

An Introduction to the Ecoregions of British Columbia



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Third Edition March, 2011

Ecosystem Information Section

Ministry of Environment

Victoria, British Columbia

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Overview

The Ecoregion Classification System was first adopted by the Ministry of Environment in 1985 to serve as a framework for recognizing small scale ecosystems in British Columbia. The Ecoregion Classification helps us to understand and to depict the great habitat diversity of the province.

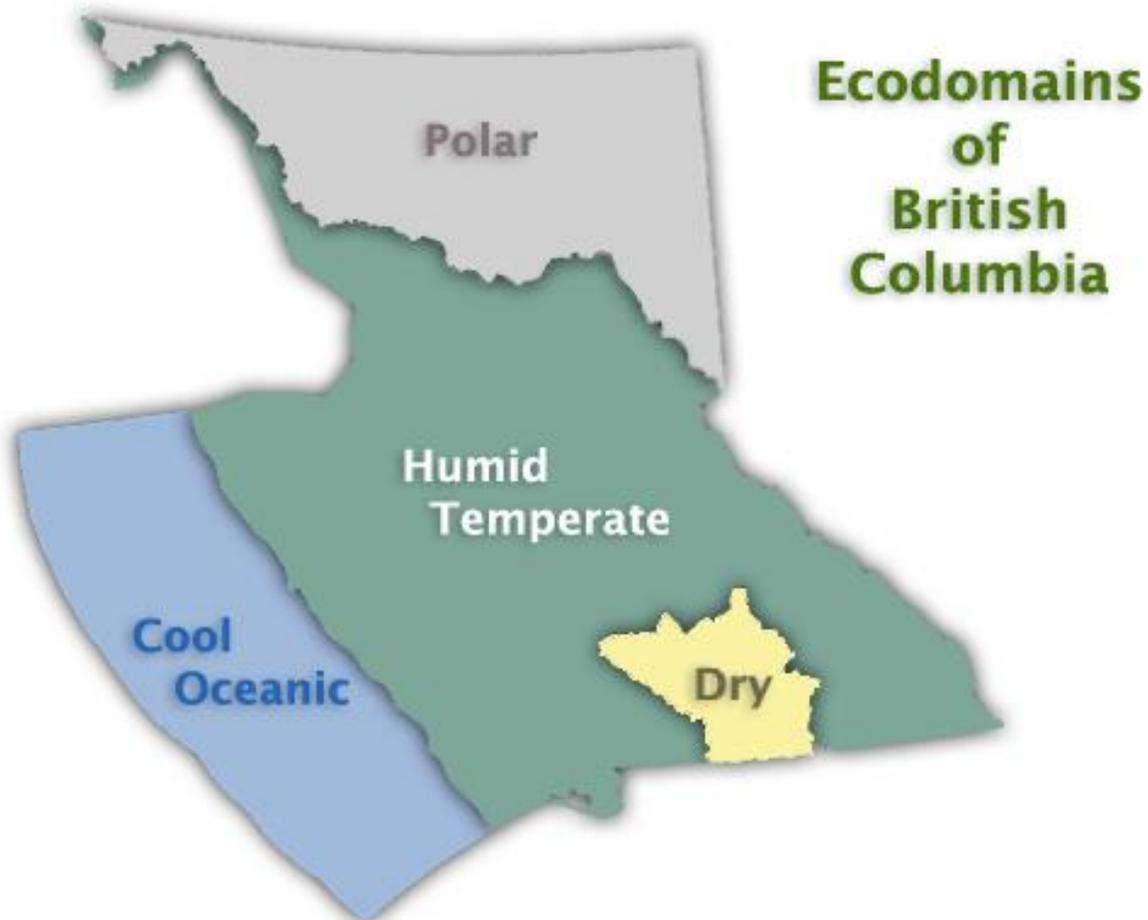
Since 1985, the Ecoregion Classification has been revised five times to reflect more detailed mapping. The fourth revision Ecoregion units was mapped at 1:250,000 using Landsat, topographic, Biogeoclimatic and marine ecosystem information, while the fifth revision has been mapped based on the earlier concepts plus detailed vegetation zonation mapping. The most current digital (GIS) database is Version 2.1 2006, but the supporting reports and descriptions is the third edition 2011.

The Ecoregion Classification system is used to stratify British Columbia's terrestrial and marine ecosystem complexity into discrete geographical units at five levels. The two highest levels, Ecodomains and Ecodivisions, are very broad and place British Columbia globally. The three lowest levels, Ecoprovinces, Ecoregions and Ecosections are progressively more detailed and narrow in scope and relate segments of the Province to one another. They describe areas of similar climate, physiography, oceanography, hydrology, vegetation and wildlife potential. Within each terrestrial ecoregion, climatic zones occur where specific soils, plant and animal communities and aquatic systems develop because of the interaction of climate with the land surface and surficial materials. These zones are best defined within the Biogeoclimatic Ecosystem Classification system.

Ecological zones in marine ecosystems are products of temperature, salinity, sea-bed configuration and water depth. The Marine Ecoregion Classification system should be used to define the marine ecosystems. Each ecosystem is ultimately identified by sampling individual sites. At the lowest level in an ecosystem classification, attention is directed to specific parameters, such as topography, surficial materials, soil development, moisture regime, microclimate, floristics, succession, productivity and animal use. Ecoregions should be thought of as 'big picture' ecosystems. As such the province should be viewed first for its big, all-inclusive landscape chunks, then progressively through more detailed levels, and finally each area of the province has to be viewed with other classifications or the underlying geographical detail. The boundaries between units must be thought of in the same way, broad lines for small scale ecosystems progressing to greater precision for the larger scale ecosystems. For convenience, however, one boundary is used to define all ecosystem levels, from Ecodomain down through to the Biogeoclimatic or marine unit level.

Ecoregions Classification Order

Ecodomains: An ecodomain is an area of broad climatic uniformity. There are three terrestrial and one oceanic ecodomain occurring in British Columbia. Ecodomains are meant to be mapped at small scale such as 1:30,000,000 for use in global environmental strategies.



An ecodivision is an area of broad climatic and physiographic uniformity. There are seven ecodivisions occurring within British Columbia. Ecodomains and ecodivisions place British Columbia in a global context. Ecodivisions are meant to be mapped at a scale of 1:7,500,000 for use in national state of the environment reporting.



An ecoprovince is an area with consistent climatic processes, oceanography, relief and regional landforms. There is one oceanic, three marine / terrestrial and seven terrestrial ecoprovinces occurring within British Columbia. Ecoprovinces are meant to be mapped at a general scale of 1:2,000,000 for use in provincial state of the environment reporting.



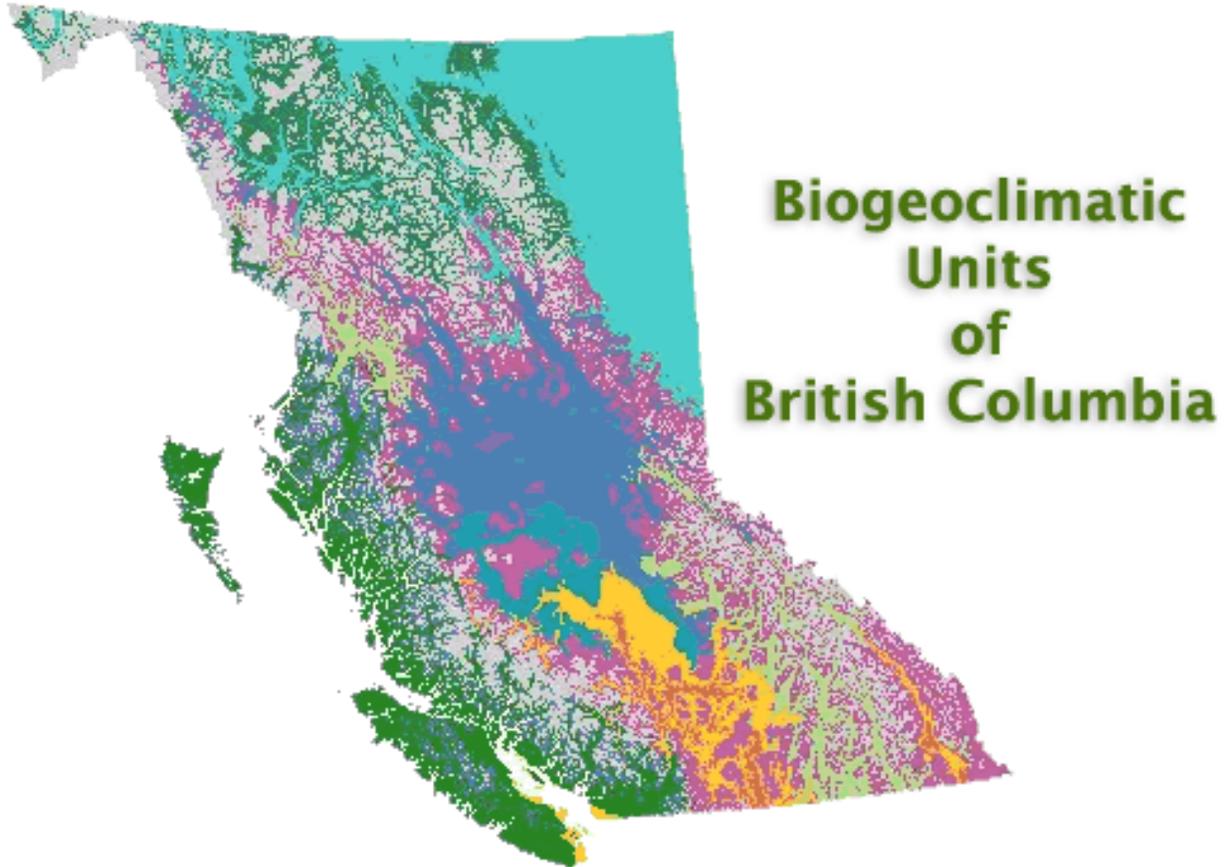
An ecoregion is an area with major physiographic and minor macroclimatic or oceanographic variation. There are 47 ecoregions in British Columbia of which 38 are terrestrial 3 are oceanic and 6 have both an oceanic and a terrestrial component. Ecodivisions are meant to be mapped at 1:500,000 for regional strategic planning.



Ecosections are areas with minor physiographic and macroclimatic or oceanographic variations. There are 139 ecosections in British Columbia varying from pure marine units to pure terrestrial units. Ecosections are meant to be mapped at small scales (1:250,000) for resource emphasis and area planning, but the boundaries have been drawn at a large scale 1:20,000.

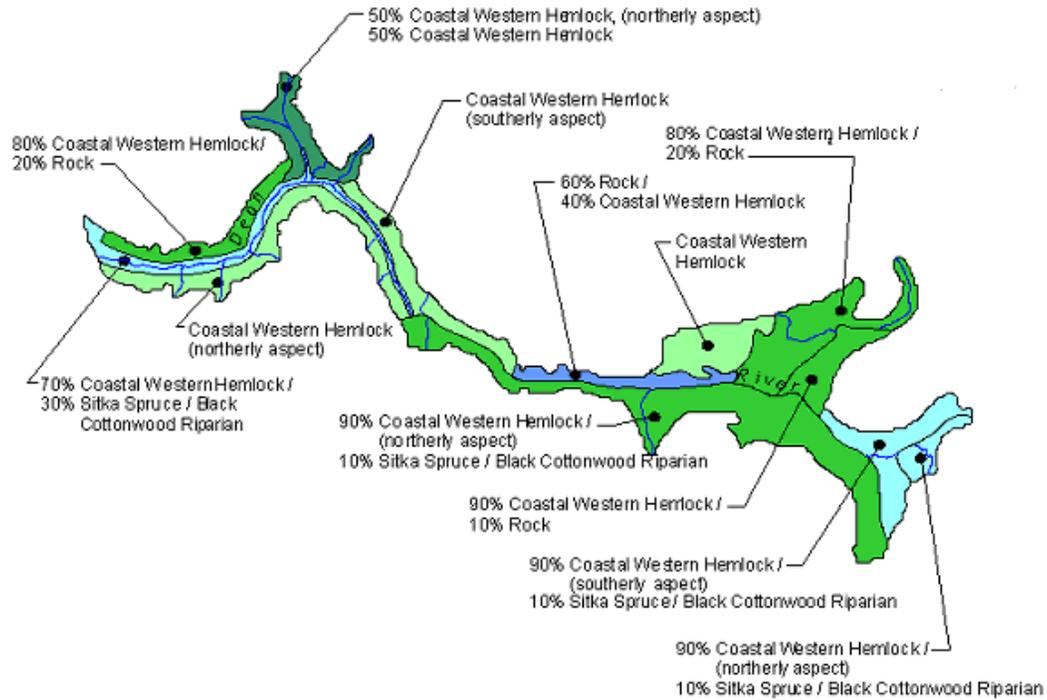


Biogeoclimatic Units: Biogeoclimatic (BGC) units represent classes of ecosystems under the same regional climate. There is a hierarchy of units with the Biogeoclimatic subzone being the basic unit. The 76 subzone are grouped into 14 zones and divided into variants and phases, based on similarities and differences in regional climate. Biogeoclimatic units are meant to be mapped a large scale (1:100,000) for higher-level biodiversity planning and medium to large scales for ecosystem mapping but the boundaries have been drawn at a large scale 1:20,000.



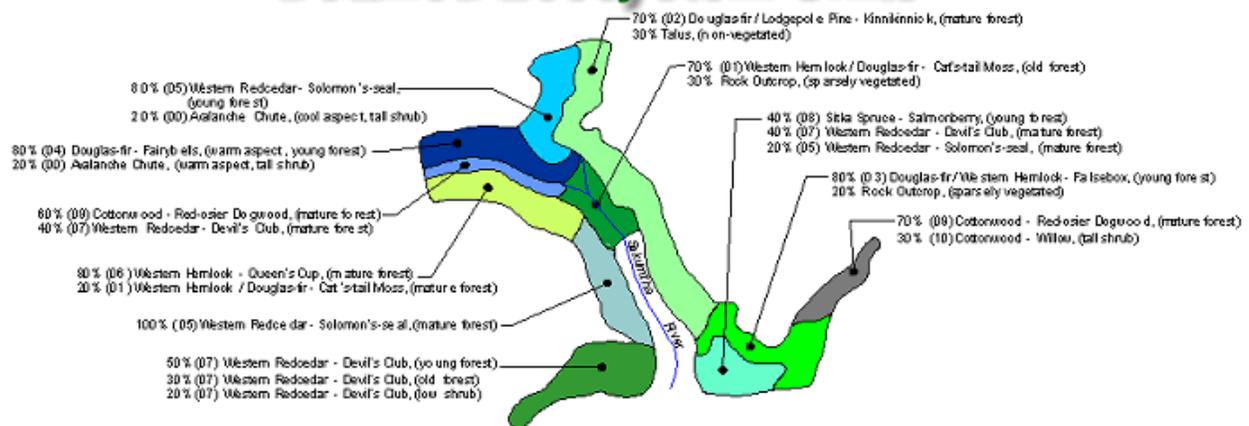
A Generalized Terrestrial Ecosystem Unit is a permanent area of the landscape that supports a distinct kind of dominant vegetative cover or distinct non-vegetative cover. A Broad Ecosystem Unit is defined as including potential vegetation and any associated seral stages; and are an amalgamation of site series contained within each Biogeoclimatic subzone. Generalized Ecosystem Units are meant to be mapped at small scales (1:250,000) for use in sub-regional land use planning.

Broad Ecosystem Units

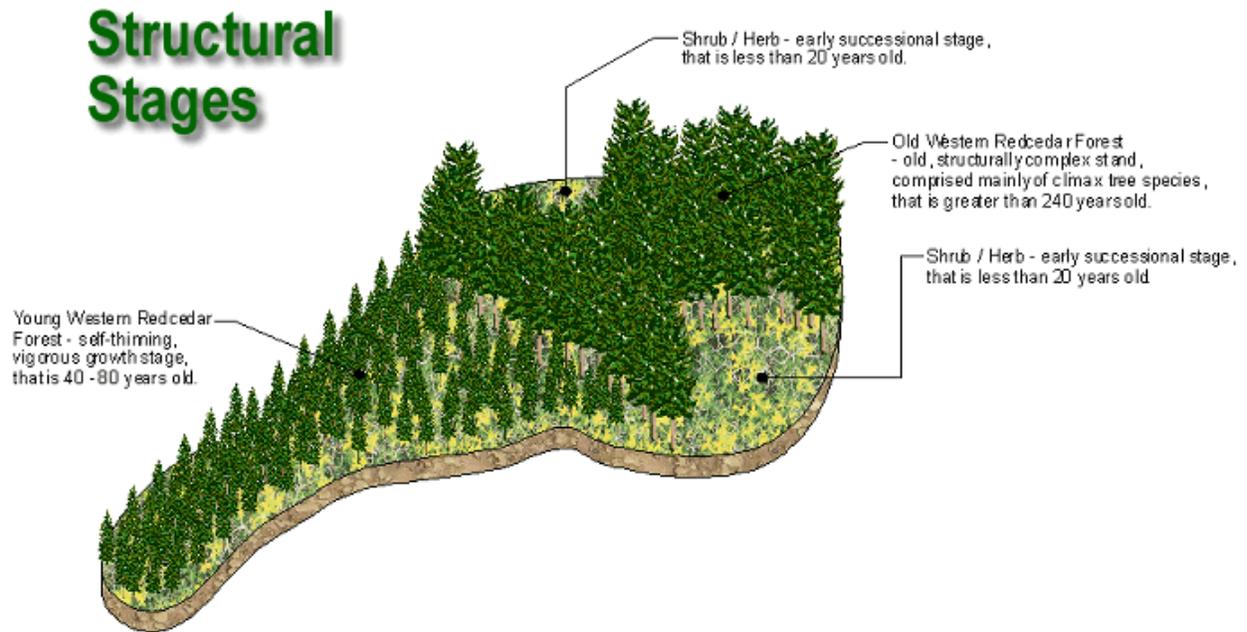


Detailed Terrestrial Ecosystem Units are developed from the site series classification within the Biogeoclimatic system (BGC). Detailed Terrestrial Ecosystem Units are mapped site series. These sites are classified by their potential to produce similar plant communities when in a late successional stage. Such sites have similar soil moisture, soil nutrients, texture and aspects. Site series are meant to be mapped at medium to large scales (1:50,000 - 1:20,000) for landscape unit planning, or forest development planning using the Terrestrial Ecosystem Mapping methodology.

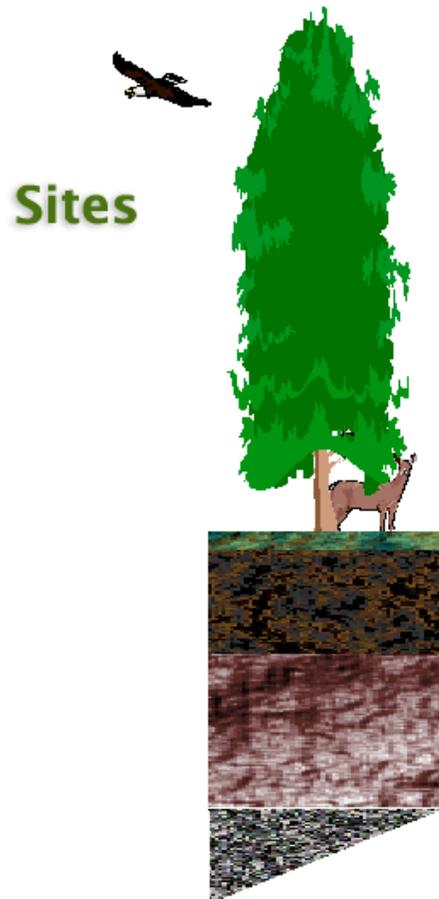
Detailed Ecosystem Units



Each ecosystem unit may have a number of different stand ages depending on disturbance history. While the plant communities may vary depending on the stage, a given site series will ultimately result in one kind of climax plant community. Stand structure is usually mapped according to Describing Terrestrial Ecosystems in the Field.



Each ecosystem / structural stage unit contains considerable variation. Sample sites are established at sites that are homogeneous in terms of soil and vegetation attributes. The measurements of physical and biological parameters such as topography, depth and texture of soil, trees, snags, coarse woody debris, shrubs, herbs, mosses and lichens are used for detailed data analysis. Sites are the basic units identified during field sampling and are scale independent.



PART I: Ecoregion Classification

Background

Introduction

British Columbia has many ecosystems due to its varied physiography and climates. It is located at mid-to northerly latitudes and is bounded on the west by oceanic influences of the northern Pacific Ocean and on the east by continental climates of the Interior Plains and Rocky Mountains. Its varied geological history has resulted in a complex topography. In addition, the Province has had a complex climatic history. Current climatic patterns are varied but, most typically, the Province is dominated by moist, cool to cold, temperate climates in a mountainous setting, most of which is higher than 1000 metres above sea level. The plants and animals of the Province are affected by that environment and also by historic factors such as the position of glaciers or other barriers to dispersal and migration.

An Ecoregion classification was developed in order to provide a systematic view of the small scale ecological relationships in the Province. This classification is based on climatic processes and landforms, and it brings into focus the extent of critical habitats and their relationship with adjacent areas. The Ecoregion Classification system was adopted by the Wildlife Branch in 1985 to serve as a framework for recognizing small scale ecosystems in British Columbia (Demarchi 1988a). The Ecoregion classification helps us understand and to depict the great habitat diversity of the Province. Since 1985, the Ecoregion Classification has been revised 3 times to reflect more detailed mapping (Demarchi 1988b, 1993, 1995). The overview map, presented at 1:2,000,000, was mapped using 1:250,000 Landsat, topographic, biogeoclimatic and oceanographic data.

Most British Columbians have an intuitive feeling for the Province's regional ecosystems. People from the Interior often travel to the "Coast" to do their shopping. You hear other expressions such as "up north" for anything north of Quesnel, the "Peace River" and the "Cariboo". These are not imaginary places or strictly administrative areas: they have their basis in an Ecoregion framework. For example "up north" is really those cold mountains, plains and plateaus which are usually under the influence of a cold Arctic air mass during the winter; the "Peace River" is the area of deep soil that occurs in the Alberta Plateau portion of British Columbia ; and the "Cariboo" is an area of rolling hills that are interspersed with wetlands, aspen groves and stunted Douglas-fir forests, and which lies between the area of hot-dry summers to the south and the area of sub-Boreal forests to the north. But these are unstructured classifications with poorly defined boundaries, little or no reference to scale and an unlimited number of possible units. While classifications do not have to be unnecessarily complicated, they must be usable. If they serve several users, then so much the better.

The Ecoregion Classification system is used to stratify British Columbia's terrestrial and marine ecosystem complexity into discrete geographical units at five different levels. The two highest levels, Ecodomains and Ecodivisions, are very broad and place British Columbia globally. The three lowest levels, Ecoprovinces, Ecoregions, and Ecoregions, are progressively more detailed and narrow in scope and relate segments of the Province to one another. They describe areas of similar climate, physiography, oceanography, hydrology, vegetation, and wildlife potential.

Within each terrestrial ecoregion, climatic zones occur where specific soils, plant and animal communities and aquatic systems develop because of the interaction of climate with the land surface and surficial materials. These zones are best defined within the Biogeoclimatic Ecosystem Classification

system. Ecological zones in marine ecosystems are products of temperature, salinity, sea-bed configuration, wave energy, and water depth.

Each ecosystem is ultimately identified by sampling individual sites. At the lowest level in an ecosystem classification, attention is divided among specific parameters, such as: topography, surficial materials, soil development, moisture regime, microclimate, floristics, succession, productivity, and animal use for terrestrial environments; or, bathymetry, substrate, morphology, currents, water chemistry and animal use for aquatic environments.

