion. Characteristic wildlife includes moose, black bear, lynx, snowshoe hare, caribou, wolf, and coyote. Bird species include sharp-tailed grouse, American black duck, wood duck, hooded merganser, and pileated woodpecker. Forestry, mining, and power generation are the most common land uses in this ecoregion. There are some low-intensity beef grazing operations scattered throughout the lacustrine clay plains. The major communities include Hearst, Kapuskasing, Cochrane, Timmins, Rouyn-Noranda, Val-d'Or, Amos, and Matagami. The population of the ecoregion is approximately 247 500.

97. LAKE TIMISKAMING LOWLAND

This ecoregion extends from Wawa, Ontario, in the west to just past the Ottawa River in the east. The ecoregion is marked by warm summers and cold winters. The mean annual temperature is approximately 3°C. The mean summer temperature is 15°C and the mean winter temperature is -9°C. The mean annual precipitation ranges 800–1000 mm, although it exceeds 1000 mm along the shores of Lake Superior. This ecoregion is classified as having a humid mid-boreal ecoclimate. Its mixed forest contains some areas of deciduous forest along the east shore of Lake Superior between Sault Ste. Marie and Wawa, and is characterized by white spruce, balsam fir, and eastern white pine, along with some red pine, yellow birch, and trembling aspen. Warmer areas along the Lake Superior shore contain sugar and red maple, and yellow birch, whereas white, red, and jack pine occur on drier terrain. Black spruce, tamarack, and eastern white cedar dominate in poorly drained areas. The ecoregion is underlain by massive, crystalline, acidic, Archean bedrock, forming hummocky and undulating, broadly sloping uplands and lowlands. The Cobalt Plain in its eastern section is composed of flat-lying clastic sediments with ridges and hills formed by gabbro sills or granitic rock inliers. There is a significant amount of fluvio-glacial deposits increasing southward. A large area of fine-textured lacustrine deposits occurs near New Liskeard, and an area of beach deposits near Chapleau. Bedrock outcroppings are common, and Humo-Ferric Podzols developed on discontinuous sandy materials are the dominant soil. Significant inclusions are Dystric Brunisolic soils found on the finer sediments around Chapleau, Gleysolic soils on the clays and loams of the Little Clay Belt near New Liskeard, and limited areas of Mesisols and Fibrisols on low-lying, poorly drained sites. Wetlands are characteristically bowl bogs that are treed and surrounded by peat margin swamps. Characteristic wildlife includes moose, black bear, lynx, snowshoe hare, wolf, coyote, and white-tailed deer. Bird species include the American black duck, wood duck, hooded merganser, and pileated woodpecker. The major land uses include forestry, mining, hydroelectric power generation, and recreation. The Little Clay Belt of New Liskeard supports livestock and grain farming. The major communities include Témiscaming, Wawa, Chapleau, Kirkland Lake, and Sault Ste. Marie. The population of the ecoregion is approximately 157 200.

98. ALGONQUIN-LAKE NIPISSING

This ecoregion lies between Sault Ste. Marie and the Ottawa River valley in southern Ontario. The ecoregion is marked by warm summers and cold winters. The mean annual temperature is approximately 3.5°C. The mean summer temperature is 15.5°C and the mean winter temperature is -8.5°C. The mean annual precipitation ranges 900–1000 mm. Mean annual precipitation exceeds 1000 mm near Georgian Bay. This ecoregion is classified as having a humid high cool temperate ecoclimate. The dominant vegetation is mixedwood forest of sugar maple, yellow birch, eastern hemlock, and eastern white pine with beech appearing on warmer sites. Dry sites are dominated by red and eastern white pine, and red oak. Wetter sites support red maple, black ash, white spruce, tamarack, and eastern white cedar. The ecoregion is underlain by massive, crystalline, acidic, Archean bedrock that forms broad, sloping uplands and lowlands. Strongly glaciated, it is characterized by ridged to hummocky rock outcrops covered with discontinuous acidic morainal tills, and significant areas of coarse, fluvioglacial, and lacustrine deposits. Exposed bedrock is common, particularly north and west of Lake Nipissing. Humo-Ferric Podzols are the dominant soil, and significant inclusions are Gray Luvisols on finer-grained lacustrine sediments near Espanola and Parry Sound, and Gleysolic soils near Lake Nipissing and Sudbury. Wetlands in the ecoregion are concentrated between Lake Nipissing and Georgian Bay. They are characterized by bowl bogs that are treed and frequently surrounded by peat margin swamps. Characteristic wildlife includes white-tailed deer, moose, black bear, wolf, lynx, snowshoe hare, and chipmunk. Bird species include the hooded merganser, American black duck, wood duck, pileated woodpecker, mourning dove, cardinal, and wood thrush. Significant land uses include forestry, mining, and tourism. Low-intensity farming, primarily grazing operations, is scattered throughout much of the ecoregion (about 5% of the area). The major communities include Elliot Lake, Sudbury, North Bay, Parry Sound, and Huntsville. The population of the ecoregion is approximately 473 700.

99. SOUTHERN LAURENTIANS

This ecoregion includes much of the rugged Laurentian Highlands of southwestern Quebec. It also includes the Gouin Reservoir area and extends northward from near Quebec City to near Lac Saint-Jean along the north shore of the St. Lawrence River. From Lac Saint-Jean, it extends to the Cabonga Reservoir in the Laurentian Highlands. In the south, it extends westward from Quebec City to the Ottawa River valley. It is marked by warm summers and cold, snowy winters. The mean annual temperature is approximately 1.5°C. The mean summer temperature is 14°C and the mean winter temperature is -11°C. The southern margins of the ecoregion exhibit a warmer, cool temperate climate. The mean annual precipitation ranges from 800 mm in the northwest to 1000 mm near Quebec City. Between Quebec City and the Saguenay River–Lac Saint-Jean area to the north, the mean annual precipitation ranges 1200–1600 mm. This ecoregion is classified as having a low to mid-boreal ecoclimate. Its mixed forest is characterized by stands of white spruce, balsam fir, paper birch, aspen, and, in some cases, pure stands of trembling aspen. Black spruce and balsam fir occur on wet, poorly drained sites, whereas strips of tamarack are found on colder, wet sites. Composed mainly of massive Precambrian granites and gneisses, this ecoregion is incised by numerous, southward-draining rivers through undulating highlands, creating a mountainous appearance where relief is commonly about 300–600 m. The Jacques-Cartier massif region rises abruptly above the St. Lawrence River like an upheaved dome dominating the surrounding uplands. This part of the region includes some of the best timberland in Quebec and provides habitat for moose, black bear, and small mammals. Much of this old erosion surface lies at about 600 m asl with scattered summits reaching 900–1200 m asl. Surficial deposits are composed mainly of varying thicknesses of till and fluvioglacial sediments. Humo-Ferric Podzols are the dominant soils, and significant inclusions are Ferro-Humic Podzols, Dystric Brunisols on drier, coarse-textured outwash, and Mesisols on fen-bog sequences. Forestry, hunting and trapping, recreation, tourism, and some farming (less than 2% of the ecoregion) are the principal land use activities. The major communities include Gatineau, Maniwaki, Saint-Jérôme, and Shawinigan. The population of the ecoregion is approximately 675 600.

100. RIVIÈRE RUPERT PLATEAU

This ecoregion includes the Mistassini Hills at the western limit of the boreal coniferous forest in west-central Quebec. It is marked by cool summers and cold winters. Summers are warmer in the southern part of the ecoregion below Lac Mistassini. The mean annual temperature is approximately 0°C. The mean summer temperature is 12.5°C and the mean winter temperature is -13.5°C. The mean annual precipitation ranges 650–900 mm. This ecoregion is classified as having a mid- to high boreal ecoclimate. The Chibougamau Hills occur southwest of Lac Mistassini in west-central Quebec. They are underlain by massive, crystalline, Archean granites, acidic intrusives, and volcanic rocks. The ecoregion's broad, rolling surfaces lie 300–350 m asl and are covered with thin, discontinuous veneers of glacial drift intermixed with organic deposits in depressions. Numerous fluvioglacial complexes fill the valleys. Productive, closed stands of black spruce and balsam fir are dominant in the region. Fires perpetuate black spruce, even though balsam fir is the climatic climax species. Open stands of white spruce with lichen and paper birch occur occasionally on well-drained sites. Feathermoss is a common ground cover, whereas sphagnum occurs in poorly drained depressions. The Mistassini Hills consist of subparallel hills, ridges, and valleys. The valleys are partially filled with the waters of Lac Mistassini. Summits are usually more than 1065 m asl in elevation in the Otish Mountains and stand 760 m above the lake. Most of the ridges are north-facing cuestas formed of Archean sedimentary rocks and gabbro sills that have a generally subdued aspect around the lake. The region is underlain by Precambrian granites and gneisses, has an undulating drift-covered surface, and is generally lower than adjoining uplands to the east. Surficial deposits are predominantly thin, discontinuous veneers of sandy and stony till. Humo-Ferric Podzols are the dominant soils, whereas Mesisols and Fibrisols are common in peat-filled depressions. Characteristic wildlife species include caribou, black bear, wolf, moose, lynx, and snowshoe hare. Bird species include Canada goose, ruffed grouse, and American black duck. Forestry, mining, hunting, and trapping, as well as outdoor recreation, are the principal land use activities. The main community is Chibougamau. The population of the ecoregion is approximately 13 600.

101. CENTRAL LAURENTIANS

This ecoregion occurs between Lac Mistassini and Manicouagan Reservoir and includes the Lac Saint-Jean valley and plains in the Laurentian Highlands. It is marked by predominantly cool summers and cold winters. The exception is in the Lac Saint-Jean plains and Saguenay River valley where summers are warm and moist. The mean annual temperature is approximately 0°C. The mean summer temperature is 12.5°C and the mean winter temperature is -12.5°C. The mean annual precipitation ranges north to south 800–1000 mm. Total precipitation is generally less than 900 mm in the Lac Saint-Jean–Saguenay river area. This ecoregion is classified as having a high to mid-boreal ecoclimate. It forms part of the larger boreal coniferous forest that occurs in the Laurentians of south-central Quebec. Closed stands of black spruce and balsam fir are dominant along lower slopes, whereas upper slopes are dominated by more open stands of black spruce with some white spruce and paper birch, usually associated with lichens and feathermosses. The warmer Lac Saint-Jean valley is dominated by mixed woods composed of tall to intermediate, closed stands of sugar maple, beech, and yellow birch on upland sites, whereas eastern hemlock, balsam fir, eastern white pine, and white spruce prevail in valleys. In the drier, northern parts of the region, white, red, and jack pine, along with spruce and balsam fir are more common. Eastern white cedar and black spruce are associated with wetlands. Much of the region has been deforested. The ecoregion, composed mainly of massive Precambrian granites and gneisses, takes the form of a rolling, glacial drift-covered, old erosion surface that lies at about 400–600 m asl. In the North Shore upper hills, paper birch and aspen occur sporadically on disturbed sites, whereas jack pine occurs on drier sites. The region rises abruptly above the St. Lawrence River. Its southern edge is deeply incised by several wide, large rivers that gather volume in the high, undulating interior and create a mountainous appearance where relief is commonly at 300–600 m. Humo-Ferric Podzols with Dystric Brunisolic and some Luvisolic and Organic soils are dominant in the ecoregion. Permafrost is found in isolated patches with low ice content, in the northern reaches of the ecoregion. Characteristic wildlife species include caribou, black bear, wolf, moose, lynx, and snowshoe hare. Bird

species include Canada goose, ruffed grouse, and American black duck. Land uses are limited but include forestry, hunting, fishing, and recreation. Significant agricultural areas occur in the warmer climate of the Lac Saint-Jean valley and plains. The major communities include Chicoutimi, Sept-Îles, Labrador City, Baie-Comeau, and Jonquières. The population of the ecoregion is approximately 386 400.

102. ANTICOSTI ISLAND

Anticosti Island is an outlier of the boreal forest in the Gulf of St. Lawrence. The ecoregion is marked by cool rainy summers and cold winters. It is modified by its maritime exposure and the influence of the Labrador current. The mean annual temperature is approximately 1.5°C. The mean summer temperature is 11.5°C and the mean winter temperature is -9°C. The mean annual precipitation ranges 800–1000 mm. This ecoregion is classified as having a perhumid mid-boreal ecoclimate. It is dominated by stands of black spruce with lesser amounts of balsam fir and an understory of moss. Paper birch and aspen occur sporadically on disturbed sites, whereas jack pine occurs on drier sites. The island is about 200 km long with a maximum width of about 56 km. It is a south-dipping cuesta of Palaeozoic carbonate strata. Relief is generally low with elevations seldom reaching 150 m asl. Wave-cut terraces up to 60 m in elevation occur on both north and south shores, being generally wider on the south side. Humo-Ferric Podzolic soils developed on rolling, sandy loam, morainal deposits are dominant in the ecoregion. White-tailed deer, black bear, wolf, fox, lynx, hare, grouse, waterfowl, and shorebirds are characteristic wildlife. Forestry, hunting, and trapping are major uses of land on the island. The population of the ecoregion is approximately 300.

103. MECATINA PLATEAU

This ocean-influenced ecoregion is found along the north shore of the Gulf of St. Lawrence in Quebec and in southeasternmost Labrador. It is marked by cool, rainy summers and cold winters. The mean annual temperature is approximately 1°C. The mean summer temperature is 11.5°C and the mean winter temperature is -9°C. The mean annual precipitation ranges 800–1100 mm. Precipitation over 1000 mm occurs along the Gulf of St. Lawrence coastline. The coastline is also exposed to constant winds. This ecoregion is classified as having an oceanic to perhumid high boreal ecoclimate. Closed, dense stands of black and white spruce, and balsam fir are dominant on sloping, protected, moist sites along rivers and drainageways. Bedrock exposures are usually covered with lichens, and exposed hilltops are characterized by matted patches of dwarf, krummholz forms of black spruce, giving way to white spruce near the coastal area. Sphagnum mosses, sedges, cottongrass, and other wetland species occupy poorly drained, sloping bogs that occur along lower valley slopes and scattered depressions. The surface of the region rises rapidly from sea level along the coast to inland elevations of about 500 m asl. Underlain by massive Archean granites, gneisses, and acidic intrusives, the ecoregion's surface form is rough and undulating with deeply dissected margins. Surface deposits are thin, discontinuous, bouldery, sandy morainal veneers. Lower valley slopes and floors contain deeper deposits of morainal material, alluvium, and fluvio-glacial and shallow peat deposits. Humo-Ferric Podzols are the dominant soils, and significant inclusions are Ferro-Humic Podzols, Dystric Brunisols, Mesisols, and Organic Cryosols. Permafrost occurs in isolated patches, mainly in organic deposits in wetlands in the northern section of the ecoregion. The ecoregion provides habitat for moose, seal, small mammals, and seabirds. Land use includes hunting, trapping, and outdoor recreation. The main communities include Havre-Saint-Pierre, Saint-Augustin, and Natashquan. The population of the ecoregion is approximately 14 900.

104. PARADISE RIVER

This maritime ecoregion is located in the southeastern corner of Labrador. Inland from the Atlantic coast, it is only slightly affected by the Atlantic Ocean. The mean annual temperature is approximately 0°C. The mean summer temperature is 8.5°C and the mean winter temperature is -8.5°C. The mean annual precipitation ranges from 900 mm in the northeast to 1100 mm in the southwest. This ecoregion is classified as having a maritime mid-boreal ecoclimate. Its forests are dominated by closed stands of balsam fir and black spruce with an understory of feathermoss on moist upland slopes. Paper birch, aspen, and black spruce are typical of disturbed sites. Dry sites are characterized by woodlands of black spruce, kalmia heath, and lichens. A dwarf, open or sometimes closed cover of black spruce and tamarack with evergreen shrubs is found on raised dome bogs. Composed of massive Archean granites, granitic gneisses, and acidic intrusives, this ecoregion is rough and undulating with deeply dissected margins. Its surface rises rapidly from the eastern sea coast to elevations of about 215–365 m asl, and is covered with sandy morainal deposits of variable thickness. Fluvioglacial deposits are sporadically distributed in the form of eskers and river terraces. Humo-Ferric Podzolic soils are dominant with significant inclusions of Ferro-Humic Podzols and Dystric Brunisols, while Fibrisols, Mesisols, and Organic Cryosols occur in wetlands. Permafrost occurs in isolated patches with low ice content, mainly in wetlands. The forests in the region are productive and provide habitat for caribou, moose, black bear, red fox, lynx, other small mammals, waterfowl, and other birds. The main community is Cartwright. The population of the ecoregion is approximately 1800.

105. LAKE MELVILLE

This ecoregion surrounds Lake Melville in southeastern Labrador. It is a narrow extension of the boreal forest into the Taiga Shield ecozone. It is marked by humid, cool summers and cold winters. The mean annual temperature is approximately -2°C. The mean summer temperature is 8.5°C and the mean winter temperature is -13°C. The mean annual precipitation ranges 800–1000 mm. This ecoregion is classified as having a perhumid high-boreal ecoclimate. Its mixed forests are dominated by productive, closed stands of balsam fir, black spruce, white birch, and trembling aspen. This ecoregion comprises all of Melville Plain and portions of river valleys entering the plain from Mecatina and Hamilton plateaus. It is basically an irregular lowland much dissected by river valleys. Elevations are generally close to sea level, to about 300 m asl, although a few hills reach about 500 m asl. Underlain by Archean granites, gneisses, and acidic intrusives, the undulating upland sites are characterized by shallow, drumlinized till and colluvium. Rock outcrops are common. Humo-Ferric Podzols are the dominant soils, and significant inclusions are Ferro-Humic Podzols, Dystric Brunisols on drier, coarse-textured outwash, Mesisols, and Organic Cryosols on fen-bog sequences. Permafrost occurs in isolated patches with low ice content, mainly in organic deposits in wetlands west of Lake Melville. This ecoregion includes some of the best timberland in Labrador. It provides habitat for caribou, moose, small mammals, birds, and waterfowl. Land uses include hunting, trapping, and recreation. The main community is Happy Valley - Goose Bay. The population of the ecoregion is approximately 10 400.

106. STRAIT OF BELLE ISLE

This ecoregion occupies the northern tip of the Northern Peninsula on the island of Newfoundland. It is marked by cool summers and cold winters. The maritime effect of the Atlantic Ocean is felt along the coast. Sea ice carried by the Labrador current plugs up the Strait of Belle Isle and delays the onset of spring. Fog frequency is high over the entire year. The mean annual temperature is approximately 2.5°C. The mean summer temperature is 10°C and the mean winter temperature is -5.5°C. The mean annual precipitation ranges 900–1100 mm. This ecoregion is classified as having an Atlantic low subarctic ecoclimate. The predominant vegetation includes dwarfed, open and sometimes closed cover patches of white spruce with an understory of mosses. White spruce is more tolerant of salt spray and is more prevalent in near-coastal

areas, whereas black spruce and tamarack are more prominent inland. Exposed sites tend to support a moss-lichen cover. This ecoregion is formed in part by the coastal lowlands and the northern tip of the highlands of Newfoundland. Most of it consists of soft, mainly unfolded, crystalline Palaeozoic strata and Precambrian rocks. Elevations range from sea level to about 630 m asl. The lowlands region is dominated by sloping bog plateaus. Wetlands cover more than 25% of the ecoregion. Hummocky sandy to loamy morainal and colluvial deposits with slopes ranging 10–30%, and rock outcrops covered with discontinuous veneers of acidic till are more prominent in the uplands. Mesisols developed on sphagnum moss are the dominant soils in the ecoregion, but well- to imperfectly drained Humo-Ferric Podzols developed on stony, sandy, to sandy loam acidic glacial till are more prevalent on the uplands. This ecoregion lies along the Atlantic migratory flyway, and provides winter range for caribou as well as habitat for arctic hare, rock ptarmigan, Atlantic puffin, and geese. The major communities include St. Anthony and Port Saunders. The first known European colony in the Americas was the Norse settlement at L'Anse aux Meadows, established about 1000 years ago on the coast north of St. Anthony. The population of the ecoregion is approximately 11 900.

107. NORTHERN PENINSULA

This maritime-influenced ecoregion occurs along the forested parts of the coastal lowlands of the Northern Peninsula of Newfoundland. It is marked by cool summers and mild winters with wind and fog. The mean annual temperature is approximately 3°C. The mean summer temperature is 11°C and the mean winter temperature is –4.5°C. The mean annual precipitation ranges 1000–1100 mm. The ecoregion is classified as having an Atlantic high boreal ecoclimate. Balsam fir is the dominant tree species on well- to imperfectly drained sites, but black spruce becomes an important codominant species at higher elevations. Black spruce thrives immediately adjacent to poorly drained depressions, which are predominantly covered by kalmia heath communities. Wind-exposed rocky outcrops are commonly vegetated by open, dwarf stands of black spruce and dwarf evergreen shrubs. Most of the ecoregion is less than 125 m asl in elevation, but it rises to about 450 m asl on the protected east side of the peninsula, which is composed predominantly of Archean igneous rock. On the west coast side of the ecoregion the geology is composed of a belt of soft, mainly unfolded, acidic, crystalline Palaeozoic strata. The surface of the ecoregion is covered by undulating to ridged, sandy morainal to loamy marine deposits. The ridged, rougher eastern side of the ecoregion is predominantly exposed bedrock with slopes ranging 15–30%. Soils are predominantly Humo-Ferric Podzols with significant inclusions of exposed rock outcrops, Ferro-Humic Podzols, Eutric Brunisols, and some Fibrisols. Wildlife includes moose, black bear, lynx, snowshoe hare, and caribou in the higher elevations between forest and upland tundra. Activities related to mining, forestry, and fishing are dominant land uses in this region. The population of the ecoregion is approximately 13 000.

108, 110, 111. LONG RANGE MOUNTAINS

This ecoregion occurs as three separate upland areas of sparsely forested heath and moss barrens extending from the southwestern coast to the Northern Peninsula of Newfoundland. It is marked by cool summers and cold snowy winters. The mean annual temperature is approximately 4°C. The mean summer temperature ranges from 11.5°C to 12°C and the mean winter temperature from –3.5°C to –4°C. The mean annual precipitation ranges 1000–1400 mm. This ecoregion is classified as having a maritime high boreal ecoclimate. Dwarf, open and sometimes closed cover patches of black spruce and balsam fir alternating with communities of dwarf kalmia and mosses are characteristic. Exposed sites support mixed evergreen and deciduous shrubs. These rugged, steeply sloping uplands are formed of acidic, crystalline Palaeozoic and Precambrian rocks. Elevations range from sea level to about 815 m asl. Most of the ecoregion falls in the 300–700 m range. Ridged to hummocky bare rock covered with discontinuous veneers of acidic till is associated with predominantly well- to imperfectly drained Ferro-Humic Podzols. Significant inclusions are bare rock outcroppings, Gleysolic soils, and Mesisols. The ecoregion provides winter range for caribou and habitat for moose, small mammals, and birds. Natural resources of this ecoregion provide opportunities for

hunting, outdoor recreation, and tourism. The main community is Buchans. The population of the ecoregion is approximately 1800.

109. SOUTHWESTERN NEWFOUNDLAND

This ecoregion covers the west coast of Newfoundland, south of the Northern Peninsula and west of the barrens of the southern Long Range Mountains and the Buchans Plateau. It is marked by cool summers and snowy, cold winters. The mean annual temperature is approximately 4°C. The mean summer temperature is 12°C and the mean winter temperature is -3.5°C. The mean annual precipitation ranges 1000–1200 mm. The ecoregion is dominated by closed stands of balsam fir. Black spruce, tamarack, and evergreen shrubs occur in poorly drained areas. Small thickets of deciduous trees occur on seepage sites and alluvial plains. The rugged, steeply sloping highlands are formed of crystalline Palaeozoic and Precambrian rocks and are part of the old Appalachian peneplain region. Elevations range from sea level to about 814 m asl in the Lewis Hills, the highest point in Newfoundland, north of Stephenville. A lowland extends from St. George's Bay to Grand Lake. Rolling to hummocky, sandy to loamy morainal deposits are associated with Humo-Ferric Podzolic soils, Brunisols, and Gleysols. The upper surface of Long Range Mountains provides the ecoregion with protection from northeasterly winds, resulting in the most favourable growing season on the island. Moose, black bear, caribou, marten, red fox, and lynx are typical wildlife. Activities related to forestry, wood processing, farming, and fishing are the common uses of land. The major communities include Stephenville and Corner Brook. The population of the ecoregion is approximately 69 400.

112. CENTRAL NEWFOUNDLAND

This maritime-influenced ecoregion covers the north-central part of Newfoundland. The ecoregion is marked by cool summers and short, cold winters. It is the most continental part of the island. The mean annual temperature is approximately 4.5°C. The mean summer temperature is 12.5°C and the mean winter temperature is -3.5°C. The mean annual precipitation ranges 1000–1300 mm. This ecoregion is classified as having a maritime mid-boreal ecoclimate. Its forests are dominated by closed, intermediate to low stands of balsam fir and black spruce on steep, moist, upland slopes. Paper birch, aspen, and black spruce are typical of disturbed sites. Drier sites are characterized by woodlands of black spruce, kalmia heath, and lichens. Dwarf, open stands of black spruce and tamarack with ericaceous shrubs are found on raised domed bogs. Where forest growth is poor, exposure to winds and wet, cold soils are the main causes. This ecoregion is composed of a mixture of crystalline Palaeozoic strata. Where stream erosion has cut deeply, the uplands are rugged and rocky, but elsewhere they present a rolling terrain of low relief. The surface of the uplands is dominated by hummocky to ridged, sandy morainal deposits with slopes that range from 5–30% and are associated predominantly with Humo-Ferric Podzols. Significant inclusions are Ferro-Humic Podzols, Gleyed Podzols, and Brunisolic and Gleysolic soils. Characteristic wildlife includes moose, lynx, black bear, red fox, and caribou. Forestry is the principal land use in the ecoregion. The major communities include Gander, Grand Falls, Windsor, and Botwood. The population of the ecoregion is approximately 75 100.

113. NORTHEASTERN NEWFOUNDLAND

This ecoregion occurs along the north shore of Newfoundland from Bonavista to the Northern Peninsula. The ecoregion is marked by cool summers and short, cold winters. It has the warmest summers of the coastal areas and is the driest part of the island. The mean annual temperature is approximately 4°C. The mean summer temperature is 12.5°C and the mean winter temperature is -3.5°C. The mean annual precipitation ranges 900–1000 mm. This ecoregion is classified as having an Atlantic mid-boreal ecoclimate. Its forests are composed of closed, low to intermediate stands of black and white spruce and/or balsam fir with an understory of feathermoss. The quality of the forest deteriorates towards the coast with increased

exposure to winds. Barrens are common in coastal localities. This ecoregion is underlain mainly by Palaeozoic strata but includes a few granitic intrusive bodies that form prominent hills. Elevations range from sea level to about 150 m asl. The surface is covered by discontinuous, hummocky to ridged, morainal deposits of variable thickness with slopes ranging 5–30%. Bedrock outcrops are common, and shallow Humo-Ferric Podzols underlain by rock are the dominant soils. Significant inclusions are Gleyed Humo-Ferric Podzols, Gleysols, and Fibrisols on sloping and blanket bogs. Wildlife includes seabirds, especially murre, eider, and tern. One of North America's most important seabird sanctuaries, Funk Island, is located along this coast. Activities related to mining, forestry, and fishing are dominant land uses in this ecoregion. The major communities include Twillingate, Wesleyville, and Springdale. The population of the ecoregion is approximately 46 100.