Ecoregions should be thought of as 'big picture' ecosystems. As such the classification hierarchy should be viewed for its big, all inclusive landscape definitions, then progressively through more detailed levels, and finally at the lowest level other classifications need to be brought into play for the definitions of local ecosystems. The boundaries on Ecoregion / Biogeoclimatic / Biophysical Habitat maps must be thought of in the same way, broad lines for small scale ecosystems progressing to greater precision for the larger scale ecosystems. For convenience, however, one boundary is used to define all ecosystem levels, from the Ecodomain down through the Biogeoclimatic/marine zone to the Biophysical Habitat Unit level.

British Columbia's Environment – The Setting

British Columbia has many ecosystems due to its varied physiography and climates. It is located at mid-to northerly latitudes and is bounded on the west by oceanic influences of the northern Pacific Ocean and on the east by continental climates of the Interior Plains and Rocky Mountains. Its varied geological history has resulted in a complex topography. In addition, the province has had a complex climatic history. Current climatic patterns are varied but, most typically, the province is dominated by moist, cool to cold, temperate climates in a mountainous setting, most of which is higher than 1,000 m above sea level. The plants and animals of the province are affected by that environment and also by historic factors such as position of glacial refugia or barriers to dispersal and migration.

The combined influence of differential heating of land and ocean masses and the spin of the earth has created a general circulation in the earth's atmosphere (Thompson 1981). That circulation is separated into a number of latitudinal belts, one being the prevailing westerly winds that influence British Columbia and most of southern Canada and the northern contiguous United States (Marsh 1988). Because of the prevailing winds, the general movement of the upper air is from west to east. Low and high pressure areas move across north-central North America embedded in the westerlies stream. Their movement is also associated with an interaction between southward flowing cold air and northward flowing warm air. In winter, cold, high pressure areas dominate the interior of the continent and relatively warm, low pressure areas dominated the coastal areas. In summer the pattern is reversed with large semi-permanent high pressure area over the northeastern Pacific dominating the general circulation in western Canada. These circulating patterns create 14 distinct regional climates.

The rugged relief of the western cordillera has a great effect on the climate of western Canada, northern Washington, and the panhandle of Alaska. The Coast Mountains limit the mild, humid Pacific air to a narrow band along the coast. As the prevailing eastward-moving air is forced to rise over successive mountain ranges, precipitation occurs on windward slopes. The Rocky Mountains commonly block westward-moving outbreaks of cold Arctic air. Southward-moving Arctic air from the Yukon and northern British Columbia is impeded by the Coast Mountains and so flows into the interior of the province. During warm months, hot, dry air from the Great Basin of the United States occasionally moves into the southern interior plateau area from the southeast, bringing clear skies and hot temperatures.

Most of British Columbia is comprised of a series of land masses (terrane) that have collided with western North America during the past 190 million years (Gabrielse et al. 1991; Yorath 1990). The two major accretion events that have occurred have caused uplift and distortion of the original continental margin. These events are still happening as the last portion of the ocean plate disappears under the continent. By using these geological events, the province can be subdivided into several major physiographic units. The oldest portion of the North American continent in the province, the northeastern plain, is a relatively flat plateau - the remnant of a great inland sea. West and southward, the former continental margin has been uplifted and distorted to form the Rocky and eastern Columbia mountains. In the centre of the province, the interior mountains and plateaus are composed of four large terranes and several smaller ones that form a superterrane that docked against the continent distorting the continental margin into the Rocky and Columbia mountains. The coastal mountains, islands, and continental shelves are composed of two large terranes and several smaller ones that docked as a second super terrane against the first. Intensive heating of basement rocks has resulted in a belt of extensive granitic intrusion. The western-most portion of British Columbia is a deep-water, oceanic sea - the continental rise. That physiographic area consists of gentle slopes overlain by an apron of thick sediments.

Within the past two million years, five successive periods of continental glaciation, followed by warm periods, have occurred over British Columbia. The result has been a reshaping of the landforms and deposition of surface materials. Since the waning of the continental ice sheets 12,000 to 15,000 years ago, there have been several climatic fluctuations in the province (Clague 1981, 1989; Fulton 1989; Pielou 1991). As recently as a few hundred years ago, there was a short period of cordilleran ice build-up; however, the current climatic trend in British Columbia as we enter an era of global warming caused by the build up of "green house" gasses possibly is for warmer and widely fluctuating climates.

The vegetation of British Columbia reflects the climatic and physiographic differences both provincially and regionally. Marked vegetation belts are a striking feature of regional vegetation (Meidinger and Pojar 1991). On the coast, the natural vegetation is needle-leaf forests of Douglas-fir, western redcedar, western hemlock, Sitka spruce, amabilis fir and yellow-cedar. These are some of the densest of all coniferous forests and hold some of the world's largest trees. On the upper mountain slopes lies a narrow subalpine belt of mountain hemlock and amabilis fir forests. Rugged, moist alpine is common at the higher elevations and relict glaciers dominate much of the high Pacific and Boundary ranges. In the Southern Interior, steppe vegetation dominates the major valleys and basins. Sagebrush, ponderosa pine, or Douglas-fir are common throughout. However, an increase in elevation prolongs the winter season enabling Douglas-fir, lodgepole pine, Engelmann spruce, and subalpine fir forests to become established. In the central interior and southeastern mountains at the lower levels is a montane belt of Douglas-fir and lodgepole pine forests, whereas western hemlock and western red cedar are characteristic where moisture is greatly increased. Above is the subalpine belt, dominated in most places by Engelmann spruce and subalpine fir or lodgepole pine forests. The uppermost vegetation belt is the alpine; quite often relict glaciers are present on the highest portions. In the Sub-Boreal Interior, the Sub-Boreal Pine-Spruce zone has forests of lodgepole pine with some white spruce, which are characteristic in the southern portion. In the northern portions, the Sub-Boreal Spruce zone forests of lodgepole pine, hybrid spruce, and subalpine fir are common. In the cold northern mountains, vertical vegetation is characterized by muskeg and black spruce in the low lying, poorly drained areas, or willow-birch shrublands in the low valleys where cold air frequently pools. White spruce, lodgepole pine, subalpine fir, and occasionally trembling aspen occur on the midslopes. Alpine grasslands dominate most rounded summits while barren rock or mat-vegetation occur on the highest summits. On the Alberta Plateau, white and black spruce and lodgepole pine forests are dominant. Some poorly drained areas have muskeg with black spruce and tamarack, the lower basins and riverbreak areas have shrub

rich grasslands intermixed with aspen. In the Fort Nelson Lowlands, extensive wetlands and muskeg occur over much of the area because it is so poorly drained, although the better drained upland areas have well developed boreal forests.

British Columbia's oceanic environment is dominated by the Subarctic Current which has moved eastward across the breadth of the northern Pacific Ocean. In the Subarctic Pacific Region that current divides into a counterclockwise flowing Alaska Current and a clockwise flowing California Current. Those currents meet the continental shelf currents and the freshwater discharges of British Columbia's rivers to form estuarine conditions for most of the coastal areas. Inland many fjords and glacial scoured inter-island channels dominate the marine environment (Thomson 1981). "British Columbia's oceanic environment is dominated by the Subarctic Current which has moved eastward across the breadth of the northern Pacific Ocean. In the Subarctic Pacific Region that current divides into a counterclockwise flowing Alaska Current and a clockwise flowing California Current. Those currents meet the continental shelf currents and the freshwater discharges of British Columbia's rivers to form estuarine conditions for most of the coastal areas. Inland many fjords and glacial scoured inter-island channels dominate the marine environment" (Thomson 1981).

The British Columbia Ecoregion Classification

The understanding of British Columbia's complex environment is essential for the management, utilization, and conservation of the province's natural resources. The purpose of a regional ecosystem classification scheme is to organize the ecological mosaic into simple patterns and to provide a practical framework for managing natural resources (Bailey, and Hogg 1986). Several regional classification schemes exist for the stratification of parts of North America into ecosystem units (see; Munro and Cowan 1947; Krajina 1965; Omernik 1977; Bailey 1980, 1983, 1995; Brown and Lowe 1980; Brown 1982; Wiken 1986; Gallant et al. 1989; Marine Environmental Quality Advisory Group 1994; McNab and Avers 1994; Ecological Stratification Working Group 1995). Each has its positive attributes, but each also has shortcomings for delineating regional ecosystems in a mountainous area such as British Columbia (Demarchi 1992a).

The British Columbia Ecoregion classification was developed to provide a systematic view of the small scale ecological relationships in the Province given its great ecological complexity (Demarchi 1988a, 1992). This classification is based on macroclimatic processes (Marsh 1988), and physiography (Holland 1964; Mathews 1986), which is a fundamental difference between this and all other regional ecosystem classifications. Macroclimatic processes are the physical and thermodynamic interaction between climatic controls, or the relatively permanent atmospheric and geographic factors that govern the general nature of specific climates (Marsh 1988).

Another concept that is unique to the British Columbia Ecoregion classification is the integration of the terrestrial and marine environments so as to describe one regional ecosystem classification. The stratification of the B.C. marine and oceanic environments into Ecoregions was first proposed by Demarchi et al. (1990), subsequently a National Marine Ecoregion classification was developed, with many of the same units as the B.C. Ecoregion classification (Marine Environmental Quality Advisory Group 1994). However, there are some notable exceptions, mainly that fjords, inter-island channels and small sounds are grouped in with adjacent continental shelf or strait units, whereas in the B.C. Ecoregion Classification, the large straits and sounds are placed into separate units from the fjords, inter-island channels and smaller sounds.

There is also another level of ecological complexity that occurs within mountainous regions, that of topo-climatic zonation. Within each terrestrial region bounded by climatic processes and landform

parameters, there are climatic zones that are reflected by the plant and animal communities present. This level is best pursued through the Biogeoclimatic Ecosystem Classification (British Columbia Ministry of Forests 1992a; Krajina 1965; Meidinger and Pojar 1991; Pojar et al. 1987). At the biogeoclimatic subzone level, the climate interacts with land surface materials to create particular environments suitable for the development of specific plant and animal communities (Rowe 1984; Demarchi 1992b; Demarchi and Lea 1987). Oceanic Environments, however, are the products of temperature, salinity, sea-bed configuration, and water depth (Thomson 1981). Classification of marine biophysical zonation is best pursued through the British Columbia Marine Ecosystem Classification (Wainwright et al. 1995) and the report on the Oceanography of British Columbia (Thomson 1981).

The Ecoregion classification system of British Columbia divides the province into 184 units (Table 1). However, arranging them into a hierarchical classification simplifies the result and makes them a useful tool for managing the natural resources of the province. The hierarchical levels has been defined as follows:

1. Ecodomain - an area of broad climatic uniformity, defined at the global level;
2. Ecodivision - an area of broad climatic and physiographic uniformity, defined at the continental level;
3. Ecoprovince - an area with consistent climatic processes or oceanography, and relief, defined at the sub-continental level;
4. Ecoregion - an area with major physiographic and minor macroclimatic or oceanographic variation, defined at the regional level;
5. Ecosession - an area with minor physiographic and macroclimatic or oceanographic variation, defined at the sub-regional level.

The Ecodomains and Ecodivisions are very broad and place British Columbia in a global context. Ecoprovinces, Ecoregions, and Ecosessions are progressively more detailed and narrow in their scope and relate the province to other parts of North America or the Pacific Ocean, or segments of the province to each other. These lower three classes describe areas of similar climate, physiography, vegetation, and wildlife potential. In the terrestrial environment each Ecoregion or Ecosession class can be further subdivided by biogeoclimatic criteria to provide a basis for detailed interpretation of climate, topography, soil, and vegetation for the purposes of habitat and wildlife management. And in the marine environment each Ecoregion or Ecosession can be subdivided by biophysical criteria to provide a detailed interpretation of climate, bathymetry, water chemistry, and currents for the purposes of fisheries management.

Since the first Ecoregions of British Columbia map was prepared in 1988 (Demarchi 1988b) there have been a number of edits, corrections and changes, in fact as predicted by Demarchi et al. (1990) as a better understanding of the broad ecological relationships in the province is gathered by such means as mapping ecosystems in greater detail, the Ecoregions map will continue to be updated. The first Ecoregion map was based on 1:2,000,000 level macroclimatic, physiographic and geographical information (Demarchi 1988b). By 1993 the Ecoregion classification became integrated with the Biogeoclimatic Ecosystem Classification as was mapped at 1:250,000 (Demarchi 1993). In 1995, the Ecoregion classification was edited using the revised - 1995 Biogeoclimatic data base, in addition a number of changes suggested from mapping exercises coordinated by the Ecological Stratification Working Group (1995), and mapping the British Columbia Ecoregion Classification criteria in the United States (Demarchi and Lea 1992; Demarchi 1994a,b) were incorporated into the British Columbia Ecoregion map (Demarchi 1995).

While the central concept of the British Columbia Ecoregion classification remains the same, there has been a redefinition of all the boundaries. For example, 100 Ecoprovinces are still recognized, but the

Southern Interior now incorporates the Southern Chilcotin Ranges Ecoregion; the Central Interior incorporates the Quesnel Lowland Ecoregion, but not the Southern Chilcotin Ranges Ecoregion; the Sub-Boreal Interior no longer is extended south in the Quesnel lowland; the Boreal Plains no longer is seen to extend to the Muskwa Plateau Ecoregion, rather that Ecoregion has now been placed in the Taiga Plains. The number of Ecoregions, however has been increased from 30 in 1988, to 34 in 1991, to 43 in 1993, to 47 in 1995. The number of Ecoregions, likewise, has increased from 78 in 1988, to 87 in 1991, to 110 in 1993, to 116 in 1995 (Demarchi 1988b, 1991, 1993, 1995). Further changes may be necessary in the future as mapping of the province's ecosystems becomes both more detailed and more extensively applied.

Uses of the British Columbia Ecosystem Classification

The value of an Ecoregion classification to resource managers is that it will place any ecosystem in a local, regional, provincial, continental or global context, and therefore provide a framework for the understanding of what are often complex, interacting systems. The merits of the Ecoregion classification to recreationalists and the general public is that they can become more aware of the Province's environment, and may understand which areas of the Province contain unique ecosystems, and which ecosystems are connected to other jurisdictions.

Since its first publication in Volume 1 of the "Birds of British Columbia" (Demarchi et al. 1990), the Ecoregion Classification for British Columbia has become widely accepted as the standard classification for describing regional ecosystems within the province, just as the Biogeoclimatic Ecosystem Classification is the standard classification for describing zonal ecosystems within B. C. (Meidinger and Pojar 1991). As Demarchi (1994 a, b) and Mah et al. (1996) have outlined, land use and conservation goals are set at provincial or regional levels using information that has been based on broad scale physiography, climate and vegetation (e.g. Ecoregions and Biogeoclimatic Zones). This information has been used by government resource agencies for provincial and regional land use planning, especially for the Protected Areas Strategy (see British Columbia Ministry of Forests 1992b; British Columbia Recreation Branch 1992; Lewis and MacKinnon 1992; Vold 1992; Province of British Columbia 1993a, b; Quesnel and Thiessen 1993; Demarchi 1994a), for a general background understanding of the province's environment (see British Columbia Commission on Resources and Environment 1994a, b, c, d; Cuthbert 1994; O'Gorman 1995), for program activity planning (see Fuhr and Demarchi 1990; British Columbia Wildlife Program 1991; British Columbia Wildlife Branch 1994, no date), and as a standard against which biological data can be assessed (see Campbell et al. 1990, in press; British Columbia Wildlife Branch 1991; British Columbia Ministry of Environment, Lands and Parks 1993,1995; Province of British Columbia 1995). In addition many non-government environmental organizations use the Ecoregion Classification for Protected Areas proposals issues (see Moore 1991; Canadian Parks and Wilderness Society 1992, 1993, 1994 1995a, b; Western Canada Wilderness Committee 1992; BC Wild 1994; Senez 1994) and for a general understanding the Province's ecological diversity (see: Wareham 1991; Hume 1993; Mackenzie 1995).

The British Columbia Ecoregion Classification has also been used as a means of understanding our regional ecosystems and resource management concerns in relation to those of our adjacent neighbours in Canada and the United States. Such products as the Ecoregions of Canada (Ecological Stratification Working Group 1995) in which the British Columbia Ecoregion level is used for National State of the Environment Reporting. In addition carnivore management specialists in American states adjacent to the south of the province have relied on the British Columbia Ecoregion classification to map regional ecosystems from British Columbia into the western United States (Demarchi 1994b), and eastern Washington, Northern Idaho, northwestern Montana, and southwestern Alberta (Demarchi and Lea 1992).

PART II: Ecoregion Unit Descriptions

Introduction

The following is brief introduction to the 10 Ecoprovinces, 46 Ecoregions and 116 Ecosections that occur in British Columbia (that is, all the terrestrial and marine environments of the Province, plus the oceanic environment of western Canada to the 200-mile Economic Expansion Zone). A more detailed description of the Ecoprovinces can be found in the Environment Chapter of Volume 1 of the "Birds of British Columbia" (Demarchi et al. 1990 in Campbell et al. 1990). And placing British Columbia's southern Ecoprovinces into a sub-continental framework can be found in Appendix A (Ecoprovinces of the Central North American Cordillera and Adjacent Plains) of "The Scientific Basis for Conserving Forest Carnivores: American Marten, Fisher, Lynx and Wolverine in the Western United States" (Demarchi 1994 in Ruggiero et al. 1994). A more detailed description of the Ecoregions can be found in a National Ecological Framework for Canada (Ecological Stratification Working Group 1995).

There are only four terrestrial Ecodomains in North America (Bailey 1980, 1983), and three in the surrounding oceans. British Columbia has four Ecodomains; Cool Oceanic, Humid Temperate, Dry, and Polar.

Continental or oceanic resource planning occurs at the Ecodivision level. It is similar to the attempt at Ecozone classification by Wiken (1986) and to the Ecodivision concept of Bailey (1980 and 1983). British Columbia contains components of 7 Ecodivisions.

There are 10 Ecoprovinces in British Columbia that delimit areas of similar climate or oceanography, topography, and geological history. Their size and broad internal uniformity make them ideal units for the implementation of natural resource policies. They form the framework for the discussion that follows. The Ecoprovinces are divided into 46 Ecoregions and 116 Ecosections which are at a scale and detail suitable for local resource management. Together, the 3 lower levels of classification put the ecosystems of British Columbia in a sub-continental, provincial or regional perspective.

What follows is an overview of the macroclimatic processes, landforms and their evolution, oceanography, vegetation, and representative wildlife species for each of the 10 Ecoprovinces that occur in British Columbia. Each account also includes a brief description of the Ecoregion and Ecosections levels.

Cool Oceanic Ecodomain

This Ecodomain extends from the eastern Asian shore to western North America, north of the North Pacific Current (latitude 40 N). It is characterized by counterclockwise rotating oceanic gyres and a slow-moving westerly sub-Arctic current. In western Canada (British Columbia) it occurs from the "200-mile (300 km) Economic Zone" to the Continental Slope. In Canada it is stratified into only one ecodivision.

Sub-Arctic Pacific Ecodivision

This ecodivision occurs within the oceanic or deep-sea portion of the province. It contains the continental rise portion of the margin of the continent. The Sub-Arctic Current has a broad, slow easterly drift. Near the coast of North America a divergence in the prevailing wind pattern causes the current to split; a northern branch to the northeast into the Gulf of Alaska (Alaska Current). The coast off British Columbia is at the point of this split with the Alaskan Current reaching west of Queen Charlotte Sound in the winter and the northern Queen Charlotte Islands in the summer. The California Current reaches

south of British Columbia in the winter and northern Vancouver Island in the summer. In western Canada it is subdivided into only one ecoprovince.

Northeast Pacific Ecoprovince

Location - This ecoprovince is the oceanic portion of Canada west of the Continental Slope, it extends westward to the "200 mile Economic Expansion Zone". It consists of the Continental Rise and the Continental Slope.

Climate - From late autumn to early spring, winds are predominantly from southeast to southwest as the air circles counterclockwise around the dominant Aleutian Low, while from late spring to early autumn, the combined effect of a greatly weakened Aleutian Low and intensified North Pacific High results in a clockwise flow of air over the ocean. Coastal winds at that time are predominantly from the northwest.

Marine Zonation - This ecoprovince lies almost entirely in the dilute salinity domain, where fresh water discharge from the coast has diluted the upper layer of the ocean. Most of it is deep sea with epipelagic, mesopelagic and bathypelagic zonation, however, there are a few seamounts that rise to near the surface and a long continental slope with complex zonation that extends the length of this ecoprovince.

Fauna - Marine mammals that occur in this ecoprovince include Northern Fur Seal, Sperm Whale, Pacific White-Sided Dolphin, and Dall's Porpoise.

At least 160 nonpasserine bird species have been reported from the Ecoprovince. Characteristic species include Laysan Albatross, Northern Fulmar, Pink-footed Shearwater, Buller's Shearwater, Short-tailed Shearwater, Red Phalarope, the jaegers, South Polar Skua, Black-legged Kittiwake, and Sabine's Gull. Many passerine species occur at sea but only as migrants. Undoubtedly, thousands perish before reaching land.

This Ecoprovince supports a wide variety of oceanic fishes, some like the great white shark, basking shark, albacore, and ocean sunfish are trans-oceanic migrants, others like the five species of pacific salmon spend part of their life in the deep ocean and the rest over the continental shelves or in freshwater streams. There is a wide variety of fish and the way in which they live, some like the deepsea skate spend their life near the deep ocean floor, while others like the northern lanternfish, and bulbous dreamer live away from the bottom in the deep ocean.

Ecoprovince Subdivisions

The Northeast Pacific Ecoprovince is divided into two ecoregions, that are represented by only two ecosections.

The Continental Rise Ecoregion is the deep-sea portion of British Columbia. In British Columbia, it is represented by two ecosections.

- **The Alaska Current Ecosection** is that portion of the deep sea that is predominantly influenced by the counter-clockwise moving Alaska Current. In the British Columbia waters, the current flow is generally northward throughout the year. This Ecosection is part of the dilute oceanic domain, where freshwater discharge has diluted the upper layer of the Northeast Pacific Ocean.
- **The Alaska - California Transition Current Ecosection** is a portion of the deep sea that is influenced by variable currents; southerly areas may be affected by southward-flowing California Current in summer but remainder of the area is characterized by weak and variable currents. This Ecosection is part of the dilute oceanic domain, where freshwater discharge has diluted the upper layer of the Northeast Pacific Ocean.

The Continental Slope Ecoregion is the steep-walled oceanic area that extends the length of the northwestern portion of the North American Continent. Nutrient-rich, upwelling currents are common throughout its length. In British Columbia, it is represented by three Ecosections.

- **The Queen Charlotte Islands Slope Ecosection** is off-shore from the Queen Charlotte Islands. It is influenced by the northward flowing Haida Current in the winter months, and by the generally, northerly flowing Alaska Current in the summer months. It is a steep-walled slope that extends from the shore of the islands to the Queen Charlotte Trench.
- **The Outer Queen Charlotte Sound Ecosection** is an oceanic area with complex canyons, troughs and banks, lying midway between the Queen Charlotte Islands and Vancouver Island. This area is influenced by the coalescing of the northward flowing Davidson Current over the Continental Shelf and the northeasterly flowing Alaska Current from the Northeast Pacific.
- **The Vancouver Island Continental Slope Ecosection** is an area of steep canyons and ridges that lies to the west of the Vancouver Island Continental Shelf. It is influenced by the southerly flowing California Current.