114. MARITIME BARRENS

This Atlantic Ocean-influenced boreal ecoregion extends westward across the southern half of the uplands of Newfoundland to the Long Range Mountains. The ecoregion is marked by foggy, cool summers and short, relatively moderate winters along the coast and colder inland. The mean annual temperature is approximately 5.5°C. The mean summer temperature is 11.5°C and the mean winter temperature is –1°C. The mean annual precipitation ranges 1200 to over 1600 mm. This ecoregion is classified as having an oceanic mid-boreal ecoclimate. It is dominated by nearly pure, closed, intermediate stands of balsam fir. Fires have caused widespread destruction of the forests, and the subsequent replacement of fir by stands of sparse black spruce, balsam fir, tamarack, and mixed ericaceous shrubs, along with mosses and lichen. *Kalmia* and sphagnum moss occur on large tracts of blanket and flat bogs. The ecoregion ranges from sea level to about 250 m asl in elevation and is composed predominantly of a mixture of late Precambrian and Palaeozoic sedimentary rocks and granites. Where stream erosion has cut deeply, the uplands are rugged and rocky, but elsewhere they present a rolling terrain of low relief. The surface of the uplands is dominated by rolling to hummocky, sandy morainal deposits and is associated predominantly with Humo-Ferric Podzolic soils. Significant inclusions are acidic rock outcroppings, Ferro-Humic Podzols, peaty Gleysols, and Fibrisols. Characteristic wildlife includes caribou, moose, lynx, black bear, and red fox. Fishing and recreation are dominant activities in this region. The major communities include Channel - Port aux Basques, Bonavista, St. John's, Marystown, Grand Bank, and Carbonear. The population of the ecoregion is approximately 311 500.

115. AVALON FOREST

This ocean-influenced boreal ecoregion is found on the Avalon Peninsula in eastern Newfoundland. The ecoregion is marked by cool summers and cold winters. Its summers are also noted for higher frequencies of fog than in the surrounding barrens. The mean annual temperature is approximately 5.5°C. The mean summer temperature is 11.5°C and the mean winter temperature is –1°C. The mean annual precipitation ranges 1400–1500 mm. Unique to this ecoregion is the natural forest dominated by a closed stand of balsam fir. Although the forest grows well in early life on good sites, heights in excess of 12 m are seldom reached. White birch is commonly found on north-facing slopes. The region is part of the Appalachian peneplain, which is composed predominantly of a mix of late Precambrian sedimentary and volcanic rocks. Surface deposits are dominated by rolling to hummocky, sandy moraines that are associated with well- to imperfectly drained Humo-Ferric Podzolic soils. Significant inclusions are Ferro-Humic Podzols, peaty Gleysols, and Organic Fibrisols found on blanket and sloping bogs. Characteristic wildlife includes moose, lynx, black bear, red fox, and caribou. Forestry, recreation, and tourism are dominant land uses in this region. There are no main communities, and the population of the ecoregion is approximately 200.

116. SOUTH AVALON–BURIN OCEANIC BARRENS

This ecoregion occurs along the southern tips of the Avalon and Burin peninsulas in Newfoundland. The ecoregion is marked by cool summers and short, relatively mild winters. It is also strongly affected by the Atlantic Ocean, and its summers are noted for higher frequencies and persistence of fog than in the surrounding barrens. The mean annual temperature is approximately 5.5°C. The mean summer temperature is 11.5°C and the mean winter temperature is –1°C. The mean annual precipitation ranges 1200–1500 mm. This ecoregion is classified as having an oceanic low boreal ecoclimate. It supports dense carpets of moss and fruticose lichen, along with closed, low-growing ericaceous shrubs. The moss–heath of this region is unique to North America. Similar communities are found in northern Scotland and Iceland. Dwarf krummholz of balsam fir occurs on some upland sites. The ecoregion is composed predominantly of a mixture of late Precambrian sedimentary and volcanic strata, and its elevations rise abruptly from sea level to about 200 m asl. Stream erosion has cut deeply, and the uplands are dissected, rugged, and rocky along the coastline, but elsewhere inland they present a rolling terrain of low relief. The surface of the uplands is dominated by peat-covered, rolling to hummocky, sandy morainal deposits with slopes that range 5–30%. Fibrisols are found on blanket and sloping bogs. These wetlands cover more than 25% of the ecoregion. Well- to imperfectly drained Ferro-Humic Podzols developed on sandy loam glacial till are the dominant soils in this ecoregion. Wildlife includes caribou, willow ptarmigan, and seabirds. One of the world's largest gannet colonies is situated at Cape St. Mary's. Fishing and water-oriented recreation are the main land uses. The main community is Trepassey. The population of the ecoregion is approximately 9200.

ATLANTIC MARITIME ECOZONE

The Atlantic Maritime ecozone covers all of the provinces of New Brunswick, Nova Scotia, and Prince Edward Island. It also covers Îles-de-la-Madeleine and the part of Quebec extending from the Gaspé Peninsula, southwesterly through the Appalachian complex of eastern Quebec to the United States border, south of Sherbrooke.

Climate Proximity of the ecozone to the Atlantic Ocean creates a cool, moist maritime climate and moderates temperatures. Mean annual temperatures range from 3.5°C in the Gaspé Peninsula to 6.5°C in southwest Nova Scotia. Mean summer temperatures range between 13°C to 15.5°C. Mean winter temperatures range from –8°C in the Gaspé Peninsula to –2°C in Nova Scotia. Mean annual precipitation varies from 900 mm inland to over 1500 mm near the coast.

Vegetation Forests are generally composed of mixed stands of conifers and deciduous species, characterized by red spruce, balsam fir, yellow birch, and sugar maple, while red and white pine, and eastern hemlock occur to a lesser but significant degree. Some boreal species are present, including black and white spruce, balsam poplar, and white birch. Jack pine is prominent on sandy soils and in areas of regrowth after fires. Common shrub species include pin cherry, willow, speckled alder, steplebush, and blueberry. Forest growth is fairly productive here, except where the bedrock is exposed. Most of the native forest has been harvested or burnt at least once in the past two centuries.

Landforms and Soils The ecozone is dominated by the interior Appalachian Upland and the Northumberland Coastal Plain physiographic units. In the maritimes the uplands are composed of granite, gneiss, and other hard, crystalline rocks. This upland terrain is covered by glacial till, and Humo-Ferric Podzols are the dominant soils. In the coastal lowland areas, deeper more fertile Luvisolic soils exist that have formed on surface materials derived from the underlying sedimentary bedrock (e.g., sandstones, shales, and limestone). These soils accommodate the greatest proportion of the population and support most of the agricultural activities in this ecozone.

Wildlife Characteristic mammals include white-tailed deer, moose, black bear, raccoon, striped skunk, bobcat, and eastern chipmunk. Representative birds include whip-poor-will, blue jay, eastern bluebird, and rose-breasted grosbeak. Breeding colonies of marine birds are also found here, including great and double-crested cormorant, Atlantic puffin, common and thick-billed murre, black guillemot, and razorbill. Representative marine species include various species of seal, killer whale and northern bottlenosed whale.

Human Activities Forestry, agriculture and mining are the major land-oriented activities. The coastal communities traditionally supported one of the country's most important fisheries, an economic mainstay of the ecozone. Recent decline in groundfish stocks, particularly cod have led to a major cutback in fishing and fish processing industries. In addition, the natural beauty of the interior and coastal environments supports an important tourist industry. The thicker and somewhat more fertile lowland soils support an agricultural industry that includes dairy, beef, and poultry production and the growing of vegetables and fruits. The largest centres include Halifax, Saint John, Moncton, Dartmouth, Charlottetown, Rimouski, Sherbrooke, and Gaspé. Most of the population of approximately 2 510 000 are found in coastal lowland areas.

117. APPALACHIANS

This ecoregion stretches from the Gaspé Peninsula at the mouth of the St. Lawrence River southwesterly through the Appalachian complex of eastern Quebec to the United States border, south of Sherbrooke. The climate is characterized by warm summers and snowy, cold winters. The mean annual temperature of the ecoregion is approximately 3.5°C. The mean summer temperature is 14.5°C and the mean winter temperature is -8°C. The mean annual precipitation ranges 900–1300 mm. In the higher elevations of the Notre Dame Mountains of the central Gaspé Peninsula annual precipitation can exceed 1300 mm and annual temperatures are colder. The mean annual temperature at Murdochville is 1.5°C. Vegetation on the mountains is characterized by closed coniferous forests that are dominated by black spruce and balsam fir with a moss ground cover. Paper birch is common. Mixedwood forests dominate southwest of Matane, including sugar maple, beech, and yellow birch on upland sites, while eastern hemlock, eastern white pine, balsam fir, and white spruce prevail in the valleys. On moist sites red maple, black ash, white spruce and tamarack are dominant. The Notre Dame Mountains are the central part of the old Appalachian peneplain, where the elevation varies 400–1200 m asl. The Chaleur Uplands, also part of the old Appalachian peneplain, range 450–600 m asl on the lower slopes. Composed of folded Devonian shale, limestone and sandstone, their slopes are steep, and surficial deposits, mainly morainal in origin, are thin and discontinuous. Scree slopes, colluvium, and peatlands in depressions are also present. The Appalachian complex along the south shore of the St. Lawrence River is dominated by folded Palaeozoic sandstones and quartzites. Relief varies from hummocky to mountainous. The average elevation is 400 m asl, but peaks above 600 m asl are common. Fluvioglacial deposits occur only in the valleys. Differential erosion of the hard and soft rocks have resulted in the development of broad sloping uplands and lowlands in the Appalachian peneplain south of Rivière-du-Loup. The Sutton Mountains, a continuation of the Green Mountains of Vermont and the Megantic Hills, a part of the White Mountains of New England, reach above 950 m asl in places. Although the soils are often shallow, the soft, vertically fractured rock permits deep rooting. Moderately fertile Podzols are the dominant soils in the ecoregion. The other significant soils are Dystric Brunisols and Gleysols. Characteristic wildlife includes moose, black bear, white-tailed deer, beaver, porcupine, bobcat, red fox, lynx, marten and rabbit. Seabirds and shorebirds are common on the Gulf of St. Lawrence coast. The region's major land uses are agriculture, forestry and recreation, and tourism. Farmland occupies approximately 15% of the ecoregion, primarily along the St. Lawrence River plain and the valleys and lowlands below 300 m asl. The major communities include Sherbrooke, Thetford Mines, Rimouski, Matane, Murdochville, and Gaspé. The total population of the ecoregion is approximately 707 300.

118. NORTHERN NEW BRUNSWICK UPLANDS

This ecoregion occupies the northwestern corner of New Brunswick and is bordered by the Saint John River valley to the west. The ecoregion is marked by warm, moist summers and snowy, cold winters. The mean annual temperature is approximately 3.5°C. The mean summer temperature is 14.5°C and the mean winter temperature is -7.5°C. The mean annual precipitation ranges 1000–1200 mm. The mixedwood forest is composed of closed stands of sugar maple, beech, and yellow birch on upland sites, whereas eastern hemlock, balsam fir, eastern white pine, and white spruce prevail in valleys. In the drier, northern part of the region, white, red and jack pine along with spruce and fir are more common. The ecoregion includes the Chaleur Uplands and lower elevations of the New Brunswick Highlands, ranging 200–500 m asl. The uplands have developed on folded sedimentary and igneous Palaeozoic strata. The Chaleur Uplands section of the region is remarkably uniform. The regularity of concordant summits is broken only by a few hills and ridges rising slightly above the general level; with increasing elevations to the east, the region becomes more rugged and dissected. The region is mantled with stony glacial deposits; bedrock outcroppings are significant. Loamy Humo-Ferric and Ferro-Humic Podzols are the dominant soils. There are significant inclusions of Gray Luvisols. The ecoregion provides habitat for moose, black bear, white-tailed deer, red fox, snowshoe hare, porcupine, fisher, coyote, beaver, ruffed grouse, bobcat, and marten. Shorebirds and seabirds inhabit the coast of Chaleur Bay. Forestry and some agriculture are major land uses. The major communities include Campbellton and Edmundston. The total population of the ecoregion is approximately 135 500.

119. NEW BRUNSWICK HIGHLANDS

The New Brunswick Highlands ecoregion is located in north-central New Brunswick. The ecoregion is marked by warm, moist summers and cold, snowy winters. The mean annual temperature is approximately 3°C. The mean summer temperature is 14.5°C and the mean winter temperature is -8°C. The mean annual precipitation ranges 1200–1400 mm. This ecoregion is classified as having a moist, high cool temperate ecoclimate. The region is characterized by a predominantly coniferous forest of balsam fir, white and black spruce, white birch, and white pine. Black spruce and balsam fir are found predominantly on shallow soils on exposed uplands. Red spruce, red maple, and yellow birch occur locally, and sugar maple may be found in isolated pockets. White and jack pine with black spruce and white cedar are associated with scattered wetlands. The region includes the highest elevations within New Brunswick, ranging from 500 to over 800 m asl. Mount Carleton at 817 m asl has the highest elevation in New Brunswick. Surfaces of its concordant summits represent the southeast-sloping Appalachian peneplain. This rolling to mountainous, dissected plateau is composed of diverse Palaeozoic metamorphic and igneous strata that are mantled with hummocky, stony, and bouldery glacial till, colluvial and minor ice-contact deposits. Loamy Humo-Ferric and Ferro-Humic podzols are dominant in the region. The region provides habitat for moose, black bear, white-tailed deer, red fox, snowshoe hare, porcupine, fisher, coyote, beaver, ruffed grouse, bobcat, and marten. Forestry dominates the land use of the region. There are no major communities in this ecoregion.

120. SAINT JOHN RIVER VALLEY

This ecoregion occupies the central portion of the Saint John River valley along the western border of New Brunswick. The ecoregion is marked by warm, moist summers and snowy, cold winters. The warmer climate is unique to western New Brunswick. The mean annual temperature is approximately 4.5°C. The mean summer temperature is 15°C and the mean winter temperature is -5°C. The mean annual precipitation ranges from 1000 mm to over 1200 mm. It is a sheltered enclave of temperate, deciduous forest made up of sugar maple, yellow birch, and beech and is associated with a sparse presence of white ash, butternut, ironwood, and basswood. Red spruce, red maple, balsam fir, and eastern hemlock are common softwoods. Poorly drained sites support white cedar, black ash, red maple, and white elm. Black spruce,

balsam fir, and cedar can be found on scattered bogs. The ecoregion ranges in elevation 100–300 m asl and has developed on folded, calcareous, and argillaceous Palaeozoic strata. The uplands are remarkably uniform; concordant summits, whose regularity is broken only by a few hills and ridges, rise slightly above the general level. The Saint John River valley is deeply entrenched into them. The region is mantled with stony glacial till and small pockets of peatlands and fluvio-glacial deposits. Loamy Humo-Ferric Podzols and Gray Luvisols are dominant soils. Gleysols are significant inclusions. Mesisols and some Humisols are found on swamps and fens. The region provides habitat for moose, black bear, white-tailed deer, red fox, snowshoe hare, porcupine, fisher, coyote, beaver, ruffed grouse, bobcat, raccoon, and muskrat. Hardwood lands have been extensively cleared for agriculture, including some orchards. Over a quarter of the ecoregion is in farmland. Forestry operations, including Christmas tree plantations, are also present. The major communities include Woodstock and Grand Falls. The population of the ecoregion is approximately 47 900.

121. SOUTHERN NEW BRUNSWICK UPLANDS

This ecoregion forms a 40-km-wide band that runs parallel to the Bay of Fundy and along the United States border to the Saint John River valley. The ecoregion is marked by warm, rainy summers and mild, snowy winters. The mean annual temperature is approximately 5°C. The mean summer temperature is 15°C and the mean winter temperature is –5°C. The mean annual precipitation ranges 1100–1400 mm. The mixedwood forest is predominantly composed of sugar and red maple, white and red spruce, and balsam fir. Warmer and moister sites are occupied by sugar maple and beech, whereas drier sites commonly support eastern white pine. The forest becomes conifer-dominated at lower elevations. Palaeozoic metamorphic, sedimentary, and volcanic rocks are the dominant strata. The region's surface represents the southeast-sloping Appalachian peneplain and can reach elevations above 350 m asl. The terrain decreases in elevation and levels out to the west, where rolling and hummocky stony till plains are predominant. Loamy Humo-Ferric Podzols are the dominant soils. In the western part of the region, significant soil inclusions are Gleysols on poorly drained sites, Fibrisols on flat bogs, and Mesisols on fens. The region provides habitat for moose, black bear, white-tailed deer, red fox, snowshoe hare, porcupine, fisher, coyote, beaver, ruffed grouse, bobcat, and muskrat. Forestry and some agriculture are major land uses. Approximately 7% of the ecoregion is farmland. The major communities include Saint John, Sussex, and St. Stephen. The population of the ecoregion is approximately 150 800.

122. MARITIME LOWLANDS

This ecoregion covers a large, triangular-shaped plain extending from south-central New Brunswick to the Gulf of St. Lawrence, including the Northumberland coastline of Nova Scotia. The climate is marked by warm summers and mild, snowy winters. The mean annual temperature is approximately 5°C. The mean summer temperature is 15.5°C and the mean winter temperature is –5.5°C. The mean annual precipitation ranges 1000–1300 mm. The closed mixedwood forest is mainly composed of red spruce, balsam fir, red maple, hemlock, and eastern white pine. Sugar maple and yellow birch are found on the larger hills. Wetlands are extensive and support dwarf black spruce and eastern larch at their perimeters. Eastern white cedar is found only on the New Brunswick section of the lowlands. The lowlands are underlain by flat to gently dipping Carboniferous sandstones, shales, and conglomerates and rise inland from sea level to 200 m asl. The ecoregion is blanketed with stony, loamy glacial tills. The dominant soils are Humo-Ferric Podzols and Gray Luvisols with compact subsoils that restrict internal drainage. Significant areas of Gleysols, Fibrisols on flat and raised bogs, and Mesisols on fens also exist. The ecoregion provides habitat for moose, black bear, white-tailed deer, red fox, snowshoe hare, porcupine, fisher, coyote, beaver, ruffed grouse, bobcat, marten, raccoon, and muskrat. Shorebirds and seabirds inhabit salt marshes and coastal habitats. Forestry, agriculture (5% of the ecoregion is farmland), coal mining, tourism, and recreation are dominant

land uses. The major communities include Fredericton, Moncton, Chatham, Bathurst, New Glasgow, and Shediac. The population of the ecoregion is approximately 441 800.

123. FUNDY COAST

This ecoregion covers a narrow coastal strip along the Bay of Fundy in New Brunswick and Nova Scotia. Strongly influenced by the Atlantic Ocean, the region is exposed to high winds, high humidity, and fog during summer and fall and is slow to warm up in spring. It is marked by cool, wet summers and mild, wet winters with most precipitation falling as rain. The mean annual temperature is approximately 6°C. The mean summer temperature is 14.5°C and the mean winter temperature is -3°C. The mean annual precipitation ranges 1100–1400 mm. High tides, averaging 10 m occur in the Minas Basin in the Bay of Fundy. The highest tide in the world was registered here at 16.1 m. The coniferous forest is predominantly composed of red spruce, balsam fir, and red maple with scattered white spruce, and white and yellow birch. Sugar maple and beech are found at higher elevations. The bedrock is composed of Proterozoic, Palaeozoic, and Mesozoic strata rising from sea level to about 215 m asl inland. The terrain is highly variable, ranging from the rolling to steep, deeply incised highlands to undulating plains. Discontinuous, stony glacial till blankets the highlands, whereas loamy tills, sandy fluvio-glacial sediments, and silty marine deposits occupy lowlands. Humo-Ferric Podzols are the dominant soil. Mesisols on flat bogs occur in lowland areas. Regosols and Gleysols on diked and drained salt marshes are used for agriculture. The region provides habitat for moose, black bear, white-tailed deer, red fox, snowshoe hare, porcupine, fisher, coyote, beaver, ruffed grouse, bobcat, and raccoon. Salt marshes and tidal flats provide important habitat for migratory shorebirds. Approximately 10% of the ecoregion is farmland. Forestry, the fishery, tourism, and seashore recreation are other land uses. The major communities include Amherst and Truro. The population of the ecoregion is approximately 82 500.

124. SOUTHWEST NOVA SCOTIA UPLANDS

This ecoregion occupies most of the southwestern portion of the Nova Scotia mainland. The climate is marked by warm summers and mild, snowy winters. It is strongly influenced by the Atlantic Ocean and is one of the most humid parts of the Maritime provinces. The mean annual temperature is approximately 6.5°C. The mean summer temperature is 14.5°C and the mean winter temperature is -1.5°C. The mean annual precipitation ranges 1200–1400 mm. This mixedwood forest region is composed of tall to intermediate, closed stands of red and black spruce, eastern hemlock, white and red pine, white birch, red maple, and red oak. Broad areas of brushland occur as a result of fire disturbance. On these areas, an open black spruce forest with scattered aspen, red maple, red oak, and white pine is common. Extensive bogs, fens, and swamps support stunted black spruce, larch, red maple, black ash, and alder. The uplands, as part of the Appalachian peneplain, consist of folded Palaeozoic slates and quartzites that form broad, sloping plains. The northern elevated portion of the region is underlain by an extensive granitic batholith. The ecoregion is covered by stony, discontinuous veneers and blankets of glacial till, drumlin fields, wetlands, and rockland barrens. Loamy Humo-Ferric Podzols dominate the ecoregion. Other soils include Ortstein Podzols on deep sandy tills, peaty Gleysols, Fibrisols on raised and flat bogs, and Organic Mesisols on fens. The ecoregion provides habitat for white-tailed deer, snowshoe hare, porcupine, raccoon, fisher, red fox, coyote, and beaver. Moose are concentrated in the central part of the region. Forestry and some limited agriculture characterize the regional land use. The main community is Bridgewater. The population of the ecoregion is approximately 87 500.

125. ATLANTIC COAST

This ecoregion covers a narrow strip along the eastern coastline of Nova Scotia where the climate is strongly influenced by the Atlantic Ocean and is characterized by cool, wet summers and mild, wet winters. The ecoregion is exposed to high winds, high humidity, and fog during summer and fall; and experiences slow spring warm-up, and has a frost-free period that is the longest in the Maritime provinces. The mean annual temperature is approximately 6.5°C. The mean summer temperature is 14°C and the mean winter temperature is -1.5°C. The mean annual precipitation ranges 1200–1500 mm. The ecoregion supports an open coniferous forest composed of predominantly white and black spruce, and balsam fir. Red maple and yellow birch are found locally on very productive sites. Along exposed headlands, stands are windswept and stunted. Raised and flat bogs, fens, and salt marshes are common wetlands. This undulating to rolling coastal landscape is part of the Atlantic Uplands of Nova Scotia, which extend along the entire length of Nova Scotia. This old peneplain surface is composed predominantly of Palaeozoic metamorphics and granites mantled by a discontinuous cover of stony glacial till. Loamy Humo-Ferric and Ferro-Humic Podzols, frequently with peaty surface horizons, are dominant and alternate with areas of exposed bedrock and wetlands. Ortstein Podzols are commonly found in deep sandy soils. Gleyed Podzols and Gleysols are notable inclusions. The ecoregion provides habitat for shorebirds and seabirds as well as winter habitat for white-tailed deer. The ecoregion is a setting for fishery, some agriculture, and seashore recreation. The major communities include Canso, Lunenburg, Liverpool, Louisbourg, and Yarmouth. The population of the ecoregion is approximately 132 400.

126. ANNAPOLIS–MINAS LOWLANDS

This ecoregion incorporates the Annapolis Valley and most of the Minas Lowlands southeast of Minas Basin. The ecoregion is sheltered from direct coastal influences, allowing for warmer summer temperatures, particularly within the Annapolis Valley. The mean annual temperature is approximately 6.5°C. The mean summer temperature is 15°C and the mean winter temperature is -2.5°C. The mean annual precipitation ranges 1100–1300 mm. The tall, closed mixedwood forest is predominantly composed of red, white, and black spruce, balsam fir, eastern hemlock, and eastern white pine, intermixed with white birch and red maple. Sugar maple, yellow birch, and beech are found on hills and ridges. Moist valley bottoms support white and red pine, and red maple. Spruce, fir, and hemlock are more prevalent on heavier soils to the east. Swampy basins support white elm, black ash, and red maple, whereas bogs favour open black spruce, and tamarack. This undulating to rolling lowland is underlain by soft Mesozoic sandstone in the Annapolis Valley and Palaeozoic shale, sandstone, gypsum, and limestone in the Minas Lowlands. The ecoregion is mantled by deep, loamy, glacial till, alluvium, and fluvio-glacial outwash, particularly in the Annapolis Valley, whereas flat and raised bogs, and stream and horizontal fens are significant on the Minas Lowlands. Humo-Ferric Podzols formed in sandy soils are characteristic of the Annapolis Valley. Loamy Gray Luvisols, Gleysols, stony Humo-Ferric Podzols, and Gleyed Regosols are typical of the Minas Lowlands. Fibrisols are found on bogs, and Mesisols on fens. The region provides habitat for white-tailed deer, snowshoe hare, porcupine, raccoon, red fox, coyote, and beaver. Agriculture, including dairy, fruit, vegetables, and livestock production, is the principal land use in the Annapolis Valley. Farmlands occupy 22% of the ecoregion. Forestry is significant in the eastern section of the ecoregion. The major communities include Kentville and Windsor. The population of the ecoregion is approximately 108 900.

127. SOUTH-CENTRAL NOVA SCOTIA UPLANDS

This ecoregion is found inland in the south-central section of Nova Scotia. Strongly influenced by the Atlantic Ocean, it is one of the most humid parts of the Maritime provinces. The ecoregion is characterized by warm summers and mild, snowy winters. The mean annual temperature is approximately 6.5°C. The mean summer temperature is 14°C and the mean winter temperature is -2°C. The mean annual

precipitation ranges 1300–1600 mm. This ecoregion is classified as having an Atlantic high cool temperature ecoclimate. This mixedwood forest region is composed of intermediate to tall, closed stands of red and white spruce, balsam fir, yellow birch, and eastern hemlock. Yellow birch, beech, and red and sugar maple can be found at higher elevations. Eastern white pine is found on sandy areas. The ecoregion has extensive wetland and rock barrens, which support stunted black spruce, larch, and heath. This region is part of the Atlantic Uplands of Nova Scotia, which represents the lower southern slope of the southeastwardly tilted Cretaceous peneplain. Rolling till plain, drumlin fields, extensive rockland, and wetlands are underlain by folded Palaeozoic slates and quartzites intruded by granites. The plain rises from 30 m asl near the Atlantic coast to 180 m asl at its northern limit and is mantled with stony, discontinuous veneers and blankets of glacial till. Loamy Humo-Ferric Podzols are the dominant soils in the ecoregion. Peaty Gleysols, Fibrisols on raised bogs, and Mesisols on horizontal fens are also present on the landscape. The region provides habitat for white-tailed deer, snowshoe hare, porcupine, raccoon, fisher, red fox, coyote, and beaver. Forestry, recreation and residential developments are the dominant land uses. Agriculture is limited to 3% of the area. The major communities include Halifax and Dartmouth. The population of the ecoregion is approximately 271 100.