Humid Temperate Ecodomain

This Ecodomain covers most of the mid-latitudes of North America from the east coast to the west. In British Columbia it includes the continental slope and shelf, all the coastal islands, adjacent mountains, the central interior plateau, and the southern interior mountains. The climate is characterized by strong seasonal cycles of temperature and precipitation with a distinct winter. In British Columbia this ecodomain is subdivided into two ecodivisions.

Humid Maritime and Highlands Ecodivision

This Ecodivision occurs along the coast from the western edge of the Continental Slope eastward to the effective height of land on the Coast Mountains, including the Nass Basin and Nass Ranges. It extends the length of the coast from Vancouver Island, Puget Sound and the northern Cascade Ranges to the Panhandle of Alaska. Its climate is temperate and rainy with warm summers. Precipitation is abundant through the year but is markedly reduced in summer. There is much cloud cover. The natural vegetation is usually a coniferous forest of Douglas-fir, western redcedar, western hemlock, Sitka spruce, amabilis fir, and yellow-cedar. It contains some of the world's largest trees and some of the densest coniferous

forests. In drier parts of the extreme south of the province, it contains arbutus and Garry oak communities.

In British Columbia, this ecoregion is subdivided into two ecoprovinces.

COM - Coast and Mountains Ecoprovince

Location – The Coast and Mountains Ecoprovince extends from the southeastern Alaska to the northern Cascade Mountains in Washington. In British Columbia it includes the windward side of the Coast Mountains and Vancouver Island, all of the Queen Charlotte Islands, and the Continental Shelf including Dixon Entrance, Hecate Strait, Queen Charlotte Strait and the Vancouver Island Shelf. The Coast and Mountains Ecoprovince consists of the large coastal mountains, a broad coastal trough and the associated lowlands, islands and continental shelf, as well as the insular mountains on Vancouver Island and the Haida Gwaii (formerly called the Queen Charlotte Islands) archipelago.



Climate - The major climatic processes involve the arrival of frontal systems from the Pacific Ocean and the subsequent lifting of those systems over the coastal mountains. In winter, oceanic low-pressure systems dominate the area and pump moist, mild air onto the south and central coast. In summer, high-pressure systems occur over the northeastern Pacific Ocean and frontal systems become less frequent and tend to strike the coast further north in the Gulf of Alaska.

Various climatic subregions can be distinguished by, the frequency of arriving fronts, the height of the mountains, the importance of rainshadow effects, and the frequency of Arctic air outbreaks. The southern coastal areas of Vancouver Island and the Pacific Ranges are subjected to less frontal systems. Where the coastal mountains are very high, they impede the passage of moist air into the interior. The central coast, Hecate Lowlands, and Kitimat Ranges are subjected to the greatest frequency of frontal systems. However, the central Coast Mountains are the lowest on the coast and the moist, oceanic air can move into the interior easily. The north coast, the Boundary Ranges, and the mountains of the Alaska Panhandle are subjected to less frequent frontal systems. The mountains there are very high and block the passage of moist, oceanic air into the interior. Rainshadow effects occur on the lee of the Haida Gwaii Islands, in the Queen Charlotte Lowlands and on the mainland, in the Nass Basin. Those areas have drier conditions than other areas on the coast. The Nass Basin in addition, is subjected to frequent outbreaks of cold, dense Arctic air in winter.

Oceanography - There is a strong estuarine gradient across this Ecoprovince, from the freshwater discharges into fjords, across the protected continental shelf to the outer continental shelf. Fjord zones are very common; nearly all large rivers empty into fjords, rather than directly onto the continental shelf. The Outer Continental Shelf, west of Vancouver Island, has the greatest salinity of any shelf area in the province, being exposed to the open Pacific Ocean. Extreme wind and wave exposure occurs on the west coast of Vancouver Island and the Queen Charlotte Islands, whereas more protected coasts occur in the Dixon Entrance, Hecate Strait, Queen Charlotte Strait and inshore areas. Upwelling from the adjacent continental slope enhances the productivity of the nutrients and plankton. The inner

continental shelf in the Hecate Depression is a semi-enclosed estuarine environment. Fresh water from river and stream discharge is poorly mixed and the surface layer is merely brackish. The area is rich in nutrients, providing an abundance of prey species for diving birds and large fish. A near shore zone surrounds all the islets, islands and mainland, with a strong intertidal zone as the dominant interface between land and sea. The near shore zone is where point waves begin to break, has a variety of microhabitats. Perhaps the most important is the intertidal zone - that area between the highest and lowest tides. The exposed parts of the beaches are the least used near shore habitat; the pounding surf is too harsh for most birds.

The sandy intertidal areas provide spawning habitat for the Pacific sand lance and Pacific herring, which are important prey species for alcids, gulls, cormorants, Orca, harbour seal, and Pacific salmon. Much of the constantly washed area of the rocky intertidal zone is occupied by mussels, which provide an excellent food source for many waterbird species. The inter-island channels and sounds provide protected habitat for many birds. Most of that shoreline is rocky and steep but with the influx of nutrients from rivers and streams it is ideal habitat for mussels. The steep-sided fjords are usually quite barren. A shelf at their mouths, pushed up by glaciers, inhibits circulation and encourages the formation of a thick layer of fresh water on the surface. Only in the estuaries at the heads of the inlets does the freshwater create habitat for a wide variety of species. With the exception of the Nass and Skeena rivers and the Skidegate Inlet, most estuaries in the Ecoprovince are medium to small in size. Estuaries provide 3 basic habitats: mudflats, marshes, and eelgrass beds. All 3 contain invertebrates that are exposed at low tides and attract flocks of migrant and wintering waterfowl and shorebirds; when covered by the rising tides those same invertebrates are an important food source for both young and mature Pacific salmon.

Vegetation - Vegetation is dominated by the Coastal Western Hemlock and Mountain Hemlock zones, Alpine Tundra Zone and glaciers occur on the mountain summits, Interior Cedar - Hemlock occurs in the Nass Basin, and transitional Interior Douglas-fir, Engelmann Spruce - Subalpine Fir, Boreal White and Black Spruce and Sub-Boreal Spruce occur along some of the eastern-most valleys. The subalpine zone is a narrow belt on the summits or upper slopes, and is composed of yellow-cedar and mountain hemlock, with blueberries and dense moss. Wet meadows are frequently found as part of the subalpine mosaic. The alpine vegetation zone is rare, with heaths formed by mountain-heathers.

Three lowland habitats that may be used by marine birds are of special interest. Rocky islets and shoreline cliffs, usually with herbaceous or shrubby vegetative cover are important bird nesting and roosting habitats. Estuarine habitats, with tufted hairgrass, sedges, rushes, glasswort, and silverweed are found at the mouths of the many rivers and streams. Low relief areas on the coastal plains and lowlands contain extensive areas of wetland vegetation. Those wetlands range from open bogs to scrubby muskeg forests of shore pine, western redcedar, and yellow-cedar. There is usually extensive development of sedges, Labrador tea, crowberry, and thick mats of sphagnum.

Fauna – The Columbia and Sitka Black-Tailed Deer are the only common large terrestrial ungulates to occur throughout this ecoprovince. Mountain Goats are widespread but restricted to rugged areas in the Coast Mountains. Moose occur mainly in the eastern valleys, and Elk are only an occasional visitor to a few of those eastern valleys. American Black Bears occur throughout this ecoprovince, Grey Wolves are absent from the Haida Gwaii; cougars are absent from the Boundary Ranges and Haida Gwaii, while Grizzly Bears occur only on the mainland except in the south where they have been extirpated. The white race of American Black Bear – the Kermode Bear occurs here, mainly on Princess Royal Island. The Sea Otter was once one of the most abundant shellfish predators, and the North American River Otter is still numerous and very widespread. Northern Sea Lions and Harbour Seals occur along the coastal areas and the Killer Whale is a common marine inhabitant.

Characteristic small terrestrial mammals include the Keen's myotis, and mink. There are many distinct island races of Townsend's vole and white-footed mouse.

The Coast and Mountains Ecoprovince holds the second highest number of birds in British Columbia, supporting 80% of all species known to occur in the province and 60% of those species known to breed. Waterbirds make extensive use of the coastal wetlands as well as near shore and offshore habitats, including islands, islets, and cliffs. The colonial breeding seabirds are of note, and many of those species breed nowhere else in Canada. Offshore habitats provide feeding sites for pelagic birds like the Black-footed Albatross, Sooty Shearwater, jaegers, Northern Fulmar, gulls, and some shorebirds. Breeding Red-throated Loons and Spotted Owls are mostly restricted to this Ecoprovince. Some resident species, including the Bald Eagle, Peregrine Falcon, and Black Oystercatcher, contain significant portions of their world populations here. In winter, the estuaries and shores support most of the world's population of Trumpeter Swans and Barrow's Goldeneyes. The coast is also an important corridor for millions of migrating birds, especially shorebirds and waterfowl. The Townsend's Warbler is a high-density breeder on Vancouver Island and Haida Gwaii. The Western Flycatcher is a high-density breeder on Haida Gwaii.

The centre of abundance of the northwestern garter snake occurs here. The rough-skinned newt, northwestern salamander, western red-backed salamander, ensatina, clouded salamander, and red-legged frog are amphibians whose range is mostly restricted to the Coast and Mountains Ecoprovince.

This ecoprovince supports a wide variety of fish, from purely oceanic species such as rockfish, sole, Pacific herring, Pacific halibut and spiny dogfish, to fish that spawn in freshwater, but live as adults in marine waters, such as the Pacific salmon, including steelhead, coastal cutthroat trout, Dolly Varden char and eulachon, through to the species that only live in fresh water, such as Coast Range sculpin and torrent sculpin.

In addition to fish the marine environment supports a wide variety of clams, barnacles, shrimp, crabs, starfish and jellyfish.

Ecoprovince Subdivisions

The Coast and Mountains Ecoprovince is divided into eight ecoregions containing 23 terrestrial ecosections and 3 aquatic marine ecosections.

BOU - Boundary Ranges Ecoregion

This ecoregion is located in northwestern British Columbia and adjacent southeastern Alaska; it is a rugged, largely ice-capped, granitic and metamorphic-based mountain range that rises abruptly from the coast; in British Columbia it grades into the adjacent Yukon – Stikine Highlands. A large alpine tundra zone mainly of large icefields, glaciers and barren rock dominates the landscape above the forests. Forested vegetation consists of the subalpine or Mountain Hemlock zone on the lower valley slopes; and, Coastal Western Hemlock zone on the valley bottoms where Sitka Spruce becomes codominant with western hemlock; amabilis fir is not found here; In British Columbia this ecoregion consists of three ecosections.



- **CBR - Central Boundary Ranges Ecosection:** This is a rugged mountain area this is capped by large icefields, and exposed granite. This area was heavily impacted by large sheets of ice that originated along the crest of the mountains. Many large remnant icefields and glaciers remain on the summits. This area is dissected in the south

by the large Stikine and Iskut river valleys; as well by the Whiting River. The Stikine River is the sole access corridor through this ecosection. This ecosection extends across the border into Alaska from Blake Channel north to Port Snettisham Inlet. In British Columbia it is drained by the tributaries of the Iskut and Stikine rivers; in Alaska is drained by short rivers entering directly in sounds, fjords and channels that occur on the west side of this ecosection; Chutine and Whiting are the only large lakes in B.C.

This ecosection is heavily affected by moist Pacific air lying in the Gulf of Alaska and by cold Arctic air the passes over these mountains for the northeast. The large western facing valleys allow moist Pacific air to pass through to the interior and for cold Arctic air to pass onto the neighbouring Alaska panhandle. Wet Coastal Western Hemlock and Mountain Hemlock forests occur on the lower windward slopes in Alaska and up the Stikine and Iskut river valleys; on the lower slopes, particularly in B.C., cold and moist, Sub-Boreal Spruce forest grow. Cold, Engelmann Spruce – Subalpine Fir forests occur at slightly higher elevations above the Sub-Boreal Spruce forests. Alpine areas are extensive, but are mainly barren rock or ice covered.

There are no communities or settlements in British Columbia, nor are there any in Alaska, although in Alaska there are many home sites along the shores of the Stikine River. There are no roads here, most access is either by riverboat or aircraft. Except for some mineral exploration there are no roads in British Columbia. In British Columbia Great Glacier Park is located west of the Stikine River above the confluence of the Iskut River.

- **NBR - Northern Boundary Ranges Ecosection:** This is a rugged mountain area this is capped by large icefields, and exposed granite. This area was heavily impacted by large sheets of ice that originated along the crest of the mountains. Many large remnant icefields and glaciers remain on the summits. This area is dissected in the south by the large Stikine and Iskut river valleys; as well by the Whiting River. The Stikine River is the sole access corridor through this ecosection. This ecosection extends across the border into Alaska from Blake Channel north to Port Snettisham Inlet. In British Columbia it is drained by the tributaries of the Iskut and Stikine rivers; in Alaska is drained by short rivers entering directly in sounds, fjords and channels that occur on the west side of this ecosection; Chutine and Whiting are the only large lakes in B.C.

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There are no communities or settlements in British Columbia, nor are there any in Alaska, although in Alaska there are many home sites along the shores of the Stikine River. There are no roads here, most access is either by riverboat or aircraft. Except for some mineral exploration there are no roads in British Columbia. In British Columbia Great Glacier Park is located west of the Stikine River above the confluence of the Iskut River.

- **SBR - Southern Boundary Ranges Ecosection:** This is an area of wet rugged mountains that are capped with glaciers, small icefields and exposed granitic and metamorphic bedrock. This area was heavily impacted by large sheets of ice that originated along the crest of the mountains.

Many large remnant icefields and glaciers remain on the summits. The Unuk River dissects these mountains, and several smaller ones, such as: the Craig, Bradfield, upper Bowser, Salmon and Bear drain directly into marine channels or sounds. The Portland Canal and its smaller reaches cut into the southern portion of this ecosection in British Columbia. This ecosection extends westward over the crest of mountains into Alaska, as far west as Behm Canal and Revillagigedo Channel. There are no lakes of any appreciable size in B.C.

All the channels and sounds in the protected waters of the Southern Boundary ranges are classified as part of the North Coast Marine Ecosection.

Moist Pacific air moves over this ecosection bringing intense precipitation to the windward slopes and adjacent mountains in the northern interior of British Columbia. While at the same time it also allows cold Arctic air to pass down the Portland Canal through onto the Dixon Entrance onto the north coast of B.C. Forests are either very wet, such as Coastal Western Hemlock forests in the lower slopes of Portland Canal and Unuk River valley in B.C. or the lower, western slopes in Alaska; or cold and wet such as the subalpine Mountain Hemlock forests that occur on all the middle elevation slopes in both B.C. and Alaska. Alpine areas are extensive, but are mainly barren rock or ice covered.

The communities of Stewart and Kincolith in B.C. and Hyder, Alaska are the only settlements here and occur near the southern boundary in Portland Canal. The Stewart Highway (No. 37A) connects Stewart and Hyder with the Cassiar Highway through the Bear River valley. Mining has occurred in the past, particularly in the Bear River valley. Craig Headwaters and Lava Forks parks are located along the British Columbia/Alaska boundary, while Ksi Xts'atKw/Stagoo Conservancy is located on the west central side of Observatory Inlet. In Alaska it is under the management of either Tongass National Forest or Misty Fjords National Monument.

COG - Coastal Gap Ecoregion¹

This area consists of rounded, granitic and metamorphic mountains that were overridden by past glaciations; they are lower in relief than mountain ranges to either the north or south, but matterhorns project higher than the normal glaciated mountains. Valley sides are rugged and steep. Because of their lower relief, they allow considerable eastern moving Pacific moisture to enter the interior of the province and cold Arctic air to breakout onto this segment of the coast. Wet coastal forests dominate but on the upper elevations there are extensive areas of alpine but often only barren rock.

- **HEL - Hecate Lowland Ecosection:** This is an area of low relief, consisting of portions of the mainland coast, islands, channels, sounds and fjords, the uplands are rocky and the lowlands are boggy. The bedrock is primarily granitic that has been warped



¹ There has been a push by some Non-Government Environmental Organizations (NGEO's), working on forest management and wildlife conservation issues in the central and northern coastal areas of the province, to call this area the Great Bear Rainforest or the Spirit Bear Rainforest. As their area of concern is much greater than just the area of the Coastal Gap Ecoregion, their name for the area was not considered as a possible name for this ecoregion.

upwards towards the east and within the lowland the topography may be quite rough even though the total relief is not great. In contrast, however, there are areas where a flat low plain, mostly below 50 m elevation. Glaciers moving west out of the Kitimat Ranges buried this area for considerable periods. The western boundary of the ecosection lies adjacent to Hecate Strait and Queen Charlotte Sound; the eastern boundary is a break in slope between the lowlands to the west and the higher Coast Mountains to the east. It extends from Portland Canal southward to Queen Charlotte Strait. There are no major streams and most small streams empty directly into marine waters. The lowlands contain many large and small lakes and wetlands.

All the channels and sounds in the protected waters of the Hecate Lowland are classified as part of the North Coast Fjords Marine Ecosection.

Moist Pacific air moves over this ecosection bringing intense precipitation to the windward slopes and adjacent mountains in to the east. While at the same time when cold Arctic air build over the central interior of the province it can pass over the low Kitimat Ranges bringing cold and deep snows for short periods. Forests are very wet and dominated by Coastal Western Hemlock forests, only on the highest summits does wet, Mountain Hemlock subalpine forests grow. There are occupied by large expanses of muskeg where drainage is poorly developed.

The port city of Prince Rupert is the largest community here, smaller settlements such as, Port Simpson, Hartley Bay, Bella Bella and Campbell Island occur here as well. Except for the terminus of the Yellowhead Highway (No. 16) into Prince Rupert there are no major roads in this ecosection most access is by boat or aircraft. The Inside Passage Ferry Route passes through the length of this ecosection from Cape Caution in the south to Prince Rupert in the north with a stop at Campbell Island. Clearcut logging with it attendant road network has occurred in the accessible upland forests. There are numerous representative parks and conservancies here: Kitasoo Spirit Bear Conservancy is the largest protected area and Klewnuggit Inlet Marine, Lowe Inlet Marine, Union Passage Marine, Codville Lagoon Marine, Penrose Island, Hakai Luxvbalis and Calvert Island are some or the other, smaller parks and conservancies.

- **KIM - Kimsquit Mountains Ecosection:** This area is comprised of rounded granitic mountains that are characteristically round-topped, dome-like mountains with cirques on their north and northeastern sides. These mountains were overridden by ice that had originated along the crest between the coast and interior, rounding these already low summits and digging out the fjords. This is a narrow inter-mountain area that rises above the lower Chilcotin Plateau to the east to the west it is separated from other Kitimat Range mountains by being in a rainshadow. It extends from the Bella Coola valley in the south to the north side of Morice Lake in the north. Many streams drain this ecosection, the Morice and Nanika drain northward into the Bulkley River; the Kimsquit and Dean flow into Dean Channel, and the Bella Coola River flows into North Bentick Arm of Burke Channel. There are several large lakes that occur wholly or in part here, these are mainly on east side of the coast divide, and include: Morice, Nanika, Tahtsa, Troitsa, Whitesail and Eutsuk lakes, the latter four being part of the multi armed reservoir that formed behind the Kenny Dam; there are no large lakes on the coastal side of this ecosection.

All the channels and sounds in the protected waters of the Kimsquit Mountains are classified as part of the North Coast Fjords Marine Ecosection.

This is an inland - coastal rainshadow area with a mild transitional climate that occurs on the eastern portions of the ecoregion. The climate is characterized by moist, warm summers, and cool to cold winters with relatively heavy amounts of wet snowfall or rain. While the fjords of the Kitimat Ranges physiographic unit runs east to west many of the river valleys in this ecosection lie north-south, thus the adjacent mountains provide some relief from the easterly flow of moist Pacific air. Those valleys also trap cold Arctic air after it has moved over this area. Lower elevation coastal forests are mild Coastal Western Hemlock, this forest type occurs on the interior side in the low mountain passes. Moist Mountain Hemlock subalpine forests occur on all the upper slopes on the coastal side; while on the interior side, moist Engelmann Spruce – Subalpine Fir forests grow on the upper slopes. Alpine is very common on the upper ridges and mountaintops, it can be heavily vegetated, but often it is only barren rock.

Bella Coola and Hagensburg are the only settlements here and are located in the southern portion of the ecosection; the Chilcotin-Bella Coola Highway (No. 20) from Williams Lake services these communities. Clearcut logging with its attendant roads has occurred in the Kimsquit, Dean and Bella Coola river valleys, access was gained via the marine waters. Small scale agriculture occurs in the Bella Coola valley. There are several large representative protected areas in this ecosection such as: Atna River, the western two-thirds of Morice Lake and the western portion of northern Tweedsmuir parks. In addition to parks there are a number of conservancies that have been established for wildlife conservation concerns, such as: the eastern portion of Huchsduwachsdu Nuyem Jees-Kitlope Heritage Conservancy. As well, the Naxalk-Carrier grease trail (also called the Alexander Mackenzie Heritage Trail) cuts southward, through the eastern portion of the ecosection from the Dean River south up the Tahyesco River valley and down into the Bella Coola River valley at Burnt Bridge Creek.

- **KIR - Kitimat Ranges Ecosection:** This is an area of subdued, yet steep-sided mountains that have been dissected by several fjords. The mountains are largely eroded granitic rock that has resulted in bold, impressive, massive mountains. In places the exposed granite has developed grand scale sheeting, so that dome-like mountains have huge rock slabs peeling from their sides and tops. The deep fjords that penetrate into the heart of this ecosection are also characteristic feature. These mountains were overridden by ice that had originated along the crest between the coast and interior, rounding these already low summits and digging out the fjords. This ecosection extends from Portland Canal in the north, to Burke Channel in the south. It rises above the Hecate Lowland to the west and is bounded on the east by similar, but drier mountains. There are many medium-sized lakes including: Kitlope, Kildala, Crab, Foch, Khtada and Alastair and many small lakes. As well, many inlets, sounds and fjords dissect this area. There is a short section of the lower Skeena River that runs through here, as well, this ecosection is drained by: the Ishkheenickh, Khutzeymateen, Exchamsks, Gitnadoix, Ecstall, lower Kitimat, Kildala, and many shorter streams that empty directly into the marine waters.

All the channels and sounds in the protected waters of the Kitimat Ranges are classified as part of the North Coast Fjords Marine Ecosection.

Wet Pacific air rises over these mountain bringing heavy precipitation and cloud cover. In the winter cold Arctic air can invade from over the central interior of the province, but such extreme cold weather is usually of short duration. The valleys and lower and mid-slopes are dominated by wet, cold Coastal Western Hemlock forests; while at higher elevations wet, cold Mountain Hemlock subalpine forest dominate.

Kitimat is the only town remaining here (Kemano, Ocean Falls, Butedale are now closed except for occasional summer recreation purposes). There are only two short stretches of highways here: the Yellowhead Trans-Canada Highway (No. 16) (and the Canadian National Railway) passes through on the north side of the Skeena River and the Kitimat-Cassiar Highway (No. 37) connects Kitimat with Terrace. The Inside Passage ferry route passes between the east side of Princess Royal Island and the mainland. Clearcut logging with its attendant roads has occurred in all the accessible valleys, such as the Kitimat and Skeena river valleys; much of the logging was marine based. Several protected areas represent this ecoregion, such as: the Khutzeymateen, Gitnadoix River, Foch-Gilttoyes, and Fiordland parks and the western part of Kitlope Heritage Conservancy.

- **NCF – North Coast Fjords:** This is the marine waters area that occurs east of Hecate Strait. It consists of narrow deep fjords, channels and sounds that cut through mainly high relief. These waters are very protected, with restricted circulation that often is strongly stratified by freshwater flowing out of the mountains and lying over brackish marine water. Glacial activity coupled with extreme faulting during past mountain-building episodes has created many steep, straight-sided fjords, channels and sounds.