128. NOVA SCOTIA HIGHLANDS

This ecoregion is a complex band of plateaus separated by lower-elevation uplands and lowlands that stretch across northern Nova Scotia from Chignecto Bay to Cape Breton Island. The climate is marked by warm, rainy summers and mild to cold, snowy winters. The mean annual temperature is approximately 6°C. The mean summer temperature is 14.5°C and mean winter temperature is –2.5°C. The mean annual precipitation ranges 1000–1600 mm. The mixedwood forest is composed of sugar and red maple, yellow birch, red and white spruce, and balsam fir. This ecoregion is distinguished from others by the abundance of yellow birch at higher elevations. Other species such as eastern white pine, eastern hemlock, balsam fir, and red and black spruce also occur. The region includes the Cobequid Mountains to the west, the dissected Antigonish Highlands in the centre, and the dissected Cape Breton Hills to the northeast. These highland plateaus are remnants of a Cretaceous peneplain surface, composed of Palaeozoic metamorphics and Proterozoic intrusives and volcanics, and range in elevation 120–300 m asl. The highland plateaus are incised with deep valleys. Undulating to rolling stony glacial till blankets, underlain by Palaeozoic shale, sandstone, and conglomerate, characterize the uplands and lowlands. Loamy Humo-Ferric Podzols predominate, but Ferro-Humic Podzols are common under hardwood stands at higher elevations. Inclusions of Gleysols, Gray Luvisols, Fibrisols on bogs, and Mesisols on fens are significant. The region provides habitat for white-tailed deer, moose, black bear, snowshoe hare, fisher, coyote, and porcupine. Forestry, farming on the lowlands (7% of the ecoregion), and localized blueberry and maple syrup production characterize land use. The major communities include Sydney, Glace Bay, and Antigonish. The population of the ecoregion is approximately 198 700.

129. CAPE BRETON HIGHLANDS

This ecoregion is located on the northern tip of Cape Breton Island. The ecoregion is marked by cool, wet summers and long winters. Fog is common. The mean annual temperature is approximately 5°C. The mean summer temperature is 15°C and the mean winter temperature is –2°C. The mean annual precipitation ranges 1400–1600 mm. The ecoregion is strongly influenced by severe winds on exposed upper slopes, where sparse, low growing conifer forests and kalmia heath are predominant. The sheltered lower slopes are characterized by intermediate to tall balsam fir, white spruce, and white birch. Associated with peatlands and seepage sites are open stands of black spruce and tamarack with an understory of sphagnum. The ecoregion covers the highest part of the Nova Scotia Highlands physiographic division and a remnant of the old Appalachian peneplain composed of Proterozoic metamorphic and volcanic rocks. The peneplain is deeply incised around its margins and has a remarkably flat interior lying at about 450 m asl. Ridged to

hummocky, stony, glacial tills are predominant; bedrock exposures, residuum, colluvium on the very steep slopes, and peatlands on the plateau are also present. Shallow, loamy Ferro-Humic Podzols are the dominant soils of the region and are commonly associated with Humo-Ferric Podzols and Dystric Brunisols on steep slopes, Fibrisols on domed and sloping bogs, and Mesisols on fens. The region provides habitat for moose, snowshoe hare, black bear, and lynx. Forestry, tourism, and recreation are dominant land uses in the region. There are no major communities in this ecoregion.

130. PRINCE EDWARD ISLAND

This ecoregion covers all of Prince Edward Island. Moderated by the Atlantic Ocean, the summers are warm and winters mild and snowy. The mean annual temperature is approximately 5.5°C. The mean summer temperature is 15°C and the mean winter temperature is -3.5°C. The mean annual precipitation ranges 900–1150 mm. Little of the original mixedwood forest is left on the island. Cultivated fields were once covered with red oak, sugar maple, yellow birch, and beech. Abandoned fields are reverting to forests of white and red spruce. In the west and along the windswept north shore, dwarf conifers are prominent on upland flats and valley bottoms. Black spruce and tamarack are common on wetlands. Eastern white pine is widespread on coarse-textured soils. The island is part of the Maritime Plain consisting of flat to gently dipping late Palaeozoic sandstones, siltstone, and conglomerates that rise from sea level to a high of 142 m asl inland. This undulating plain is mantled with loamy glacial till, fluvioglacial deposits, and level marine sediments of varying depth. This ecoregion has the best-developed sand dune and beach systems in the Atlantic Maritime ecozone. These systems, combined with ocean waters that, during the summer, are the warmest ocean waters in Canada, make them ideal recreational sites. The dominant soils of the region are Humo-Ferric Podzols. Significant inclusions are Gleysols, Gray Luvisols, Mesisols on flat and bowl bogs, and Fibrisols on domed bogs and fens. The ecoregion provides coastal and salt marsh habitat for shorebirds and seabirds. Agriculture, ocean-based fishery, tourism, and recreation are the predominant land uses. Farmland occupies much of the ecoregion. The major communities include Charlottetown and Summerside. The population of the ecoregion is approximately 129 800.

131. ÎLES-DE-LA-MADELEINE

These islands are found in the Gulf of St. Lawrence. The strongly maritime climate is marked by warm summers and stormy, mild winters. The mean annual temperature is approximately 4.5°C. The mean summer temperature is 13°C and the mean winter temperature is -3.5°C. The mean annual precipitation ranges from 900 to over 1000 mm. The boreal forest is characterized by black spruce and balsam fir with an understory of feathermoss. Fires have resulted in the development of low-growing kalmia heath and moss. Poorly drained sites support open stands of black spruce and tamarack with alder, kalmia heath, and moss. The ecoregion consists of flat to gently dipping Palaeozoic Carboniferous sandstones, shales, and conglomerates rising inland from sea level to 100 m asl in elevation. Small bedrock outcrops stand as prominent hills. Mantled with stony, loamy glacial till of varying depth, the dominant soils of the region are Humo-Ferric Podzols, which have compact subsoils that restrict internal drainage. Significant inclusions are Gleysols, Organic Fibrisols on domed bogs, and Mesisols and Humisols on basin swamps. There are very few terrestrial mammals on Îles-de-la-Madeleine because of its isolation. Shorebirds and seabirds inhabit salt marshes and coastal habitats. Fishing, tourism, and recreation are the region's dominant activities. The principal community is Fatima. The population of the ecoregion is approximately 14 000.

MIXEDWOOD PLAINS ECOZONE

The ecozone covers the lower Great Lakes–St. Lawrence River valley. Its geographic location, waterways and combination of gentle topography, fertile soils, warm growing season and abundant rainfall have made it the most intensely used and populated area in Canada.

Climate The climate is marked by warm summers and cool winters. The weather is highly changeable because the ecozone lies along one of the major storm tracks of North America. Within the ecozone mean annual temperatures range from 5°C to 8°C. The mean summer temperature ranges from 16°C to 18°C. The mean winter temperature ranges from –2.5°C to –7°C. Mean annual precipitation ranges 720–1000 mm per year. The annual growing season ranges from 1750 growing degree-days in the north to 2500 in the south, near Lake Erie.

Vegetation At one time, this area was heavily forested, supporting more species of trees than any other part of Canada. However, presently less than 10% of this area remains. Where forest cover exists, it varies from the mixed coniferous–deciduous stands of white and red pine, eastern hemlock, oak, maple, and birch in the northern portions to the rich diversity of the deciduous Carolinian forest in the southwest near Detroit–Windsor area. Species which were previously abundant include sugar maple, beech, white elm, basswood, red and white oak, walnut, and hickory. Some of the rarest trees in Canada, such as sassafras, tulip tree, sycamore, and cucumber-tree, were native to the southernmost tip of this area.

Landforms and Soils This ecozone is underlain by carbonate-rich Palaeozoic bedrock. The topography is a combination of level plains and gently rolling hills consisting of deep moraine, lacustrine and marine/estuarine deposits. Luvisols, Brunisols, and Gleysols are the predominate soils on level to gently sloping landscapes near the Great Lakes and along the Ottawa and St. Lawrence river valleys. Along the northern fringe, Podzols and Brunisols are more prevalent on coarser textured soils. The area contains the most productive agricultural soils in Canada.

Wildlife The large mammals such as the white-tailed deer and black bear that once lived in this forest have largely disappeared. Smaller mammals, such as the raccoon, skunk, vole, grey and black squirrel, eastern cottontail and groundhog, remain fairly common. Rare bird species such as the Carolina wren, bobwhite, and green heron are unique to this area. Other representative birds include the great blue heron, red-shouldered hawk, whip-poor-will, cardinal, blue jay, red-headed woodpecker, and Baltimore oriole.

Human Activities This ecozone spans the shorelines of three of the Great Lakes and incorporates important aquatic ecosystems, industrial complexes and recreation areas. Most of the deciduous forest has been cleared away for farms, orchards, highways, and cities. Today, service industries and the manufacturing sector are the largest employment sectors. Approximately one-half of Canada's population, almost 14 million, reside in the ecozone. Almost 85% live in urban centres stretching along the Quebec City–Windsor Corridor, including Canada's two largest cities, Toronto and Montreal.

132. ST. LAWRENCE LOWLANDS

The ecoregion includes the lowlands centred on the Ottawa and St. Lawrence rivers stretching from Quebec City to the Frontenac Axis near Brockville, Ontario. It is bounded on the north by the hilly Laurentian Highlands and the Eastern Quebec Uplands to the south. The ecoregion is marked by warm summers and cold snowy winters. Moist summers are more prevalent west of Montreal. The mean annual temperature is approximately 5°C. The mean summer temperature is 16.5°C and the mean winter temperature is –7°C. The mean annual precipitation ranges 800–1000 mm. Mixedwood forests of sugar maple, yellow birch, eastern hemlock, and eastern white pine form the most stable vegetation in the region; beech occurs on warmer

sites. Dry sites are dominated by red pine, eastern white cedar, and red oak. Wetter sites support red maple, black ash, white spruce, tamarack, and eastern white cedar. Underlain by flat-lying Palaeozoic strata that are either faulted or lie upon the crystalline rocks of the Canadian Shield, the ecoregion is rarely more than 152 m asl, except for the seven Monteregian Hills in the south, which are formed of intrusive igneous rocks. Gleysolic soils developed on level, poorly drained, clayey deposits are dominant in the region; significant inclusions are Humo-Ferric Podzols and Dystric Brunisols on morainal uplands. Characteristic wildlife includes deer, black bear, moose, wolf, hare, chipmunk, other small mammals, waterfowl, and other birds. Most of the region is intensively cultivated farmland (60%) with corn being the dominant crop grown. Dairy and mixed farming systems prevail. Urban development is extensive. The major communities include Quebec City, Montreal, Trois-Rivières, Saint-Hyacinthe, Cornwall, Brockville, Ottawa/Hull, and Pembroke. The population of the ecoregion is approximately 5 910 000.

133. FRONTENAC AXIS

This ecoregion extends between Kingston and Brockville with the majority of the ecoregion existing within the Adirondacks area of upper New York state. The ecoregion is characterized by warm summers and cold winters with monthly precipitation being evenly distributed throughout the year. The mean annual temperature is approximately 4.5°C. The mean summer temperature is 16°C and the mean winter temperature is -7°C. The mean annual precipitation ranges 700–800 mm. The dominant land cover is mixed forest with species common to the Mixedwood Plains and Boreal Shield ecozones. Forest vegetation is characterized by sugar maple, eastern hemlock, and red oak. Pioneer species include white pine, paper birch, and trembling aspen. Moist sites are characterized by yellow birch, white elm, and red maple with slippery elm, black ash, and white cedar occurring in depressions and near streams. Drier sites contain red oak, and white and red pine. The region is underlain by carbonate-rich, Palaeozoic bedrock, which contrasts it with the acidic bedrock found in the balance of the Precambrian Shield to the north. The landscape is a complex mix of bedrock outcrops and deeper marine and lacustrine clay deposits. Gleysolic soils on the fine-textured deposits and Humo-Ferric Podzolic soils on the coarse-textured deposits are codominant. Significant inclusions are Fibrisol soils found in depressions distributed throughout the ecoregion. Characteristic wildlife includes white-tailed deer, snowshoe hare, coyote, red and grey squirrel, and chipmunk. Bird species include the cardinal, wood thrush, screech owl, mourning dove, green heron, pileated and red-bellied woodpecker, and wood and American black duck. Mixed farming and dairy are the dominant farming systems, and major crops include grains, corn, and hay. Other significant land uses include urban development, recreation and tourism. Major communities include Gananoque and Mallorytown. The population of the ecoregion is approximately 18 500.

134. MANITOULIN–LAKE SIMCOE

This ecoregion extends eastward from Manitoulin Island to Kingston at the east end of Lake Ontario in southern Ontario. The ecoregion is characterized by warm summers and mild winters. The mean annual temperature is approximately 6°C. The mean summer temperature is 16.5°C and the mean winter temperature is -4.5°C. Mean annual precipitation ranges 750–1000 mm. The higher precipitation levels occur in areas bordering Lake Huron. Precipitation is evenly distributed throughout the year. The dominant land cover is cropped land with significant areas of mixed forest. Climax vegetation is characterized by sugar maple, beech, eastern hemlock, red oak, and basswood. Pioneer species include white pine, paper birch, and trembling aspen. Moist sites are characterized by yellow birch, white elm, and red maple with slippery elm, black ash, and white cedar occurring in depressions and near streams. Drier sites contain red oak, and white and red pine. The ecoregion falls within the West St. Lawrence Lowland, is underlain by carbonate-rich, Palaeozoic bedrock, and is dominated by a wide variety of deep glacial deposits. Level to undulating bedrock outcropping occurs in a few limited areas. The northeasterly facing Niagara Escarpment, extending northwesterly from Niagara River to the Manitoulin Islands, divides the region into two parts. The area to

the west slopes gradually southwestward through an area of rolling topography of low relief. East of the escarpment, the land rises gently from Lake Ontario to Georgian Bay. Loamy Melanic Brunisolic and Gray Brown Luvisolic soils are dominant. Significant inclusions are clayey Gleysolic soils. Characteristic wildlife includes white-tailed deer, snowshoe hare, coyote, red and grey squirrel, and chipmunk. Bird species include the cardinal, wood thrush, screech owl, mourning dove, green heron, pileated and red-bellied woodpecker, and wood and American black duck. The most extensive land use in this ecoregion is agriculture, which occupies 56% of the land area. Mixed, dairy, and cash crop are the dominant farming systems, and major crops include grains, corn, soybeans, hay, and fruit. Other significant land uses include urban development, recreation, and tourism. The major communities include Kingston, Belleville, Peterborough, Oshawa, Kitchener–Waterloo, Barrie, Owen Sound, Stratford, and Brantford. The population of the ecoregion is approximately 2 150 000.

135. LAKE ERIE LOWLAND

This ecoregion extends from Windsor to Toronto, including the Niagara Peninsula at the southern tip of Ontario. The ecoregion has one of the warmest climates in Canada. It is marked by humid, warm to hot summers and mild, snowy winters. The mean annual temperature is approximately 8°C. It reaches as high as 9°C in the Windsor area. The mean summer temperature is 18°C and the mean winter temperature is –2.5°C. The mean annual precipitation ranges 750–900 mm. Precipitation is evenly distributed throughout the year. The dominant land cover is cropped land with limited areas of mixed and deciduous forests on the Niagara Escarpment. Urban development is the other significant land cover. Climax vegetation is characterized by sugar maple, beech, white and red oak, shagbark hickory, black walnut, and butternut. Moist sites are characterized by white elm, eastern cottonwood, balsam poplar, red and black ash, and silver maple. Drier and warmer sites contain black, chestnut, and chinquapin oak. Tulip tree, sycamore, and bitternut hickory occur on moist slopes. The ecoregion is underlain by carbonate-rich, Palaeozoic bedrock and is dominated by a wide variety of deep glacial deposits. Most of the region lies southwest of the Niagara Escarpment, where the land surface slopes gradually southwestward through low-relief, rolling topography. Bedrock outcrops are only in a limited area between Hamilton and Georgetown. The ecoregion east of the escarpment consists of primarily level, fine-textured lacustrine deposits. Minor areas of sandy to loamy till deposits also occur. Clayey Gleysolic and Gray Brown Luvisolic soils are dominant in the ecoregion. Characteristic wildlife species include white-tailed deer, grey and red squirrel, and chipmunk. Bird species include the cardinal, wood thrush, screech owl, mourning dove, green heron, pileated and red-bellied woodpecker, and wild turkey. Agriculture is the predominant land use occupying 65% of the ecoregion, and major crops include corn, soybeans, tobacco, and tender fruit. The other dominant land use is urbanization, including residential, commercial, and industrial uses. The major communities include Toronto, Hamilton, St. Catharines, Niagara Falls, Windsor, Sarnia, London, Chatham, and Brantford. The population of the ecoregion is approximately 3 938 000.

BOREAL PLAINS ECOZONE

The Boreal Plains ecozone extends as a wide band from the Peace River country of British Columbia in the northwest to the southeastern corner of Manitoba. Unlike the neighbouring Boreal Shield, the ecozone is not bedrock controlled, has few bedrock outcrops and considerably less lakes.

Climate The climate is typified by cold winters and moderately warm summers and is strongly influenced by continental climatic conditions. The mean annual temperature ranges between –2°C to 2°C. Mean summer temperatures range between 13°C to 15.5°C. Mean winter temperatures range from –17.5°C to –11°C. Winter temperatures in the foothills of Alberta are a few degrees warmer. Mean annual precipitation

rises from 300 mm in northern Alberta to 625 mm in southwest Manitoba. The average annual growing season ranges 1000–1250 growing degree–days above 5°C.

Vegetation White and black spruce, jack pine, and tamarack are the main coniferous species. Broadleaf trees, particularly white birch, trembling aspen, and balsam poplar, are most numerous in the transitional section leading to the prairie grasslands. Black spruce and tamarack increase in dominance along the northerly sections of the ecozone.

Landforms and Soils Underlain by Cretaceous shales, this nearly level to gently rolling plain consists largely of hummocky to kettled glacial moraine and lacustrine deposits. The surface materials are usually deep and tend to mask the underlying topography. The soils of this ecozone are largely Luvisols. These grade southward into Black Chernozems and northward into Brunisols and Organics. Wetlands, including peatlands with organic soils cover between 25–50% of the ecozone.

Wildlife Characteristic mammals include woodland caribou, mule and white-tailed deer, moose, wapiti (elk), coyote, black bear, marten, fisher, lynx, and chipmunk. Representative birds include boreal and great horned owl, blue jay, rose-breasted and evening grosbeak, Franklin's gull, red-tailed hawk, and northern harrier. This is also the zone in which pelican, cormorant, gull, heron, and tern are most prominent. The whooping crane, perhaps Canada's most famous endangered species, nests in wetlands of Wood Buffalo National Park at the extreme north of the ecozone.

Human Activities Agricultural development has made considerable inroads into the southerly and northwesterly fringes (Peace River). However, the other principal uses of this ecozone include forestry, mining, oil and gas exploration and production, hunting and trapping, outdoor recreation, and tourism. Forestry operations focus on harvesting large volumes of wood fibre for pulp and paper. The largest employment sectors are service industries and public administration. The population of the ecozone is approximately 707 700, and the largest centres include Fort McMurray, Grande Prairie, Fort St. John, Dawson Creek, and Hinton.

136. SLAVE RIVER LOWLAND

This ecoregion in northeastern Alberta includes the lower reaches of the Peace and Athabasca rivers, the Peace–Athabasca delta, and the Slave River drainage up to Great Slave Lake in the Northwest Territories. The climate is characterized by short, cool summers and long, cold winters. The mean annual temperature is approximately –2°C. The mean summer temperature is 13°C and the mean winter temperature is –17.5°C. The mean annual precipitation ranges 300–400 mm. The ecoregion is classified as having a subhumid mid-boreal ecoclimate. Its boreal vegetation is typically medium to tall, closed stands of trembling aspen, balsam poplar, and jack pine with white and black spruce, and balsam fir occurring in late successional stages. Cold and poorly drained fens and bogs are covered with tamarack, black spruce, ericaceous shrubs, and mosses. Underlain by relatively flat, low-relief Palaeozoic carbonates, and except for the delta, the region is mainly an undulating sandy plain with some eolian features. Up to 50% of the area is covered by peatlands. Sporadic discontinuous permafrost with low ice content is prevalent, mainly in the organic deposits. Dystric Brunisols are the main soils with some Gleysols and some saline inclusions along the Slave River. Regosols and Gleysols are the most common soils on the alluvial materials of the Slave River delta. Characteristic wildlife includes moose, black bear, wolf, lynx, beaver, muskrat, snowshoe hare, waterfowl, sandhill crane, ruffed grouse, and other birds. This region contains most of Wood Buffalo National Park, the largest park in Canada (44 840 km²). It is also the home of the world's largest bison herd. Other land uses include hunting, fishing, trapping, and some mineral exploration. The major communities include Pine Point, Fort Resolution, and Fort Smith. The population of the ecoregion is approximately 5600.

137. CLEAR HILLS UPLAND

This ecoregion spans the British Columbia–Alberta boundary north of the Peace River district. The climate is characterized by cool, short summers and cold winters with severe temperatures moderated by frequent chinooks. The mean annual temperature is approximately -0.5°C . The mean summer temperature is 13°C and the mean winter temperature is -17.5°C . The mean annual precipitation ranges 400–600 mm. Permafrost is limited to isolated patches along the northern boundary of the ecoregion. It represents a transition between boreal and cordilleran vegetation which occurs on the lower slopes of the Rocky Mountains and the western edge of the Alberta Plain. The boreal forest has a mixture of lodgepole pine, which may dominate at higher elevations. White spruce and fir are also common species in the uplands areas, whereas black spruce communities may dominate in the poorly drained valleys. Bedrock materials are composed of Cretaceous sandstone and shale strata, which are an extension of the Alberta Plateau out from the Rocky Mountains. The ecoregion is a dissected upland with an elevation range of 550–1050 m asl. There are steep slopes, some rolling plateau remnants, and broad, gently undulating valleys. A moderately fine-textured till covers most of the area with some clayey lacustrine deposits in the valleys, which may have over 50% of the area covered with organic soils. Fibrisols and Mesisols occur on bog blankets, and Gray Luvisols occur on rolling, moderately to steeply sloping, loamy morainal deposits, which are dominant in the region. Wildlife in the region includes moose, deer, elk, woodland caribou, black bear, beaver, mink, wolf, marten, hare, and spruce grouse. This ecoregion supports a forestry industry, oil and gas exploration, and hunting. Some agriculture, limited to forage production and short-season cereal grains, is present on the southern edge. The population of the ecoregion is approximately 5100.

138. PEACE LOWLAND

This region is composed of the gently undulating, or sloping lands associated with the Peace River and its major tributaries. The ecoregion is characterized by a unique climate, marked by warmer summers than the surrounding areas. The mean annual temperature is 0.5°C . The mean summer temperature is 13°C and the mean winter temperature is -14°C . The mean annual precipitation ranges 350–600 mm. The ecoregion is classified as having a subhumid low boreal ecoclimate. It forms part of the extensive deciduous forest belt that extends from southeastern Manitoba to north-central Alberta. A closed cover of tall trembling aspen with secondary quantities of balsam poplar, an understory of mixed herbs, and tall shrubs is the predominant vegetation. White spruce and balsam fir are the climax species but are not well represented because of fires. Poorly drained sites are usually covered with sedges, willow, some black spruce, and tamarack. There are some areas of more open parkland vegetation associated with a warmer climate and often saline soils. The rivers are incised up to 300 m in the foothills of northeastern British Columbia, where the elevation of the valleys is about 750 m asl, and drop gradually to the Slave Lowland at an elevation of about 300 m asl. Clayey lacustrine deposits are the predominant parent material, along with some fine-textured tills and significant areas of sandy fluvial deposits. Gray Luvisols are the predominant soil type, but the abundant vegetative understory and common restricted drainage have resulted in an abundance of Dark Gray Luvisols and Solods with some Chernozemic soils in the Alberta portion of the ecoregion. The region also provides habitat for white-tailed deer, black bear, moose, beaver, ruffed grouse, coyote, rabbit, and waterfowl. There is also some oil and gas activity, forestry, and hunting. About 45% of the area is farmland with annual small grains and grasses dominating. The major communities include Fort St. John, Dawson Creek, Grande Prairie, Fairview, and High Level. The population of the ecoregion is approximately 148 000.

139, 140, 141, 144, 147, 150, 151, 152, 153, 154.
MID-BOREAL UPLANDS

This mid-boreal ecoregion occurs as 10 separate, mostly upland areas, south of the Canadian Shield (147), stretching from north-central Alberta to southwestern Manitoba. It includes remnants of the Alberta Plateau (139, 140, 141, 144) in Alberta, several prominent uplands known locally as the Thickwood (150), Pasquia (151), and Porcupine (152) hills in Saskatchewan, and the Duck (153) and Riding (154) mountains in Manitoba. The climate has predominantly short, cool summers and cold winters. The mean annual temperature ranges from -1°C to 1°C . The mean summer temperature ranges from 13°C to 15.5°C and the mean winter temperature ranges from -13.5°C to -16°C . Some areas of the ecoregion can be very cold with winter mean temperatures exceeding -17°C in northern Alberta. The mean annual precipitation ranges 400–550 mm. The ecoregion is classified as having a predominantly subhumid mid-boreal ecoclimate. These uplands form part of the continuous mid-boreal mixed coniferous and deciduous forest extending from northwestern Ontario to the foothills of the Rocky Mountains. Medium to tall, closed stands of trembling aspen and balsam poplar with white and black spruce, and balsam fir occurring in late successional stages, are most abundant. Deciduous stands have a diverse understory of shrubs and herbs; coniferous stands tend to promote feathermoss. Cold and poorly drained fens and bogs are covered with tamarack and black spruce. Consisting for the most part of Cretaceous shales, these uplands are covered entirely by kettled to dissected, deep, loamy to clayey-textured glacial till, lacustrine deposits, and inclusions of coarse, fluvioglacial deposits. Elevations range from about 400 to over 800 m asl. Associated with rougher morainal deposits are a large number of small lakes, ponds, and sloughs occupying shallow depressions. Permafrost is very rare and found only in peatlands. Well-drained Gray Luvisolic soils are dominant in the region. Significant inclusions are peaty-phase Gleysols and Mesisols that occupy poorly drained depressions. Dystric Brunisols occur on droughty, sandy sites. In Alberta, the ecoregion slopes gently and drains northward via the Athabasca and Clearwater rivers and their tributaries, whereas in most of Saskatchewan and Manitoba the uplands slope gently and drain northeastward via the Churchill and North Saskatchewan river systems. Characteristic wildlife includes moose, white-tailed deer, elk, black bear, timber wolf, lynx, snowshoe hare, beaver, and muskrat. Bird species include common loon, red-tailed hawk and neotropical migrants. Pulpwood and local sawlog forestry, water-oriented recreation, hunting, and trapping are the main land use activities. Agricultural activities are significant in southern parts of the ecoregion, particularly in Saskatchewan and Manitoba. Major communities include Fort Assiniboine, Trout Lake, Peerless Lake, La Loche, Buffalo Narrows, and Île-à-la Crosse. The population of the ecoregion is approximately 45 200.