GWH - Gwaii Haanas Ecoregion²

This is an isolated group of islands that range from lowland muskeg, wet coastal forest to rugged upland subalpine. The core of most of these islands is granitic, but volcanic rocks are also present. The ecoregion consists of two larger islands and over 150 smaller islands, islets and reefs. These islands were glaciated by a local ice cap that covered the island during the last ice age. There are three ecoregions in this ecoregion.



- **QCL - Queen Charlotte Lowland Ecoregion:** This is an area of low relief, poor drainage and extensive muskegs and wetlands in the northeastern part of Haida Gwaii. This ecoregion is underlain by basaltic lava and sedimentary rocks all covered by a thin layer of till. The movement of glacial ice from the adjacent mountain across this lowland has left drumlin-like forms and deep drift deposits. That eventually joined with ice from Alaskan and mainland glaciers in Dixon entrance. Masset Inlet and Naden Harbour separate the uplands into three units, and it is drained by small streams that originate on this lowland, such as Jalun, Christie, Hancock, Hielien and Tlell, streams; Yakoon River originates in the adjacent plateau before emptying into Masset Inlet. Mayer Lake is the only large lake, but there are many smaller ones.

² The name Gwaii Haanas was used because it refers to the ‘beautiful islands’ and it is generic, but still pertains to the Haid 1 - a Gwaii; Haida Gwaii was not used as it is more politically charged; finally Queen Charlotte Islands was not used because of the recent push to use a First Nation name when referring to those islands, although only the archipelago has been renamed by the provincial government in 2009 to Haida Gwaii, however, all other physiographic units named ‘Queen Charlotte’ still retain that name.

The north-facing marine waters, such as Naden Harbour, Masset Inlet and Masset Sound are classified as part of the Dixon Entrance Marine Ecosection; while Skidegate Inlet is classified as part of the Hecate Strait Marine Ecosection.

This area lies in a slight rainshadow of the Queen Charlotte Ranges to the west however Pacific air can easily flow over here bringing intense rainfall and cloud cover. Arctic air seldom invades this area and then only for brief periods. Wet Coastal Western Hemlock forest are the only ones to grow here, much of the upland is muskeg or wetlands.

The community of Port Clements was built at the south end of Masset Inlet, and the communities of Masset and Haida (Old Masset) were established at the mouth of Masset Sound, while Skidegate and Sandspit have been established on opposite sides of the Skidegate Inlet. The Queen Charlotte section of the Yellowhead Highway (No. 16) the only paved highway connects Haida and Masset with Port Clements and Queen Charlotte City, but a major gravel industrial road connects Port Clements to Queen Charlotte City. Clearcut logging with its attendant roads has occurred throughout on the non-muskeg uplands. Livestock grazing has been carried out but only on a very small scale. There are several representative protected area in this ecosection; Naikoon Park has been established on the muskeg and sandy beaches in the northeastern portion of this ecosection; as well, Kumdis Conservancy located along the shoreline from Virago Sound east to and up Masset Sound, Yaaguun Gandlaay and Tlall conservancies have been establish on the southeast side of this ecosection and the northeastern portion of Duu Guusd Conservancy has been established west of Virago Sound.

- **QCR - Queen Charlotte Ranges Ecosection:** This area is the very wet, rugged western side of the Haida Gwaii archipelago, despite their low relief these mountains are extremely rugged and their serrated peaks have been sculpted into cirques by locally generated glaciers during the past ice age. Granitic rocks occur from Tasu Sound to Nagas Point and of the high range between Skidegate Channel and Rennell Sound, much of the rest of this area is volcanic in origin; many of the steep forested slopes are unstable and subject to failure after logging. The ecosection extends the length of the Queen Charlotte Islands from Cape St. James in the south to Langara Island in the north. It is drained to the west by short streams that enter directly into the Pacific Ocean. The western margin is highly dissected by sounds, channels and short fjords.

All the channels, sounds and fjords are classified as part of the Continental Shelf Marine Ecoregion.

This area is very wet, as it receives Pacific storms directly off the Pacific Ocean, often covering these ranges in a blanket of thick clouds. Very wet Coastal Western Hemlock forest dominate the lower to mid-slopes and very wet Mountain Hemlock subalpine forests grown on the upper slopes, alpine communities are rare because these are low mountains.

There are a few native villages, but most of the logging communities have been abandoned. Most roads, except the road from Queen Charlotte City to Rennell Sound, are short as logs were taken into the marine water for rafting to sawmill sites. Clearcut logging with its attendant roads has occurred on the accessible slopes, valleys and islands. Everything south of Tasu Sound in the west and Dana Inlet in the east has been placed into the Gwaii Haanas National Park; Duu Guusd Conservancy extends from Langara Island south to Rennell Sound, Daawuuxusda Conservancy extends from Rennell Sound on Graham Island south to the national park on Moresby island; as

well, the Vladimir J. Krajina Ecological Reserve has been established on both sides of Port Chanal Sound on the southwest side of Graham Island.

- **SKP - Skidegate Plateau Ecoregion**

This is a dissected plateau that lies in the lee of the Queen Charlotte Mountains to the west and extends from Pivot Mountain in the north of Graham Island south to Juan Perez Sound on the east side of Moresby Island. It is comprised of highly dissected volcanic rocks; glaciers that originated in the higher mountains to the west moved over this area rounding its profile. Many short streams dissect this area flowing eastward into Dixon Entrance or Hecate Strait, the longest is the Yakoun River; Eden, Yakoun and Skidegate lakes are the three largest in this ecoregion and indeed on the entire ecoregion. This plateau is greatly dissected by Masset, Skidegate, Cumshewa, and Selwyn inlets, and Darwin Sound.

All the channels and sounds in the protected waters of the Skidegate Plateau are classified as part of the Hecate Strait Marine Ecoregion.

This area lies in a slight rainshadow of the Queen Charlotte Ranges to the west however Pacific air can easily flow over here bringing intense rainfall and cloud cover. Arctic air seldom invades this area and then only for brief periods. Wet Coastal Western Hemlock forests are the dominant low and mid-elevation forest; wet Mountain Hemlock subalpine forest occurs only on the highest ridges nearest to the height of land.

Queen Charlotte City and Skidegate are the main communities remaining now in the past many communities were established by the native peoples and by logging communities, the latter were only to be of a short duration. Most roads were built for hauling logs, but there is a short extension of the Yellowhead Highway (No. 16) between Skidegate and Queen Charlotte City, and there are all-weather roads between Queen Charlotte City and Port Clements and from Sandspit to the head of Cumshewa Inlet. Clearcut logging with its attendant roads has been intensive in this ecoregion. The southernmost portion of this ecoregion, from Laskeek Bay to Juan Perez Sound, has been placed into the Gwaii Haanas National Park for its ecological value and to protect Haida villages and historic sites; a small portion of Duu Guusd Conservancy has been established in the north of this ecoregion and a small portion of the Daawuuxusda Conservancy has been established in the upper Yakoun watershed.

NRA - Nass Ranges Ecoregion

This is a transitional coastal-interior area lying leeward of the main Kitimat Ranges physiographic unit, subdued, smooth rounded mountains with a strong rainshadow effect on the leeward slopes and basins, but the mountains and ridges on the western windward slopes are more rugged. The mountains in the east are underlain by volcanic and sedimentary (and small granitic batholiths) rock. The mountains to the west are comprised mainly of the coast granitic rocks. Vegetation consists of Coastal Western Hemlock and Mountain Hemlock on the windward slopes and Interior Cedar – Hemlock and Engelmann Spruce – Subalpine Fir on the leeward slopes. It consists of four ecoregions.



- **NAB - Nass Basin Ecosection:** This is an irregular shaped basin of low relief that is encircled by sharply rising mountains, the Boundary Ranges to the west, the Hazelton Mountains on the south and the Skeena Mountains on the east. Rock underlying this basin are predominantly volcanic and the relief is flat or gently rolling. Ice from the Boundary Ranges and Skeena Mountains flowed down out over these flat lands down the Nass River, or down the Kispiox River to the Skeena River, or even over the Nass Ranges to the Skeena. There are many meandering streams, wetlands and small lakes, however, this ecosection is drained primarily by the Bell-Irving, Kwinageese, White and Kinskuch rivers that flow into the lower Nass River; and by the Kispiox River that flows into the Skeena River. Swan Lake is the largest that is wholly within this ecosection both Meziadin and Bowser lakes have only their eastern halves here.

The climate is intermediate between the cool, wet conditions of the outer coast and the drier, conditions of the interior of the province. These mountains provide protection from Pacific storms but also trap cold Arctic air in the winter and spring bringing periods of intense cold and snowy conditions thus the climate of this basin is transitional between the wet mild coast, and cold, dry interior. The cold, Arctic air that invades this basin allows a more interior forest type, the Interior Cedar – Hemlock forests to grow on the valley floor. Subalpine forests of Engelmann Spruce - Subalpine Fir occurs on the few higher hills and ridges.

The settlements in this ecosection are all First Nation villages that include: New Aiyansh, Gitwinksihlkw, Aiyansh and Kispiox. The Kitimat-Cassiar Highway (No. 37) passes through on the west side from Hazelton to the Bell-Irving River; and the Nisga'a Highway (No. 113) from Terrace, connects New Aiyansh with Highway No. 37 at Cranberry Junction. Clearcut logging with its attendant roads has been extensive and occurs throughout. The northern portion of Anhlut'ukwsim Laxmihl Angwinga'Asanskwhl Nisga'a Park is located near the mouth of the Nass River and the western half of Swan Lake-Kispiox River Park is located on the eastern margin around Swan Lake and the adjacent upper Kispiox River.

- **CRU - Cranberry Upland Ecosection:** The mountains and ridges here are subdued sedimentary and volcanic rocks that have rounded summits showing signs of heavily glaciation. Ice from the Skeena Mountains flowed down unimpeded over the flat lands of the Nass Basin down the Kispiox River to the Skeena River, or even over this ecosection to the Skeena. The northward flowing Bulkley River joins the south-westward flowing Skeen River here and there are many small streams that flow into either river such as: Suskwa, Kitseguecla and Kitwancool streams; Kitwanga is the only large lake here.

This area is in a strong rainshadow but at times large Pacific air masses can stall over the mountains to the east bringing heavy rain and a thick layer of clouds. Cold Arctic air flowing over the mountains to the north and east can bring short periods of extreme cold temperatures, and the interaction of cold air with the wet Pacific air brings deep snow. Valleys and lower slopes on the western side have wet Coastal Western Hemlock forests, the upper slopes have wet, transitional Mountain Hemlock subalpine forests and the alpine is thickly vegetated or barren rock. On the eastern portion of the ecosection, cold Interior Cedar – Hemlock forests grow in the valley bottoms and lower slopes, giving way to cold Engelmann Spruce – Subalpine Fir forests on the mid- to upper slopes. The alpine is less lush here, but barren rock is still common.

There are several small communities here including Kitwanga, Hazelton, New Hazelton, South Hazelton and Moricetown. The Yellowhead Highway (No. 16) passes through, above the Skeena

River from Kitwanga to Moricetown and the Kitimat-Cassiar Highway (No.37) connects Kitwanga with Dease Lake. The Canadian National Railway is located above the Bulkley and Skeena Rivers from Moricetown to Kitwanga. Logging with its attendant roads has been extensive throughout this ecoregion, except for the higher peaks. There are no large parks in this ecoregion.

- **MEM - Meziadin Mountains Ecoregion:** This is a rugged, granitic mountain area, lying on the leeward side of the main Boundary Ranges and west of the low Nass Basin. It extends from the lower Nass River and estuary north to Mounts Knipple and Anderson on the north side of Bowser Lake and the upper Bowser River. Ice that formed in the Boundary Ranges moved east into the Nass Basin, coalescing with ice moving south from the adjacent Skeena Mountains the entire then moved down out the Nass Valley to the Dixon Entrance or south through Cranberry Upland Ecoregion to the Skeena River valley. The mountain summits still have small icefields or glaciers. It is drained by: the upper Bowser River and many small streams that empty into the Nass River. There are two large lakes: Bowser and Meziadin, both are only have the western portions in this ecoregion.

There is a strong rainshadow here, as the western summits protect this area from some Pacific air that arrives from over the Boundary Ranges to the west however, some Pacific air can enter into this area via the wide Nass River valley bringing heavy rain and dense cloud cover. In the winter and early spring, cold Arctic air can override the Skeena Mountains to the west and build up along the east side of this ecoregion, bringing short periods of intense cold and the interaction of that cold air with the warm Pacific air can lead to heavy snowfalls. The southern east-facing valleys have wet Coastal Western Hemlock forests, with wet Mountain Hemlock subalpine forests on the upper slopes. The northern portion of this ecoregion has cold Interior Cedar – Hemlock forests in the east-facing valleys, with cold Engelmann Spruce – Subalpine Fir forest on the mid-to-upper slopes. Alpine can be heavily vegetated or barren rock; many of the larger mountain blocks still have large icefields or small glaciers, such as the Cambria Icefield southwest of Meziadin Lake.

There are no settlements in this ecoregion; the Stewart Highway (No. 37A) connects Stewart (and Hyder, Alaska) a former port community, with the Kitimat-Cassiar Highway (No. 37 at Meziadin Junction through the Bear River Pass. Gingieltl Creek Ecological Reserve is the largest protected area here.

- **NAM - Nass Mountains Ecoregion:** This is a rugged, granitic mountain area lying east of the Kitimat Ranges and west of the Nass Basin and Cranberry Upland. These mountains comprise serrate peaks, rounded summits and ridges. The source of lavas forming the recent lava plain along the northern border with the Nass Basin is in the Tsax River valley. This area was heavily glaciated with ice moving over it from the Boundary Ranges and Skeena Mountains to the east, some ice was also locally generated adding to the large moving sheets. As well as many small streams, the Kiteen and Tseax rivers drain into the Nass River; the Kitwanga, Kitsumkalum and Zymoetz rivers drain into the Skeena River; and the Wedeene River drains into the Kitimat River. There are three medium sized lakes: Lava, Kitsumkalum and Lakelse lakes.

Its climate is somewhat transitional between coastal and interior regimes, but this is the wettest of the four ecoregions in this ecoregion because Pacific air easily enters via the wide Skeena River valley or overrides the Kitimat Ranges to the west and then stalls bringing heavy rain and cloud cover. Cold Arctic air occasionally invades from the north and can bring extreme cold

temperatures deep snow events for short periods. All the major valley bottoms and lower to mid-slopes have wet Coastal Western Hemlock forests, on the upper slopes wet Mountain Hemlock subalpine forests grow. The alpine is either heavily vegetated or barren rock; a few small glaciers survive on the north or northeastern-facing cirque basins.

Terrace is the only large town, Lakelse Lake is a small suburb located to the south on the Kitimat-Cassiar Highway and Usk is a small community on the Canadian National Railroad and Rosswood is located on Kitsumkalum Lake. The Yellowhead Highway (No. 16) passes through along the Skeena River as does the Canadian National Railway; the Nisga'a Highway (No. 113) connects New Aiyansh and the Nisga'a First Nation with Terrace via the Kitsumkalum valley; and the Kitimat-Cassiar Highway (No. 37) connects Terrace with Kitimat. Clearcut logging with its attendant roads has been intensive in the large river valleys such as the Kitimat and Kitsumkalum as well as in many of the lower slopes. The two largest protected areas here are: Seven Sisters Park located on the east side of the Skeena River south of Kitwanga; and the Anluut'ukwsim Laxmihl Angwinga'Asanskwhl Nisga'a Park was established on the extensive lava beds in the Tseax watershed.

PAC - Pacific Ranges Ecoregion

This is the southern-most mountain range of the Coast Mountains. This ecoregion includes all of the Pacific Ranges of the Coast Mountains as it extends from Burke Channel in the north to the Fraser River Lowland in the south; in addition it extends southward across the Fraser River to include the north-westernmost portion of the Cascade Ranges in Washington as far south as the South Fork of Snoqualmie River. It includes the coastal islands, channels and fjords southeast of Queen Charlotte Sound, otherwise it lies east of the Georgia-Puget Basin, Johnstone Strait and Queen Charlotte Strait. The mountains are characteristically coastal granites that are high, steep and rugged. This ecoregion is affected by heavy fall and winter rains that bring extreme rainfall or snowfall events from October to March, in some cases however warm subtropical storms can bring intense rainfall from the southwest during the October to early January period. Otherwise winter rain arrives from the Northeast Pacific in the west. Cold Arctic can build up over the interior of the province and then flow down the major valleys onto the coast, or it can build up and overflow the entire Pacific Ranges bringing extreme cold weather and snow for short periods before being forced back into the interior by the Pacific systems.



This ecoregion consists of seven ecosections.

- **CPR - Central Pacific Ranges Ecosection:** This is a rugged, ice-dominated ecosection that has the highest mountains, in British Columbia, south of the St. Elias Mountains and Alsek and Kluane ranges in the far northwestern portion of the province; Mount Waddington is 4016m high and Silverthrone Mountain is 2350m. This ecosection is composed of granitic rocks; the summits diminish to the west with the downward slope of the dissected and eroded surfaces. Ice built up over these mountains flowing northward onto the Chilcotin Plateau or southward into the Strait of Georgia, rounding some of the ridges and mountains and depositing glacial debris over the plateau or in the Georgia Depression. Much of the upper levels still have very large icefields and glaciers with much exposed bedrock. The area is dissected by: the Smokehouse, Klinaklini,

Homathko, Southgate and Toba rivers and their accompanying fjords, respectively, Knight, Bute and Toba inlets.

The fjords classified as the Johnstone Strait Marine Ecoregion: these are deep, steep-sided fjords that have been formed along major faults and were deepened and steeped by successive glaciations. The glaciers deposited a shelf of material at the fjord outlets, thus trapping brackish water below the freshwater that comes down the rivers; there is very little mixing of the two water layers.

Pacific air moving over Queen Charlotte Sound and Strait, or over the Vancouver Island Mountains contain much moisture which it drops on this ecoregion as that air rises to pass over into the interior, in so doing it hits cold air and precipitates heavy rains or snow on the ecoregion. Dense, cold Arctic air can slide down either the Klinaklini or Homathko valleys bring strong winds and cold temperatures to the coast from the interior, such systems, though are usually short-lived. The valleys and lower elevation slopes are dominated by wet Coastal Western Hemlock forests; while the mid-elevation slopes are dominated by wet Mountain Hemlock subalpine forests. Vegetated alpine is usually a narrow band above the subalpine and below barren rock or icefields.

Except for logging and summer sport fishing recreation camps this area has no settlements. There are a few valley bottoms, resource roads for logging radiating out from the estuaries. There are numerous conservancies and two parks here: the Lockhart-Gordon, Tsalat/Smokehouse and Catto conservancies are located in the northwestern area; the Dzawadi/Upper Klinaklini River, lower portion of the Homathko – Tatlayoko and the Bishop River parks are located along the eastern boundary; and the Hunwadi/Ahnuhati-Bald Conservancy is located on the west side overland from Kingcome to Knight inlets.

- **EPR - Eastern Pacific Ranges Ecoregion:** This is a rugged inland area that has a transitional wet mild coast and dry cold interior climates including some strong rainshadows. This ecoregion extends into Washington as far south as the south end of Ross Lake of the dammed Skagit River. These mountains are built of granitic rocks and rise in height from south to north and the northern summits have large icefields. Glaciers passed down out of the mountains and down the Lillooet Valley to the Lower Mainland, or it passed through one of the other more narrow mountain valleys to either Howe Sound or Jarvis Inlet. One of the most recent volcanoes in southern British Columbia, Mount Meager occurs in the headwaters of the Lillooet River, other volcanoes are: Mount Garibaldi and Mount Cayley in the Squamish watershed. The Fraser River Canyon from Boston Bar to Yale and the Coquihalla River cut through on the east side; the Lillooet River, with the north half of Harrison Lake, lies in the middle; the Squamish-Elaho-Glenndining and Chekamus rivers cut through on the west portion of the ecoregion.

Pacific air often passes over this ecoregion leaving little precipitation and mild temperatures. In the winter though cold Arctic air and invade this area from the central interior of the province bringing extreme cloud and snow; such systems can become trapped by the Pacific air once it build in strength leaving the large valleys in a temperature inversion with cold temperature and heavy cloud cover for long periods. Almost all the valleys and lower slopes are dominated by moist, mild Coastal Western Hemlock forests, only parts of the Pemberton Valley can have a moist Interior Douglas-fir forest that is more common in the Leeward Pacific Ranges Ecoregion to the north. Upper slopes have moist, mild Mountain Hemlock subalpine forests, although

some of the northeastern slopes have moist Engelmann Spruce – Subalpine Fir subalpine forests. Vegetated alpine occurs just above the subalpine forest and above that is usually barren rock; a few icefields and glaciers remain on the higher summits northwest of Lillooet River.

Several towns and communities have been established here, such as, Whistler, Pemberton, Mount Currie, Hope and Yale; the first three are connected to the Lower Mainland by the Sea-to-Sky Highway (No. 99), and the last two are connected to the Lower Mainland and the interior by the Trans Canada (No. 1), Crownsnest Highway (No.3) and Coquihalla Highway (No. 5). Extensive clearcut logging with its attendant roads has occurred on the lower to mid slopes outside the parks. Pemberton Valley is the most productive agricultural area in the entire Coast and Mountains Ecoprovince. There are a number of large protected areas including: northern three-quarters of Garibaldi Park; most of Clendinning Park; all of Upper Lillooet Park, Upper Soo and Callaghan conservancies and Chilliwack Lake Park; the western half of Skagit Valley and Mehatl parks.

- **JOS - Johnstone Strait Marine Ecosystem:** The marine waters include most of the Johnstone Strait and a small portion of the Queen Charlotte Strait marine ecosystems. There is much mixing of the marine waters especially through Johnstone Strait with water moving in or out of the Strait of Georgia or Queen Charlotte Strait through this strait depending on tides. Freshwater from the Homathko, Southgate, Klinaklini, Kingcome and Wakeman rivers mixes with marine waters through tidal action here.
- **NPR - Northern Pacific Ranges Ecosystem:** This ecosystem it has steep, rugged, often ice capped, mountains that rises above the Kitimat Range physiographic unit to the north, but it is somewhat lower than the Central Pacific Ranges to the south. Glaciers built up along the crest of these mountains before moving either eastward onto the Chilcotin Plateau or westward to the coast. It is dissected in part by several deep, narrow river valleys and fjords of the: Machmell and Taleomey rivers; associated Owikeno Lake; Rivers Inlet and Burke Channel fjords. It extends north from the Machmell-Owikeno-Rivers Inlet drainage to Burke Channel in the north and the Atnarko River valley on the east.

Wet Pacific air rises over these mountain bringing heavy precipitation and cloud cover. In the winter cold Arctic air can invade from over the central interior of the province, but such extreme cold weather is usually of short duration. The valleys and lower and mid-slopes are dominated by wet, cold Coastal Western Hemlock forests; while at higher elevations wet, cold Mountain Hemlock subalpine forest dominate. Alpine areas can have dense vegetation or more often barren rock; alpine glaciers remain on the highest summits.

Rivers Inlet a former fish cannery village is now a summer recreation fishing site. Clearcut logging with its attendant roads has occurred in the accessible valleys and lower slopes, although much of this ecosystem is rugged and inaccessible, in many cases logging was marine based. A narrow, southwestern portion of Tweedsmuir Park lies along the northeastern boundary of this ecosystem as well as several conservancies such as: Thorsen Creek, Hot Springs-No Name Creek, Sheemahant and Owikeno conservancies.

- **NWC - Northwestern Cascade Ranges Ecosystem:** This is a block of rugged mountains of the north-westernmost segment of the Cascade Ranges that extends northward from Washington to barely enter British Columbia south of the eastern portion of the lower Fraser Valley. It

includes the large snowfield draped Baker Mountain volcano. Only a small shoulder of these mountains enters into British Columbia, ending at the south bank of the Fraser River at Bridal Falls. It extends from the international boundary in Washington south to the South Fork Snoqualmie River valley. It is bounded on the west side by the Puget Lowlands and on the east by the dry interior climate of Washington on the crest of the Cascades. These mountains are composed of a mix of metamorphosed volcanic rock, sandstone, shale and limestone that were all folded and thrust-faulted during the mountain building episode of the past 100 million years. In Washington there are several notable volcanoes with Mount Baker at 3285m is the most visible in the Lower Mainland. There has been considerable mountain glacier on these mountains, but the large Cordilleran from British Columbia only went as far south as this eco-section before stalling. In its movement it eroded and rounded the ridges on the west diminishing their heights. In B.C. it is drained by the Chilliwack River; whereas in Washington it is drained by the Nooksack, Skagit, Stillaquamish, Skykomish, and Snoqualmie Rivers, Cultus is the only large lake in B.C., there are several large lakes in Washington, including: Tolt Seattle Water Supply Reservoir, Spada, Cavanaugh, Big, Samish, and Whatcom lakes with Shannon and Baker lakes being the two largest.

Pacific air masses arrive from the Strait of Juan de Fuca a large mountain gap to the west or from either down the Strait of Georgia or from the around the south side of the Olympic Mountains and they can bring intense rainfall events and heavy cloud cover for extended periods. Cold Arctic air can arrive from over the Coast Mountains in B.C. bringing short periods of strong, cold winds and heavy snowfall, but such systems are generally short-lived. Wet, warm Coastal Western Hemlock forests dominate the lower to mid slopes and valleys; wet Mountain Hemlock subalpine forests occur on the upper slopes and ridges. Alpine vegetation is generally dense but gives way to barren rock and even large snowfields on the higher mountains.

In British Columbia, the small community of Bridal Falls is located along the Trans Canada Highway (No.1); the Canadian Pacific Railway mainline runs between the Fraser River and the Trans Canada Highway. In Washington, it is crossed by: Interstate Highway (No. 90) in the South Fork Snoqualmie River valley, State Highway (No. 2) in the Skykomish River valley and North Cascade highway (No. 20) through the Skagit River valley. There are many small communities and settlements in Washington, such as: Concrete, Darrington and Granite Falls. Outside the parks and wilderness areas logging with its attendant roads has been extensive throughout in both British Columbia and Washington. Cultus Lake Park and Liumchen Ecological Reserve are two protected areas in British Columbia. There are several large protected areas in Washington: the northwestern portion of North Cascades National Park; and numerous Wilderness Areas such as Mount Baker and Glacier Peak.

- **OUF - Outer Fiordland Eco-section:** This is an area of low but rugged islands and mainland peninsulas that are dissected by a great many inlets, fjords and sounds. It lies east of Vancouver Island at Johnstone Strait and Discovery Passage, and it extends from the southern area of Queen Charlotte Strait south to the northern area of Georgia Strait. This rugged eco-section is composed mainly of granitic rocks that have been intermixed with volcanic rocks that have been heavily eroded by past glaciations. It is heavily faulted and glaciers passing over have eroded them creating a myriad of channels, sounds, straits and fjords. Glaciers moving down from the adjacent Pacific Ranges overwhelmed this area as it moved both to the north into Queen Charlotte Strait or to the south into the Georgia Basin. There are many short streams that empty

straight into the marine waters, and the upland surface has many low elevation lakes with Tom Browne, Fulmore and Heydon being three of the larger ones.

The marine waters include most of the Johnstone Strait and a small portion of the Queen Charlotte Strait marine ecosections. There is much mixing of the marine waters especially through Johnstone Strait with water moving in or out of the Strait of Georgia or Queen Charlotte Strait through this strait depending on tides. Freshwater from the Homathko, Southgate, Klinaklini, Kingcome and Wakeman rivers mixes with marine waters through tidal action here.

Pacific air can move down from Hecate Strait over this area before rising over the high mountains to the east bringing periods of intense rainfall and heavy cloud cover. In the summer months hot air from much further south can bring clear skies to the southern portion but it can also bring fog and heavy clouds to the northern portion as the hot air meets the cooler moist air. At times in the winter cold, Arctic air can move down the large valleys that are connected to the interior such as the Klinaklini and Homathko, bring short periods of strong winds and intense cold. Wet Coastal Western Hemlock forests dominate most of this area, only the highest areas have wet Mountain Hemlock subalpine forests.

There are many small fishing camps, logging sites, recreational homes and small settlements throughout this ecosection, but there are no large communities. Most access is either by boat or floatplane as there are few all weather roads. Clearcut logging has occurred over all the accessible forests. Commercial and recreational fishing and fish farms all occur here. Of the larger protected areas: East Redonda Island Ecological Reserve, Mains Lake Chain, and Small Inlet parks have been established on the southern islands, while Broughton Archipelago Marine Park has been established on the northern islands.

- **SPR - Southern Pacific Ranges Ecosection:** This is an area of bold, rugged granitic mountains that rises abruptly above the Fraser Valley and Sunshine Coast. Large glaciers built up over the crest of this ecosection before flowing down the valleys and ridges to coalesce in the Strait of Georgia forming a large ice sheet that overwhelmed the entire area. There are several fjords in the northern section that drain into the Strait of Georgia, such as: Indian Arm, Howe Sound and Jervis Inlet. As well there are what can be considered fjord-lakes in the southern portion, such as: Harrison, Stave, Pitt, and Coquitlam lakes that drain into the Fraser River before emptying into the strait; while Powell Lake another fjord-lake occurs in the northern portion above the Sunshine Coast. These fjord-lakes were probably true fjords before the Fraser Lowland build up with sediment. There are many short streams that feed into those bodies of water, Pitt River is one of the largest to originate in this ecosection, while the Squamish River originates to the east before passing through here to Howe Sound.

The fjords are all part of the Strait of Georgia Marine Ecosection that originates in the adjacent Georgia Depression Ecoprovince. These are typical fjords with steep mountains flanking their margins and having been formed by glacial action in existing faults or weak bedrock fractures. Freshwater from the streams usually lies on top of deeper brackish water with little mixing of the two. Most of the steep outward sills lie in the adjacent ecosections.

This ecosection is greatly affected by westerly Pacific storms bringing heavy rain and snow from late fall to winter; summers can be dry and warm with occasional rainy periods. During periods of Arctic air outbreaks outflow winds in the Squamish and Lillooet river valleys can bring

extreme winds and cold weather those valleys allow that cold air to enter the Puget-Georgia Basin, such severe winter events are generally short-lived. The valleys, lower to mid-slopes have wet Coastal Western Hemlock forests; while the upper, forested slopes are dominated by wet, Mountain Hemlock subalpine. Alpine vegetation is usually dense, but barren rock becomes common on the highest ridges and mountaintops.

Squamish and several small communities, such as Lions Bay, Brackendale and Harrison Lake occur here. The Sea to Sky Highway (No. 99) passes through from West Vancouver to the village of Whistler and Pemberton and the Lougheed Highway (No. 7) passes along the north side of the Fraser River between Hope and Agassiz. Except in the several parks intensive clearcut logging, with its attendant roads has occurred on all the valleys and lower slopes. Several large parks have been established here, including: Golden Ears, Pinecone – Burke, Indian Arm, Cypress, Tantalus, Tetrahedron, Mount Seymour and the southern one-fifth of Garibaldi parks.

WVI - Western Vancouver Island Ecoregion

This area includes the western and northern lowlands, islands and mountains of Vancouver Island. The mountains are composed of a heterogeneous mix of sedimentary and volcanic rocks with numerous granitic intrusions. There is an extensive lowland at the northern end and a strandflat along the western coast. This ecoregion is affected by heavy rainfall events during the October to February period, and in some cases, warm subtropical storms that bring intense rainfall and winds from the southwest during the October to early January period. Otherwise winter rain arrives from the west and northwest Northeast Pacific.



The alpine zone is limited to a few mountaintops, but where it does occur it is usually dominated by rock outcropping or mountain-heathers and small wet meadows. The subalpine or Mountain Hemlock Zone has a mixed climax of mountain hemlock and amabilis fir, with seral yellow-cedar on richer sites. A dense shrub layer occurs. Common plants include blueberries, false azalea, copperbush, white-flowered rhododendron, and dense mosses. At higher elevations, the forest cover becomes discontinuous and may be mixed with meadows. The lowest or Coastal Western Hemlock Zone is dominated by western hemlock. Except in the drier Nimpkish Valley, where Douglas-fir is a common seral species, amabilis fir is also common. Sitka spruce forests grow in a narrow belt adjacent to the ocean. Other trees include western redcedar (lower elevations), yellow-cedar (higher elevations), shore pine and red alder. Understories are dominated by woody shrubs such as blueberries, salal, huckleberries, and false azalea, with bunchberry, deer fern, sword fern, and a carpet of mosses. Floodplains are composed of Sitka spruce, red alder, salmonberry, and ferns.

This ecoregion consists of three ecosections.

- **NWL - Nahwitti Lowland Ecosection:** This is an area of low to rolling topography, with high precipitation located at the north end of Vancouver Island. It was heavily overridden by glacial ice from the mainland; erosion of the soft sedimentary rocks has produced the low-lying gentle topography that rise to the harder volcanic rocks towards the west and to the mountains in the south. The faulting and eroded fractured surface gives this ecosection a rough feature in spite of its low elevation. Glaciers that moved down from the mountains to the south overrode this area

gouging the fjords and channels and eroded the upland surface. The ecosection extends from the mouth of the Nimpkish River north and west around the north end of Vancouver Island past Quatsino Sound to the Klaskish and Colonial valleys. The many inlets of Quatsino Sound dissect it. The rivers that drain this area are short, with most originating on the lowland. Victoria, Alice and Nahwitti are three of the largest lakes, but there are many smaller ones and wetlands across the uplands.

Vancouver Island Shelf Marine Ecosection waters enter into all the inlets including the large, multi-armed Quatsino Sound, bringing seawater in from the Continental Shelf. The small streams on the adjacent lowland provide little freshwater, that is poorly mixed with the marine waters. Glaciers gouged out the fjords, inlets and sounds, deepening them except near their outlets where deep sediments were deposited when the glaciers waned.

This is a wet lowland as moist Pacific air arrives off the Pacific Ocean unimpeded over this area before they rise over the adjacent Vancouver Island Mountains or the Pacific Ranges far to the east. Very wet Coastal Western Hemlock forests are the only forest type here, but there are many wetlands and muskeg areas on the upland surface.

Port Hardy, Port McNeil and the largest towns, other settlements include Holberg, Coal Harbour and Port Alice. The Vancouver Inland Island Highway (No. 19) from Campbell River services Port McNeill and terminates at Port Hardy; there are many all-weather industrial roads that lead to Coal Harbour, Holberg, Quatsino, Winter Harbour and Port Alice. Clearcut logging, with its attendant roads has been extensive throughout. Many communities are based on recreational and commercial fishing as the lumber industry undergoes downsizing, a large open pit mine for copper was dug on the north shore of Rupert Inlet. Cape Scott Park is the only large protected area; it extends along the coastline from Shushartie Bay west to Cape Scott and south to San Joseph Bay. Quatsino, Kwakiutl Lawn Point and Marble River are three smaller parks representing this area.

- **NIM - Northern Island Mountains Ecosection:** This is a partial rainshadow area consisting of a long, wide north-facing valley and associated mountains located in the northern mountain portion of Vancouver Island. The rocks are composed of a heterogeneous group of sedimentary, volcanic rocks folded about northerly trending axes and intruded by granitic batholiths. Uplift and dissection of the surface produced extremely rugged topography that rises above Johnstone Strait to the east or the Nimpkish Valley in the centre. Glaciers built up in these mountains before moving northward down the Nimpkish valley or eastward over the eastern flank to coalesce with glaciers coming out of the Pacific Ranges to the east. The northward flowing Nimpkish River is the largest; others include: the White, Adam, Eve, Kokish, Cluxewe, Benson, Oktawanch and Gold Rivers. Nimpkish Lake is the largest, but other large lakes include: Alice, Victoria, Bonanza, Woss, Vernon and Muchalat.

Moist Pacific air moves over the mountains from the Pacific Ocean to the west or down the north-facing valleys from Hecate Strait, bringing intense rainfall events and heavy cloud cover. There are several areas however that are in rainshadows that are somewhat protected from such air masses. The valleys and lower to mid-elevation slopes are dominated by very, wet Coastal Western Hemlock forests, drier forests occur in the rainshadows. Wet Mountain Hemlock subalpine forests occur on the upper slopes, below the alpine, which here is either

densely vegetated or barren rock, small mountain glaciers occur on the highest northeast-facing mountains.

The settlement of Woss a former logging camp is located in the middle of this ecosection while Kelsey Bay and Sayward are located on the northeastern boundary near Johnstone Strait and Gold River is located at the southern boundary upstream from Muchalat Inlet. The Vancouver Inland Island Highway (No. 19) passes through Woss and Nimpkish, while the Gold River Highway (No. 28) connects Gold River with Campbell River. Intensive and extensive clearcut logging with its attendant roads has occurred in the valley bottoms and lower slopes. Many of the roads have become major all-weather roads that provide access from eastern Vancouver Island to small coastal villages. Several parks have been established in this ecosection including: the Lower Tsitika River, Nimpkish Lake, Schoen Lake, Woss Lake and White Ridge parks; the upper Elk and Ucona rivers portions of Strathcona Park; and Robson Bight (Michael Biggs) Ecological Reserve that was established for the protection of killer whales.

- **WIM - Windward Island Mountains Ecosection:** This is an area on the western margin of Vancouver Island that consists of lowlands, islands, and rugged mountains. The rocks are composed of a heterogeneous group of sedimentary, volcanic rocks folded about northerly trending axes and intruded by granitic batholiths. Uplift and dissection of the surface produced extremely rugged topography that rises above the Continental Slope to the west. Glaciers built up along the crest of these mountains before flowing westward into the Pacific Ocean, rounding some of the summits and ridges and leaving vast quantities of glacial sediment along the coast line. As well that large ice sheet heavily impacted the many fjords, channels and sounds by deepening them and straightening their margins. The ecosection extends from Jordan River in the south to Brooks Peninsula in the north. There are any short rivers that empty directly into the marine waters. Nahmint, Henderson and Nitinat are three of the largest lakes here.

Vancouver Island Shelf Marine Ecosection waters enter into all the inlets included the large, multi-armed Quatsino Sound, bringing seawater in from the Continental Shelf. The small streams on the adjacent lowland provide little freshwater, that is poorly mixed with the marine waters. Glaciers gouged out the fjords, inlets and sounds, deepening them except near their outlets where deep sediments were deposited when the glaciers waned. There are many fjords, inlets and channels here, including: Kyuquot, Nootka, Clayoquot and Barkley sounds and Esperanza Inlet and Port San Juan.

Pacific storms can bring intense rainfall and storms to these mountains as it rises over them heading to the east. Warm summer temperatures mixing with the cold Pacific water can bring heavy fog along the coast. Very wet Coastal Western Hemlock forests dominate the islands, lowlands, and valleys and lower to mid–elevation slopes; muskeg and wetlands occur along the Estevan Coastal Plain on the extreme western margin. Very wet Mountain Hemlock subalpine forests are restricted to the very few higher summits along the eastern margin with the adjacent ecosections.

Several towns and communities have been established to service resource extraction, Tofino and Ucluelet are the two largest, other smaller settlements include: Zebellos, Tahsis, Bamfield, Port Renfrew, River Jordan and several First Nation villages; Sooke is located along the southern margin. The Port Alberni-Pacific Rim Highway (No. 4) connects the Long Beach area with Port Alberni; and the West Coast Highway (No. 14) connects Port Renfrew and River Jordan with Victoria. Several all-weather resource roads are also used to gain access for some of the

communities. Extensive clearcut logging, with its attendant roads, has occurred in almost all the accessible valleys and lower slopes outside the protected areas. There are a wide variety of representative protected areas that have been established in this ecoregion: Pacific Rim National Park (including Long Beach, Broken Group and West Coast Trail units), Juan De Fuca Marine Trail, Carmanah – Walbran, Clayquot Arm and Clayquot Plateau, Flores Island, Hesquiat Peninsula, the western one-third of Strathcona, Bligh Island, Tashish – Kwois, and Brooks Peninsula parks and Checleset Bay Ecological Reserve.

- **Outer Pacific Shelf Marine Ecoregion:** This is a narrow continental shelf area that extends westward from Vancouver Island to the bottom edge of the continental slope. It is a triangle-shaped area 90 km wide off the southwest coast of Vancouver Island to 45 km wide off the north coast. There is intense upwelling at the edge of the continental slope and strong tidal currents around the Scott Islands and Brooks Peninsula, that creates intense tidal mixing which results in the proliferation of sea life. This shelf is under the influence of the southeasterly flowing California Current during the late spring to early autumn period and brings with it northwest winds. Starting in late autumn or early winter the California Current is shifted offshore by the Davidson Current and this southward flowing current then persists until early spring when the California Current again moves inshore.

This aquatic marine ecoregion contains six marine ecoregions in the offshore and more protected British Columbia waters. Two ecoregions have a terrestrial component and the other four are predominately marine.

- **CNS – Continental Slope Marine Ecoregion:** This is a steep, dissected slope at the edge of the Continental Shelf that lies to the east. There are strong down-slope and cross-slope turbidity currents, causing great upwelling currents from the great depth (1800m) along the western margin. This slope marks the seaward extent of the North American Continent the start of the slope varies from 90 km off the southwestern coast of Vancouver Island to 45 km off the northern tip of the Island, to begin right offshore of Graham Island. Glaciers stopped at about the upper limit of this ecoregion, dropping much sediment in the process.
- **DIE – Dixon Entrance Marine Ecoregion:** This is an east-west depression in the Continental Shelf, that is bounded by Dall and Prince of Wales islands, in Alaska to the north and by Graham Island on Haida Gwaii to the south. At the seaward end it is split into two deep 400m deep channels and by a shallow ridge that rises to within 35m of the surface. To the east these channels recombine to form a single depression that gradually shoals to 270 m over a sill south of Cape Chacon, Alaska, followed by more rapid shoaling over the submarine ridge that separates Dixon Entrance from Chatham Sound. Glaciers moving down out of the Coast Mountains to the east and north, combined with submarine faulting of the bedrock have caused most of the relief changes and sedimentation. Freshwater coming out of the adjacent mountains, especially from the Nass and Skeena rivers greatly reduces the salinity.

Pacific air moving over this ecoregion brings strong winds, heavy rains, and heavy seas as large swells move in from the adjacent ocean. The few islands and islets that occur here have wet Coastal Western Hemlock forests or they have bare rock and muskeg. Commercial fishing is the main resource use, but this strait is also important for ocean-going vessels serving Prince Rupert.

- **HES – Hecate Strait Marine Ecoregion:** This is the shallowest of the three large Inner Pacific Shelf ecoregions, as well it is the least exposed and has the most uniform bathymetry (bottom contour). The axis is a narrow, submarine valley that hugs the mainland flank, with depths that diminish from about 300m in the south to about 50m in the north. The northwest side is a broad platform of glacially deposited sands and gravels that were transported from the Kitimat Ranges to the east. Moist Pacific air can easily override this strait bringing heavy precipitation, strong winds and rough seas. Freshwater coming out of the adjacent mountains, especially from the Skeena River reduces the salinity greatly. Commercial fishing is the main resource use.
- **QCS – Queen Charlotte Sound Ecoregion:** This is a shallow marine area that lies between the mainland, northern Vancouver Island and southern Haida Gwaii. It contains only a few islets that are close to the main body of the Hecate Lowland physiographic unit. The bathymetry is complex as it contains a large shallow bank and three broad troughs that slice inland from the Continental Slope, all three have shallow sills that are glacial in origin as a result of the large Cordilleran Ice Sheet that pushed soft debris out from the adjacent mountains.

This is a wide marine shelf located between the Hecate Lowland in the east, the Haida Gwaii in the northwest, the open Pacific Ocean to the southwest and Vancouver Island to the south. Ocean waves and currents mixing marine water with freshwater coming out of the mountains affect this area.

Pacific air masses move easily over this shelf bringing strong winds, heavy rain and rough seas. The few islands and islet here are wind-swept and contain sparse Coastal Western Hemlock forest, barren rocks or muskeg.

There are no settlements and the major resource use is commercial fishing. The Goose Group of islands and islets are part of the Hakai Luxvbalis Conservancy; the Moore/McKenney/Whitmore Islands and the Byers/Conroy/Harvey/Sinnett Islands and surrounding marine waters are two Ecological Reserves established for nesting seabirds and for harbour seal breeding. The islets in this ecoregion are very important for colony nesting birds and as Harbour Seal and Sea Lion haul outs.

- **QCT - Queen Charlotte Strait Ecoregion:** This is shallow marine area that is interspersed with many islands, islets and reefs, located between northern Vancouver Island and the Hecate Lowland. The southern large islands, namely Malcolm and Cormorant are comprised of soft sedimentary rocks, while the northern islands, such as Hope and Nigei are composed of erosion resistant volcanic rocks. Glaciers moved west down from the Pacific Ranges to the east and coalesced with smaller glaciers from the northern Vancouver Island Mountains as they moved out over the Hecate Strait. They scoured the islands and deposited glacial debris in the water. There are strong currents mixing the oceanic and freshwaters in the many channels, sounds and straits.

The marine waters are primarily shallow basin with adjacent deep fjords. There are strong currents, well mixed with moderate salinity, but with some freshwater from the adjacent uplands.

Pacific air moves over this area, bringing strong winds and heavy precipitation as that air moves eastward over the adjacent Pacific Ranges or southward into the Georgia Basin. The islands support wet Coastal Western Hemlock forests.

The only two communities, Alert Bay and Sointula occur on Cormorant and Malcolm islands respectively, but many smaller village sites and summer recreation locations occur here. There are three protected areas here: God's Pocket Marine Park is located on Hurst and Bell islands and surrounding waters; the northern portion of Broughton Archipelago Marine Park is located in the south of this ecosection and Ugwiwey-Cape Caution Conservancy is located south of Bramham Island in the northeast.

- **VIS – Vancouver Island Shelf Ecosection:** This is a shallow oceanic area, with a few isolated islands, islets and reefs. It lies offshore from western Vancouver Island and it extends westward as far as the top edge of the continental slope.

This is a very important area for commercial fishing. The islands and islets are very important for Sea bird colony nesting, harbour seal breeding and sea lions haul outs. The marine portion of Pacific Rim National Park, and Checleset Bay Ecological Reserve; and the Anne Valle (Triangle Island), Sartine Island and Beresford Island ecological reserves and Lanz and Cox Islands Parks are all included as protected areas in this ecosection.

GED - Georgian Depression Ecoprovince

Location - This ecoprovince lies between the Vancouver Island Mountains and Olympic Mountains on the west and the southern Coast Mountains and northern Cascade Ranges on the east. In British Columbia, this ecoprovince is a large basin that encompasses the southeastern Vancouver Island Ranges and the Nanaimo Lowlands in the west, the Strait of Georgia, Gulf Islands and Strait of Juan de Fuca in the middle, and the Georgia Lowlands and the Fraser Lowlands in the east. In Washington, this Ecoprovince is also a large basin that encompasses the lower, eastern slopes of the Olympic Mountains in the west, the Puget Trough and adjacent lowlands in the middle, and the western foothills of the Cascade Ranges on the east.