142. WABASCA LOWLAND

This ecoregion encompasses the undulating lowlands of north-central Alberta and forms a portion of the continuous mid-boreal mixed forest extending from northwestern Ontario to the foothills of the Rocky Mountains. The climate is characterized by cool summers and long, cold winters. The mean annual temperature is approximately 0.5°C . The mean summer temperature is 13.5°C and the mean winter temperature is -13.5°C . The mean annual precipitation ranges 350–500 mm. The ecoregion is classified as having a subhumid mid-boreal ecoclimate. Medium to tall, closed stands of trembling aspen and balsam poplar with white and black spruce, and balsam fir, occurring in late successional stages, are most abundant. Cold and poorly drained fens and bogs are covered with tamarack and black spruce. Formed on Mesozoic and Palaeozoic sediments, the surface of this region is predominantly a gently undulating lowland plain covered with thick, loamy glacial till, clayey lacustrine, sandy fluvioglacial, and organic deposits. This low-relief plain is rather poorly drained, and organic materials cover about 50% of the area. Organic soils are dominant in the region. Gleysolic and Gray Luvisolic soils are significant inclusions. The whole of the region slopes gently and drains northward via the Athabasca and Wabasca rivers within the region. Characteristic wildlife includes moose, black bear, wolf, lynx, snowshoe hare, waterfowl, ruffed grouse, and other birds. Land uses include forestry, water-oriented recreation, and wildlife hunting and trapping, and some oil and

gas exploration in the western part. Fort McMurray is the main community. The population of the ecoregion is approximately 38 700.

143. WESTERN BOREAL

This ecoregion is a southern extension of the Peace River Lowland. The climate is characterized by cool, short summers and cold winters. The mean annual temperature is approximately 1°C. The mean summer temperature is 13.5°C and the mean winter temperature is -13°C. The mean annual precipitation ranges 450–550 mm. The mid-boreal mixedwood vegetation is dominated by aspen with inclusions of white spruce and aspen on better-drained sites, and black spruce and willows dominating in the poorly drained areas. Underlain by Tertiary sandstone and shale strata, much of the plain has a level to gently undulating surface, is about 750 m asl in elevation, and has several wide river valleys entrenched some 60–120 m. Its surface materials are mainly imperfectly drained clayey lacustrine sediments with some sandy fluvio-glacial deltas associated with its major river systems. This low-relief plain is mainly imperfectly drained, but with a significant amount of poor drainage and about 20% organic deposits. Gleyed Solonchak Gray Luvisolic soils are dominant in the region. Significant inclusions are Gleysolic and Organic soils. Characteristic wildlife in the region includes moose, deer, elk, black bear, wolf, marten, hare, beaver, mink, spruce grouse, and waterfowl. Land uses include forestry, hunting and trapping, recreation, and some gas and oil exploration. Approximately 14% of the region is in farmland. The major communities include Little Smoky and Sturgeon Heights. The total population of the ecoregion is approximately 4900.

145, 146. WESTERN ALBERTA UPLAND

This ecoregion occurs as two separate areas in west-central Alberta. The smaller southern part of this area extends into the foothills (146), and the larger northern part crosses into British Columbia, with a second small extension into Alberta south of the Peace River (145). The mean annual temperature ranges from 1.5°C in the north to 2°C in the south. The mean summer temperature is 12.5°C and the mean winter temperature ranges from -11°C in the north to -8.5°C in the south. The mean annual precipitation is approximately 450–600 mm. The region represents a transition between mid-boreal and mid-cordilleran vegetation, which occurs on the lower southeastern slopes of the Rocky Mountains and the western edge of the Alberta Plain. Its mixed forests of lodgepole pine, trembling aspen, and white spruce with balsam poplar, paper birch, and balsam fir, are characteristic of the region. Aspen and open stands of lodgepole pine occur on drier sites; black spruce and tamarack are associated with wet sites. Conifers are more prevalent on cooler, higher elevations in the foothills, whereas aspen is more dominant in its lower plains section. The foothills, composed of Cretaceous sediments, rise abruptly above the plains and are mainly linear ridges, rolling plateau remnants, and broad valleys. Their summits range 700–1500 m asl in elevation. These strongly dissected uplands with local relief of 100–200 m are covered with thin, discontinuous, loamy glacial till, some peat blankets, and clayey lacustrine and sandy fluvio-glacial deposits. Well-developed Luvisolic soils with some bare rock ridges and Gleysolic and Organic soils are dominant in the region. The ecoregion generally slopes and drains northeastward via the Peace, Athabasca, and Saskatchewan river systems. Characteristic wildlife includes moose, black bear, beaver, muskrat, wolf, snowshoe hare, waterfowl, sandhill crane, ruffed grouse, and other birds. Land use activities include commercial pulpwood and sawlog forestry, water-oriented recreation, and wildlife trapping and hunting. The major communities include Hinton, Edson, Nordegg, and Swan Hills. The population of the ecoregion is approximately 55 100.

148. MID-BOREAL LOWLAND

This ecoregion occupies the northern section of the Manitoba Plain from the eastern shore of Lake Winnipeg to the Cumberland Lowlands in Saskatchewan. The climate is marked by short, warm summers and cold winters. The mean annual temperature is approximately -1°C . The mean summer temperature is 13.5°C and the mean winter temperature is -17°C . The mean annual precipitation ranges from 375 mm in the northwest to 625 mm in the southeast. The ecoregion is classified as having a subhumid mid-boreal ecoclimate. It is part of the boreal mixed coniferous and deciduous forest, extending from Lac Seul in northwestern Ontario to the foothills of the Rocky Mountains. It is a relatively flat, low-lying region with extensive wetlands covering approximately half the area. The cold and poorly drained fens and bogs are covered with tamarack and black spruce. The mixed deciduous and coniferous forest is characterized by medium to tall, closed stands of trembling aspen and balsam poplar with white and black spruce, and balsam fir occurring in late successional stages. Permafrost occurs in isolated patches in peatlands and is more prevalent in the region's northeastern section. Underlain by flat-lying, Palaeozoic limestone bedrock, the ecoregion is covered almost entirely by level to ridged glacial till, lacustrine silts and clays, and extensive peat deposits. Eutric Brunisols developed on extremely calcareous, loamy glacial till and Mesisols on forest peat are codominant, and are associated with local areas of limestone bedrock outcroppings and Gray Luvisols on loamy to clayey-textured lacustrine deposits. Wildlife includes moose, black bear, wolf, lynx, snowshoe hare, waterfowl including duck, goose, pelican, sandhill crane, ruffed grouse, and other birds. Pulpwood and local sawlog forestry, water-oriented recreation, and wildlife trapping and hunting are the dominant uses of land in this region, although seed grains, oilseeds and forage crops are produced where soils and drainage are suitable. The major communities include The Pas and Grand Rapids. The population of the ecoregion is approximately 18 300.

149. BOREAL TRANSITION

This ecoregion extends from southern Manitoba to central Alberta. The ecoregion is characterized by warm summers and cold winters. The mean annual temperature is approximately 1°C . The mean summer temperature is 14°C and the mean winter temperature is -13.5°C . The mean annual precipitation ranges from 450 mm in the west to 550 mm in the east. The ecoregion is classified as having a subhumid low boreal ecoclimate. As part of the dominantly deciduous boreal forest, it is characterized by a mix of forest and farmland. It marks the southern limit of closed boreal forest and northern advance of arable agriculture. A closed cover of tall, trembling aspen with secondary quantities of balsam poplar, a thick understory of mixed herbs, and tall shrubs is the predominant vegetation. White spruce and balsam fir are the climax species, but are not well represented because of fires. Poorly drained sites are usually covered with sedges, willow, some black spruce, and tamarack. Underlain by Cretaceous shale, this hummocky to kettled plain is covered by calcareous, glacial till and significant inclusions of relatively level lacustrine deposits. Associated with the rougher morainal deposits are a large number of small lakes, ponds, and sloughs occupying shallow depressions. The region drains northeastward via the Saskatchewan River system. Well- to imperfectly drained Gray Luvisols and Dark Gray Chernozemic soils are predominant. Local areas of Black Chernozemic, peaty Gleysolic, and Mesisolic soils also occur. The region also provides habitat for white-tailed deer, black bear, moose, beaver, coyote, snowshoe hare, and cottontail. It also provides critical habitat for large numbers of neotropical migrant bird species, as well as ruffed grouse and waterfowl. Over 70% of the ecoregion is farmland, spring wheat and other cereals, oilseeds, and hay are the dominant crops. Other land uses include forestry, hunting, fishing, and recreation. The major communities include Athabasca, Lac la Biche, Meadow Lake, Prince Albert, Melfort, Hudson Bay, and Kamsack. The population of the ecoregion is approximately 298 100.

155. INTERLAKE PLAIN

This ecoregion extends northwestward from the southeastern corner of Manitoba to the Saskatchewan boundary north of the Porcupine Hills (Mid-Boreal Uplands 152). The climate is marked by warm summers and cold winters. The mean annual temperature is approximately 1°C. The mean summer temperature is 15.5°C and the mean winter temperature is -14.5°C. The mean annual precipitation ranges from 425 mm in the northwest to 575 mm in the southeast. The ecoregion is classified as having a subhumid low boreal ecoclimate. It is part of the dominantly deciduous boreal forest that extends from southeastern Manitoba to the Peace River in north-central Alberta. It presents a mosaic of farmland and forest, marking the southern limit of closed boreal forest and northern extent of arable agriculture. Its native vegetative cover consists of a closed cover of tall to low trembling aspen with secondary quantities of balsam poplar, an understory of tall shrubs, and a ground cover of mixed herbs. White spruce and balsam fir are the climax species but are not well represented. Open stands of tall jack pine occur on dry, sandy sites. Depressions are water-filled or are covered with sedges, willow, some black spruce, and tamarack. Underlain by flat-lying Palaeozoic limestone, the region is covered by broadly ridged, extremely calcareous, glacial till and by shallow, level lacustrine sands, silts, and clays. Predominant soils are Dark Gray Chernozems. Peaty Gleysols and Mesisols are usually associated with poorly drained depressions. The ecoregion includes habitat for white-tailed deer, black bear, moose, beaver, coyote, snowshoe hare, and eastern cottontail, as well as for waterfowl and colonial water birds like cormorant, gull, tern, heron, American white pelican, and grebe. Approximately 40% of the ecoregion is in farmland. Growing season length, available heat, and precipitation permit production of spring wheat, other cereal grains, oilseeds, and hay on the more suitable lacustrine soils. Native hay used for pasture is more prevalent on the stony, glacial till soils. The major communities include Swan River, Gypsumville, Winnipegosis, Riverton, Steinbach, and Selkirk. The population of the ecoregion is approximately 84 600.

PRAIRIES ECOZONE

The Prairies ecozone has its base on the Canada–United States border and arcs from the western edge of Alberta to the eastern edge of Manitoba. This zone comprises the northern extension of open grasslands in the Great Plains of North America. Although characterized by relatively little topographic relief with its grasslands and limited forests, and its subhumid to semiarid climate, it is also the most human-altered region in Canada.

Climate The climate of the Prairies ecozone is determined by its location in the heart of North America. The Rocky Mountains to the west impede easy access of moisture-bearing winds from the Pacific. The result is a continental climate, subhumid to semiarid with short hot summers, long cold winters, low levels of precipitation, and high evaporation. Mean annual temperatures range from 1.5°C to 3.5°C. Mean winter temperatures range from -12.5°C to -8°C and mean summer temperatures from 14°C to 16°C. Mean annual precipitation has extreme variability, ranging from 250 mm in the arid grassland regions in southwest Saskatchewan and southeast Alberta, to slightly less than 700 mm in the Manitoba Plain, the warmest and most humid region in the ecozone. A water deficit situation is a characteristic of this ecozone. The presence of high winds accelerates the evaporation of water.

Vegetation The Aspen Parkland constitutes the northern edge of this ecozone, a transition zone to the boreal forest. It is associated with groves of trembling aspen, balsam poplar, intermittent grasslands, and Black Chernozemic soils. The Aspen Parkland has expanded southward considerably since the prairie fires were effectively stopped by settlement. Natural grassland vegetation was dominated by spear, wheat, and blue grama grass. Sagebrush is abundant. Yellow cactus and prickly pear are found on drier sites. Its shortgrass prairie section occupies the driest southerly arc of this ecozone, where Brown Chernozemic soils

are dominant. The moist mixed grasslands are associated with the Dark Brown Chernozemic soils to the north.

Landforms and Soils The ecozone is underlain for the most part by Cretaceous shales and by flat-lying Palaeozoic limestone in southeastern Manitoba. The surface of this nearly level to rolling plain consists largely of hummocky glacial moraine and level to gently undulating lacustrine deposits. The relatively high natural fertility and good moisture-holding capacity of the area's Chernozemic soils make them highly productive for agriculture. The most productive soils are found on the Black, Dark Gray and Dark Brown Chernozems of the Aspen Parkland and the tall and moist mixed grass prairie. Relatively flat topography is particularly conducive to highly mechanized farming. Depending on rainfall, there are millions of small depressional wetland areas in the form of sloughs, ponds and marshes. The greatest concentration occurs in the subhumid northern grasslands and adjacent Aspen Parkland. Most of the major rivers originate in the Rocky Mountains and flow in an easterly direction across the ecozone. They are dominated by rainfall as well as snowmelt and glacial runoff at their headwaters. Many of the smaller rivers and streams have pronounced variability in streamflow and are often dry for extended periods.

Wildlife Characteristic mammals include mule deer, elk (wapiti), coyote, pronghorn antelope, badger, white-tailed jack rabbit, Richardson's ground squirrel, and northern pocket gopher. White-tailed deer are a recent invader. Bird species include ferruginous hawk, Swainson's hawk, American avocet, and burrowing owl. Great blue heron, black-billed magpie, northern oriole, veery, and brown thrasher are other representative birds. The wetlands in the Prairies ecozone provide major breeding, staging, and nesting habitat for migratory waterfowl using the North American Flyway. These wetlands provide critical habitat for more than half of North America's waterfowl. The transformation of the Prairies ecozone by agricultural activities has resulted in dramatic reduction in habitat for many species. It has resulted in a significant number of extirpated, threatened and endangered wildlife species relative to its area and population.

Human Activities Agriculture is the dominant land use in the prairie landscape. Called the breadbasket of Canada, over 60% of Canada's cropland and 80% of its rangeland, and pasture are located in the ecozone. The other major activities contributing to the economy are mining (coal, potash, mineral, and aggregates) and oil and gas production. Despite the dominance of agricultural activities on the landscape, approximately 80% of the population of 3.8 million are found in urban communities. The major population centres are Calgary, Edmonton, Winnipeg, Regina, and Saskatoon.

156, 161. ASPEN PARKLAND

This ecoregion extends in a broad arc from southwestern Manitoba, northwestward through Saskatchewan to its northern apex in central Alberta. The parkland is considered transitional between the boreal forest to the north and the grasslands to the south. The climate is marked by short, warm summers and long, cold winters with continuous snow cover. The mean annual temperature is approximately 1.5°C. The mean summer temperature is 15°C and the mean winter temperature is -12.5°C. The mean annual precipitation ranges 400–500 mm. The ecoregion is classified as having a transitional grassland ecoclimate. Most of the ecoregion is now farmland but in its native state, the landscape was characterized by trembling aspen, oak groves, mixed tall shrubs, and intermittent fescue grasslands. Open stands of trembling aspen and shrubs occur on most sites, and bur oak and grassland communities occupy increasingly drier sites on loamy Black Chernozemic soils. Poorly drained, Gleysolic soils support willow and sedge species. This broad plains region, underlain by Cretaceous shale, is covered by undulating to kettled, calcareous, glacial till with significant areas of level lacustrine and hummocky to ridged fluvioglacial deposits. Associated with the rougher hummocky glacial till, landscapes are numerous tree-ringed, small lakes, ponds, and sloughs that provide a major habitat for waterfowl. The ecoregion also provides a major breeding habitat for waterfowl and includes habitat for white-tailed deer, coyote, snowshoe hare, cottontail, red fox, northern pocket gopher, Franklin's ground squirrel, and bird species like sharp-tailed grouse and black-billed magpie.

Owing to its favourable climate and fertile, warm black soils, this ecoregion represents some of the most productive agricultural land in the Prairies. It produces a wide diversity of crops, including spring wheat and other cereals, oilseeds, as well as forages and several specialty crops. Dryland continuous cropping methods for spring wheat and other cereal grains are prevalent. Major communities include Red Deer, Edmonton, Lloydminster, North Battleford, Humboldt, Yorkton, and Brandon. The population of the ecoregion is approximately 1 689 000.

157. MOIST MIXED GRASSLAND

This ecoregion comprises the northern extension of open grasslands in the Interior Plains of Canada and is closely correlated with semiarid moisture conditions and Dark Brown Chernozemic soils. The mean annual temperature is approximately 2.5°C. In some areas of southwestern Alberta the mean annual temperature can reach 5°C. The mean summer temperature is 15.5°C and the mean winter temperature is -11°C. The mean annual precipitation ranges 350–400 mm. Native vegetation is relegated to nonarable pasturelands, dominated by spear grass and wheat grass, and a variety of deciduous shrubs including buckbrush, chokecherry, wolf willow, and saskatoon. Patches of scrubby aspen, willow, cottonwood, and box-elder occur to a limited extent on shaded slopes of valleys, on river terraces, and ringing nonsaline depression sites covered with meadow grasses and sedges. Local saline soil areas support alkali grass, wild barley, red sampeire, and sea blite. The region is composed of upper Cretaceous sediments and covered almost entirely by hummocky to kettled glacial till and level to very gently undulating, sandy to clayey lacustrine deposits. Although Dark Brown Chernozemic soils are dominant, significant areas of Solonchic soils occur, particularly in eastern Alberta. Intermittent sloughs and ponds provide habitat for waterfowl. White-tailed deer, pronghorn antelope, coyote, rabbit, and ground squirrel are common in the region. Spring wheat and other cereal grains are produced by employing a wheat or other grain–fallow rotation. Oilseed crops are also becoming increasingly important. Minor irrigation of these crops occurs near Lake Diefenbaker in Saskatchewan and in southern Alberta. Waterfowl hunting is common, and recreation is important around several large reservoirs. Major communities include Fort Macleod, Lethbridge, Drumheller, Rosetown, Unity, Biggar, Saskatoon, Moose Jaw, Regina, Estevan, and Weyburn. The total population of the ecoregion is approximately 656 000.

158. FESCUE GRASSLAND

This region of fescue grassland lies in the chinook belt of southwestern Alberta along the face of the Rocky Mountain foothills. The climate is characterized by warm summers and winters that are mild, due to moderating chinook conditions. The mean annual temperature is approximately 3.5°C. The mean summer temperature is 14°C and the mean winter temperature is -8°C. The mean annual precipitation ranges 400–450 mm. The thick grass sward and Black Chernozemic soils are similar to those of the Aspen Parkland ecoregion (156, 161), but trees are found only in very sheltered locations along some of the waterways. This grassland community is dominated by rough fescue with lesser quantities of Parry oat grass, June grass, and wheat grass. Forbs are abundant and often include yellow bean, sticky geranium, bedstraw, and chickweed. Drier sites have an increased amount of needle-and-thread grass. Moist sites along stream banks, north-facing slopes, and seepage sites support shrub communities dominated by snowberry, rose, saskatoon, and silverberry. Grazing and tillage have disturbed most of the native vegetation in the region. Underlain by sandstones and shale, the surface is covered by undulating to rolling, loamy glacial till and clayey lacustrine deposits. Chernozemic Black soils are dominant in the region. Intermittent sloughs and ponds on the plains provide habitat for waterfowl. White-tailed deer, pronghorn antelope, coyote, rabbit, ground squirrel, sage grouse, and duck are common in the region. The northern section of the ecoregion is almost completely cultivated. Its southern section, along the United States border, has a mixture of cultivation on the flatter portions and ranching on the rougher, ridged components of the uplands and foothills. The major communities include Beiseker, High River, and Cardston. The total population is approximately 528 000.

159. MIXED GRASSLAND

This semiarid grassland ecoregion in southwestern Saskatchewan and southeastern Alberta forms part of the shortgrass prairie in the Great Plains of North America. The mean annual temperature is approximately 3.5°C. In southern Alberta, west of the Cypress Upland ecoregion mean annual temperatures can exceed 5°C. The mean summer temperature is 16°C and the mean winter temperature is -10°C. The mean annual precipitation ranges 250–350 mm. Moisture deficits in late summer are caused by low precipitation and high evapotranspiration. The natural vegetative cover is dominated by spear grass, blue grama grass, and wheat grass. June grass and dryland sedge are significant associates. Blue grama and spear grass predominate on drier sites, along with dwarf sedges. A variety of shrubs and herbs also occurs, but sagebrush is most abundant, and on the driest sites yellow cactus and prickly pear can be found. Scrubby aspen, willow, cottonwood, and box-elder occur to a limited extent on shaded slopes of valleys and river terraces. Local saline areas support alkali grass, wild barley, greasewood, red sampire, and sea blite. The region is composed of upper Cretaceous sediments and is covered almost entirely by dissected to kettled, loamy glacial till, undulating to dissected, loamy lacustrine sediments, and hummocky sandy eolian deposits. The region skirts the Cypress Hills with the area to the south being drained by the Missouri River system, and the area to the north by the South Saskatchewan River. The soils are mainly Brown Chernozemic with significant areas of Solonchic soils. Pronghorn antelope, deer, sage grouse, short-horned lizard, western rattlesnake, coyote, rabbit, and ground squirrel are common species in the region. The production of spring wheat and other cereal grains occurs by employing a grain–fallow rotation. Flaxseed and durum wheat are also grown. About half of the region is cultivated with the remainder being used for pasture or rangeland. As part of the North American waterfowl migratory flyway and with its diverse wildlife habitat, the region provides opportunities for hunting and recreation. The major communities include Medicine Hat, Leader, Swift Current, Assiniboia, Maple Creek, Shaunavon, and Kindersley. The population of the ecoregion is approximately 187 200.

160. CYPRESS UPLAND

This rolling upland in southeastern Alberta and southwestern Saskatchewan is an outlier of the montane vegetative zone that occurs on the lower slopes of the Rocky Mountains. The climate is cooler and more moist than the surrounding Mixed Grassland ecoregion. The mean annual temperature is approximately 3°C. The mean summer temperature is 15°C and the mean winter temperature is -9°C. The mean annual precipitation ranges 325–450 mm. The Cypress Hills, rising abruptly 400–500 m above the surrounding plains, are composed of a mix of dissected Tertiary and Cretaceous sediments covered with glacial till, or with loessial deposits on unglaciated upper plateau sections. The Cypress Hills slope eastwards from a maximum elevation of 1465 m asl at the west side. Natural vegetation ranges from fescue and wheatgrass grasslands below 1000 m to a mixed montane-type open forest of lodgepole pine, deciduous trees, and shrubs at upper elevations. Numerous species, including larkspur, death camas, and wild lupine, are not found elsewhere on the prairies. Chernozemic Black and Dark Brown soils are dominant. Luvisolic soils under pine forests and loamy Regosolic soils on eroded valley slopes are also present. The ecoregion slopes eastward and is drained by deeply incised Frenchman River, and Battle and Swift Current creeks. Mule and white-tailed deer, pronghorn antelope, sage grouse, short-horned lizard, western rattlesnake, coyote, rabbit, and ground squirrel are common in the region. Audubon's warbler is a unique bird, which is not found elsewhere on the prairies. Physical conditions allow free-range livestock grazing and limited production of cereals on smoother lower slopes. Wildlife hunting and recreation are also important uses on rougher upper slopes. The population of the ecoregion is approximately 3900.

162. LAKE MANITOBA PLAIN

This ecoregion stretches northwestward from the International Boundary with the United States to Dauphin Lake. It is one of the warmest and most humid regions in the Canadian prairies. The mean annual temperature ranges from 2°C in the north to over 3°C along the Canada–United States border. The mean summer temperature is 16°C and the mean winter temperature is –12.5°C. The mean annual precipitation ranges 450–700 mm. The ecoregion is transitional between areas of boreal forest to the north and the aspen parkland of the southwest. It is a mosaic of trembling aspen/oak groves and rough fescue grasslands. Trembling aspen and shrubs occur on moist sites, and bur oak and grass species occupy increasingly drier sites on loamy to clayey, Black Chernozemic soils. Poorly drained, Gleysolic soils support willow and sedge communities. Lower and smoother than the Saskatchewan Plain to the west (Aspen Parkland ecoregion), the surface of the plain has an elevation ranging from about 410 m asl near the Manitoba Escarpment to 218 m asl at Lake Winnipeg. This low-relief ecoregion, underlain by limestone bedrock, is covered by extremely calcareous, broadly ridged glacial till in its northern half and by smooth, level, lacustrine sands, silts, and clays in its southern half. Wildlife includes significant waterfowl, as well as white-tailed deer, coyote, rabbit, and ground squirrel. Its growing season length, available heat, and precipitation permit the production of corn, spring wheat, and other cereal grains by dryland continuous cropping methods. Oilseeds, hay, and livestock production are more prevalent in the northern section owing to topography and stoniness limitations. Hunting and water-oriented recreation are additional significant uses of land. The major communities include Winnipeg, Portage la Prairie, Emerson, and Dauphin. The population of the ecoregion is approximately 782 100.

163, 164. SOUTHWEST MANITOBA UPLANDS

In Manitoba, this ecoregion includes two elevated uplands, the Pembina Hills (163) and Turtle Mountain (164). Turtle Mountain rises some 200 m above the surrounding smooth plains. The Pembina Hills of the Manitoba Escarpment also rise some 200 m above the adjacent Manitoba Plain to the east, but only 30–100 m on the smoother section of the west. The mean annual temperature is approximately 2.5°C. The mean summer temperature is 16°C and the mean winter temperature is –12.5°C. The mean annual precipitation ranges from 450 mm to slightly less than 700 mm. Most of the upper elevations are wooded, and a forest reserve occupies most of the higher elevations of Turtle Mountain. A closed cover of tall trembling aspen with secondary quantities of balsam poplar, an understory of tall shrubs, and a ground cover of mixed herbs is the predominant vegetation. White spruce and balsam fir are the climax species but are not well represented. Poorly drained sites are usually covered with sedges, willow, some black spruce, and tamarack. Underlain by Cretaceous shale, these hummocky to kettled uplands are covered by calcareous, glacial till. Associated with the rougher morainal deposits are a large number of small lakes, ponds, and sloughs occupying shallow depressions to provide valuable habitat for waterfowl. Well- to imperfectly drained Dark Gray Chernozemic soils are predominant. Local areas of Gray Luvisols, peaty Gleysols, and Mesisols also occur in these uplands. The ecoregion remains for the most part in its native state and wildlife includes white-tailed deer, black bear, moose, ruffed grouse, beaver, coyote, and rabbit. Lower elevations have a growing season length, available heat, and precipitation that permit the production of spring wheat, other cereals, oilseeds, and hay crops. The main communities are Swan Lake and Somerset. The population of the ecoregion is approximately 4800.

TAIGA CORDILLERA ECOZONE

This ecozone is located along the northernmost extent of the Rocky Mountain system and covers most of the northern half of the Yukon and southwest corner of the Northwest Territories. In this ecozone are found Canada's largest waterfalls, deepest canyons and wildest rivers.

Climate Annual precipitation ranges from less than 300 mm in the north to over 700 mm in the southeast (Selwyn Mountains). Mean annual temperatures range from -10°C in the north to -4.5°C in the south. Mean summer temperatures range from 6.5°C to 10°C and are modified by vertical zonation and aspect. Summers are warm to cool with extended periods of daylight. Mean winter temperatures range from -25°C in the north to -19.5°C in the south. Winters are long and cold with very short daylight hours. Weather patterns from the Arctic and Alaskan coasts have a marked influence on this ecozone.

Vegetation Natural vegetation ranges from arctic tundra (dwarf or low shrubs, mosses and lichens, and cottongrass) in the north, to alpine tundra (dwarf shrubs, lichens, saxifrages, and mountain avens) in higher elevations, and taiga or open woodland in the south (white spruce and white birch), mixed with medium to low shrubs (dwarf birches and willows), mosses, and lichens.

Landforms and Soils Steep, mountainous topography, consisting of repetitive, sharply etched ridges and narrow valleys, predominates with foothills and basins also present. The bedrock is largely sedimentary in origin with minor igneous bodies. Much of the area is mantled with colluvial debris with frequent bedrock exposures and minor glacial deposits. The northwest portion of this ecozone consists of unglaciated terrain. Brunisols, Regosols, and Cryosols tend to be the predominant soils. Most wetlands, which in some ecoregions are extensive, are underlain by permafrost. Abundant permafrost features, such as peat hummocks, palsas, and peat plateaus, are common in peatlands. The unglaciated portions of this ecozone commonly exhibit periglacial features such as cryoplanation terraces and summits and various forms of sorted and unsorted patterned ground. Continuous permafrost underlies most of the ecozone with the exception of the western half of the Mackenzie and Selwyn Mountains ecoregions.

Wildlife Wildlife in the area is diverse. Characteristic mammals include Dall's sheep, woodland and barren-ground caribou, moose, mountain goat, black and grizzly bear, wolf, lynx, arctic ground squirrel, American pika, hoary marmot, and a large concentration of wolverine. Important birds include gyrfalcon, willow and rock ptarmigan, and waterfowl. Most of the area remains a wilderness. The Yukon's Old Crow Flats is a large wetland complex which has received international recognition for its value to swans, Canada Geese, and other waterfowl species that nest or stage here each year in the tens of thousands.

Human Activities Present activities include hunting, trapping, ecotourism, and outdoor recreation, as well as exploration for minerals. During the 1960s and 1970s much exploration for hydrocarbons was undertaken in the major basins of the ecozone. The ecozone is sparsely populated and home to the Vuntut Gwitchin people. Total population is roughly 300 of which over 80% reside in the remote settlement of Old Crow, the Yukon's most northern settlement.

165. BRITISH-RICHARDSON MOUNTAINS

This ecoregion includes the Richardson and British mountains, located in the northern Yukon. This ecoregion is marked by short, cool summers. Winters are generally extremely cold, although winters at higher elevations are more moderate during frequent periods of temperature inversion. Major mountain passes can be subject to strong outflow winds, causing severe wind chill conditions. The mean annual temperature for the area is approximately -10°C with a summer mean of 6.5°C and a winter mean of -25°C . Mean annual precipitation ranges from 300 mm in the northwest to approximately 400 mm in the southeast.

This ecoregion is characterized by alpine tundra at upper elevations and subalpine open woodland vegetation at lower elevations. Alpine vegetation consists of lichens, mountain avens, intermediate to dwarf ericaceous shrubs, sedge, and cottongrass in wetter sites. Barren talus slopes are common. Subalpine vegetation consists of discontinuous open stands of stunted white spruce in a matrix of willow, dwarf birch, and Labrador tea. Sedge, cottongrass, and mosses occur in wet sites. The highest latitudinal limit of tree growth (white spruce) in Canada is reached in this ecoregion. The northern unglaciated Richardson and British mountain ranges reach 1675 m asl in the region's northern core. The southern Richardson ranges exhibit smooth, rounded profiles composed almost entirely of folded, sedimentary strata of Cambrian- and Palaeozoic-age rocks. The ecoregion includes a small portion of unglaciated plateau physiography composed of Tertiary sediments. Turbic Cryosols with Static Cryosols developed on colluvial and alluvial deposits are dominant. Low ice content continuous permafrost predominates in the southern half of the region with the ice content increasing in the northern half and towards the Alaska border. Limestone rock outcrops are significant. Magnificent examples of periglacial landforms, particularly cryoplanation summits and terraces exist in sedimentary rocks of the Richardson Mountains. Characteristic wildlife includes caribou, grizzly bear, Dall's sheep, moose, snowshoe hare, fox, and arctic ground squirrel. The ecozone is within the annual migration range of the Porcupine caribou herd. There are no permanent settlements within the ecoregion, and land uses are restricted to subsistence wildlife trapping and hunting. Recreation and tourism activities are associated with Ivvavik National Park which covers most of the British Mountains.

166. OLD CROW BASIN

This ecoregion occupies the hills and pediment slopes that surround the Old Crow Basin in northwestern Yukon. The landscape is characterized by generally flat to gently rolling terrain lying within the unglaciated Porcupine Plain and Old Crow Range. The ecoregion has a strongly continental climate despite its proximity to the Beaufort Sea. The mean annual temperature for the area is approximately -9.5°C with a summer mean of 7.5°C and a winter mean of -26°C . Mean annual precipitation ranges 200–300 mm. This region is classified as having a high subarctic ecoclimate. Open, very stunted stands of black spruce and tamarack with secondary quantities of white spruce and ground cover of dwarf birch, willow, ericaceous shrubs, cottongrass, lichen, and moss, are predominant. Tussock tundra vegetation covers most gentle slopes. Permafrost is continuous with medium ice content. Turbic Cryosols found on loamy, gently sloping pediments and on clayey lacustrine material are dominant in the ecoregion. Regosolic Turbic and Regosolic Static Cryosols occur on river floodplains. Wetlands cover much of the ecoregion. Characteristic wetlands are polygonal peat plateau bogs with basin fens and locally occurring shore fens. Characteristic wildlife includes caribou, grizzly and black bear, moose, beaver, fox, wolf, hare, raven, rock and willow ptarmigan, and golden eagle. Chum and Chinook salmon spawn in the Porcupine River and its tributaries. Land uses are predominantly subsistence activities of the people of Old Crow and include hunting, fishing, and trapping. Recreation and tourism are becoming increasingly important with the advent of Vuntut National Park in the northern portion of the ecoregion.

167. OLD CROW FLATS

This unglaciated ecoregion incorporates the area of wetlands and oriented lakes that occupy a glaciolacustrine plain that makes up the lowest portion of the Old Crow Basin. This level, low-relief ecoregion, locally referred to as "The Flats" lies at about 300 m asl. The climate is strongly continental. Mean monthly air temperature ranges are as extreme as anywhere in North America. Short, warm summers contrast with long, very cold winters. The mean annual temperature for the area is approximately -10°C with a summer mean of 7.5°C and a winter mean of -27°C . Mean annual precipitation ranges 200–250 mm. This ecoregion is classified as having a high subarctic ecoclimate. Characteristic wetlands cover most of the ecoregion and are made up of polygonal peat plateau bogs with basin fens and locally occurring shore fens. Organic Cryosols are the most common wetland soils. Better drained portions of the land support open,

very stunted stands of black spruce and tamarack with minor quantities of white spruce and ground cover of dwarf birch, willow, ericaceous shrubs, cottongrass, lichen, and moss. Static Cryosols on sandy alluvial material and Turbic Cryosols on loamy, ice-rich lacustrine material dominate the mineral soils of the ecoregion. Permafrost is continuous with a high ice content in the form of ice wedges and massive ice bodies. Characteristic wildlife includes caribou, grizzly and black bear, moose, beaver, muskrat, fox, wolf, hare, raven, rock and willow ptarmigan, and bald and golden eagle. The Old Crow Flats are important for native hunting, trapping, and fishing. The eroding banks of the Old Crow and Porcupine rivers have yielded large quantities of Pleistocene vertebrate fossils and have been the object of much scientific study over the last twenty years. Old Crow is the main community in the ecoregion. The population of the ecoregion is approximately 300.

168. NORTH OGILVIE MOUNTAINS

This ecoregion extends from the Alaska boundary southeastward to the Taiga Ranges. The ecoregion occupies the northern portions of the unglaciated Ogilvie and Wernecke mountains and associated intermontane basins. Except for a few higher mountain summits, the terrain consists of flat-topped and rounded hills, which are eroded remnants of a former plain. The climate is strongly continental. The mean annual temperature for the area is approximately -6°C with a summer mean of 9°C and a winter mean of -21.5°C . Strong temperature inversions exist through the winter. Some of the coldest temperatures in Canada are experienced in valley bottoms in winter, where values of -50°C are not uncommon. Mean annual precipitation ranges 300–400 mm. Open white spruce grows in a matrix of ericaceous shrubs, dwarf willow, birch, and a ground cover of moss and lichen in more protected subalpine sections of this ecoregion. Paper birch can form extensive communities on lower-elevation and mid-slope terrain. Many of the mountain slopes are largely devoid of vegetation, particularly steeply-sloping calcareous rock outcrops. The bedrock is dominated by Palaeozoic limestones and marine shales. Most elevations are 900–1350 m asl, and the highest peak is 1803 m asl. River valleys are frequently wide and flat-bottomed. Turbic and Static Cryosols developed on coarse rubble to fine colluvium are dominant in the region. Inclusions on permafrost-free sites support Eutric Brunisol and Melanic Brunisol soil development. Permafrost is continuous with low to medium ice content. Characteristic wildlife includes caribou, grizzly and black bear, Dall's sheep, moose, beaver, fox, wolf, hare, raven, rock and willow ptarmigan, and bald and golden eagle. Land uses include recreation, tourism, hunting, and trapping values. Potential reserves of mineral and hydrocarbon resources exist.

169. EAGLE PLAINS

This ecoregion takes in the Eagle Plain, Bell Basin, and part of the Porcupine Plateau and is almost an entirely unglaciated rolling plateau. The mean annual temperature for the area is -6.5°C with a summer mean of 10°C and a winter mean of -23.5°C . Mean annual precipitation ranges 400–450 mm. This region is classified as having a high subarctic ecoclimate. The vegetative cover of this ecoregion is typical subarctic forest. Open, often very stunted stands of black spruce and tamarack with secondary quantities of white spruce and ground cover of dwarf birch, willow, ericaceous shrubs, cottongrass, lichen, and moss, are predominant. On the southern part of the ecoregion, long, even-topped ridges along the Porcupine Plateau have broad, gently rounded summits typical of unglaciated terrain. Relief is low; elevation ranges 300–600 m asl. The highest peak is 925 m asl. The plain is underlain by Cretaceous and older sandstone and shale. A discontinuous veneer of eolian material covers much of the more stable upper slopes in the region. Permafrost is continuous. High ice content permafrost in the form of ice wedges is common in basin areas. Turbic Cryosols on loamy, inclined and dissected colluvial material are most common. Regosols on gravelly alluvial material and Dystric Brunisols on sandy colluvium occur on nonpermafrost sites. Characteristic wetlands covering 25–50% of the land area consist of peat plateau bogs, palsa bogs, ribbed and horizontal fens. Characteristic wildlife includes caribou, moose, grizzly and black bear, wolf, red fox, snowshoe hare,

spruce grouse, beaver, raven, osprey, and waterfowl. Climate and natural resources provide land use opportunities for wildlife trapping and hunting, some fishing, river-oriented recreation, and tourism along the Dempster Highway. Exploration activities have revealed some hydrocarbon reserves in the ecoregion, but no development of these resources has yet occurred. The only permanent settlement is Eagle Plains, a year around service centre for traffic on the Dempster Highway.

170. MACKENZIE MOUNTAINS

This extremely rugged, heterogeneous mountainous ecoregion spans the Yukon–Northwest Territories border from Alaska to the Mackenzie Valley. It includes the Ogilvie and Wernecke mountains in its westernmost section, the Backbone Ranges in its interior, and the Canyon Ranges to the east. The eastern ranges of the Mackenzie Mountains that lie in the rain shadow of the higher Selwyn Mountains to the west are also included. The ecoregion shows evidence of localized alpine and valley glaciation. The mean annual temperature for the area is approximately -5°C with a summer mean of 9°C and a winter mean of -19.5°C . Mean annual precipitation is highly variable with the highest amounts, greater than 600 mm, occurring in the southwest portion of the ecoregion. Moving west towards Alaska and the southern Ogilvies, precipitation drops to approximately 400 mm. Higher precipitation occurs at higher elevations. The region is characterized by alpine tundra at upper elevations and subalpine open woodland vegetation at lower elevations. Alpine vegetation consists of lichens, mountain avens, intermediate to dwarf ericaceous shrubs, sedge, and cottongrass in wetter sites. Barren talus slopes are common. Subalpine vegetation consists of discontinuous open stands of stunted white spruce and occasional alpine fir in a matrix of willow, dwarf birch, and Labrador tea. The Ogilvie Mountains, composed of Palaeozoic and Proterozoic sedimentary strata intruded by granitic stocks, reach 2134 m asl in elevation. The Wernecke Mountains are formed of phyllite and nearly horizontal carbonate rocks carved by glaciation. They are divided into several ranges by broad northwesterly-trending valleys. Permafrost is continuous and of low ice content in most of the Yukon portion of the ecoregion. Permafrost is extensive but discontinuous with variable ice content in the Northwest Territories portion of the ecoregion. Alluvium, fluvio-glacial deposits, and morainal veneers and blankets are dominant in the region. Rock outcrops are common at higher elevation. Turbic Cryosols with some Dystric Brunisols and Regosols occur on steeply sloping colluvium. Characteristic wildlife includes caribou, grizzly and black bear, Dall's sheep, moose, beaver, fox, wolf, hare, raven, rock and willow ptarmigan, golden eagle, gyrfalcon, and waterfowl. These ranges support various forms of hunting and trapping, and contain considerable mineral potential, but for the most part the ecoregion is an isolated wilderness with little permanent human occupation.

171. SELWYN MOUNTAINS

This ecoregion is located in the Selwyn and southern Mackenzie mountains that span the Yukon–Northwest Territories border. For the most part this is a rugged mountain wilderness, a northern extension of the Rocky Mountains. The highest mountains found in the Northwest Territories occur in this ecoregion. Climatic conditions vary with elevation. The mean annual temperature for major valley systems is approximately -4.5°C with a summer mean of 9.5°C and a winter mean of -19.5°C . Mean annual precipitation is highly variable ranging from 600 mm at lower elevation on the perimeter of the ecoregion up to 750 mm at high elevation. The ecoregion is characterized by alpine tundra at upper elevations and by subalpine open woodland vegetation at lower elevations. Alpine vegetation consists of crustose lichens, mountain avens, dwarf willow, and ericaceous shrubs; sedge and cottongrass are associated with wetter sites. Barren talus slopes are common. Subalpine vegetation consists of discontinuous open stands of stunted white spruce, and occasional alpine fir and lodgepole pine, in a matrix of willow, dwarf birch, and northern Labrador tea with a ground cover of moss and lichen. Sedge, cottongrass, and mosses occur in wet sites. The ecoregion includes the Selwyn Mountains and a small portion of the southern Backbone Ranges of the Mackenzie Mountains in its easternmost section. The Selwyn Mountains, which have been extensively

glaciated, are composed of Palaeozoic and Proterozoic strata intruded by granitic stocks. They are divided into several ranges by broad, northwesterly-trending valleys. Some contain alpine and valley glaciers. Mount Keele, at 2950 m asl, is the most outstanding peak. Local alpine glaciers exist in the highest ranges of this ecoregion. Bare rock outcrops and rubble are common at higher elevation. Permafrost is extensive but discontinuous in the western part and continuous with low ice content in the eastern part of the ecoregion. Dystric and Eutric Brunisols on alluvial, fluvioglacial, and morainal veneers and blankets are dominant in the region. Static and Turbic Cryosols with Dystric Brunisols or Regosols are developed on upper-elevation, steeply-sloping colluvium. Characteristic wildlife includes caribou, grizzly and black bear, Dall's sheep, moose, beaver, fox, wolf, hare, raven, rock and willow ptarmigan, and bald and golden eagle. Climate and resources provide opportunities for hunting and trapping of wildlife, ecotourism, and mineral exploration. There are no major permanent settlements in the ecoregion. The population of the ecoregion is approximately 50.

BOREAL CORDILLERA ECOZONE

This ecozone is located in the midsection of the cordilleran system. It covers sections of northern British Columbia and the southern Yukon.

Climate The climate ranges from cold, subhumid to semiarid. It is marked by long, cold winters and short, warm summers and modified by vertical zonation and aspect. Mean annual temperatures range from 1°C to 5.5°C. The coldest mean annual temperatures occur in the Yukon Plateau region. The mean summer temperatures range from 9.5°C to 11.5°C. Mean winter temperatures range from -13°C to -23°C. The Pacific maritime influence moderates temperatures over most of the ecozone. Mean annual precipitation is lowest in valleys within the rain shadow of the coastal ranges (<300 mm) and increases in the interior ranges farther east, where up to 1500 mm of precipitation is received at higher elevations. Precipitation in the intermontane plateau areas ranges 300–600 mm annually.

Vegetation In some parts of this ecozone (British Columbia), there are grasslands on south-facing slopes with boreal forest vegetation on the north-facing slopes, a feature unique within the boreal forests of Canada. The vegetative cover ranges from closed to open canopies over much of the plateaus and valleys. Tree species include white and black spruce, alpine fir, lodgepole pine, trembling aspen, balsam poplar, and white birch. In the northwest, the stands are generally open, and lodgepole pine and alpine fir are usually absent. At higher elevations, there are extensive areas of rolling alpine tundra characterized by sedge-dominated meadows, and lichen-colonized rock fields are common.

Landforms and Soils This ecozone is characterized by mountain ranges that contain numerous high peaks and extensive plateaus, and are separated by wide valleys and lowlands. These have been modified as a result of glaciation, erosion, solifluction, and eolian and volcanic ash deposition. Glacial drift, colluvium, and outcrops constitute the main surface materials. Only a small portion of this ecozone in the northwest was unglaciated. Permafrost and associated landscape features tend to be widespread in the more northerly areas and at higher elevations; soils are Cryosolic in these regions. In the warmer, lower elevations in the southern half, Brunisols, Podzols, and Luvisols are common.

Wildlife Characteristic mammals of the Boreal Cordillera ecozone include woodland caribou, moose, Dall's sheep, mountain goat, black and grizzly bear, marten, lynx, American pika, hoary marmot, and arctic ground squirrel. Representative bird species include willow, rock and white-tailed ptarmigan, and spruce grouse, along with a range of migratory songbirds and waterfowl.

Human Activities The zone is rich in mineral resources, and in addition to mining, the large river systems that drain this ecozone have fostered forestry, tourism, hydroelectric development, and some localized agriculture. The total population of the ecozone is approximately 30 800, and the major communities include Whitehorse, Dawson, Faro, Haines Junction, and Mayo. Between 1951–1991, Whitehorse's population increased 29–54% of the total population.

172. KLONDIKE PLATEAU

This ecoregion lies along the Yukon–Alaska border extending southeastward to include the Dawson Range. The ecoregion is dominated by low-elevation terrain and includes the Wellesley Basin and portions of the Kluane and Klondike plateaus. The mean annual temperature for the area is approximately -5.5°C with a summer mean of 10.5°C and a winter mean of -23°C . Mean annual precipitation ranges 300–450 mm. Mean monthly air temperature ranges are extreme under this continental climate. The short, warm summers are in sharp contrast to the long, very cold winters. The official lowest temperature recorded in North America was at Snag in the southern end of the ecoregion. On February 3, 1947 a temperature of -63°C was observed. Open black and white spruce forests with aspen and occasionally lodgepole pine are most prevalent in the warmer boreal sections. Black spruce and paper birch prevail on slopes underlain by permafrost. Balsam poplar occurs along floodplains. Scrub birch and willow form extensive stands in subalpine sections from valley bottoms to well above the treeline. Characteristic terrain features include smooth, unglaciated, rolling plateau topography with moderate to deeply incised valleys and large structural basins composed of level to undulating glaciated terrain. Most of the terrain lies 1000–1500 m asl elevation, the highest peak being 2148 m asl. Major drainage channels extend below 1000 m asl. The unglaciated Klondike Plateau is dissected by deep, narrow, V-shaped valleys. Permafrost is extensive and discontinuous with medium ice content in fine-textured valley deposits. Turbic Cryosols associated with permafrost and Eutric Brunisols developed on irregular, steeply-sloping, loamy colluvial materials are dominant in the region. Regosols occur on sandy floodplains. Characteristic wildlife includes caribou, grizzly and black bear, Dall's sheep, moose, beaver, fox, wolf, hare, raven, rock and willow ptarmigan, and golden eagle. Land uses include wilderness recreation, tourism, hunting, and trapping values. Placer mining has historically been active in this ecoregion since the Klondike Gold Rush of 1898. The major community is Dawson. The western-most community in Canada, Beaver Creek, lies within this ecoregion on the Alaska–Yukon border at 141°W latitude. The population of the ecoregion is approximately 1600.

173. ST. ELIAS MOUNTAINS

This ecoregion includes most of the St. Elias Mountains and Kluane Ranges in the Yukon and includes vast regions of ice fields and high elevation mountain peaks. The mean annual temperature decreases with elevation, but for major valley bottoms it is approximately -1.5°C , with a summer mean of 9.5°C and a winter mean of -14°C . Mean annual precipitation ranges from 300 mm at low elevations increasing with elevation and moving west to very high levels of more than 1000 mm in the ice fields. This ecoregion is a combination of permanent ice and snowfields with minor areas of rock outcrop, rubbly colluvium, and alpine tundra vegetation composed of low-growing heather, dwarf birch, willow, grass, and lichen. Wet sites in the vegetated areas support cottongrass and sedge. The St. Elias Mountains, composed of Palaeozoic and Mesozoic strata, are among the highest mountains in Canada with their serrated pinnacles ranging upward to 6000 m asl. The main peaks stand as isolated blocks separated by broad ice fields. As the limit of permanent snow is 2150 m asl, the mountains present great masses of ice and snow and are the source of many great valley glaciers radiating out towards the Shaskwak Trench. Permafrost is continuous at high elevation and sporadic discontinuous at low elevation along the east side of the ecoregion. The few valleys that are included in the eastern portion of this ecoregion are dominated by morainal and fluvio-glacial materials, with Eutric Brunisols being the most common soil development. Characteristic wildlife includes caribou, grizzly bear, Dall's sheep, and mountain goat. Much of the ecoregion is composed of protected

areas including Kluane National Park Reserve, Kluane Game Preserve and the Tatshenshini–Alsek Wilderness Park in British Columbia. Land uses are dominated by recreational activities, including hiking, mountain climbing, and river rafting and kayak trips. There are no permanent settlements in the ecoregion.

174. RUBY RANGES

This ecoregion covers the Kluane, Ruby, and Nisling ranges, Shawkak Valley (Trench), and Kluane Plateau. The climate is characterized by short, cool summers and long, cold winters. Winter temperature inversions are common, giving milder temperatures at higher elevation. Maritime air from the Gulf of Alaska periodically invades the ecoregion during the winter to produce mild spells with near-thawing temperatures. The mean annual temperature for the area is approximately -3°C with a summer mean of 10°C and a winter mean of -17°C . Mean annual precipitation ranges 250–300 mm. Northern boreal forests occupy lower slopes and valley bottoms. Open white and black spruce in a matrix of dwarf willow, birch, ericaceous shrubs, and, occasionally, lodgepole pine form extensive forests. Black spruce, scrub willow, birch, and mosses are found on poorly drained sites. Alpine fir and lodgepole pine occur in higher subalpine sections, whereas at highest elevations sparsely vegetated alpine communities consist of mountain avens, dwarf willow, birch, ericaceous shrubs, graminoid species, and mosses. The terrain consists of rolling to undulating hills above 900 m asl, and the highest peak is 2304 m asl. The most common soils in this ecoregion are Eutric Brunisols on sandy loam morainal or colluvial materials. West of the Nisling Range, there is an area of Turbic Cryosols on sandy loam morainal material. Regosolic soils are associated with active deposition of gravelly fluvioglacial outwash materials on braided floodplains. Volcanic ash from the 1300 year old White River eruption is up to 100 cm thick on lower slopes. In these cases, the soils are classified as either Regosols or Regosolic Turbic Cryosols, depending on the presence or absence of permafrost. Permafrost is extensive and discontinuous over most of the ecoregion decreasing to sporadic along the western side of the ecoregion. Characteristic wildlife includes caribou, grizzly and black bear, Dall's sheep, moose, beaver, fox, wolf, hare, raven, rock and willow ptarmigan, and golden eagle. Land uses reflect high recreational, tourism, and hunting values in alpine and subalpine sections. Mining potential is locally high. Forestry resources are significant in lower slopes and valley bottoms. The main community in the region is Haines Junction. The population of the ecoregion is approximately 700.

175. YUKON PLATEAU–CENTRAL

This ecoregion extends northward from Lake Laberge to the lower Stewart River in the central Yukon. The Yukon Plateau–Central ecoregion is composed of several groups of rolling hills and plateaus separated by deeply cut, broad valleys. The climate is cold and semiarid. The mean annual temperature for the area is approximately -3.5°C with a summer mean of 12°C and a winter mean of -19°C . Mean annual precipitation varies from 250 mm in the southern areas near Carmacks to 400 mm at higher elevations in the north and east. White and black spruce form the most common forest types. Black spruce is usually dominant in wetter areas. Lodgepole pine frequently invades burnt-over areas and very dry sites. Alpine fir occasionally forms the treeline but is sparse and is usually associated with white spruce and occasionally with paper birch. Sedge tussocks and/or sphagnum are common in wetlands. Scrub birch and willow occur in subalpine sections that extend up to the treeline. A significant vegetative feature of this ecoregion is the presence of extensive grasslands on all low-elevation, south-facing slopes. The forests suffer frequently from recurring natural fires such that seral communities are most common. Elevations are above 1000 m asl, except for major river valleys, which lie below 600 m asl in the northwestern portion. Several mountains reach heights of 1500 m asl. Eutric Brunisols developed on steeply-sloping, ridged to hummocky, loamy morainal and sandy fluvioglacial material are dominant in the ecoregion. Much of the ecoregion is covered by a veneer of recent volcanic ash 10–30 cm thick. Permafrost is discontinuous to sporadic with high ice content associated with fine-textured valley deposits. Turbic Cryosols are confined to wet depressions and beneath mature forests on lower, north-facing slopes. Characteristic wildlife includes caribou, grizzly and

black bear, moose, beaver, fox, wolf, hare, raven, rock and willow ptarmigan, and golden eagle. Land uses reflect recreational, tourism, hunting, and trapping values as well as some forestry activities and mining. Major communities in the region are Carmacks and Pelly Crossing. The population of the ecoregion is approximately 600.

176. YUKON PLATEAU-NORTH

This ecoregion lies within the Stewart, Macmillan, and Pelly plateaus and the southern foothills of the Selwyn Mountains. The terrain includes rolling uplands, small mountain groups, and nearly level tablelands dissected by deeply cut, generally broad, U-shaped valleys. The Tintina Trench, a straight, steep-sided valley 5–22 km wide, traverses the ecoregion from southeast to northwest. The mean annual temperature for the area is approximately -4°C with a summer mean of 10.5°C and a winter mean of -20°C . Mean annual precipitation ranges from 300 mm in the major valleys up to 600 in the mountains to the northeast. Northern boreal forests exist at elevations up to 1500 m asl. White spruce in a matrix of dwarf willow, birch, ericaceous shrubs, and, occasionally, lodgepole pine forms extensive open forests, particularly in the northwestern portion of the ecoregion. Black spruce, scrub willow, birch, and mosses are found on poorly drained sites. Alpine fir and lodgepole pine occur in higher subalpine sections, whereas alpine vegetation consists of mountain avens, dwarf willow, birch, ericaceous shrubs, graminoid species, and mosses. Extensive discontinuous permafrost with a medium ice content is widespread decreasing to sporadic discontinuous permafrost along the southwestern edge of the region. Turbic Cryosolic and Eutric Brunisolic soils predominate, and occasional pockets of Dystric Brunisols occur on coarse-textured morainal and fluvoglacial materials. Characteristic wildlife includes caribou, grizzly and black bear, Dall's sheep, moose, beaver, fox, wolf, hare, raven, rock and willow ptarmigan, and golden eagle. Land uses reflect mining, recreation, hunting, and trapping values. Major communities in the area are Keno Hill, Mayo, and Ross River. The population of the ecoregion is approximately 2100.