The majority of the human population in British Columbia and Washington occurs in this ecoprovince and the environment has been greatly modified. Large portions have been converted to exclusive urban and industrial use. Agriculture is intense and includes dairy production, food crops, berries and cereals. Logging remains important on the periphery of the settled area, but is coming into serious conflict with recreational use of the few remaining natural areas.

Climate - This ecoprovince is characterized by a particularly effective rainshadow in the lee of the Vancouver Island Ranges of the Insular Mountains and the Olympic Peninsula of the Coast Range in Washington. After moving over these barriers, surface air flow is level or subsiding and creates clearer skies and drier conditions than in coastal areas adjacent to the Pacific Ocean. The southern parts of this

ecoprovince have the greatest annual amounts of sunshine in British Columbia. Temperatures throughout the area are moderated by the adjacent Pacific Ocean and inshore marine waters.

Except where prevailing winds and topography have combined to create rainshadow effects, such as on the Saanich Peninsula and Gulf Islands, the Vancouver Island side is wetter and cloudier than the Lower Mainland side, because of increased exposure to moist air from the sea. On the Lower Mainland side, there is not sufficient relief to force moist air to cooler elevations, and as a result the area is fairly dry. Part of it is known locally as the Sunshine Coast.

This ecoprovince is affected by heavy fall and winter rains that bring extreme rainfall events during the October to February period, and in some cases, warm subtropical storms bring intense rainfall from the southwest during the October to early January period. Otherwise winter rain arrives from northeast Pacific from the west and northwest, through the Strait of Juan de Fuca, low passes such as the Nitinat/Cowichan valley and Johnstone Strait or over the Vancouver Island Mountains.

Physiography - In British Columbia, the Georgia Depression Ecoprovince is a large basin that encompasses the southeastern Vancouver Island Mountains, the Nanaimo Lowlands, and the Gulf Islands in the west, the Strait of Georgia, in the middle, and the Georgia Lowlands and Fraser Lowlands in the east.

The whole area was covered by ice during the glacial periods of the past one million years. Ice flowing westward from the Coast Mountains and eastward from Vancouver Island Ranges coalesced in the strait to form a glacier that flowed southeastward and southward and escaped to the sea westward through Juan de Fuca Strait, or moved south across the Puget Sound and Puget Lowlands in Washington. Much of the lowland area was flooded after being pushed below sea level by the weight of ice. Fine silt and clay material settled out over those areas. At some sites fast-moving water deposited coarse sand and gravels, and there are moraines of mixed rock and soil.

The western portion of the ecoprovince consists of rugged mountains that have been deeply eroded, leaving some mountains isolated above the general land surface. East of these mountains are the Nanaimo Lowlands, and area with low relief and undulating topography mixed with areas of sharp crests and narrow valleys. Several medium-sized rivers (Cowichan, Chemainus, Nanaimo, Puntledge, and Campbell rivers) flow from the mountains through the coastal lowlands to terminate with well-developed estuaries.

Within the Strait of Georgia are many small islands. Most are composed of bedrock, although a few, such as Savary, Sidney and James islands, are composed of glacial deposits. Savary Island is a particularly large end-moraine.

The eastern portion of the ecoprovince consists of a large delta that has filled in around low hills (Fraser Lowlands) and a narrow coastal plain of glacial deposits (Georgia Lowlands). The Fraser River dominates the area but there are several small rivers and streams that cross the valley from the mountains.

Oceanography -The Strait of Georgia is a semi-enclosed estuarine environment that is strongly affected by freshwater discharge, mainly from the Fraser River, but also from numerous other streams, such as: the Skagit, Squamish, Cowichan, Puntledge, Campbell and Toba rivers. It is rich in a variety of foods at depths that many different diving birds can attain. There are 4 distinct marine environments in the Georgia Depression Ecoprovince. A nearshore zone surrounds all the islets, islands, and mainland, with an intertidal zone as the dominant interface between land and sea. Most of the shoreline is rocky and steep. Inter-island channels and sounds provide a variety of habitat quality. Most are steep-sided with fast tidal currents. Extensive shallow areas such as Baynes Sound provide a nutrient-rich environment. Estuaries trap nutrients carried down by rivers and create extremely diverse and rich ecosystems that attract thousands of migrant and wintering waterfowl and shorebirds. Several estuaries occur in the

ecoprovince, including the Fraser River estuary, which is by far the largest in the province. This ecoprovince has only protected waters, but the Strait of Georgia is deep enough to have a mesopelagic zone as well as an epipelagic layer.

Vegetation - The Georgia Depression supports vegetation with the longest growing season in British Columbia. Vegetation is dominated by the Western Hemlock Zone that occurs on the Vancouver Island Mountains and lowlands, and the lowlands on the eastern side of the Olympic Mountains. Coastal Douglas-fir occurs along the Nanaimo Lowlands, Gulf Islands and Puget Trough; Mountain Hemlock and Alpine Tundra Zones occur only on the higher portions of the Vancouver Island Ranges and Olympic Mountains. In addition, two important local habitats have developed. Estuarine habitats form where freshwater rivers enter the marine straits. From the high tide ridges to subtidal mudflats, there are bands of vegetation that include tufted hairgrass, fescues, rushes, seaside arrow-grass, silverweed, and sedges. Further inland, creeks and rivers support riparian forests dominated by black cottonwoods, red alder, and bigleaf maple. Agricultural and residential development on most of the lowland areas has resulted in the loss of much of both habitats.

At lower elevations, a vegetation zone dominated by Douglas-fir occurs. The common trees include grand fir, western redcedar, and western flowering dogwood. Understory plants include a dense shrub cover of salal, dull Oregon-grape, sword fern, starflower, and mosses. Soils are moderately weathered, and become dry in summer. In the Fraser Valley, fluvial soils are now extensively altered by agriculture or urban development. Of special interest, particularly on Vancouver Island and the Gulf Islands, are rocky sites with arbutus and Garry oak forests, with understories dominated by spring wildflowers, such as camas, sea blush, shootingstar, and blue-eyed Mary, and by shrubs such as oceanspray and common snowberry. This unique habitat has suffered from urban development.

Above the low elevation forests and further inland, where climatic moisture increases, lays an extensive vegetation belt dominated by western hemlock, however, Douglas-fir and western redcedar are the common seral species in this moist zone. Understories are generally shrub-dominated, primarily with salal and dull Oregon-grape. Red alder, salmonberry, sword fern, bracken, fireweed, and dense mosses are characteristic. Logging has been extensive. At higher elevations, amabilis fir may be mixed with western hemlock.

The subalpine vegetation belt is dominated by dense forests of mountain hemlock and amabilis fir. Yellow-cedar may also be present, and understories are shrub-dominated with white-flowered rhododendron, false azalea, blueberries, queen's cup, bunchberry, twayblades, and five-leaved bramble. Soils are heavily leached and acidic, with thick forest floor accumulation. At upper elevations, the forest cover becomes discontinuous and dominated by mountain hemlock. Extensive dry areas between the tree clumps may be covered with mountain-heathers, crowberry, and partridgefoot. In wetter areas with delayed snow melt, moisture-requiring species such as Sitka valerian, Indian hellebore, white marsh-marigold, leatherleaf saxifrage, and black alpine sedge occur.

The upper vegetation zone of alpine tundra is limited in extent to a few mountain peaks on Vancouver Island. Mountain-heathers, saxifrages, and lichens predominate and rock outcropping is extensive.

Fauna – Columbian Black-Tailed Deer are very abundant in the rural and natural areas throughout the ecoprovince. American Black Bear occur throughout, although less commonly on the Gulf and San Juan islands. Grizzly Bears have been extirpated from the Lower Mainland of British Columbia for a considerable time now, (they however, never did occur in either Vancouver Island nor apparently, in the Puget Sound area). Other large mammals include Cougar, Roosevelt Elk (Vancouver Island and Olympic Mountains, as well they have been introduced to the Georgia Lowland), and Coyote (Lower Mainland and Puget Sound.) The extensive marine/land interface provides haul-out areas for Harbour Seals and

Northern and California Sea Lions. Offshore, Killer Whales and Harbour Porpoises are common marine mammals. On-shore, in the estuaries, along riverbanks and lakeshores, Northern American River Otters, Mink and Raccoons are common predators.

Small mammals almost restricted to the ecoprovince, include the Vancouver Island Marmot, on Vancouver Island and Olympic Marmot, on the Olympic Peninsula; other small mammals include: Marsh Shrew, Trowbridge's Shrew, Shrew-Mole, Townsend's and Coast Mole, Douglas' Squirrel, Creeping Vole and Eastern Cottontail (introduced).

This ecoprovince supports the highest diversity of birds in British Columbia - 90% of all species known to occur in the province. It also has 60% of the species that are known to breed in British Columbia. Many of these species are casual and accidental - spotted by the many birdwatchers in the area.

The wetlands of the Fraser River delta make up the largest single unit of wetland habitat in British Columbia. In addition, the mild climate enables it to be the most important migratory and wintering area for waterbirds in the province. Waterfowl are abundant, including Snow Geese during the winter months. The delta supports the largest wintering population of raptors in Canada. Notable among these are the Northern Harrier, Red-tailed Hawk, and Short-eared Owl. The delta is also important to migrating shorebirds, most of the world's Western Sandpipers stage, rest and feed there. In winter, Dunlin is the most numerous shorebird.

Large numbers of waterbirds winter in bays, surge narrows, and estuaries throughout the Georgia Depression Ecoprovince. Notable among these are the Pacific Loon, Western Grebe, Brandt's Cormorant, Common and Barrow's goldeneyes, Surf, White-winged and Black scoter, Greater and Lesser scaup, Thayer's and Glaucous-winged gulls, Common Murre, and Marbled and Ancient murrelets. The area is also important to wintering shorebirds such as Black Turnstone and Surfbird.

In British Columbia the only resident populations of Barn Owl and Anna's Hummingbird occur in this ecoprovince. The Gulf Islands support the only breeding colonies of Double-crested Cormorants, and most of the colonies of Glaucous-winged Gulls in the province. Three species of passerines breed only in the Georgia Depression Ecoprovince: Purple Martin, Bushtit, and Hutton's Vireo. The Eurasian Skylark introduced to the Victoria area, and the Crested Myna, introduced to the Vancouver area, maintain the only North American breeding populations in this Ecoprovince.

Reptiles include the western pond turtle (introduced), and sharptail snake. Characteristic amphibians include the Pacific treefrog, Pacific giant salamander, ensatina, bullfrog (introduced), and green frog (introduced).

This ecoprovince supports a wide variety of fish from the purely marine species such as rockfish, flounder, spiny dogfish, Pacific herring and ling cod, to fish that spawn in freshwater, but live as adults in marine water, such as the Pacific salmon, steelhead, coastal cutthroat trout, and eulachon, through to the species that only live in fresh water, such as the introduced pumpkinseed and smallmouth bass, or the native peamouth chum and threespine stickleback. A few species move regularly from freshwater to the brackish estuaries and even marine environment, such as the green sturgeon, Dolly Varden char, (bull trout occur only in the Lower Mainland), and Coast Range sculpin.

Ecoprovince Subdivisions

The Georgia Depression Ecoprovince in British Columbia is subdivided into four ecoregions containing seven ecosections (One of those is a marine ecoregion and three are marine ecosections).

EVI - Eastern Vancouver Island Ecoregion

This is an area of reduced rainfall leeward of the Vancouver Island Ranges. The rugged mountains along the centre of the island gradually become reduced in height to the east, becoming low ridges and isolated hills before ending on a wide lowland plain. There is also a small basin in the centre. The area is comprised of a heterogeneous group of sedimentary and volcanic rocks folded about northwesterly trending axes that have been intruded by numerous granitic batholiths. The highest mountains on the island lie between Cowichan Lake and the White River. It is comprised of two ecosections that correspond to physiographic differences.



- **LIM - Leeward Island Mountains Ecosection:** This is a mountainous area from the crest of the Vancouver Island Ranges to the Nanaimo Lowlands. It includes the Great Central Lake Basin and Port Alberni and Cowichan Lake. These mountains have been eroded by past glaciation that has eroded the slopes and ridges and deposited deep glacial debris on the adjacent lowland. Glaciers moved down off the mountains to coalesce with large glaciers from the Pacific Ranges to the east that moved south down the Strait of Georgia. Several large rivers, including, drain this ecosection on the eastside: Salmon, Elk, Puntledge, Qualicum, Englishman, Nanaimo, Cowichan and Shawnigan. On the west side, primarily the Stamp River drains these mountains. As well, there are many shorter streams. In this area there are several lakes, such as: Buttle, Great Central, Sproat, Upper Campbell, and Cowichan.

Moist Pacific air that has moved over the western side of Vancouver Island gives rise to rainshadows and a drop in precipitation, although still bringing heavy cloud cover. In the summer hot, dry air from the south can advect into the lower valleys bring in warm temperatures and very dry conditions. Winter storms can result from cold Arctic air moving through wide valleys in the Pacific Ranges and across the Strait of Georgia, bringing very cold conditions and deep snow to the east facing valleys and slopes; such storms are infrequent and of a short duration. Due to its elevation this ecosection has the harshest winter climate within this ecoprovince. Vegetation zones reflect the mountainous, coastal environment: moist Coastal Western Hemlock forests occurs on all the lower mountain slopes, along the eastern foothills and in the large valleys; parkland stands of moist Mountain Hemlock subalpine forests occurs near tree line, while below that, denser Mountain Hemlock and Yellow Cedar forests dominate. Wet Alpine vegetation occurs on the summits of only the highest mountains.

Port Alberni is the largest population centre in this ecosection, smaller communities include: Sooke, Shirley, Mesachie Lake and Youbou. The West Coast Highway (No. 14) from Sooke to River Jordan provides access from Victoria to Port Renfrew; Qualicum to Port Alberni Highway (No. 4), from Coombs to Port Alberni provides access from Parksville to Long Beach; the Gold River Highway (No. 28) provides access from Campbell River to Gold River; the Vancouver Island Highway (No. 19), in the northern part of the ecosection, provides access from Campbell River to Port Hardy. Clearcut logging has been extensive throughout the ecosection for the past one hundred years and there are many forest access roads; mining has occurred in selected locations such as the Westmin mine on the slopes above the southern end of Buttle Lake and the mining area has been excluded from Strathcona Park. The eastern portion of Strathcona and Strathcona – Westmin parks constitute the largest area protected within the ecoprovince.

- **NAL - Nanaimo Lowland Ecosystem:** This is a coastal plain that is situated on the eastern margin of Vancouver Island. It is underlain by sedimentary rocks, in which coal deposits can occur. Glaciers that moved eastward down from the adjacent mountains met and coalesced with the larger glacier moving across the Strait of Georgia from the Pacific Ranges to the east, as the glaciers retreated the large glacier stagnated while the Vancouver Island glaciers retreated upslope washing large quantities of sand and gravel and even silt into the marine waters lying west of the Strait of Georgia glacier. This resulted in very deep deposits of sediments on this lowland. There are no large streams that originate on this lowland, but several larger ones pass through it, such as: lower Elk, Puntledge, Nanaimo, Englishman, Cowichan and Koksilah; there are however many short streams that drain this ecosystem. There are several large lakes that are contained within this ecosystem or that are partially in it: Horne and Shawnigan are examples of the former, while Comox Lake and Campbell Lake reservoir are examples of the latter.

Pacific systems can arrive via the Strait of Juan de Fuca to the south, the Hecate Strait to the north or from over the Vancouver Island Mountains. There are some rainshadow areas and some areas receive greater amounts of precipitation than others. In the summer hot, dry air from the south can advect over this lowland bringing in warm temperatures and very dry conditions that are Mediterranean in effect. Winter storms can result from cold Arctic air moving through wide valleys in the Pacific Ranges and across the Strait of Georgia, bringing very cold conditions and deep snow to this lowland; such storms are infrequent and of a short duration. This ecosystem has a mild climate with low snow depths, as expressed by the warm, dry Coastal Douglas-fir forests, with Arbutus trees that occur in small stands or are intermixed with the Douglas-fir forests; mild Coastal Western Hemlock forests occur on the higher elevations, along the eastern foothills and in the northern segment of this ecosystem. Along its entire eastern boundary this ecosystem includes the marine/land interface including the intertidal and nearshore zone.

The Nanaimo Lowland Ecosystem includes a large population located along its length, such as: the communities of Duncan, Cowichan Lake, Chemainus, Ladysmith, Nanaimo, Parksville, Qualicum Beach, Courtney-Comox and Campbell River as well as numerous smaller suburban and rural centres; the Trans-Canada Highway (No. 1) extends up the east side of the Ecosystem from Mill Bay to Nanaimo, from there the Vancouver Island Highway (No. 19 & 19A) extends north past Courtney and Campbell River past Sayward; there are numerous rural and industrial roads throughout this ecosystem. In the past logging was excessive and has resulted in very little of the old growth forest types left. There are several small parks used for day-use recreation and camping in this ecosystem, Cowichan River and Elk Falls parks are the two largest.

GPB - Georgia-Puget Basin Ecoregion is a semi-enclosed estuarine basin that includes several straits, troughs, island clusters, as well as the Strait of Georgia. It extends from Johnstone Strait, south across the Canada/U.S.A. boundary to Nisqually Reach in Washington State.

This ecoregion contains only one terrestrial ecosystem that has been based on its location within the oceanographic basins.

- **SGI - Southern Gulf Islands Ecosystem** is a collection of islands, that occur south of Departure Bay at Nanaimo:



notably Newcastle and Gabriola islands south to Chatman, Discovery and Chain islands, and inter-island channels and sounds that extends across the Strait of Georgia, the San Juan Island in Washington; as well this ecoregion includes the Saanich Peninsula, Sooke and Shawnigan Lake basins. The islands consist of folded and faulted sedimentary rocks, with some volcanic stocks intermixed. It is the faulting that has resulted in the many linear valleys and island separations. Glaciers that moved eastward down from the adjacent mountains met and coalesced with the larger glacier moving across the Strait of Georgia from the Pacific Ranges to the east, as the glaciers retreated the large glacier stagnated while the Vancouver Island glaciers retreated upslope washing large quantities of sand and gravel and even silt into the marine waters lying west of the Strait of Georgia glacier. This resulted in very deep deposits of sediments on this lowland. Streams that originate here are short and often ephemeral, drying in the summer. There are many small lakes and some wetlands but no large lakes here.

Pacific systems can arrive via the Strait of Juan de Fuca to the south, the Hecate Strait to the north or from over the Vancouver Island Mountains. There are some rainshadow areas and some areas receive greater amounts of precipitation than others. In the summer hot, dry air from the south can advect over this lowland bringing in warm temperatures and very dry conditions that are Mediterranean in effect. Winter storms can result from cold Arctic air moving through wide valleys in the Pacific Ranges and across the Strait of Georgia, bringing very cold conditions and deep snow to this lowland; such storms are infrequent and of a short duration. This ecoregion has a mild climate with low snow depths, as expressed by the warm, dry Coastal Douglas-fir forests, with extensive Garry Oak and arbutus dominates the terrestrial environment on the drier areas throughout. The intertidal, nearshore and epipelagic zones dominate the marine environment.

The Strait of Georgia Marine Ecoregion surrounds these islands, in the inner channels and sounds the water is generally calmer and shallower, while to the east the deeper and windier portion of the Strait of Georgia dominates.

Urban centres include all of Greater Victoria (from Sooke to North Saanich), Shawnigan Lake, Ganges and small centres on each of the Southern Gulf Islands. The main corridors include the Trans-Canada Highway (No. 1) from southern Victoria to Mill Bay; the Patricia Bay Highway (No. 17) from Saanich north to Swartz Bay Ferry Terminal, and many other suburban and rural roads on all but the smallest and most isolated islands; access to the islands is by ferry, small boat or small aircraft. In the past logging has removed much of the old growth Douglas-fir forests and extensive suburban and rural development has occurred here. The Gulf Islands National Park is located at numerous small locations scattered throughout the southern Gulf Islands, there are also several Provincial (such as Gowland Tod Park) and Regional parks (such as East Sooke Park) in this ecoregion.

- **GEB – Georgia Basin Marine Ecoregion:** In British Columbia this marine ecoregion contains two marine ecoregions.
 - **SOG - Strait of Georgia Marine Ecoregion:** This is a broad relatively shallow, semi-enclosed estuarine basin that separates southern Vancouver Island from the mainland. It is mainly marine waters, but it also contains several islands. The islands have very dry mild climates, such as southern Quadra, Cortes, Texada, Lasqueti, Denman and Hornby islands. The southern islands and lower portion of Texada Island area dominated by the dry Coastal Douglas-fir Zone, whereas the northern islands and the upper portion of

Texada Island are dominated by the very dry maritime variant of the Coastal Western Hemlock Zone. The marine environment is dominated by the intertidal, nearshore, epipelagic and mesopelagic zones.

- **JOS - Strait of Juan de Fuca Marine Ecosystem:** This a deep trough marine area with a strong “estuary-like” outflow current. It is the major water exchange conduit between the Georgia - Puget Basin Ecoregion and the open Pacific Ocean. Except for a few islets, such as Race Rocks, most of the ecosystem is marine waters. The northern and southern boundaries approximate the outer limit of the nearshore zone; while the eastern boundary in British Columbia is south of Chain Islets & Discovery Island; in Washington it is south of the San Juan Islands and east of Whidbey Island. The southern deep-sea marine portion of Pacific Rim National Park – West Coast Trail Unit occurs in the far northwest portion of this ecosystem.

LOM - Lower Mainland Ecoregion

This an area of increased rainfall and precipitation increases towards the Coast Mountains and Cascade Ranges. There is a slight rainshadow on the lowlands and Fraser River delta. This ecoregion extends from Desolation Sound, south across the International border to the Chehalis River in Washington. The land is generally flat but some higher ridges and hills occur above the low land surface. There are two ecosystems that correspond to physiographic differences.



- **FRL - The Fraser Lowland Ecosystem:** This ecosystem consists of the Fraser delta, estuary, lowlands, and associated uplands. This lowland has been formed primarily by deposition of great age that has washed down the Fraser River for several million years. It is a triangular shaped area with its headland in the narrow Fraser River valleys east of Bridal Falls, from there it extends south-westward to Bellingham, Washington. The area is bounded on the north by the Pacific Ranges; it terminates at the shoreline of the Fraser Delta and West Vancouver. The nearshore zone of the Strait of Georgia forms the western boundary. The rocks at the basement of the sediment is the typical granitic rocks of the Coast Mountains, but nearly 3,000 m of sediment overly those rocks. The Fraser Delta is still building seaward every year supplied with material from the interior of the province, washed down annually by the Fraser River. Other than the Fraser River there are several large streams that cross here, including: Harrison, Stave, Pitt and Coquitlam, on the north side of the valley; and Chilliwack, Sumas and Serpentine in B.C. and the Nooksack River in Washington. There are no large lakes here but historically Sumas Lake occupied much of what is now called Sumas Prairie.

The Strait of Georgia Marine Ecosystem extends to the Fraser River estuary, as well as an intertidal and nearshore zones this environment extends up Burrard Inlet.

Pacific air passing over this area can stall against the mountains bringing intense rain or snow to the adjacent mountains. In the summer hot, dry air from the south can advect over this lowland bringing in warm temperatures and very dry conditions that are Mediterranean in effect. Winter storms can result from cold Arctic air moving through wide valleys in the Pacific Ranges and across the lowlands bringing cold conditions and deep snow to this lowland; such storms are

infrequent and of a short duration. Vegetation zonation varies with elevation, distance from the Strait of Georgia and the corresponding nearness of the mountains. In the lowest portion of the Fraser Delta dry Coastal Western Hemlock forests occur, which gives way to the dry maritime Coastal Western Hemlock forests on the highest areas.