177. YUKON SOUTHERN LAKES

This ecoregion extends from Lake Laberge south to the boundary with British Columbia. The ecoregion covers parts of the Lewes and Nisutlin plateaus and all of the Teslin Plateau. The climate is cold and semiarid. Within major valleys the mean annual temperature is approximately -2.5°C with a summer mean of 10°C and a winter mean of -16.5°C . Lying within the rain shadow of the St. Elias Mountains, mean annual precipitation ranges 225–300 mm in the major valleys. Boreal forests are composed of open white spruce and lodgepole pine intermixed with aspen. South-facing slopes at low elevation are occupied by grassland communities. Subalpine elevations above 1200 m asl support open forest communities of alpine fir, white spruce and occasionally lodgepole pine. The forests suffer frequently from recurring natural fires such that seral communities are most common. Mountain avens, dwarf shrubs, forbs, grasses, and lichens constitute the main vegetative cover in colder, more exposed alpine sections. Most of the terrain lies 600–1500 m in elevation, but a few peaks are over 1800 m asl. Underlain by Mesozoic sedimentary strata and Palaeozoic metamorphic slates, schists, the topography is characterized by dissected plateaus and rolling hills. Eutric Brunisolic soils on sandy loam and rolling morainal to steep colluvial material are dominant. Low ice content permafrost occurs in a sporadic discontinuous pattern. Cryosolic soils are scattered throughout the landscape on some poorly drained areas and on north-facing slopes. Representative wildlife includes mountain goat, Stone's and Dall's sheep, grizzly bear, moose, ptarmigan, wolf, coyote, ground squirrel, and caribou. Land uses include hunting, trapping, and recreation values in alpine and subalpine regions, whereas forestry and forage-based agricultural activities occur in warmer, lower valleys below 850 m asl elevation. Whitehorse and Teslin are the major communities. The population of the ecoregion is approximately 20 900.

178. PELLY MOUNTAINS

This ecoregion encompasses the Pelly and northern Cassiar Mountains spanning the British Columbia–Yukon border. The mean annual temperature for the area is approximately -3°C with a summer mean of 10.5°C and a winter mean of -17.5°C . Mean annual precipitation is 500–1000 mm, varying with elevation. Boreal forests of white spruce, black spruce, lodgepole pine and aspen cover the lower-elevation valley bottoms. Much of the ecoregion lies above the treeline and is characterized by alpine tundra communities of lichens, dwarf ericaceous shrubs, birch, and willows. Grasses, sedges, cottongrass, and some mosses occupy wet sites. Open-growing black and white spruce, and alpine fir are prevalent in the subalpine region. Some aspen and scrub birch occur in valleys and on lower, warmer slopes of the subalpine sections. Lodgepole pine is common following fires. The Pelly and Cassiar Mountains, composed of crystalline Mesozoic and Palaeozoic strata, are of moderately high relief, ranging from generally over 1500 m asl to the highest peak at 2404 m asl. Relief is greater in the Pelly Mountains than in the Cassiar Mountains. Permafrost is sporadically distributed. Dystric and Eutric Brunisols are codominant in the ecoregion. Dystric Brunisols are associated with coarse igneous rocks at higher elevation. Plateau areas with sandy loam morainal parent materials are associated with Eutric Brunisols. Turbic Cryosolic soils are found in alpine areas and in some imperfectly to poorly drained sites. Representative wildlife includes moose, wolverine, snowshoe hare, black and grizzly bear, Stone's and Dall's sheep, ptarmigan, ground squirrel, and caribou. Land use reflects hunting, trapping, and recreation values as well as mining and mineral exploration activities in both the alpine and subalpine regions. Swift River is the only settlement in the ecoregion. The population of the ecoregion is approximately 30.

179. YUKON–STIKINE HIGHLANDS

This ecoregion covers a zone of climate transition from coastal to interior conditions in northwestern British Columbia and southern Yukon. The ecoregion falls within the rain shadow of the Coast Mountains. Precipitation decreases moving inland, and temperatures are moderated throughout the year by the influence of maritime air masses. The mean annual temperature for the area is approximately -1°C with a summer mean of 10°C and a winter mean of -13°C . The mean annual precipitation is 500–600 mm. The ecoregion is composed of a combination of three distinct vegetation zones: alpine tundra dominated by low-growing heather, dwarf birch, willow, grass, and lichen; subalpine forests of alpine fir, white spruce, and an occasional Engelmann spruce; and closed boreal forests of black and white spruce. Aspen and lodgepole pine regenerate after fire at mid to lower elevations. The ecoregion encompasses the mountainous areas leeward of the St. Elias Mountains and a portion of the Kluane Ranges. It is a region with subdued mountains and wide valleys. Permafrost is discontinuous and sporadic with generally low ice content. Soils range from Brunisolic and Regosolic with some Cryosolic soils in alpine regions to Dystric and Eutric Brunisols in subalpine and boreal sections of the ecoregion. Characteristic wildlife includes grizzly and black bear, Stone's and Dall's sheep, mountain goat, pika, wolf, wolverine, ptarmigan, moose, spruce grouse, and deer. Land use presently includes outfitting, hunting, outdoor recreation, mining and mineral exploration. The extreme northwestern portion of the ecoregion in British Columbia, west of the Haines Road, falls within the Tatshenshini–Alsek Wilderness Park. Telegraph Creek is the only permanent settlement in the ecoregion. The population of the ecoregion is approximately 60.

180. BOREAL MOUNTAINS AND PLATEAUS

This ecoregion covers a vast area of northwestern British Columbia and an extreme southern portion of the Yukon. The ecoregion is composed of a complex of rugged mountains, high plateaus, and lowlands. Temperature and precipitation vary with elevation. The climate tends to be more moderate in the western half of the ecoregion and is more continental as one moves eastward. The typical mean annual temperature for the area is approximately -2°C with a summer mean of 10°C and a winter mean of -15°C . The mean

annual precipitation ranges 400–700 mm. The vegetation is a complex of ecosystems, ranging from *Dryas* spp./lichen alpine vegetation and bare bedrock on higher mountain elevations; to alpine fir with some white spruce and deciduous shrubs dominating subalpine forests to middle elevations in the southern Cassiar and northern Omineca mountains; and to closed canopied forests of lodgepole pine, and white and black spruce dominating the boreal forests of the Stikine and Yukon plateaus. A unique feature of this ecoregion is the presence of a number of late Tertiary and Pleistocene volcanoes. The most prominent volcanoes are the great shield volcano of Level Mountains, a low domed mass reaching 2134 m asl, and Mount Edziza, a complex cone reaching 2787 m asl. The Cassiar and Omineca mountains form a belt of massive Palaeozoic and Proterozoic crystalline rocks whose highest peaks carry a number of alpine glaciers. Humo-Ferric Podzolic soils on upland sites in subalpine regions, and Gray Luvisolic with Dystric Brunisolic soils in the boreal forest regions are most common. Permafrost with low ice content occurs sporadically in the northern portion of the ecoregion and is confined to isolated patches in the southwest. Representative wildlife includes mountain goat, Stone's sheep, grizzly bear, moose, ptarmigan, ground squirrel, and caribou. Land use varies from hunting, trapping, and recreation in alpine and subalpine regions to limited forestry and forage crop-based agriculture in the boreal region. The main communities in the region are Atlin, Dease Lake, and Carcross. The population of the ecoregion is approximately 3300.

181. LIARD BASIN

The Liard Basin ecoregion spans the British Columbia–Yukon boundary to incorporate the Liard Plain, a broad, rolling, low-lying area mantled with glacial drift and outwash deposits in which the Liard River is entrenched. The mean annual temperature for the area is approximately -3°C with a summer mean of 11°C and a winter mean of -18.5°C . Annual precipitation is 350–450 mm. The ecoregion is characterized by extensive stands of boreal forest composed of lodgepole pine, white and black spruce, and aspen. Dry sites support lodgepole pine; moist sites have black spruce and larch with Labrador tea, horsetail, and moss. The ecoregion is underlain by Carboniferous Palaeozoic limestone and Cretaceous shale and lies 620–930 m asl. Luvisolic soils are associated with the productive upland boreal forests of the region. Cumulic Regosols support productive stands of white spruce along the floodplain of the Liard River and its larger tributaries. Eutric and Dystric Brunisols exist on coarse-textured fluvioglacial deposits. Permafrost is scattered, confined mainly to lower north-facing slopes and sphagnum bogs. Big game hunting, outfitting, and trapping are other uses of land in this region. Characteristic wildlife includes moose, black bear, wood bison, wolf, beaver, muskrat, snowshoe hare, waterfowl, crane, ruffed grouse, and other birds. Local sawlog forestry and mining are main industrial land uses. There is some recreational use of the major lakes and rivers in the ecoregion. Watson Lake is the main community. The population of the ecoregion is approximately 1400.

182. HYLAND HIGHLAND

This ecoregion in southeastern Yukon spans the boundary with British Columbia north of the Liard River. The mean annual temperature for the area is approximately -2°C with a summer mean of 10°C and a winter mean of -18°C . Precipitation varies 500–600 mm being greatest at higher elevations in the northern portion of the ecoregion. Open stands of black and white spruce with an understory of dwarf birch, Labrador tea, lichen, and moss predominate the boreal forest. Drier and warmer sites tend to have more white spruce with lodgepole pine, paper birch, and some aspen. The ecoregion supports forests with considerable productivity. Wet sites are usually covered with bog or fen vegetation such as dwarf black spruce, larch, Labrador tea, ericaceous shrubs, sedges and mosses. The ecoregion takes in parts of the Liard Plateau physiographic unit that is underlain mainly by Cretaceous shale. Many summits and hills are flat, but extensive remnants of former erosion surfaces are evident. Elevations are usually less than 1400 m asl, but some local ranges contain summits over 1800 m asl. The valleys are wide. Permafrost is sporadic, being confined to lower, north-facing slopes and some organic deposits primarily in the northwestern part of the ecoregion. Brunisolic Gray Luvisols are common on medium-textured deposits. Eutric Brunisols are

common on coarse materials. Dystric Brunisols occur in alpine and subalpine areas. This ecoregion provides habitat for a wide range of wildlife species, including moose, red fox, beaver, snowshoe hare, arctic ground squirrel, wolf, lynx, weasel, snowy owl, and various raptors. Land uses include some forest harvesting, mineral exploration, big game hunting and guiding, subsistence hunting and trapping, and minor amounts of recreation and tourism. There are no major settlements in the ecoregion. The population of the ecoregion is approximately 100.

183. NORTHERN CANADIAN ROCKY MOUNTAINS

This ecoregion incorporates the northern Rocky Mountains and the Muskwa Ranges in northern British Columbia. The mean annual temperature for the area is approximately -0.5°C with a summer mean of 11.5°C and a winter mean of -13°C . Mean annual precipitation ranges from 500 mm in the lower elevations and surrounding plateau up to 800 mm at higher elevations and in the mountain passes. The ecoregion is a complex of alpine vegetation, consisting of dwarf shrubs such as willow and birch, alpine grasses, sedges, *Dryas spp.*, mountain avens, and bare bedrock at elevations above the treeline; willow and birch shrubs along with alpine fir and white spruce dominating subalpine forests; and closed canopied forests of lodgepole pine, and white and black spruce dominating the boreal forests at lower, warmer, elevations. The rugged Muskwa Ranges are broadest and highest around Mount Churchill at 3200 m asl in elevation, and a number of glaciers occur around the higher peaks. Sporadic discontinuous permafrost containing low ice content occurs throughout the ecoregion. Bedrock outcrops are common. Soils range from Turbic Cryosolic and Regosolic soils in alpine terrain; to Humo-Ferric Podzols and Dystric Brunisolic with some Cryosolic, Organic, and Gleysolic soils in subalpine terrain; and to Gray Luvisolic and Dystric Brunisolic soils in warmer boreal sections of the region. Characteristic wildlife includes moose, elk, Stone's sheep, caribou, and mountain goat. Grizzly bear, black bear, and wolf are common throughout the valleys. Wolverine and lynx are also common. Land use includes hunting and recreation in alpine and subalpine areas, and forestry, forage production-based agriculture, and tourism in the warmer boreal sections of the ecoregion. Muncho Lake is the main settlement. The population of the ecoregion is approximately 30.

PACIFIC MARITIME ECOZONE

This ecozone covers the mainland Pacific coast and offshore islands of British Columbia. The wettest climates in Canada occur in this ecozone on the coast, especially near the mountains on the windward slopes of Vancouver Island, the Queen Charlotte Islands, and the mainland Coast Mountains.

Climate This ecozone's soil climate ranges from a relatively mild humid maritime at low elevations to cool very humid at higher elevations in the main mountain systems. The ecozone has some of the warmest and the wettest climatic conditions in Canada. Mean annual temperatures range from 4.5°C in the north to 9°C in the Georgia-Puget Basin - Lower Mainland regions. The mean summer temperature ranges from 10°C in the north to 15.5°C in the south. Mean winter temperatures range from -0.5°C to 3.5°C . Relative to the rest of Canada, there is little variation between the mean monthly temperatures through the year. The annual precipitation ranges from as little as 600 mm in the Gulf Islands of lower Strait of Georgia to over 4000 mm in the Coastal Gap region to the north. Overall, the zone typically receives 1500–3000 mm of precipitation per year. The Pacific maritime influence is responsible for the high level of precipitation and for the temperature moderation.

Vegetation The temperate coastal forests are composed of mixtures of western red cedar, yellow cedar, western hemlock, Douglas-fir, amabilis fir, mountain hemlock, Sitka spruce, and alder. Many of these trees reach very large dimensions and grow to great ages, forming ancient or old growth forests of this ecozone.

Douglas-fir is confined largely to the extreme southern portion of the ecozone. In the north, *amabilis* fir becomes more common. Mountain hemlock is usually associated with higher elevations. Variations in altitude account for the presence of widely contrasting ecosystems within the ecozone, ranging from mild, humid coastal rainforest to cool boreal and alpine conditions at higher elevations.

Landforms and Soils Mountainous topography dominates, cut through by numerous fjords and glacial valleys and bordered by coastal plains along the ocean margin. Igneous and sedimentary rocks underlie most of the area. Colluvium and glacial deposits are the main surface materials. The soils are largely Podzolic and Brunisolic. The Queen Charlotte Islands and part of Vancouver Island that escaped glaciation are unique, because they now contain many endemic species — ones that are peculiar to those habitats. Ice free coastal waters are associated with the narrow continental shelf and slope.

Wildlife Characteristic mammals include black-tailed deer, black and grizzly bear, elk, wolf, otter, and raccoon. Bird species unique to this area include American black oystercatcher, California and mountain quail, tufted puffin, and chestnut-backed chickadee. Other representative birds are pygmy-owl, Steller's jay, and northwestern crow. Marine environments are typified by northern sea lion, northern fur and harbour seal, and giant beaked, sperm, grey, killer, Pacific pilot, and blue whale. Salmon and associated spawning streams are located throughout this ecozone. Freshwater discharge from coastal rivers mixing with ocean waters stimulates the occurrence of abundant marine life.

Human Activities Currently, most of the land is linked to forest harvesting. Forest productivity is the highest in the country and commercial forest operations are of major economic importance to Canada's forest industry. The lowlands of the Fraser Valley and the southeastern tip of Vancouver Island possess the area's main expanse of highly productive agricultural soils, as well as urban lands. Fishing, tourism, and transportation are other major activities. The total population is approximately 2 504 000, and the largest centres include Vancouver, Victoria, Nanaimo, Chilliwack, and Port Alberni. Almost 75% of British Columbia's population is concentrated in the Georgia Basin, particularly in Victoria and the Lower Mainland.

184. MOUNT LOGAN

This most northerly of Pacific Maritime ecoregions is composed predominantly of very high elevation ice fields, alpine glaciers and summit outcrops. This ecoregion incorporates part of the largest nonpolar ice fields in the world and includes the highest mountains in Canada. The terrain is similar to that in the adjacent St. Elias Mountains ecoregion (173) but this ecoregion has higher peaks, milder temperatures and receives much higher precipitation as it is on the windward side of the coastal ranges. Although no climate stations exist in this ecoregion, high elevations are estimated to receive up to 3500 mm of precipitation, almost all of it falling as snow. There is no terrestrial vegetation or soil development in this ecoregion. Mount Logan, the highest mountain in Canada at 5959 m asl and King Peak at 5175 m asl are major peaks. A half dozen other peaks exceed 4000 m in height. The Seward, Hubbard, and Malaspina glaciers run from their source areas at high elevation in the ecoregion to tide water in the Gulf of Alaska less than 100 km to the west. Each year, mountain climbers attempt ascents of Mount Logan and the other major peaks during May and June.

185, 186. NORTHERN COASTAL MOUNTAINS

This ecoregion takes in the steep, rugged Fairweather Ranges (polygon 185) and the Boundary Ranges (polygon 186) that extend from northwestern British Columbia along the eastern boundary of the Alaskan panhandle. The mean annual temperature for this high elevation area is approximately -0.5°C with a summer mean of 10°C and a winter mean of -11.5°C . Mean annual precipitation ranges from 1000 mm in the

eastern part of the Boundary Ranges up to 2400 m in the ice fields of the Fairweather Ranges. The ecoregion is composed of a complex of three vegetation zones: alpine tundra vegetation of variable ground cover dominated by low-growing heather, dwarf birch, willow, grass, and lichen at elevations above the treeline; subalpine forests of alpine fir, mountain hemlock, and some Sitka spruce at middle elevations; and closed forests of western hemlock and some Sitka spruce at warmer, more humid, lower elevations. Mountain summits in this region range 2100–3050 m asl and are capped by several large ice fields that include the Grand Pacific and Llewellyn glaciers. Composed of crystalline gneisses and granite rocks, these ranges are cut into several segments by large steep-sided transverse valleys. In places, relief along sides of the valleys reaches 2745 m. Large glaciers move down tributaries to about 150 m asl with several reaching the sea in Alaska. Isolated patches of permafrost occur in mountain summits over 2500 m asl. Brunisolic and Regosolic soils occur in alpine regions; Podzolic and Brunisolic soils occur in the subalpine zone; and Humo-Ferric Podzolic and Gleysolic soils are most common in the low elevation forests of the ecoregion. Land use is limited to various forms of outdoor recreation in the major river valleys and mountaineering in the higher elevations. Characteristic wildlife includes grizzly and black bear, mountain goat, wolf, wolverine, ptarmigan, moose, and spruce grouse with black-tailed deer in the river valleys. Mining and mineral exploration occur throughout the ecoregion. Stewart is the main community in the ecoregion. The population of the ecoregion is approximately 1400.

187. NASS BASIN

The Nass Basin in west-central British Columbia is an ecoregion of subalpine and montane forests transitional between the interior (leeward) and coastal portions of the Coast Mountains. The climate is humid and cool. The mean annual temperature for the area is approximately 1.5°C with a summer mean of 11.5°C and a winter mean of -9.5°C. Mean annual precipitation ranges from 1500 mm in the lower elevations up to 2500 mm at higher elevations. The region is characterized by forests of western hemlock and western red cedar in the moist montane zone and to a lesser extent lodgepole pine, Engelmann spruce, and alpine fir forests in the subalpine zone. The Nass Basin, composed of folded Jurassic and Cretaceous sediments, is an area of low relief with a gently rolling floor that for the most part lies below 750 m asl. The basin is almost encircled by mountains, but large gaps connect it with the ocean through the Skeena River valley and the Nass River valley and to the interior through the Bulkley River valley. Soils range from Humo-Ferric Podzols and Dystric Brunisols in the montane zone to Dystric Brunisolic and Podzolic soils in the subalpine zone. Characteristic wildlife includes moose, black-tailed deer, woodland caribou, grizzly and black bear, beaver, wolf, red fox, marten, snowshoe hare, and grouse. Land use consists of forest harvesting, mining, hunting, recreation, and tourism. The main communities are Kispiox and Aiyansh. The population of the ecoregion is approximately 1700.

188. QUEEN CHARLOTTE RANGES

This ecoregion incorporates the mountainous portions of the Queen Charlotte Islands. The Queen Charlotte Ranges lie along the western side of the island and are the backbone of the islands with summits reaching 1067 m asl. The Skidegate Plateau lies to the east of these mountains. The ecoregion's climate is strongly maritime. The mean annual temperature for the area is approximately 8°C with a summer mean of 12°C and a winter mean of 3.5°C. Mean annual precipitation ranges from 2000 mm on the west flanks of the range decreasing to 1500 mm on the eastern flanks. The oceanic nature of the climate is expressed in the sloping bogs and stunted, open-growing western red cedar, yellow cedar, shore pine, and western hemlock forests on the outermost headlands along the west coast of the Queen Charlotte Islands. Better drained sites support complexes of western hemlock, western red cedar, and Sitka spruce. Red alder is common on disturbed alluvial sites. Lower elevations between sea level and 900 m asl are vegetated by western hemlock and amabilis fir with an understory of salal, *Vaccinium* spp., and mosses. Mountain hemlock is usually found above 900 m asl. Humo-Ferric and Ferro-Humic Podzolic soils develop on irregular, steeply-sloping, often

unstable, colluvial and morainal deposits. Folisols, soils developed on upland surfaces but composed of organic material, are also present. Characteristic wildlife includes black-tailed deer (introduced), black bear, raccoon (introduced), otter, seabirds, shorebirds, and marine mammals. Important land uses are forestry, recreation, and tourism. Much of the forest lands are under Tree Farm License. A national park covers much of the lower end of Moresby Island and adjacent offshore islands. Native subsistence activities are also important land uses. Mining has occurred sporadically throughout the ecoregion. Sandspit and Sewell Inlet are the main communities. The population of the ecoregion is approximately 2300.

189. QUEEN CHARLOTTE LOWLAND

This ecoregion covers the forested plain and wetland complex of northern and eastern Graham Island. Elevation varies up to 300 m asl. The mean annual temperature is approximately 7.5°C with a summer mean of 11.5°C and a winter mean of 3.5°C. Mean precipitation is approximately 1500 mm per year. Vegetative cover of this ecoregion is characterized by wetlands in association with open western hemlock, shore pine, and amabilis fir. Drier sites support stands of western hemlock, western red cedar, and Sitka spruce. The lowland is formed of gently sloping Tertiary sedimentary strata covered by glacial till, organic deposits and thick outwash deposits. Mesisols and Fbrisols are the dominant organic soils. Gleysolic and Podzolic soils with thick organic surface horizons are dominant mineral soils in the ecoregion. Many of the Podzols contain impermeable subsurface horizons which inhibit vertical soil drainage and enhance the moisture status of these soils. Wetlands cover much of the ecoregion. The predominant wetland forms are slope, basin, and shore bogs with localized stream fens and estuaries. Characteristic wildlife includes black-tailed deer (introduced), black bear, elk (introduced), otter, seabirds, shorebirds, and marine mammals. Dominant uses of land include forestry, recreation, and tourism. Much of the ecoregion is covered by Naikoon Provincial Park. Masset, Queen Charlotte, and Port Clements are the main communities. The population of the ecoregion is approximately 3000.

190. NASS RANGES

The Nass Ranges ecoregion is located in the Hazelton Mountains in west-central British Columbia. The topography is characterized by glacierized mountain peaks over 2700 m asl and broad valleys of the Skeena River and its tributaries. This ecoregion incorporates large areas of alpine and subalpine at higher elevations as well as warmer montane climate at lower elevations. The mean annual temperature for the major valleys is 4.5°C with a summer mean of 13°C and a winter mean of approximately -4.5°C. Mean annual precipitation is highly variable ranging from 2000 mm in the west to 1500 mm in the east where the climate is transitional to more interior conditions. The eastern portion of the ecoregion is characterized by closed stands of lodgepole pine, Engelmann spruce, and alpine fir forests in subalpine regions and by mature forests of interior western red cedar and western hemlock in the Skeena River valley. The western portion of the ecoregion has a more coastal climate wherein mountain hemlock dominates the subalpine and western hemlock the coastal forests of the lower Skeena River valley. The ecoregion, traversed by the deeply incised Skeena River valley, is largely underlain by folded Jurassic sediments and volcanic rocks with intrusions of igneous rocks in the south. Eutric Brunisolic and Gray Luvisolic soils are dominant in the eastern portion of the ecoregion, whereas Dystric Brunisolic and Humo-Ferric Podzolic soils dominate the milder, more humid western portion. Characteristic wildlife includes black-tailed deer, mountain goat, grizzly and black bear, and wolf. Forestry, recreation, hunting and fishing, and tourism are important land uses. Terrace, Hazelton and New Hazelton, are the main communities. The population of the ecoregion is approximately 24 300.

191. COASTAL GAP

This mid-coast ecoregion extends from the British Columbia–Alaska border north of Prince Rupert southward to the southern tip of the Hecate Lowland near Ocean Falls on Broughton Island. The ecoregion covers the Kitimat Ranges, which form part of a relatively low relief portion of the Coast Mountains. The ranges are composed of crystalline gneisses and granitic rocks, rarely reach 2400 m asl in elevation, and form a saddle between the higher Boundary Ranges to the north and the Pacific Ranges to the south. Glaciers are few and small. Numerous, steep-sided, transverse valleys, inlets and fjords dissect this mountainous coastal region. A climatic gradient exists across the Coast Mountains to slightly drier and cooler conditions across the divide towards the interior of the province. The mean annual temperature for the ecoregion is approximately 6.5°C with a summer mean of 13°C and a winter mean of –0.5°C. Along the coast, mean annual temperatures range from 9°C to 7.5°C. Mean annual precipitation is the highest on the British Columbia coast ranging from 2000 mm to greater than 4500 mm at higher elevations on the windward side of the Coast Mountains. Ocean Falls is the rainiest community in Canada with an average of 4386 mm of rain per year. The vegetation immediately adjacent to the Pacific Ocean includes stunted, open-growing western red cedar, yellow cedar, and western hemlock with some stunted shore pine and Sitka spruce. Wetlands predominate this part of the ecoregion with sloping bogs, basin bogs and occasional stream fens being the most common wetland forms. Red alder is common on disturbed alluvial sites. On steep topography, forest stands are primarily western hemlock and western red cedar, whereas amabilis fir is found with western hemlock on moister sites. Soils formed on mineral substrates range from Podzols to Gleysols while organic soils including upland Folisols with Mesisols and Fibrisols occur on the wetlands. Characteristic wildlife includes grizzly and black bear, mountain goat, black-tailed deer, wolf, mink, otter, seabirds, shorebirds, waterfowl, and grouse. Important land uses include pulp and sawlog forestry, water-oriented recreation, hunting, and tourism. Kitimat, Prince Rupert, Kemano, and Bella Coola are the main communities. The population of the ecoregion is approximately 35 500.