The largest urban population in British Columbia, from Vancouver to Chilliwack occurs here; in Washington, beside Bellingham, extensive urban and rural development occurs throughout the Ecoregion. The Trans Canada Highway (No. 1) is located from Horseshoe Bay in the northwest, through Greater Vancouver, to Bridal Falls in the east; The Lougheed Highway (No. 7) is located on the north side of the Fraser River, from Vancouver in the west to Agassiz in the east; the Vancouver to Blaine (No. 99) is located from West Vancouver, through Vancouver, south across the Fraser Delta to the Canada/USA border (it continues south past Bellingham as Interstate Highway No. 5. As well there are many roads and highways connecting all parts of this ecoregion. Historically these lowlands contain dense conifer forests that were clearcut late in the 19th Century, and Sumas Lake was drained and turned into farmland, as did other forest lands. Farmland has given way in many cases to rural and then urban development. Sturgeon Bank and Boundary Bay wildlife management areas are the largest protected areas; portions of Golden Ears and Pinecone Burke parks occur in the northern portion of the ecoregion.

- **GEL - Georgia Lowland Ecoregion:** This area consists of areas of low relief at the base of the Coast Ranges. It consists of deep sediments that overlie the coast granitic rocks. Deposits of glacial gravel and debris connect Patches of rocky outcrop. Glaciers moving down from the Pacific Ranges to the east smoothed the uplands as they continued westward into the Strait of Georgia. When those glaciers waned and stagnated in the marine water that allowed the sediment that was still coming off the mountains to build up along the shoreline. Several inlets, channels, sounds and fjords dissected this lowland, such as Okeover, Jervis, Sechelt inlets and Howe Sound. Sakinaw Lake is the only large lake that is entirely within this ecoregion; Powell, Haslam and Lois lakes, all fjord lakes, only terminate here.

The Strait of Georgia Marine Ecoregion surrounds the islands, inner channels and sounds that water is generally calmer and shallower, while to the west the deeper and windier portion of the Strait of Georgia dominates.

Pacific air arrives predominantly from the west from over the Vancouver Island Mountains and Strait of Georgia before it rises over the Pacific Ranges to the east. When that air remains at a high level then little precipitation falls in this ecoregion, but otherwise the area can be greatly affected by Pacific storms. In the summer hot, dry air from the south can advect over this lowland bringing in warm temperatures and very dry conditions that are Mediterranean in effect and giving the true to this area's 'Sunshine Coast' name. Winter storms can result from cold Arctic air moving through wide Squamish valley bringing strong cold winds called the 'Squamish Winds' resulting in cold conditions and deep snow to this lowland; such storms are infrequent and of a short duration. Vegetation zonation varies with elevation, distance from the Strait of Georgia and the corresponding nearness of the mountains. In the lowest portion of the Georgia Lowland dry Coastal Western Hemlock forests occur, which gives way to the dry maritime Coastal Western Hemlock forests on the highest areas nearest to the mountains.

Small urban communities, such as Powell River, Sechelt and Gibsons, plus extensive rural housing occur throughout. The Sunshine Coast Highway (No. 101) is located along the western

edge of the ecosection from Langdale in the south to Lund in the north, with a connection ferry from Earl's Cove to Saltery Bay. Clearcut logging occurred throughout this area in the past removing much of the old growth forests. Desolation Sound Marine Park is the largest, protected area, but there are numerous small ones.

Humid Continental Highlands Ecodivision

This is the second part of the Humid Temperate Ecodomain in British Columbia. It occurs in the southeastern mountains and central plateau but does not cover the southern plateau area. It has a cold snowy winter with a warm summer. Precipitation is ample all year. The natural vegetation is a coniferous forest arranged in striking belts. At the lower levels there is a montane belt of Douglas-fir, and in the south, western larch. Grasslands are exceptional. The subalpine belt is usually dominated by Engelmann spruce and subalpine fir but western hemlock and western redcedar occur where moisture is increased. The uppermost belt is alpine where trees are absent. In British Columbia this Ecodivision has

CEI - Central Interior Ecoprovince

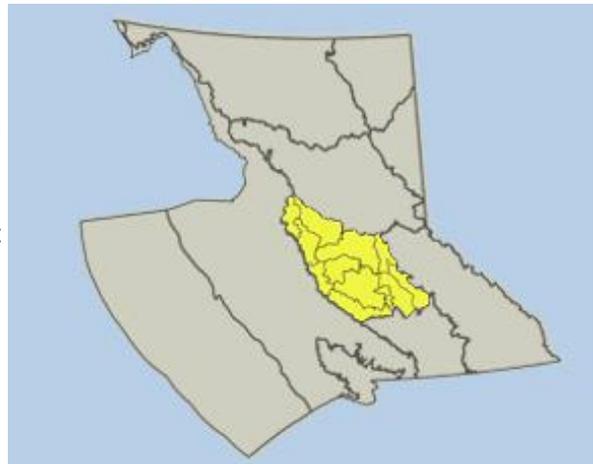
Location - The Central Interior Ecoprovince lies to the east of the Coast Mountains, between the Fraser Basin and the Thompson Plateau. This ecoprovince contains the flat to rolling Chilcotin and the Cariboo Plateaus and the southern two-thirds of the Nechako Plateau. It also contains the Chilcotin Ranges west to the centre of the Pacific Ranges and the Bulkley and Tahtsa Ranges.

Agriculture is limited to grazing and small production of forage crops. Logging is the most extensive industry based on renewable resources and there are many mines.

Climate - The area has a typical sub-continental climate: cold winters, warm summers, and a precipitation maximum in late spring or early summer. Some of the mountain ranges on the east side of the coastal mountains are included because they are much drier than the windward side and therefore have a more interior type or sub-continental climate. However, the moderating influences of Pacific air occur throughout the year, as is the case for most of the province south of 57degreesN. The area lies in a rainshadow leeward of the Coast Mountains. In summer there is intense surface heating of the many wetlands, lakes and streams and convective showers, and in the winter there are frequent outbreaks of Arctic air. They are less frequent than in areas to the north, but there is no effective barrier to slow the invasion of cold air.

Along the leeside of the Coast Mountains, especially the Chilcotin, Bulkley, and Tahtsa ranges, there is an interplay of several climatic processes. Generally this is an area of rainshadow and is dry, but extreme western areas receive more rainfall. Local areas are subjected to higher precipitation where moist coastal air pushes through the lower mountain passes. During the winter and early spring, Arctic air frequently stalls on the eastern edge of these ranges.

The northern portion of the Fraser Plateau surface exhibits little rainshadow effect, because it lies east of the low Kitimat Ranges. There is a greater influence of Pacific air through increased rainfall and a



smaller east-west precipitation gradient. The southern portion of the Fraser Plateau marks a better defined rainshadow region and is less affected by the low Kitimat Ranges to the northwest.

Physiography - The Central Interior Ecoprovince contains the Chilcotin and Cariboo plateaus, the southern two-thirds of the Nechako Plateau, and the Bulkley, Tahtsa, and Chilcotin ranges.

The Chilcotin, Cariboo, and Nechako plateaus are flat or gently rolling, and have large areas of undissected upland lying between 1,200 m and 1,500 m elevation. Much of the upland plateau is covered with glacial drift. Meandering streams and low depressions have created many wetlands and lakes. The Fraser River and lower Chilcotin River have cut below the plateau surface forming a deep badlands area that divides the Fraser Plateau into the western Chilcotin Plateau and the eastern Cariboo Plateau. To the southeast the upland surface rises gradually to 1,800 m. Most of the plateau surface is underlain by flat-lying lava flows. Those flows have steep escarpments along the rivers and creeks but almost horizontal upper surfaces. In the vicinity of Anahim Lake, 3 shield volcanoes rise above the plateau surface. In the Whitesail Lake and West Road river area, isolated mountains of erosion-resistant granite also stand above the general level of the plateau.

The Chilcotin Ranges lie along the east side of the Pacific Ranges of the Coast Mountains. They rise progressively higher in approaching the granitic ranges to the west. For the most part, the Chilcotin Ranges display a combination of high, serrated peaks rising above lower rounded summits and gently sloping areas of undissected upland. The Bulkley and Tahtsa ranges are outliers of the Kitimat Ranges and consist of softer rocks than the hard granite rocks of the Coast Mountains. The entire ecoprovince was covered by the last Cordilleran Ice Sheet arising in the Coast Mountains to the west and south and flowing northward or northeastward towards the Nechako Lowland, Columbia Mountains and the Hart Ranges; however, in a small portion of the ecoprovince, especially in the Bonaparte River watershed the ice moved to the southeast into the Okanagan valley via the Thompson valley.

Biogeoclimatic Zonation - In this ecoprovince 7 vegetation zones occur: Vegetation is dominated by the Interior Douglas-fir Zone in the south, the Sub-Boreal Pine - Spruce Zone in the centre and the Sub-Boreal Spruce Zone in the north. In addition, the Bunchgrass Zone occurs within the deeply entrenched portion of the Fraser River, the Montane Spruce Zone occurs at middle elevations in the Chilcotin Ranges and southern Chilcotin Plateau, the Engelmann Spruce - Subalpine Fir Zone occurs on the middle slope of all mountains and the higher portion of the northern Chilcotin and southern Nechako Plateaus, the Alpine Tundra Zone occurs on the upper slopes of all mountains.

Vegetation - The area is intermediate in vegetation between the wet forests of the Coast and Columbia mountains, the dry southern interior forests to the south, and the cold boreal forests to the north. Moisture increases from west to east and from south to north. Vegetation is relatively diverse and deciduous forests increase towards the northeast.

In southern areas, the lowest vegetation zone in the Fraser River badlands is grassland. Common plants include big sagebrush, rabbit-brush, bluebunch wheatgrass, needlegrasses, pasture sage, and sand dropseed. Soils have a high organic content, with dark brown surface horizons.

The shrub-grassland habitats intergrade into a zone whose climax is Douglas-fir. At lower elevations, the open forest is dominated by Douglas-fir, with bluebunch wheatgrass understories. At higher elevations, the more closed forests proceed through a succession of lodgepole pine and pinegrass stages. Other tree species are trembling aspen, white spruce (moist sites), paper birch, and Rocky Mountain juniper. Common understory species include common juniper, prickly rose, soopolallie, willows, kinnikinnick, and aster. Soils are moderately weathered and often calcareous. Floodplains are dominated by black cottonwood.

Most of the upland area is covered by two sub-boreal vegetation zones. In the southern and western portion, where the climate is severe, and dry, extensive even-aged stands of lodgepole pine dominate the rolling landscape. White spruce may only be present in the understory, except where increased moisture in depressions allows for better growth. Fires are frequent and succession extremely slow. Understories are sparsely vegetated, often with ground lichens and scattered common juniper, soopolallie, birch-leaved spirea, grouseberry, kinnikinnick, or pinegrass. Of special interest are the numerous, scattered wetlands that are characteristic of the central interior plateau surface. Sedge fens, shrub fens, and marshes are widespread. Slight increases in climatic moisture in the east, allow greater vegetation diversity. White spruce becomes more common, often with transition stands of trembling aspen, lodgepole pine, of Douglas-fir. Understory shrub density increases to include thimbleberry, falsebox, Douglas maple, velvet-leaved blueberry, asters, and grouseberry. Soils often have clay accumulation and better moisture retention.

In moister and more northern areas, the second sub-boreal zone has a climax of white spruce, often with subalpine fir. Transitional forests of lodgepole pine are common, but stands of trembling aspen and paper birch may be more characteristic of the finer soil materials (clays and fine silts). Shrub and herb diversity is high, with prickly rose, highbush-cranberry, thimbleberry, creamy peavine, pinegrass, and blue wildrye occurring along with a moderately-developed moss layer. Wetlands are common, but are often covered by shrubs and trees. Many are black spruce and sphagnum bogs.

In the southwestern area, bordering the coastal systems, there is a montane vegetation zone that is dominated by hybrid spruce, with scattered subalpine fir and extensive lodgepole pine forest. It has a sparse understory.

The subalpine vegetation zone is very limited. Its climax forest is Engelmann spruce and subalpine fir. Lodgepole pine is the common transitional species; whitebark pine may be present at higher elevations. Understories are dominated by shrubs and grasses - common plants include common juniper, soopolallie, grouseberry, lupines, arnicas, and lichens.

The alpine tundra zone is restricted to western areas. In the Chilcotin Ranges, at higher elevations that zone is dominated by rock and expansive glaciers. However, on some of the more rounded peaks in Tweedsmuir and Itchuz - Ilgachez provincial parks, alpine tundra vegetation is distinctive, dense bunchgrasses, sedges, and hardy forbs predominate.

Fauna - Moose are the most widespread wild ungulate, while mule deer occur in large populations in the southern plateau and Fraser River 'badlands' area. Several large populations of California bighorn sheep occur in the Fraser River badlands and alpine areas. Cougars, black bears, coyotes, and wolves are also common through the ecoprovince. Widespread small mammals include the western jumping mouse, muskrat and long-tailed weasel. Two species of bat, big brown bat and Townsend's big-eared bat, hibernate in the ecoprovince.

This ecoprovince supports 65% of all bird species known to occur in British Columbia and 61% of all species known to breed in the province. The only breeding colony of the American White Pelican in the province is found in the Chilcotin Plateau. Excellent habitat for waterfowl and other waterbird (e.g. grebes) production exists throughout the plateau. The world centre of breeding abundance for Barrow's Goldeneye occurs here. It is also the centre of breeding abundance for Greater Yellowlegs and the Yellow-headed Blackbird, and is one of two important breeding areas for Long-billed Curlew and Ring-billed Gull. High breeding concentrations of Eared Grebe, Sandhill Crane, Herring Gull, and Black Tern have also been found here.

The western terrestrial garter snake is the most common reptile, while the western toad and spotted frog occur throughout the area.

This ecoprovince supports both anadromous and freshwater fish. Anadromous species include: Chinook salmon, sockeye salmon, steelhead, white sturgeon and Pacific lamprey. Freshwater fish include: rainbow trout (both native and introduced populations), bull trout, mountain and lake whitefish, lake chub and redband shiner.

Ecoprovince Subdivisions

The Central Interior Ecoprovince is subdivided into 3 ecoregions containing 12 ecosections.

GPB - Georgia-Puget Basin Ecoregion is a semi-enclosed estuarine basin that includes several straits, troughs, island clusters, as well as the Strait of Georgia. It extends from Johnstone Strait, south across the Canada/U.S.A. boundary to Nisqually Reach in Washington State.

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Urban centres include all of Greater Victoria (from Sooke to North Saanich), Shawnigan Lake, Ganges and small centres on each of the Southern Gulf Islands. The main corridors include the Trans-Canada Highway (No. 1) from southern Victoria to Mill Bay; the Patricia Bay Highway (No. 17) from Saanich north to Swartz Bay Ferry Terminal, and many other suburban and rural roads on all but the smallest and most isolated islands; access to the islands is by ferry, small boat or small aircraft. In the past logging has removed much of the old growth Douglas-fir forests and extensive suburban and rural development has occurred here. The Gulf Islands National Park is located at numerous small locations scattered throughout the southern Gulf Islands, there are also several Provincial (such as Gowland Tod Park) and Regional parks (such as East Sooke Park) in this ecoregion.

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This an area of increased rainfall and precipitation increases towards the Coast Mountains and Cascade Ranges. There is a slight rainshadow on the lowlands and Fraser River delta. This ecoregion extends from Desolation Sound, south across the International border to the Chehalis River in Washington. The land is generally flat but some higher ridges and hills



occur above the low land surface. There are two ecosections that correspond to physiographic differences.

- **FRL - The Fraser Lowland Ecosection:** This ecosection consists of the Fraser delta, estuary, lowlands, and associated uplands. This lowland has been formed primarily by deposition of great age that has washed down the Fraser River for several million years. It is a triangular shaped area with its headland in the narrow Fraser River valleys east of Bridal Falls, from there it extends south-westward to Bellingham, Washington. The area is bounded on the north by the Pacific Ranges; it terminates at the shoreline of the Fraser Delta and West Vancouver. The nearshore zone of the Strait of Georgia forms the western boundary. The rocks at the basement of the sediment is the typical granitic rocks of the Coast Mountains, but nearly 3,000 m of sediment overlies those rocks. The Fraser Delta is still building seaward every year supplied with material from the interior of the province, washed down annually by the Fraser River. Other than the Fraser River there are several large streams that cross here, including: Harrison, Stave, Pitt and Coquitlam, on the north side of the valley; and Chilliwack, Sumas and Serpentine in B.C. and the Nooksack River in Washington. There are no large lakes here but historically Sumas Lake occupied much of what is now called Sumas Prairie.

The Strait of Georgia Marine Ecosection extends to the Fraser River estuary, as well as an intertidal and nearshore zones this environment extends up Burrard Inlet.

Pacific air passing over this area can stall against the mountains bringing intense rain or snow to the adjacent mountains. In the summer hot, dry air from the south can advect over this lowland bringing in warm temperatures and very dry conditions that are Mediterranean in effect. Winter storms can result from cold Arctic air moving through wide valleys in the Pacific Ranges and across the lowlands bringing cold conditions and deep snow to this lowland; such storms are infrequent and of a short duration. Vegetation zonation varies with elevation, distance from the Strait of Georgia and the corresponding nearness of the mountains. In the lowest portion of the Fraser Delta dry Coastal Western Hemlock forests occur, which gives way to the dry maritime Coastal Western Hemlock forests on the highest areas.

The largest urban population in British Columbia, from Vancouver to Chilliwack occurs here; in Washington, beside Bellingham, extensive urban and rural development occurs throughout the Ecosection. The Trans Canada Highway (No. 1) is located from Horseshoe Bay in the northwest, through Greater Vancouver, to Bridal Falls in the east; The Lougheed Highway (No. 7) is located on the north side of the Fraser River, from Vancouver in the west to Agassiz in the east; the Vancouver to Blaine (No. 99) is located from West Vancouver, through Vancouver, south across the Fraser Delta to the Canada/USA border (it continues south past Bellingham as Interstate Highway No. 5. As well there are many roads and highways connecting all parts of this ecosection. Historically these lowlands contain dense conifer forests that were clearcut late in the 19th Century, and Sumas Lake was drained and turned into farmland, as did other forest lands. Farm land has given way in many cases to rural and then urban development. Sturgeon Bank and Boundary Bay wildlife management areas are the largest protected areas; portions of Golden Ears and Pinecone Burke parks occur in the northern portion of the ecosection.

- **GEL - Georgia Lowland Ecosection:** This area consists of areas of low relief at the base of the Coast Ranges. It consists of deep sediments that overlie the coast granitic rocks. Deposits of glacial gravel and debris connect Patches of rocky outcrop. Glaciers moving down from the

Pacific Ranges to the east smoothed the uplands as they continued westward into the Strait of Georgia. When those glaciers waned and stagnated in the marine water that allowed the sediment that was still coming off the mountains to build up along the shoreline. Several inlets, channels, sounds and fjords dissected this lowland, such as Okeover, Jervis, Sechelt inlets and Howe Sound. Sakinaw Lake is the only large lake that is entirely within this ecosection; Powell, Haslam and Lois lakes, all fjord lakes, only terminate here.

The Strait of Georgia Marine Ecosection surrounds the islands, inner channels and sounds that water is generally calmer and shallower, while to the west the deeper and windier portion of the Strait of Georgia dominates.

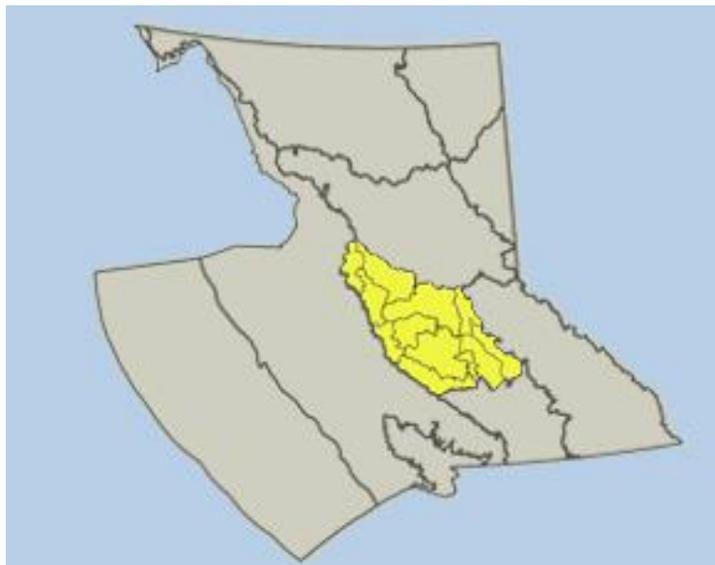
Pacific air arrives predominantly from the west from over the Vancouver Island Mountains and Strait of Georgia before it rises over the Pacific Ranges to the east. When that air remains at a high level then little precipitation falls in this ecosection, but otherwise the area can be greatly affected by Pacific storms. In the summer hot, dry air from the south can advect over this lowland bringing in warm temperatures and very dry conditions that are Mediterranean in effect and giving the true to this area's 'Sunshine Coast' name. Winter storms can result from cold Arctic air moving through wide Squamish valley bringing strong cold winds called the 'Squamish Winds' resulting in cold conditions and deep snow to this lowland; such storms are infrequent and of a short duration. Vegetation zonation varies with elevation, distance from the Strait of Georgia and the corresponding nearness of the mountains. In the lowest portion of the Georgia Lowland dry Coastal Western Hemlock forests occur, which gives way to the dry maritime Coastal Western Hemlock forests on the highest areas nearest to the mountains.

Small urban communities, such as Powell River, Sechelt and Gibsons, plus extensive rural housing occur throughout. The Sunshine Coast Highway (No. 101) is located along the western edge of the ecosection from Langdale in the south to Lund in the north, with a connection ferry from Earl's Cove to Saltery Bay. Clearcut logging occurred throughout this area in the past removing much of the old growth forests. Desolation Sound Marine Park is the largest, protected area, but there are numerous small ones.

CEI - Central Interior Ecoprovince

Location - The Central Interior Ecoprovince lies to the east of the Coast Mountains, between the Fraser Basin and the Thompson Plateau. This ecoprovince contains flat to rolling Chilcotin and the Cariboo Plateaus and the southern two-thirds of the Nechako Plateau. It also contains the Chilcotin Ranges west to the centre of the Pacific Ranges and the Bulkley and Thatsa Ranges.

Agriculture is limited to grazing and small production of forage crops. Logging is the most extensive



the

industry based on renewable resources and there are many mines.

Climate - The area has a typical sub-continental climate: cold winters, warm summers, and a precipitation maximum in late spring or early summer. Some of the mountain ranges on the east side of the coastal mountains are included because they are much drier than the windward side and therefore have a more interior type or sub-continental climate. However, the moderating influences of Pacific air occur throughout the year, as is the case for most of the province south of 57degreesN. The area lies in a rainshadow leeward of the Coast Mountains. In summer there is intense surface heating of the many wetlands, lakes and streams and convective showers, and in the winter there are frequent outbreaks of Arctic air. They are less frequent than in areas to the north, but there is no effective barrier to slow the invasion of cold air.

Along the leeward side of the Coast Mountains, especially the Chilcotin, Bulkley, and Tahtsa ranges, there is an interplay of several climatic processes. Generally this is an area of rainshadow and is dry, but extreme western areas receive more rainfall. Local areas are subjected to higher precipitation where moist coastal air pushes through the lower mountain passes. During the winter and early spring, Arctic air frequently stalls on the eastern edge of these ranges.