192. PACIFIC RANGES

This ecoregion extends to include the Coast Mountains from the British Columbia–Washington border north to Burke Channel and Bella Coola. The Pacific Ranges are high, irregular, steeply-sloping mountains that form the main southern part of the rugged Coast Mountains. They are composed of crystalline gneisses and granitic rocks, ranging from sea level to 4000 m asl. The higher peaks are surrounded by expansive ice fields; many large glaciers extend to low elevations but do not reach sea level. Numerous, large, steep-sided, transverse valleys, inlets, or fjords dissect this mountainous coastal region. The mean annual temperature for the major valleys is approximately 6.5°C with a summer mean of 13.5°C and a winter mean of –1°C. Mean annual precipitation ranges from 1500 mm in the lower elevations up to 3400 mm at higher elevations. The ecoregion incorporates three main ecological zones: the coastal forest zone, which ranges from sea level to about 900 m asl; the subalpine zone, from about 900 to 1800 m asl; and the alpine zone above 1800 m asl. Vegetative cover of the low-elevation slopes includes very productive stands of western hemlock, western red cedar and amabilis fir. Drier sites support stands of western hemlock and Douglas-fir. The subalpine zone is dominated by forests of mountain hemlock and amabilis fir with some yellow cedar. Podzolic and Dystric Brunisolic soils form on mineral materials. Mesisols and Humisols are the typical soils formed on organic materials. Sloping and basin bogs as well as stream fens and floodplain swamps are the major wetland forms in the ecoregion. Humo-Ferric Podzolic soils form in the subalpine. In addition to the rock outcrops and ice fields at highest elevations, Podzolic, Regosolic, and Brunisolic soils are found in the alpine portions of the ecoregion. Characteristic wildlife includes black-tailed deer, black and grizzly bear, mountain goat, wolf, mink, otter, seabirds, shorebirds, waterfowl, and blue grouse. This ecoregion contains some of the most productive forest lands in Canada. Important land uses include pulp and sawlog forestry, production of hydroelectric power, water-oriented recreation, and tourism. Much of the forest land is under Tree Farm Licence. The main communities are Squamish, Whistler, Hope, and Pemberton. The population of the ecoregion is approximately 36 500.

193. WESTERN VANCOUVER ISLAND

This generally heavily forested ecoregion takes in the northwestern two-thirds of Vancouver Island including the western lowlands and offshore islands. Numerous, steep-sided, transverse valleys, inlets, and sounds dissect the ecoregion. The climate is marked by warm, moist summers and very wet but mild winters. The mean annual temperature for the ecoregion is approximately 8.5°C with a summer mean of 13.5°C and a winter mean of 3.5°C. Mean annual precipitation ranges from 1500 mm in the northeast portion of the ecoregion up to 3500 mm at higher elevation in the main ranges of the island's interior. Henderson Lake holds the Canadian record for precipitation in one year at 8122 mm in 1931. Tofino has the warmest average January temperature of any community in Canada. Coastal forest cover at low elevation includes stands of western hemlock, Douglas-fir, and amabilis fir. Drier sites support stands of western hemlock and western red cedar. Subalpine regions are dominated by forests of mountain hemlock and amabilis fir with some yellow cedar. Alpine tundra sites have an abundance of dwarf willow, sedge, fescue grass, and forbs. The Vancouver Island Ranges form the main body of the island, and their highest peaks reach 2135 m asl. These mountains have been sculptured by glaciers that have left deep, U-shaped valleys. They are composed mainly of Cretaceous and Tertiary strata with volcanic rocks more abundant in the southern half of the island. The narrow Estevan Coastal Plain and Nahwitti Lowland are composed of soft, gently dipping, folded Tertiary strata that form low hills and plains. Soils range from Podzolic and Dystric Brunisolic on well-drained mineral substrates to Gleysolic soils in poorly drained portions of the landscape. Organic soils form on sloping bogs on lowlands along the coast. Humo-Ferric Podzolic soils are most common in the subalpine zone. Characteristic wildlife includes black-tailed deer, American elk (wapiti), black bear, wolf, mink, otter, raccoon, seabirds, shorebirds, waterfowl, and grouse. This very humid ecoregion includes some of the most productive forest lands in British Columbia. Forest management is an important land use and much of the forest lands are under Tree Farm License. Harvested wood is used in both pulp and lumber production. Mining, water-oriented recreation, and tourism are also important land uses. Much of the south and western coast of Vancouver Island falls within the Pacific Rim National Park and the main ranges of the Island fall within Strathcona Provincial Park. Some major communities are Port Alice, Tofino, Ucluelet, and Port Hardy. The population of the ecoregion is approximately 20 500.

194. EASTERN VANCOUVER ISLAND

This ecoregion incorporates the eastern slopes of the Vancouver Island Ranges and adjacent Nanaimo Lowland plain. The ecoregion contains low relief and undulating topography mixed with areas of sharp crests and narrow valleys. The climate is marked by warm, dry summers and wet, very mild winters. Frosts are common in winter, but snow cover at sea level is ephemeral. The mean annual temperature for the ecoregion is one of the mildest in Canada at approximately 9°C with a summer mean of 14°C and a winter mean of 3.5°C. Mean annual precipitation ranges from 800 mm at lower elevations to 2500 mm at higher elevations. Forest cover is characterized by stands of Douglas-fir, western hemlock and grand fir with an understory of salal, Oregon grape, and moss. Mixed stands of Douglas-fir and western hemlock with occasional Garry oak, dogwood, and arbutus are common in the driest portions of the ecoregion along the southeast coast of Vancouver Island. Higher elevation forests are composed of amabilis fir and western hemlock. Brunisolic and Podzolic soils formed on glacial drift and glaciomarine deposits dominate the ecoregion. Characteristic wildlife includes black-tailed deer, American elk (wapiti), wolf, black bear, raccoon, otter, shorebirds, seabirds, and waterfowl. Most of the mountainous portions of the ecoregion are managed for forest production under various forms of public and private tenure. On the gentler terrain adjacent to the Strait of Georgia, land use is more intensive. Residential, industrial, recreational, transportation (corridors) and agricultural uses all compete for land. There are approximately 40 000 ha of farmland mainly in the Nanaimo Lowland. Tourism and fishing are also important economic activities. Some major communities are Port Alberni, Victoria, Campbell River, and Nanaimo. The population of the ecoregion is approximately 547 600.

195. GEORGIA-PUGET BASIN

This coastal ecoregion incorporates the numerous Gulf Islands of the Strait of Georgia. The ecoregion has a "mediterranean" climate of warm dry summers and mild wet winters where frosts are common in winter but snow is ephemeral. The mean annual temperature for the area is approximately 9°C with a summer mean of 15°C and a winter mean of 3.5°C. Mean annual precipitation ranges from 600 mm in the southern Gulf Islands up to 1000 mm farther north in the ecoregion. Very little precipitation falls as snow. The vegetative cover is characterized by forests of Douglas-fir, grand fir and western hemlock with an understory of salal, Oregon grape, and moss. Mixed stands of Douglas-fir with some Garry oak, dogwood, and arbutus are common on drier sites. Moist sites support western hemlock and western red cedar. This lowland basin is formed from an old erosion surface where differential erosion has formed cuesta-like ridges (below 610 m asl) and bevelled hills from soft, folded, Tertiary and Cretaceous sandy sediments. Volcanic and crystalline Mesozoic gneissic and igneous rocks are also present. Humo-Ferric Podzols and Dystric Brunisolic soils have developed on glaciomarine and glacial till deposits. Characteristic wildlife includes black-tailed deer, raccoon, harbour seal, otter, mink, turkey vulture, bald eagle, blue grouse, shorebirds, seabirds, and waterfowl. Land uses reflect the favourable climate in that residential, industrial, recreational, and agricultural uses compete strongly with forestry uses. Eighteen percent of the land area is farmland. Populations continue to increase as the Gulf Islands are a popular retirement region. Most of the population is rural. The largest concentration of population is on Saltspring Island. The population of the ecoregion is approximately 20 800.

196. LOWER MAINLAND

This ecoregion extends westward from the foothills of the Cascade Range at Chilliwack to the Fraser River delta at Richmond and northward to include the narrow Georgia Lowland along the Sunshine Coast. The mean annual temperature for the area is approximately 9°C with a summer mean of 15°C and a winter mean of 3.5°C. Mean annual precipitation ranges from 850 mm in the west end up to 2000 mm in the eastern end of the Fraser River valley and higher elevations. Maximum precipitation occurs in winter as rain; less than 10% falls as snow at sea level but this proportion increases significantly with elevation. Mature native vegetation is characterized by forests of Douglas-fir with an understory of salal, Oregon grape, and moss. Mixed stands of Douglas-fir and western hemlock with some dogwood and arbutus are common on drier sites. Red alder is common where sites have been disturbed. Wet sites support Douglas-fir, western hemlock, and western red cedar. The ecoregion is underlain by unconsolidated glaciofluvial deposits, silty alluvium, silty and clayey marine sediments, and glacial till. Bedrock outcrops of Mesozoic and Palaeozoic origin form rolling hills up to about 310 m asl. The Fraser River dominates this lowland. Gleysols, Mesisols, and Humisols are the dominant wetland soils in the region, while Eutric and Dystric Brunisols and some Podzols have developed on sandy to loamy outwash and glacial till in the uplands. Wildlife includes black-tailed deer, coyote, raccoon, shorebirds, and waterfowl. This is an urban/agricultural region, containing the largest population centre in British Columbia. Intensive agriculture occurs on the valley bottoms of the Fraser River valley where it competes with urban development. Forestry operations occur on higher slopes along the mountains. There are about 87 000 ha of highly productive farmland in the ecoregion. Coastal salt marshes are important wildlife habitat on the Fraser River delta and adjacent Boundary Bay. Urban and suburban development continues in the Vancouver area and is scattered amongst many communities in the Fraser River valley and Sunshine Coast. The main population centre in this ecoregion is greater Vancouver, accompanied by North Vancouver, Chilliwack, Abbotsford, and Mission. The population of the ecoregion is approximately 1 810 000.

197. CASCADE RANGES

This relatively small ecoregion borders on the southeastern edge of the Fraser Lowland and includes the Cascade Mountains that extend into British Columbia from Washington. The mean annual temperature for the area is approximately 9°C with a summer mean of 15.5°C and a winter mean of 2°C. Mean annual precipitation ranges 1200–1500 mm. At lower elevations, the forest cover is composed of stands of western hemlock and Douglas-fir. The subalpine zone is dominated by forests of mountain hemlock, amabilis fir, and some yellow cedar. The small area of alpine tundra is characterized by low-growing shrubs, grasses, and forbs. These mountains reach about 2400 m asl. Humo-Ferric Podzols and Ferro-Humic Podzols are the dominant soils in the ecoregion. Characteristic wildlife includes black-tailed deer, black bear, mink, otter, and grouse. Land uses reflect high recreational and wildlife values at upper elevations and forestry values at lower elevations. The population of the ecoregion is approximately 700.

MONTANE CORDILLERA ECOZONE

Most of southern British Columbia and a portion of southwestern Alberta are contained within this ecozone. It is the most diverse of all the ecozones, ranging from alpine tundra to dense conifer forests to dry sagebrush and grasslands. There are some large deep lakes and major river systems, including the Fraser River and the Columbia River headwaters.

Climate The climate of the region ranges from subarid to arid and mild in southern lower valleys to humid and cold at higher elevations in the northern reaches. Moist Pacific air and the effect of orographic rainfall control the precipitation pattern such that both rain shadows and wet belts are generated within the ecozone, often in close geographic proximity to each other. The rain shadow cast by the massive coast mountains results in some of the driest climates in Canada in the valley bottoms of the south-central part of the ecozone. The Rocky Mountains also impede the westward flow of cold continental Arctic air masses. Mean annual temperatures range between 0.5°C in the northwest (Skeena Mountains) to 7.5°C in the Okanagan area along the Canada–United States border. Mean summer temperatures range from 11°C to 16.5°C. The mean winter temperatures range from –11°C to –1°C. Annual precipitation drops 1200–1500 mm in the mountains and ranges to the west, to 500–800 mm in the north and interior and rises again to 1200 mm in the mountains and ranges along the British Columbia–Alberta border. Precipitation falls below 300 mm in the arid valleys and plateaus to the south.

Vegetation Vegetative cover is extremely diverse; alpine environments contain various herb, lichen, and shrub associations, whereas the subalpine environment has tree species such as lodgepole pine, alpine fir, and Engelmann spruce. With decreasing elevation, the vegetation of the mountainous slopes and rolling plains separates into three general groups: a marginal band of forests characterized by Engelmann spruce, alpine fir, and lodgepole pine; forests characterized by ponderosa pine, interior Douglas-fir, lodgepole pine, and trembling aspen in much of the southwest and central portions; and forests characterized by western hemlock, western red cedar, interior Douglas-fir, and western white pine in the southeast. Shrubbed vegetation found in the dry southern interior, includes sagebrush, rabbitbrush, and antelope-bush. Most of the natural grasslands that existed in the dry south have vanished, to be replaced by urban settlement and agriculture.

Landforms and Soils It is a rugged, mountainous unit that incorporates several major interior plains. The plains are more extensive in the north and extend out as intermontane valleys towards the southern half of the ecozone. Most of these plains and valleys are covered by glacial moraine and, to some degree, fluvial and lacustrine deposits, whereas the mountains consist largely of colluvium and rock outcrops. Luvisols and Brunisols are the most common soils with Podzols occurring in the mountain ranges in the wetter eastern

portion of the ecozone. The soils of the lower valley floors to the south are often Chernozems and support grasslands. These grade into arid environments in the Okanagan area towards the Canada–United States border.

Wildlife Characteristic mammals include woodland caribou, mule and white-tailed deer, moose, mountain goat, California bighorn sheep, coyote, black and grizzly bear, hoary marmot, and Columbian ground squirrel. Typical bird species include blue grouse, Steller's jay, and black-billed magpie.

Human Activities Commercial forest operations have been established in many parts, particularly in the northern interior sections. Mining, oil and gas production, and tourism are the other significant activities. In the eastern Rocky and Columbia mountains, however, national and provincial parks have been established for recreational use or as reserves for wildlife habitat. It is mainly in the valleys that areas have been improved for range or are farmed; near streams, where water is available for irrigation, row crops and hay are grown. The southern valleys are nationally important for their orchards and vineyards. Although much less densely urbanized than the Pacific Maritime ecozone, more than half of the roughly 751 800 population live in cities and towns. The larger centres include Prince George, Kelowna, Kamloops, Penticton, and Vernon.

198. SKEENA MOUNTAINS

This ecoregion covers the portions of the western Skeena Mountains. The mean annual temperature for the ecoregion is approximately 0.5°C with a summer mean of 11°C and a winter mean of –11°C. Mean annual precipitation exhibits a strong gradient from 1200 mm in the west to 600 mm in the east. The ecoregion is a vertically stratified complex of ecosystems, ranging from low-elevation forests of interior western red cedar and western hemlock; to mixed stands of lodgepole pine, Engelmann spruce, and alpine fir in its subalpine sections; and to discontinuous cover of alpine tundra vegetation of low-growing heather, sedge, and mountain avens. The Skeena Mountains lie between the more rugged and massive coastal ranges to the west and the somewhat more subdued Omineca Mountains to the east. The Skeena Mountains are composed of folded, stratified Mesozoic sediments of uniform resistance. Extensive glaciers exist in the main ranges above 2000 m asl. Delta Peak in the northern portion of the ecoregion and Shedin Peak in the southern portion of the ecoregion are heavily glacierized. Soils developed on steeply-sloping veneers and blankets of colluvial and morainal deposits range from Gray Luvisolic and Dystric Brunisolic soils in the region's montane zone to Brunisolic and Podzolic soils in the subalpine zone, and to Regosolic and Sombric Brunisolic soils in alpine areas. Isolated patches of permafrost occur in the alpine zone. Characteristic wildlife includes moose, woodland caribou, mountain goat, grizzly and black bear, beaver, wolf, red fox, marten, hare, and grouse. Forestry dominates land use at lower elevations. Hunting, recreation, and tourism are also important in the ecoregion. There are no major settlements within this ecoregion.

199. OMINECA MOUNTAINS

This ecoregion covers the southern section of the Omineca Mountains and the eastern ranges of the Skeena Mountains. The mean annual temperature for the area is approximately 1.5°C with a summer mean of 11.5°C and a winter mean of –10°C. Mean annual precipitation ranges 500–700 mm. This ecoregion is a vertically stratified complex of ecosystems, ranging from subboreal vegetation, consisting of trembling aspen, balsam poplar, paper birch, lodgepole pine, and black and white spruce; to extensive subalpine forests of Engelmann and white spruce, and alpine fir. Alpine tundra vegetation consists of low-growing heather, heath, sedge, and mountain avens. The Omineca Mountains form a complex belt of Palaeozoic and Mesozoic sedimentary and massive crystalline rocks. The Skeena Mountains, composed of folded, Jurassic and Cretaceous sediments and volcanic strata, are similar in general elevation. Both ranges have peaks which reach about 2400 m asl. Dystric Brunisolic and Gray Luvisolic soils dominate in the region's montane

and subalpine zones. Brunisolic and Regosolic soils are present in alpine sections. Isolated patches of permafrost occur in the northwestern portion of the region. Characteristic wildlife includes moose, woodland caribou, black and grizzly bear, beaver, wolf, red fox, marten, hare, and grouse in warmer, forested sections; and mountain goat on the more rugged subalpine and alpine sections. Land use ranges from forest harvesting in montane and subalpine zones while mineral exploration, hunting, recreation, and tourism activities take place throughout the ecoregion. The main communities are Germansen Landing and Mackenzie. The population of the ecoregion is approximately 6100.

200. CENTRAL CANADIAN ROCKY MOUNTAINS

This ecoregion covers the central section of the Rocky Mountains of east-central British Columbia. The ecoregion takes in a portion of the Rocky Mountain Foothills to the east and the Hart Ranges and southern Muskwa Ranges in its western half. The mean annual temperature for the area is approximately 1.5°C with a summer mean of 12°C and a winter mean of -10°C. Mean annual precipitation ranges 500–700 mm with the highest values occurring in the south. Low-elevation forest cover is predominantly mixed species with lodgepole pine, trembling aspen, and white and black spruce. The subalpine section is characterized by forests of lodgepole pine, Engelmann spruce, and alpine fir. Alpine communities are usually composed of low-growing heather, shrubs, and grasses. The Rocky Mountains in the western section of the ecoregion are relatively subdued with summits ranging up to 2700 m asl. The foothills, composed of linear ridges and hills of Jurassic and Cretaceous sediments, rise abruptly above the plains of the prairies to the east. Gray Luvisolic, Dystric Brunisolic, and Podzolic soils developed on irregular, steeply-sloping colluvium and morainal blankets are dominant in the region. Sporadic discontinuous permafrost occurs throughout the ecoregion at high elevation. Characteristic wildlife includes wolverine, grizzly and black bear, moose, mountain goat, caribou, wolf, elk, mule deer, and ruffed grouse. Forestry, hunting, recreation, and coal mining are important land uses. There are no major communities in the ecoregion.

201. BULKLEY RANGES

This high elevation, mountainous ecoregion is located in the southern section of the Hazelton Mountains in west-central British Columbia and is transitional between the adjacent coastal forest ecosystems to the west and the drier montane forests to the east. Two main ranges make up the ecoregion, the Telkwa Range to the north and the Tahtsa Ranges in the south. A number of prominent, elongated lakes (Morice, Tahtsa, and Kidprice lakes) run out from the Coast Mountains towards the Interior Plateau. The ecoregion is relatively wetter and warmer than in the interior ranges to the east. The mean annual temperature for major valleys is approximately 2.5°C with a summer mean of 11.5°C and a winter mean of -8°C. Mean annual precipitation is highly variable ranging from 1500 mm in the west to 600 mm at low elevations in the east. The ecoregion is characterized by lodgepole pine, Engelmann spruce, and alpine fir forests in the subalpine zone and by extensive areas of alpine vegetation. Folded Jurassic and Cretaceous sediments and volcanic rocks predominate. Intrusions of igneous rocks are more abundant in its southern section. The highest peaks support glaciers and range 2500–2800 m asl. Dystric Brunisolic and Humo-Ferric Podzolic soils are dominant in the subalpine zone. Dystric Brunisolic and Gray Luvisolic soils are associated with the low-elevation valley systems in moist montane regions where western red cedar and western hemlock forests grow. Isolated patches of low ice content permafrost occur in the northern portion of the ecoregion. Characteristic wildlife includes wolverine, grizzly and black bear, mountain goat, woodland caribou, moose, and ptarmigan. Recreation, hunting, tourism, and forestry are important land uses. There are no major settlements, and the population of the ecoregion is approximately 900.

202. FRASER PLATEAU

This ecoregion covers the Interior Plateau and interior foothills of the Coast Mountains of central British Columbia, from François Lake in the northwest to Bonaparte Lake in the southeast. The mean annual temperature for the area is approximately 3°C with a summer mean of 12.5°C and a winter mean of -7°C. Mean annual precipitation ranges 250–600 mm. The highest values occur at higher elevations in the west along the Chilcotin Ranges and the lowest values (250–300 mm) occur in the area around the junction of the Chilcotin and Fraser rivers. The ecoregion is dominated by white spruce, lodgepole pine, trembling aspen, and Douglas-fir forests. Open-growing lodgepole pine and Douglas-fir occur on drier mid-elevation sites. Engelmann spruce and alpine fir are found at subalpine elevations, usually above 1250 m asl. In addition, bunchgrass-dominated grasslands occur at valley bottom elevations along the Fraser and Chilcotin rivers. Localized alpine tundra vegetation occurs on the summits of the Quanchus Range south of Ootsa Lake and the shield volcanoes of the Ilgachuz and Itcha ranges. This broad, rolling plateau generally lies 1150–1800 m asl. Surface deposits include glacial till with well-developed drumlinoid features, pitted terraces, simple and compound eskers, and areas of glacial lake (lacustrine) deposits. Gray Luvisolic and Dystric Brunisolic soils are dominant in the region. Numerous depressions in the landscape are occupied by Organic soils. Dark Gray to Brown Chernozemic soils occur on sites at the lowest elevations. Characteristic wildlife includes California bighorn sheep, moose, mule deer, caribou, wolf, coyote, black bear, blue and sharp-tailed grouse, waterfowl, and sandhill crane. Forestry and ranching are the main land uses, along with outdoor recreation including hunting and fishing. Five percent of the ecoregion is farmland. Major communities include Williams Lake, Anahim Lake, Smithers, Vanderhoof, and 100 Mile House. The population of the ecoregion is approximately 69 400.

203. FRASER BASIN

This ecoregion covers the plateaus and plains of north-central British Columbia. The region occupies the Nechako Lowlands, the northern portion of the Nechako Plateau, the southern portion of the Northern Rocky Mountain Trench, and the western flank of the MacGregor Plateau. The mean annual temperature for the area is approximately 3°C with a summer mean of 12.5°C and a winter mean of -8°C. Mean annual precipitation ranges 600–800 mm. Forests are characterized by mixed stands of trembling aspen, paper birch, lodgepole pine, and the climax species, white and black spruce. The subalpine zone that occurs above 1200 m asl, supports forests of lodgepole pine, which develop after fires, as well as Engelmann spruce and alpine fir. The ecoregion is underlain by flat-lying Tertiary and volcanic bedrock that generally lies below 1000 m asl. It has a gently rolling surface covered by thick glacial drift into which the Fraser River and its major tributaries are commonly incised. The glacial deposits include moraine with well-developed drumlinoid features, glaciofluvial terraces, eskers, and large areas of glacial lake deposits. Gray Luvisolic and Dystric Brunisolic soils are dominant in the region. Isolated patchy permafrost occurs in the northern part of the ecoregion. Characteristic wildlife includes moose, mule deer, wolf, muskrat, lynx, black bear, migratory waterfowl, and spruce and ruffed grouse. Forestry is the predominant land use. Ranching, hunting, some trapping, tourism, and forage-based agriculture are also common land uses. Major communities include Prince George, Fort St. James, and Quesnel. The population of the ecoregion is approximately 110 600.

204. CHILCOTIN RANGES

This ecoregion is composed of a complex of ecosystems covering alternating mountain ridges and valleys within the rain shadow of the Pacific Ranges of the Coast Mountains. The Chilcotin Ranges are high and somewhat rounded, reaching 2700 m asl. The mean annual temperature for the area is approximately 3.5°C with a summer mean of 12°C and a winter mean of -5.5°C. Mean annual precipitation follows a strong gradient with the western edge of the ecoregion receiving 1200 mm and the eastern flanks receiving 600 mm. Alpine tundra vegetation communities are found at elevations above 1900 m asl. Engelmann

spruce, subalpine fir, and lodgepole pine dominate the subalpine zone. Lodgepole pine and pine grass understory with some aspen, white spruce, and Douglas-fir make up the montane forests of the ecoregion. Steeply-sloping veneers and blankets of coarse colluvium and glacial till form the dominant soil parent materials. Regosolic soils are common in alpine zones, Dystric Brunisols and Humo-Ferric Podzols are found in subalpine and montane zones, and Gray Luvisols and Eutric Brunisols occur on increasingly drier sites at the lowest elevations. Characteristic wildlife includes California bighorn sheep, mountain goat, mule deer, grizzly and black bear, coyote, and blue grouse. Land uses reflect high recreational and wildlife values, as well as mineral exploration and development in alpine and subalpine zones. Forestry activities occur in lower, warmer elevations. The population of the ecoregion is approximately 300.

205. COLUMBIA MOUNTAINS AND HIGHLANDS

This ecoregion covers the "Interior Wet Belt" of British Columbia. It extends from the northern end of the Cariboo Mountains south to the international border. The mountains, composed of a series of ranges and alternating trenches, contain many peaks higher than 3000 m asl and are ruggedly sculptured. These peaks are composed of glaciers and rock outcrops. The ecoregion is a complex of elevationally stratified montane to alpine ecosystems. The mean annual temperature for the ecoregion varies from north to south but an average of 5°C with a summer mean of 14°C and a winter mean of -5°C is typical for major valley systems. Mean annual precipitation ranges up to 1200 mm. In the major valleys precipitation is between 1000–1100 mm falling locally to less than 1000 mm in drier valleys. At elevations below 1200 m asl in major valleys are found mature forests of western hemlock and western red cedar, mixed with occasional Douglas-fir, western white pine, and western larch. The subalpine zone is characterized by Engelmann spruce and alpine fir and stands of lodgepole pine, which can develop after fire. The ecoregion incorporates the Columbia Mountains and the western portion of the Columbia Highlands, which are composed of folded sedimentary and volcanic strata and massive metamorphic rocks of Palaeozoic and Mesozoic age. All are intruded by small to large bodies of igneous and volcanic rocks. Humo-Ferric Podzols with Dystric Brunisolic soils developed on colluvial and morainal deposits are the dominant soils in the ecoregion. Characteristic wildlife includes grizzly and black bear, woodland caribou, mountain goat, grouse, and waterfowl; mule and white-tailed deer, and American elk (wapiti) in the south; and moose in the north. Forestry, mountain recreation, localized agriculture and grazing, tourism, mining, and hydroelectric power production are all uses of land. Several large provincial and national parks are included in this ecoregion. Some main communities are Revelstoke, Nelson, Blue River, Wells, and Creston. The population of the ecoregion is approximately 57 000.

206. WESTERN CONTINENTAL RANGES

This ecoregion covers the Rocky Mountains of southeastern British Columbia including the Continental Ranges, where elevations rise to over 3000 m asl along the continental divide. The ecoregion includes the western portion of the Columbia Icefield as well as the highest mountain in the Canadian Rocky Mountains, Mount Robson, at just over 3600 m asl. Low-elevation valleys are marked by warm, showery summers and mild, snowy winters. Subalpine summers are cool, showery, and prone to frosts. Winters are moderately cold and snowy. The mean annual temperature for the valleys of the ecoregion is approximately 3.5°C with a summer mean of 13°C and a winter mean of -6.5°C. The mean annual precipitation in the major valleys is 700–800 mm. In the subalpine zone the annual precipitation climbs up to 1200 mm. The ecoregion is predominantly composed of subalpine and alpine ecosystems and a few major valley systems covered by montane forests. This ecoregion is differentiated from the adjacent Eastern Continental Ranges ecoregion (207) by generally higher precipitation, particularly in the northern portion of the ecoregion. Montane forests are composed of western hemlock and western red cedar in the north, trending to white spruce and alpine fir forests in the south. Subalpine forests are composed of Engelmann spruce, alpine fir, and lodgepole pine. The mountain ranges are composed of Palaeozoic limestones and quartzites. Glaciation has

sculpted great U-shaped valleys and left valley floors filled with glaciofluvial and morainal sediments. Rock outcrops predominate at the highest elevations. Regosolic, Brunisolic, and occasional Podzolic soils have developed on colluvial, morainal, and fluvioglacial deposits in the ecoregion. Permafrost occurs in isolated patches in alpine areas. Characteristic wildlife includes elk, bighorn sheep, mule deer, caribou, wolf, grizzly and black bear, and mountain goat. Part of the ecoregion falls within Mount Robson Park as well as Yoho, Kootenay and Glacier national parks, where tourism and recreation are the major land uses. Outside of the park boundaries, big game hunting, and some forestry and mineral resource exploration take place. Field is the main community, and the population of the ecoregion is approximately 1200.

207. EASTERN CONTINENTAL RANGES

This ecoregion covers the Rocky Mountains of Alberta incorporating the eastern flanks of the Continental Ranges. The major peaks on the continental divide cluster around the Columbia Icefield, the largest ice field in the Rocky Mountains. Southward, the mountains are generally lower. The mean annual temperature for the ecoregion varies from north to the south. Typical values for the mean annual temperature for major valley systems is approximately 2.5°C. Mean summer temperature is 12°C and the winter mean is -7.5°C. The mean annual precipitation ranges 600–800 mm increasing with elevation from east to west. Climatic conditions in the major valleys are marked by warm, dry summers and mild, snowy winters. Subalpine summers are cool, showery, and prone to early frosts. Winters are cold and snowy. The ecoregion is predominantly composed of subalpine and alpine ecosystems, characterized by mixed forests of lodgepole pine, Engelmann spruce, and alpine fir. In addition, stands of Douglas-fir intermixed with trembling aspen and grassland ecosystems occur on the warmest, driest sites in the major valley systems of the Bow, Saskatchewan, and Athabasca rivers. At upper elevations, usually between 1600 and 2100 m asl, open stands of alpine fir are found. Limber pine can be found on rock outcrops. The alpine vegetation is characterized by low-growing heather with sedges and mountain avens occurring on warmer sites. The ranges are linear with great cliffs and precipitous faces of thick sections of gray carbonate strata. Rock outcrops characterize most peaks and ridges in the ecoregion. Regosolic and Eutric Brunisolic soils developed on steeply-sloping colluvial, morainal, and fluvioglacial deposits are dominant in the region. Dystric Brunisols are more common in the subalpine and alpine environments. Isolated patches of permafrost occur at higher elevations. Characteristic wildlife includes elk, bighorn sheep, mule deer, caribou, wolf, grizzly and black bear, and mountain goat. Most of the ecoregion falls within Banff and Jasper national parks, and Willmore Wilderness Provincial Park, where tourism and recreation are the major land uses. Outside of the park boundaries, big game hunting, and some forestry and resource exploration take place. The main communities are Jasper, Banff, and Lake Louise. The population of the ecoregion is approximately 10 100.

208. INTERIOR TRANSITION RANGES

This ecoregion is a mountainous upland region within the eastern portion of the southern Pacific Ranges. The ecoregion incorporates a strong climatic gradient from the moist maritime climate of the coast to the semiarid continental climate of the southern interior of British Columbia. Elevation ranges 300–3000 m asl. The mean annual temperature for the area is approximately 6°C with a summer mean of 15°C and a winter mean of -3.5°C. The mean annual precipitation experiences a strong gradient through the Fraser Canyon ranging from south (300 mm) to north (500 mm) and in the mountain ranges from west (1200 mm) to east (800 mm). This ecoregion contains ecosystems ranging from alpine at the highest elevations; to subalpine forests of Engelmann spruce, alpine fir, and lodgepole pine; and to montane forests of lodgepole pine, trembling aspen, white spruce, and Douglas-fir. At the lowest elevations in the eastern portions of the ecoregion there is a parkland of scattered ponderosa pine in a matrix of bluebunch wheat grass and sagebrush grasslands. The soils of the region vary from Humo-Ferric Podzols and Dystric Brunisols at the higher elevations, to Gray Luvisols and Eutric Brunisolic soils on calcareous morainal and lacustrine deposits at middle elevations, and to Eutric Brunisolic and Dark Gray Chernozemic soils at lower elevations.

Dark Brown and Brown Chernozemic soils are usually associated with valley bottoms along the lower Fraser River and its tributaries. Characteristic wildlife are mule deer, bighorn sheep, mountain goat, grizzly and black bear, cougar, coyote, grouse, and various raptors. Land uses reflect high recreational and wildlife values in alpine and subalpine zones, whereas forestry and agriculture tend to become more important in lower, warmer zones. Mineral exploration occurs throughout the region. There are 50 000 ha of farmland in the ecoregion, the most productive are the irrigated forages, mainly alfalfa, on the benches of the Fraser and lower Thompson rivers. These river valleys are also important transportation corridors. The main communities are Lillooet and Lytton. The population of the ecoregion is approximately 6900.

209. THOMPSON-OKANAGAN PLATEAU

This is one of the warmest and driest ecoregions in Canada. It is characterized by rolling plateaus and major valley systems of the Okanagan, Thompson and Nicola rivers. The mean annual temperature of the major valleys is approximately 6°C with a summer mean of 15°C and a winter mean of -3.5°C. Kamloops, located on the Thompson River, has the highest average daytime summer temperature of all Canadian cities at 27.2°C. The mean annual precipitation ranges 250–300 mm in the major valleys to over 1000 mm in subalpine and alpine areas. Plateau regions receive 400–600 mm. A strong gradient in precipitation occurs with elevation. Vegetative cover includes alpine, forests, and grasslands. Engelmann spruce, subalpine fir, and lodgepole pine grow in subalpine areas. Lower elevations support forests of lodgepole pine with pine grass understory, mixed with some trembling aspen, white spruce, and Douglas-fir. Valley bottoms support open stands of Douglas-fir and pine grass or parklands of scattered ponderosa pine in a matrix of bluebunch wheat grass and sagebrush. In the driest areas south of Penticton and around Kamloops, grasslands of bluebunch wheat grass, blue grass, June-grass, sagebrush, rabbitbrush, and antelope-bush occur. This ecoregion, lying within the southern section of the Interior Plateau, is composed of flat-lying Tertiary sediments and volcanic rocks 1220–1525 m asl in elevation. The region has a gently rolling surface covered mainly by glacial deposits into which rivers are commonly incised below the general surface. Glacial deposits include hummocky moraines, well-developed drumlinoid features, glaciofluvial terraces, esker complexes, and glacial lake (glaciolacustrine) deposits. The soils of the region include Humo-Ferric Podzols and Dystric Brunisols at the higher elevations, Gray Luvisols and Eutric Brunisolic soils on calcareous morainal and lacustrine deposits at middle elevations, and Eutric Brunisolic and Dark Gray Chernozemic soils at lower elevations. Dark Brown and Brown Chernozemic soils are usually associated with low-elevation valley bottoms along the Okanagan and Thompson rivers. The range of representative wildlife is equally complex and includes California bighorn sheep, mule and white-tailed deer, elk, black bear, coyote, bobcat, cougar, blue grouse, waterfowl, long-billed curlew, rattlesnake, and chukar (introduced). Land use also reflects ecological stratification. Grazing, forage production, orchards, water-oriented recreation, and residential development are common at lower elevations, woodland grazing and forestry at middle elevations, and forestry, hunting, and recreation at higher elevations. Approximately 10% of the ecoregion is farmland, much of it irrigated in horticultural or forage crops. Major communities are Penticton, Kelowna, and Kamloops. The population of the ecoregion is approximately 344 500, and growing annually as this ecoregion has become a favoured retirement area.

210. OKANAGAN RANGE

This rugged ecoregion incorporates the southeastern portions of the Cascade Mountains and Okanagan Range which are some of the warmest and driest mountain ranges in British Columbia. The mean annual temperature for the ecoregion is approximately 7°C with a summer mean of 15°C and a winter mean of -1°C. The mean annual precipitation follows a strong gradient moving from east (500 mm) to west (1000 mm) with up to 1200 mm falling at higher elevations. Subalpine forests dominate the ecoregion and are composed of Engelmann spruce, subalpine fir, and lodgepole pine forests which occur between 1200 and 2000 m asl. Douglas-fir, occasional ponderosa pine, and pine grass parklands cover the major valley bottoms. The soils

of the region vary from Humo-Ferric Podzols and Dystric Brunisols at the higher elevations, to Gray Luvisols and Eutric Brunisolic soils on the generally calcareous, colluvial, and morainal deposits at middle elevations, to Eutric Brunisols and Dark Gray Chernozems at lowest elevations. The range of representative wildlife is wide and includes California bighorn sheep, mountain goat, mule deer, black bear, cougar, coyote, bobcat, grouse, California quail, waterfowl, and rattlesnake. Land use reflects ecological stratification. Grazing, forage production, orchards, water-oriented recreation, and tourism are common at lower elevations, woodland grazing, forestry, hunting, and recreation at higher elevations. E.C. Manning Park covers a portion of the ecoregion. The main communities are Keremeos and Hedley in the Similkameen Valley. The population of the ecoregion is approximately 3900.

211. OKANAGAN HIGHLAND

This ecoregion, like most of the dry interior ecoregions of southern British Columbia, lies within the rain shadow of the Cascade Mountains to the west. The ecoregion is composed of long, rounded ridges of moderate relief and deep, wide valleys often occupied by large elongated lakes. This is one of the hottest and driest ecoregions in Canada. The climate is characterized by very warm to hot, dry summers and moderately cool winters with relatively little snowfall. Summer drought, promoted by very warm temperatures, is the primary factor promoting the development of grassland vegetation below 700 m asl in valley bottoms. The mean annual temperature for the major valleys of the ecoregion is approximately 7.5°C with a summer mean of 16.5°C and a winter mean of -1.5°C. The mean annual precipitation ranges from 250 mm in the very dry valleys to 300–400 mm on the plateau surface. The climate varies with elevation and topography. Forest cover ranges from lodgepole pine with trembling aspen, white spruce, and Douglas-fir on the plateau to Douglas-fir and pine grass at moderate mid-slope elevations. Valley bottoms are covered by a parkland of scattered ponderosa pine in a matrix of bluebunch wheat grass and sagebrush and at lowest elevations by sagebrush, bluebunch wheat grass, blue grass and June-grass. Gray Luvisols and Eutric Brunisolic soils form on the common colluvial, morainal, and lacustrine deposits. Dark Gray, Dark Brown and Brown Chernozemic soils are usually associated with low-elevation valley bottoms such as along the Okanagan River. A wide range of representative wildlife includes California bighorn sheep, mule and white-tailed deer, black bear, cougar, coyote, bobcat, badger, blue grouse, and California quail (introduced). A number of southern species indigenous to the Great Basin of the western United States extend into this ecoregion including the pallid bat, sage thrasher and burrowing owl. Reptiles include the western painted turtle, western rattlesnake, and western yellow-bellied racer, while amphibians include the Great Basin spadefoot toad, tiger salamander and western toad. Land use pressures are high in the valleys. Along with an increasing residential population and urban land uses, grazing, irrigated forage production, fruit orchards, water-oriented recreation, and tourism are common. Woodland grazing and some forestry take place at higher elevations. Approximately 40 000 ha of farmland occur in this ecoregion. The main communities are Oliver and Osoyoos. The population of the ecoregion is approximately 23 000.

212. SELKIRK-BITTERROOT FOOTHILLS

This foothills ecoregion covers a somewhat drier section of the "Interior Wet Belt" than the adjacent Columbia Mountains and Highlands (ecoregion 205). It extends from the south-central part of eastern British Columbia south to the international border. The ecoregion embraces the southwestern flank of the Columbia Mountains and the southeastern portion of the Columbia Highlands. It is a complex of subalpine and moist montane vegetation zones. The mean annual temperature for the area is approximately 5.5°C with a summer mean of 14.5°C and a winter mean of -3.5°C. The mean annual precipitation ranges from 500 mm in the cedar-hemlock forested valleys to greater than 800 mm in the upland areas. The subalpine is characterized by forests of Engelmann spruce and alpine fir which predominate at 1200–2150 m asl. Open stands of alpine fir, larch, or whitebark pine may be found at higher elevations. In lower valleys, mature forests consist of western hemlock and western red cedar, and seral stands consist of lodgepole pine and

Douglas-fir with some western white pine and western larch. The ecoregion is underlain by folded sedimentary and volcanic strata and massive metamorphic rocks of Palaeozoic and Mesozoic age, all are intruded by small to large bodies of igneous and volcanic rocks. The mountains in this ecoregion are somewhat lower and less rugged than the series of ranges to the north. Humo-Ferric Podzols with Dystric Brunisolic soils developed on irregular, steeply-sloping colluvial and morainal deposits are dominant at the upper elevations, while Dystric Brunisols are most common at the lower elevations. Characteristic wildlife includes mule and white-tailed deer, woodland caribou, grizzly and black bear, and grouse. Forestry, mining, outdoor recreation, tourism-related activities, and a limited amount of agriculture and grazing are the main land uses. The main communities are Trail, Castlegar, and Rossland. The population of the ecoregion is approximately 33 700.

213. SOUTHERN ROCKY MOUNTAIN TRENCH

This ecoregion is a long, narrow complex of ecosystems that occupy the valley of this major geological fault that runs between the Columbia Mountains and the Rocky Mountains. The Southern Rocky Mountain Trench is a linear, steep-walled, faulted valley about 480 km long. The valley floor is relatively level and can vary in width from less than 1 km to 20 km. The headwaters of a number of large rivers lie in the trench. The northern limit of the ecoregion is around 54° N latitude and runs south to the border with western Montana. Climate tends to become warmer and drier moving from north to south. The mean annual temperature for the ecoregion is approximately 4.5°C with a summer mean of 14°C and a winter mean of -5.5°C. The mean annual precipitation is less than 500 mm in the southern end of the ecoregion around Windermere and Cranbrook, and 800–1000 mm in the central portion in the vicinity of Kinbasket Lake. Valley bottom vegetation ranges from bunchgrass, ponderosa pine, and Douglas-fir in the south, to western red cedar and western hemlock in the central portion, and to white and black spruce and lodgepole pine in the northern portions of the ecoregion. Underlain by Palaeozoic and Proterozoic strata, the trench is covered with a variety of glacial deposits including ground moraine, outwash plains and terraces, drumlins, eskers, glacial lake terraces, and recent alluvium. Large floodplains and wetlands have been formed by several large rivers that drain into and meander along the valley floor of the trench. Dystric and Eutric Brunisolic soils developed on steeply-sloping colluvial and morainal deposits dominate upland sites and well-drained valley floors. Gleysolic and Mesisolic soils occupy areas of wetlands. Characteristic wildlife includes elk, moose, mule and white-tailed deer, bighorn sheep, grizzly and black bear, cougar, coyote, grouse, and waterfowl. Land uses include forestry, water impoundment, grazing, hunting, recreation, livestock, forage crop production, and tourism. Some main communities are Cranbrook, Kimberley, Invermere, and Golden. The population of this ecoregion is approximately 45 000.

214. NORTHERN CONTINENTAL DIVIDE

This high elevation, mountainous ecoregion spans the Alberta–British Columbia boundary from Banff to the United States border. Much of the ecoregion lies 1200–2000 m asl. Winter temperatures are moderated by frequent Chinooks, especially on the eastern slopes. The mean annual temperature for the major valleys is approximately 3.5°C with a summer mean of 12.5°C and a winter mean of -6.5°C. The mean precipitation ranges 600–700 mm annually. Vegetation cover is elevationally stratified. Engelmann spruce and alpine fir make up old growth forests at higher elevations. Some hybrid spruce, western hemlock, and western red cedar occur at middle and lower elevations. Locations that have suffered recent forest fires are often characterized by closed canopied forests of lodgepole pine. The Continental Ranges south of Crowsnest Pass are characterized by linear ranges of carbonate-rich Palaeozoic and Proterozoic sedimentary strata. Unvegetated rock outcrops are common along ridges and peaks. Humo-Ferric Podzols and Dystric Brunisols with some Gray Luvisolic soils developed on irregular, steeply-sloping colluvial, morainal, and fluvioglacial deposits are dominant in the region. Characteristic wildlife includes wapiti (elk), bighorn sheep, marten, lynx, bobcat, cougar, wolverine, grizzly and black bear, mountain goat, and mule and white-tailed

deer. Forestry, coal mining at higher elevations, and limited agricultural activities at lower elevations are common uses of land. Hunting and recreation are extensive land uses throughout. Portions of Banff and Waterton Lakes national parks fall within the ecoregion. Grazing or forage production occurs in the Alberta portion of the ecoregion. The main communities are Fernie and Sparwood. The population of the ecoregion is approximately 35 200.

HUDSON PLAINS ECOZONE

The Hudson Plains ecozone is centred in northern Ontario and extends into northeastern Manitoba and western Quebec. The largest extensive area of wetlands in the world are associated with this ecozone.

Climate Climatically, the ecozone is strongly influenced by the cold and moisture laden Hudson Bay–low and Polar–high air masses. The short cool summers and very cold winters generally reflect a cold continental climate. Mean annual temperatures generally range from -4°C to -2°C . Mean annual temperatures can be colder in Manitoba, ranging as low as -7°C in places. Mean summer temperatures range from 10.5°C to 11.5°C . Mean winter temperatures range between -19°C and -16°C . Precipitation annually ranges from 400 mm in the northwest to 800 mm in the southeast.

Vegetation Vegetative associations consist of arctic tundra and some boreal forest transition types. The poorly drained areas support dense sedge–moss–lichen covers, and the less frequent and better-drained sites support open woodlands of black spruce and tamarack. The raised beaches present a striking pattern of successive black spruce-covered ridges alternating with depressional bogs and fens. The character of the drier, less frequent upland sites suggests similarities to those of the Boreal Shield and Boreal Plains ecozones.

Landforms and Soils This lowland plain is underlain by flat-lying Palaeozoic and Proterozoic sedimentary rocks which slope gently towards the Hudson and James bays. Elevations rarely exceed 500 m asl. The surface is composed of extensive wetlands with subdued glacial features and a belt of raised sandy beaches. The wetlands include extensive peatlands (largely bogs and fens), and shallow open waters less than 2 m deep. Coastal marshes and extensive tidal flats are present along the coastline. The relief of the lowland has been significantly affected by postglacial marine submergence and upwarping of its surface. Due to poor drainage Organic Cryosols and Mesisols are the predominant soils in the zone. Significant saline Regosols occur on silty to clayey marine sediments along the coastal shore. Permafrost ranges from continuous in the northwest to isolated patches in the southeast.

Wildlife Characteristic mammals include woodland caribou, moose, black and polar bears, marten and Arctic fox. The ecozone is an important habitat for breeding waterfowl, particularly Canada Goose. The marine environment includes bearded, harbour and ringed seals, as well as beluga and bowhead whales in the summer.

Human Activities Activities are primarily limited to aboriginal hunting, trapping, and fishing with some localized sport fishing and tourism. The total population of the ecozone is approximately 9900. The major communities include Churchill, Fort Severn, Attawapiskat, and Moosonee.

215. COASTAL HUDSON BAY LOWLAND

This ecoregion occurs along the southern coast of Hudson Bay, from the Seal River in Manitoba east to James Bay in Ontario. The ecoregion is marked by short cool summers and very cold winters. The mean annual temperature is approximately -4°C . Temperatures can be colder in the Manitoba part of the ecoregion reaching a mean annual low of -7°C . The mean summer temperature is 10.5°C and the mean winter temperature is -19°C . The mean precipitation ranges from 400 mm in the northwest to 600 mm in the east. The ecoregion has a high subarctic ecoclimate and is part of the broad area of tundra and boreal forest transition where the latitudinal limit of tree growth is reached. The vegetation is characterized by very open stands of stunted black spruce and tamarack with secondary quantities of white spruce. A shrub layer of dwarf birch, willow or ericaceous shrubs, and a ground cover of cottongrass or lichen and moss is predominant. Poorly drained sites usually support tussock vegetation of sedge, cottongrass, and sphagnum moss. Low shrub tundra vegetation consisting of dwarf birch and willow is also common. The ecoregion is part of the Hudson Bay Lowland, a distinct physiographic unit within the Hudson geologic platform, which is a large flat geological structure of Palaeozoic limestone. After deglaciation the ecoregion was inundated by the Tyrrell Sea and covered by marine sediments. This was followed by a continued uplifting of the land surface due to isostatic rebound. Along the Hudson Bay coast east of the Nelson River numerous, parallel, well-drained raised beaches present a striking pattern of successive white spruce-covered ridges, alternating with fens, polygonal peat plateaus, and peat plateaus. North of the Nelson River beaches are more subdued and the terrain is dominated by fens, polygonal peat plateaus, and peat plateaus. Peat plateaus occur often in parallel rows marking the underlying beaches. In the fens, small incipient palsas bogs are common. The coastal areas are dominated by marshes and shallow waters and extensive tidal flats, especially north of the Nelson River. Extensive tidal flats and well developed beach ridges of limestone shingles are found at the junction of Hudson and James bays. Wetlands occupy up to 75% of the ecoregion. Organic Cryosols formed on sedge and fibrous sphagnum peat are dominant; Mesisols formed on moderately decomposed sedge and woody peat are significant; and saline Regosols and Gleysols occur on silty to clayey marine sediments along the coast of the bay. Permafrost with low to high ice content is widespread throughout the ecoregion. Characteristic wildlife includes barren-ground caribou, polar bear, arctic fox, brown lemming, snow and Canada goose, swan, sea ducks, and shorebirds. White whale and seal are found in coastal waters. Human activities are limited to trapping and hunting, marine mammal hunting, fishing, recreation, and tourism. The major communities include Peawanuck, Fort Severn, and Churchill. The population of the ecoregion is approximately 1600.

216. HUDSON BAY LOWLAND

This ecoregion extends from Herchmer in northern Manitoba to James Bay, and includes Akimiski, North Twin and South Twin islands in northern Ontario. The ecoregion is marked by short cool summers and very cold winters. The mean annual temperature is approximately -3.5°C . In Manitoba the mean annual temperature can exceed -5°C . The mean summer temperature is 11°C and the mean winter temperature is -18.5°C . The mean annual precipitation ranges from less than 500 mm in the west to less than 700 mm near James Bay. The ecoregion has a low subarctic ecoclimate. Stands are denser and trees are larger than in the coastal ecoregion to the north. The vegetation cover is dominated by open stands of stunted black spruce, tamarack and white spruce. The shrub layer consists of dwarf birch, willow and northern Labrador tea. The ground cover is dominated by cottongrass or by moss and lichen. Dry sites often support open stands of white spruce with an ericaceous shrub layer, and a ground cover of lichen. Poorly drained sites have vegetation characterized by sedge and cottongrass tussocks or sphagnum hummocks. Balsam poplar, white spruce and paper birch are common along rivers. The ecoregion is part of the Hudson Bay Lowland, and is controlled by flat-lying Palaeozoic limestone bedrock, that slopes gently northeastward and eastward to Hudson Bay. The maximum elevation is about 120 m asl in the south. This area was also inundated by the postglacial Tyrrell Sea and covered by marine sediments. Gradual uplifting continues in this region as well. The ecoregion is an extensive, wet, flat plain characterized by poorly drained peatlands and small lakes,

ponds, and creeks. The wetlands cover up to 75% of the area and consist of peat plateau and palsa bogs, and horizontal fens. In the northern section and along upland areas belts of raised beaches, resulting of isostatic, postglacial rebound are prominent. To the southwest and south the region is bounded by Archean crystalline bedrock covered by calcareous loamy till and clayey lacustrine deposits. Moderate to high ice content permafrost is widespread, especially in organic deposits and along the northern boundary. Organic Cryosols and Mesisols are the dominant soils developed on organic materials, whereas Eutric Brunisols are associated with marine and till upland deposits. Wildlife characteristic of the region includes barren-ground caribou, snowshoe hare, willow ptarmigan, snow and Canada goose, and shorebirds. Human activities, while limited, include mining, hunting, trapping, sport fishing, and localized tourism. Shamattawa is the principal community and the population of the ecoregion is approximately 1200.

217. JAMES BAY LOWLAND

This ecoregion extends west from James Bay in Quebec to Attawapiskat River in northern Ontario. It is marked by cool, short summers and cold winters. The mean annual temperature is approximately -2°C . The mean summer temperature is 11.5°C and the mean winter temperature is -16°C . The mean annual precipitation ranges 700–800 mm. The ecoregion has a perhumid high boreal ecoclimate. It is an area of transition, lying between the coniferous and mixed forests of the clay belt to the south, and the tundra to the north. In the southern section and along rivers, the forests are composed of balsam fir, white and black spruce, trembling aspen, and paper birch. Most of the ecoregion is poorly drained, and the dominant vegetation consists of sedge, mosses, and lichens with or without stunted black spruce and tamarack. The ecoregion is underlain by flat-lying, Palaeozoic limestone bedrock of the Hudson Bay Lowland. These lowlands slope gently towards James Bay. Most of the Quebec section of the ecoregion is part of the Eastmain Lowland. The ecoregion consists largely of flat, poorly drained plains with subdued fluvial and marine features. Throughout the area, there are gravelly, well-drained belts of raised beaches, resulting from postglacial, isostatic rebound. To the south, the region is dominated by fine-textured lacustrine and marine deposits. Wetlands cover between 50% of the area in the south to over 75% of the area in the north and around James Bay. They are composed largely of northern ribbed fens, northern plateau bogs, and palsa bogs. The soils are dominantly Organic Mesisols and Fibrisols with some Organic Cryosols. Limited areas of Dystric and Eutric Brunisolic soils occur on upland sands. Eutric Brunisols and Gleysols are associated with river levees, while clayey uplands may have Gray Luvisol soils. Sporadic, discontinuous permafrost with medium to high ice content in the north decreases to isolated patches surrounding James Bay. Mineral soil profiles exhibit uneven and often discontinuous or distorted soil horizon development as a result of past and present permafrost action. Characteristic wildlife includes barren-ground caribou, black bear, wolf, moose, lynx, and snowshoe hare. Bird species include the Canada goose, ruffed grouse, and American black duck. Land use activities include tourism and recreation, hunting, trapping, and fishing. The major communities include Attawapiskat, Eastmain, Waskaganish, and Moosonee. The population of the ecoregion is approximately 7100.