The northern portion of the Fraser Plateau surface exhibits little rainshadow effect, because it lies east of the low Kitimat Ranges. There is a greater influence of Pacific air through increased rainfall and a smaller east-west precipitation gradient. The southern portion of the Fraser Plateau marks a better defined rainshadow region and is less affected by the low Kitimat Ranges to the northwest.

Physiography - The Central Interior Ecoprovince contains the Chilcotin and Cariboo plateaus, the southern two-thirds of the Nechako Plateau, and the Bulkley, Tahtsa, and Chilcotin ranges.

The Chilcotin, Cariboo, and Nechako plateaus are flat or gently rolling, and have large areas of undissected upland lying between 1,200 m and 1,500 m elevation. Much of the upland plateau is covered with glacial drift. Meandering streams and low depressions have created many wetlands and lakes. The Fraser River and lower Chilcotin River have cut below the plateau surface forming a deep badlands area that divides the Fraser Plateau into the western Chilcotin Plateau and the eastern Cariboo Plateau. To the southeast the upland surface rises gradually to 1,800 m. Most of the plateau surface is underlain by flat-lying lava flows. Those flows have steep escarpments along the rivers and creeks but almost horizontal upper surfaces. In the vicinity of Anahim Lake, 3 shield volcanoes rise above the plateau surface. In the Whitesail Lake and West Road river area, isolated mountains of erosion-resistant granite also stand above the general level of the plateau.

The Chilcotin Ranges lie along the east side of the Pacific Ranges of the Coast Mountains. They rise progressively higher in approaching the granitic ranges to the west. For the most part, the Chilcotin Ranges display a combination of high, serrated peaks rising above lower rounded summits and gently sloping areas of undissected upland. The Bulkley and Tahtsa ranges are outliers of the Kitimat Ranges and consist of softer rocks than the hard granite rocks of the Coast Mountains. The entire ecoprovince was covered by the last Cordilleran Ice Sheet arising in the Coast Mountains to the west and south and flowing northward or northeastward towards the Nechako Lowland, Columbia Mountains and the Hart Ranges; however, in a small portion of the ecoprovince, especially in the Bonaparte River watershed the ice moved to the southeast into the Okanagan valley via the Thompson valley.

Biogeoclimatic Zonation - In this ecoprovince 7 vegetation zones occur: Vegetation is dominated by the Interior Douglas-fir Zone in the south, the Sub-Boreal Pine - Spruce Zone in the centre and the Sub-Boreal Spruce Zone in the north. In addition, the Bunchgrass Zone occurs within the deeply entrenched portion of the Fraser River, the Montane Spruce Zone occurs at middle elevations in the Chilcotin Ranges and southern Chilcotin Plateau, the Engelmann Spruce - Subalpine Fir Zone occurs on the middle

slope of all mountains and the higher portion of the northern Chilcotin and southern Nechako Plateaus, the Alpine Tundra Zone occurs on the upper slopes of all mountains.

Vegetation - The area is intermediate in vegetation between the wet forests of the Coast and Columbia mountains, the dry southern interior forests to the south, and the cold boreal forests to the north. Moisture increases from west to east and from south to north. Vegetation is relatively diverse and deciduous forests increase towards the northeast.

In southern areas, the lowest vegetation zone in the Fraser River badlands is grassland. Common plants include big sagebrush, rabbit-brush, bluebunch wheatgrass, needlegrasses, pasture sage, and sand dropseed. Soils have a high organic content, with dark brown surface horizons.

The shrub-grassland habitats intergrade into a zone whose climax is Douglas-fir. At lower elevations, the open forest is dominated by Douglas-fir, with bluebunch wheatgrass understories. At higher elevations, the more closed forests proceed through a succession of lodgepole pine and pinegrass stages. Other tree species are trembling aspen, white spruce (moist sites), paper birch, and Rocky Mountain juniper. Common understory species include common juniper, prickly rose, soopolallie, willows, kinnikinnick, and aster. Soils are moderately weathered and often calcareous. Floodplains are dominated by black cottonwood.

Most of the upland area is covered by two sub-boreal vegetation zones. In the southern and western portion, where the climate is severe, and dry, extensive even-aged stands of lodgepole pine dominate the rolling landscape. White spruce may only be present in the understory, except where increased moisture in depressions allows for better growth. Fires are frequent and succession extremely slow. Understories are sparsely vegetated, often with ground lichens and scattered common juniper, soopolallie, birch-leaved spirea, grouseberry, kinnikinnick, or pinegrass. Of special interest are the numerous, scattered wetlands that are characteristic of the central interior plateau surface. Sedge fens, shrub fens, and marshes are widespread. Slight increases in climatic moisture in the east, allow greater vegetation diversity. White spruce becomes more common, often with transition stands of trembling aspen, lodgepole pine, or Douglas-fir. Understory shrub density increases to include thimbleberry, falsebox, Douglas maple, velvet-leaved blueberry, asters, and grouseberry. Soils often have clay accumulation and better moisture retention.

In moister and more northern areas, the second sub-boreal zone has a climax of white spruce, often with subalpine fir. Transitional forests of lodgepole pine are common, but stands of trembling aspen and paper birch may be more characteristic of the finer soil materials (clays and fine silts). Shrub and herb diversity is high, with prickly rose, highbush-cranberry, thimbleberry, creamy peavine, pinegrass, and blue wildrye occurring along with a moderately-developed moss layer. Wetlands are common, but are often covered by shrubs and trees. Many are black spruce and sphagnum bogs.

In the southwestern area, bordering the coastal systems, there is a montane vegetation zone that is dominated by hybrid spruce, with scattered subalpine fir and extensive lodgepole pine forest. It has a sparse understory.

The subalpine vegetation zone is very limited. Its climax forest is Engelmann spruce and subalpine fir. Lodgepole pine is the common transitional species; whitebark pine may be present at higher elevations. Understories are dominated by shrubs and grasses - common plants include common juniper, soopolallie, grouseberry, lupines, arnicas, and lichens.

The alpine tundra zone is restricted to western areas. In the Chilcotin Ranges, at higher elevations that zone is dominated by rock and expansive glaciers. However, on some of the more rounded peaks in

Tweedsmuir and Itchuz - Ilgachez provincial parks, alpine tundra vegetation is distinctive, dense bunchgrasses, sedges, and hardy forbs predominate.

Fauna - Moose are the most widespread wild ungulate, while mule deer occur in large populations in the southern plateau and Fraser River 'badlands' area. Several large populations of California bighorn sheep occur in the Fraser River badlands and alpine areas. Cougars, black bears, coyotes, and wolves are also common through the ecoprovince. Widespread small mammals include the western jumping mouse, muskrat and long-tailed weasel. Two species of bat, big brown bat and Townsend's big-eared bat, hibernate in the ecoprovince.

This ecoprovince supports 65% of all bird species known to occur in British Columbia and 61% of all species known to breed in the province. The only breeding colony of the American White Pelican in the province is found in the Chilcotin Plateau. Excellent habitat for waterfowl and other waterbird (e.g. grebes) production exists throughout the plateau. The world centre of breeding abundance for Barrow's Goldeneye occurs here. It is also the centre of breeding abundance for Greater Yellowlegs and the Yellow-headed Blackbird, and is one of two important breeding areas for Long-billed Curlew and Ring-billed Gull. High breeding concentrations of Eared Grebe, Sandhill Crane, Herring Gull, and Black Tern have also been found here.

The western terrestrial garter snake is the most common reptile, while the western toad and spotted frog occur throughout the area.

This ecoprovince supports both anadromous and freshwater fish. Anadromous species include: Chinook salmon, sockeye salmon, steelhead, white sturgeon and Pacific lamprey. Freshwater fish include: rainbow trout (both native and introduced populations), bull trout, mountain and lake whitefish, lake chub and redbreast shiner.

Ecoprovince Subdivisions

The Central Interior Ecoprovince is subdivided into 3 ecoregions containing 12 ecosections.

EHN - Eastern Hazelton Mountains Ecoregion is a narrow mountain area located leeward of the rounded Kitimat Ranges. Moist Pacific air spills over into this area, or enters via low mountain passes. The area is greatly influenced by dry descending air creating rainshadow on the eastern portion. Arctic Air invades from the northeast, bringing periods of intense cold temperatures. Forest vegetation is transitional between wet rain forests to the west and the sub-boreal forests to the east. This ecoregion consists of two ecosections.

- **BUR - Bulkely Ranges Ecosection:** This is a narrow, rounded mountain system that lies on the leeward side of the Kitimat Ranges. Most of this ecosection are underlain with granitic rocks. The Cordilleran Ice Sheet once covered the entire ecosection. The higher peaks have been sculpted by the glaciers to form cirques, they usually occur on the north and east facing sides. The highest mountain in the Telkwa Range only reaches to 2325 m, while most are lower than 2,000 m. In addition to the numerous small streams the area is drained by: large



streams such as Telkwa and Morice Rivers that flows into the Bulkley River; numerous small streams flowing directly into the Bulkely River; small streams that flow eastward into the Nechako Reservoir, such as, Andrews and Sibola creeks; streams that flow into the Skeena River, such as, the upper Zymoetz, upper Clore rivers and Burnie Creek. Many small lakes occur on the upland, the northernmost segment of Morice Lake is the largest.

Moist Pacific air invades this area through numerous low mountain passes, while cold Arctic air frequently stalls along its eastern boundary. Vegetation zonation varies mainly with elevation but also with the influence of moist Pacific air: Sub-Boreal Spruce in the valleys and lower slopes; over 60 percent of this ecosection is dominated by the Engelmann Spruce - Subalpine Fir zone, which occurs on the middle slopes; alpine tundra with small glaciers occur on the upper slopes and summits; finally small stands of Coastal Western Hemlock and the Interior Cedar - Hemlock forests occur on the lower slopes adjacent to the low coastal passes. Hudson Bay Mountain, which provides a backdrop to Smithers, demonstrates the environmental complexity of this Ecosection.

There are no settlements in this ecosection. Access is limited to resource extraction roads mainly in the Telkwa and upper Zymoetz watersheds, and to the Hudson Bay Mountain ski development, but an extensive road network has been built to harvest almost all non-park commercial timber. Most of Tazdli Wyiez Bin/Burnie-Shea Park occurs in this ecosection, as well as, all of the Morice Lake Park and Burnie River protected area, and portion of the Atna River Park.

- **NEU - Nechako Upland Ecosection:** This is a hilly upland area consisting of several monadnocks in the Nechako Plateau and the eastern foothills of the Kitimat Ranges. Successive glaciers from the past Ice Age moved generally eastward from the Coast Mountains and eroded the hills and deposited large quantities of soil and rocks. This ecosection is drained by many small streams that flow eastward into Whitesail and Eutsuk lakes; and the streams that flow into coastal fjords, such as, the South Seekwyakin Creek and Dean and Tsaytis rivers. Many medium sized and small lakes and wetlands occur across the ecosection, and the damming of the Nechako River has created a large reservoir complex - Eutsuk-Whitesail lakes. There are no permanent settlements and access is limited to the forest development roads north of Tahtsa Lake. The current pine beetle epidemic has hit most the Lodgepole Pine stands within this ecosection. A majority of the ecosection lies within the North Tweedsmuir Park and the northern third of the South Tweedsmuir Park, in addition, Nadina Mountain Park occurs in the northern portion of the ecosection. As well, the Naxalk-Carrier grease trail (the so called Alexander Mackenzie Heritage Trail) cuts across the South Tweedsmuir Park in the southern portion of the ecosection.

CHR - Chilcotin Ranges Ecoregion is a long, narrow area of high, somewhat rounded mountains, located in the rainshadow of the Pacific Ranges. Precipitation is greatest in the northwest portion adjacent to the low coastal passes of the Atnarko River; and least in the southeast, which is leeward of the highest portion of the Pacific Ranges. Cold Arctic air



often lies against the northern perimeter, infiltrating into the north-facing valleys. There are two ecosection subdivisions.

- **CCR - Central Chilcotin Ranges Ecosection:** This is a dry, rounded mountain area located leeward of the Pacific Ranges to the south. The Central Ranges Ecosection rises progressively higher going from the eastern boundary with the CHP Ecosection and with the western boundary with the NPR Ecosection. This ecosection is mainly composed of non-granitic rocks (except along the northwestern boundary with the CPR Ecosection), which are volcanic and sedimentary in origin; there is a small portion of the Pacific Range granitic rocks that occur along the western boundary of this ecosection. A rainshadow effect is enhanced on the eastern perimeter, where the deep Fraser River trench creates usually cloudless skies. In addition to the northward flowing Taseko River and Big Creek this ecosection is drained by the northeastward flowing Churn Creek, the eastward flowing Cabin, French Bar, Watson Bar creeks which all flow into the Fraser River; the southward flowing upper Yalakum River, Relay/Tyughton creeks, and the upper Homathko River and upper Mosley Creek that flow south into Bute Inlet. The mountain summits are dominated by alpine tundra, which ranges from the dry grasslands on the outer mountains, through barren rock fields to extensive snowfields adjacent to the Coast Range divide. Adjacent to the Fraser River and in the low, north-facing valleys dry Douglas-fir forests occur. While at higher elevations the Engelmann Spruce -Subalpine Fir zone, with extensive cold air, shrub meadows. On the mid-elevations slopes and valleys occurs the Montane Spruce zone with predominantly Lodgepole Pine forest occurs. It must be noted that most of the lodgepole pine stands within this ecosection have been affected by the current pine beetle epidemic. Access is limited to a few resource roads that penetrate into the larger, lake-filled valleys, such as in the upper Yalakum River or to Taseko, Tatlayoko and Bluff lakes. Large wilderness protected areas have been established in this ecosection: almost all of Ts'yil-Os (Ts'il?os) Park, half of Homathko River/Tatlayoko Lake protected area, two thirds of Big Creek Park and one third of Spruce Lake protected areas occur within this ecosection.
- **WCR - Western Chilcotin Ranges Ecosection:** This is a moist, rugged mountain area located leeward of the north end of the Pacific Ranges. It is composed of a mix of arc volcanoes and plutonic rocks lying east of the fault that formed the North Klinaklini and Atnarko valleys in the south and north of the Bella Coola Valley it follows through Burnt bridge/Tahyesco valleys, and the ecosection lies west of the level volcanic rocks of the Chilcotin Plateau and the upper Dean River valley. It includes the Rainbow Range, the western-most of the three Chilcotin shield volcanoes. Low passes and exposure to the coastal environment via the Bella Coola and Klinaklini river valleys, bring increased moisture to these portions of the ecosection. Cold Arctic air often lies against the northern and eastern margins and low valleys and occasionally overriding the entire area with intense cold air for short periods during the winter and early spring months. The streams in this ecosection flow into the four main rivers: tributaries of the Klinaklini are the North Klinaklini and McGlitchy Creek; tributaries of the Atnarko are Whitton, Telegraph, Kappan, Hotnarko and Young streams; Burnt Bridge Creek flows into the Bella Coola River; tributaries of the Dean River are the Tusulko, Beef Trail, Talataeszi, Kohasganko and Tahysecos streams. Dry Douglas-fir forests occur in the Klinaklini and Atnarko river valleys. The lodgepole pine dominated Montane Spruce zone occurs along the lower slopes of the eastern margin along the Fraser Plateau. At higher elevations the Engelmann Spruce - Subalpine Fir Zone dominates. While the Alpine Tundra Zone occurs throughout on the mountain summits. It must be noted that most of the lodgepole pine forests within this ecosection have been hit by the current pine beetle epidemic. Access is limited to a portion of the Chilcotin Highway that

traverses the lower Atnarko river valley. The southern portion of Tweedsmuir Park occurs in the northwest portion of this ecosection, as well as a portion of the Dzawadi/Upper Klinaklini River and Dean River Corridor conservancies.

FAP - Fraser Plateau Ecoregion is a broad, rolling plateau that is underlain by flat or gently sloping basaltic lava flows. This ecoregion also includes several shield volcanoes and a small portion of the leeward side of the Kitimat Ranges. The entire area was overridden by cordilleran ice moving eastward in the north and northward in the south levelling and moving vast quantities of rock and soil. The climate is sub-continental, with precipitation resulting from the vast areas of wetlands, lakes and streams; however there is also additional moisture brought into the areas by way of the low Kitimat Ranges. The entire ecoregion is often embedded under Cold Arctic air in winter and spring. It contains ten ecosections:



- **BUB - Bulkley Basin Ecosection:** This is a broad lowland area, lying in the northern portion of the Fraser Plateau Ecoregion. There is a strong rainshadow effect caused from its position eastward of the Kitimat and Nass ranges of the Coast Mountains. The broad valleys are filled with many lakes from the large Francois Lake, to medium sized Fraser, Tchesinkut, Tachink, Nulki and Cheslatta lakes to many smaller ones. A large, multi-armed reservoir (Ootsa, Whitesail, Natalkuz and Tetachuck lakes) from damming of the Nechako River. River drainage is via the Bulkely/Morice Rivers northward to the Skeena River or the Nechako/Endako rivers eastward to the Fraser River. The entire area was overridden by cordilleran ice moving out of the Coast Mountains southeastward in the north up the Bulkley Valley and eastward in the south in the general direction of the Nechako River. Except for small areas of higher relief that has Engelmann Spruce - Subalpine Fir zone, most of this ecosection is dominated by lodgepole pine forest in the Sub-Boreal Spruce Zone. It must be noted that most of the Lodgepole Pine forests in this ecosection have been hit with the current pine beetle epidemic. In the lower valleys, trembling aspen stands occur on the southerly-facing slopes. Extensive development and farming occurs along the Yellowhead Highway corridor of the Bulkley/Endako Valley from Vanderhoof in the east to Smithers and Moricetown in the west, and in the Francois Lake area in the south central portion of the ecosection. Extensive logging has occurred throughout this Ecosection. Francois Lake Park is the largest protected area in this ecosection, other protected areas include: the northern tip of Tweedsmuir Park extends into this ecosection on the south shore of Ootsa Lake, the Uncha Mountains Red Hills Park and Nechako Canyon protected area.
- **CAB - Cariboo Basin Ecosection:** This is a rolling upland area with dry forests, interspersed with wetlands and grasslands on south-facing slopes, lying in the southeastern portion of this ecoregion. It lies mainly on the uplands on the east side of the Fraser River south of McLeese Lake, but it includes a portion of the Chilcotin in the Meldrum - Mackin Creek areas, as well as a short segment of the Fraser River up stream from the Chilcotin Bridge. It is one of the last places in this ecoregion to be overridden by southward moving cold Arctic air, and it is more often affected by warm dry air from the south. The numerous lakes, streams and wetlands contribute

to the summer precipitation. This area is a rolling plateau of flat-lying basaltic lava that slopes gently to the west and south. The entire area was overridden by cordilleran ice that flowed from the mountains to the east and west to coalesce and moved northward in the north and southward in the south. Vegetation is predominantly in the Interior Douglas-fir Zone. Douglas-fir forests are common throughout with lodgepole pine forests occurring at higher elevations. Trembling aspen stands occur throughout and are most striking in the low elevation, south-facing grasslands. It must be noted that most of the Lodgepole Pine stands within this ecosection have been hit by the current pine beetle epidemic. Numerous wetlands, small streams and lakes occur across the landscape; Williams, Chimney, Lac La Hache, Green and Loon are the largest lakes. The area is drained by many streams and small rivers flowing off the plateau surface most flow into the Fraser River, but a few of the southern ones flow into the Thompson River via either the Bonaparte or the Deadman rivers. The Cariboo Highway provides for the major flow of traffic through this ecosection, but the numerous communities, small farms and ranches throughout and logging operations are connected by a series of roads and secondary highways. Williams Lake is the largest city; smaller centres include Clinton, 100 mile House, Lac La Hache, 150 Mile House, Lone Butte and Spring House. Three provincial parks of note include: Moose Valley, Flat Lake, and Chasm parks – but there are no large protected areas within this ecosection.

- **CAP - Cariboo Plateau Ecosection:** This is a rolling upland of increased relief on the southeastern portion of this ecoregion. Cordilleran ice moved south-westward and north-westward out of the adjacent Columbia Highlands, rounding the hills and ridges and depositing vast quantities of soil and rocks. This ecosection is drained to the Fraser River in the west by the Quesnel, Horsefly, and Canim Rivers and to the Thompson River in the south by the upper Bonaparte River. There are several medium-sized lakes including: Bonaparte, Canim, Sheridan, Deka, Bridge, Eagle and Big lakes, as well many wetlands, small lakes and streams occur throughout the entire ecosection.

There is increased moisture as a result of the eastwardly moving moist Pacific air rising over the Columbia Mountains to the east. Temperatures are also cooler than in the adjacent Cariboo Basin Ecosection due to the increased elevation here. Cold Arctic air can build up along the western margin bringing periods of intense cold and snow. Most of the ecosection is dominated by two forested zones: the Sub-Boreal Pine – Spruce zone with lodgepole pine and trembling aspen forests, it occurs in the south at the lower elevations; and the Sub-Boreal Spruce zone with white spruce, subalpine fir and lodgepole pine forests that occurs at higher elevations and in the northern portion of the ecosection. . It must be noted that most of the lodgepole pine stands within this ecosection have been hit by the current pine beetle epidemic.

There are no large communities, but several smaller ones occur here, such as, Bridge Lake, Miocene, and McLeese Lake. The 93 Mile – Little Fort Highway (No. 24) bisects the southern portion of the ecosection, however most access through this ecosection is via the many secondary highways and resource development roads that service the small communities, farms and forest industry. There are no large protected areas within this ecosection; small protected areas include: Schoolhouse Lake Park, which lies south of Eagle Creek and west of Canim Lake; Taweet and Emar Lakes parks.

- **CHP - Chilcotin Plateau Ecosection:** This is a rolling upland with increased relief in the south near the Chilcotin Ranges and in the northwest near the large shield volcanoes of the west

Chilcotin, underlain by extensive lava beds that have been heavily glaciated by north flowing glaciers. In addition, this ecosection is underlain by extensive lava beds that have been heavily glaciated by north flowing glaciers. Cordilleran ice moved north-easterly across this area moving vast quantities of soil and rocks. This ecosection lies in the southwest portion of the ecoregion. This ecosection is drained by the eastward flowing Chilcotin River and its tributaries the Puntzi, Chilanko, Tatla Lake, Chilco, Taseko and Big creeks, as well in the west it is drained by the upper Klinaklini and upper Dean rivers, while in the east it is drained by Riske and Churn creeks. There are many small streams and rivers that drain this area, and in addition to Puntzi, Choelquoit, Eagle, One Eye, Tatla and Stum lakes, the upland is dotted with many small lakes and wetlands. A rainshadow effect is quite pronounced here as easterly moving Pacific air retains most of its moisture as it passes over this area. Winter temperatures are often very cold, with some of the lowest temperatures in the province occurring here. Vegetation zonation reflects the rise in elevation from the Chilcotin River in the northeast towards the mountains in the south and west. Douglas-fir zones forests occur adjacent to the Chilcotin River, giving way to Sub-Boreal Pine – Spruce zone forests with predominantly lodgepole pine. At higher elevations near the Chilcotin Ranges Montane Spruce and ultimately Engelmann Spruce – Subalpine Fir zone forests occur. . It must be noted that most of the lodgepole pine forests within this ecosection have been hit by the current pine beetle epidemic.

Alexis Creek is the largest community; smaller ones include Tatla Lake, Big Creek and Hanceville. The Chilcotin Highway, No. 20, which connects Anahim Lake and Bella Coola with Williams Lake is the major access link, but there are many resource roads that provide access to the ranches and farms and for the logging industry. The northern portion of Big Creek Park is the largest park in this ecosection, but Nuntsi Park is the largest wholly within the ecosection, there are also three smaller parks: Nazko Lakes and White Pelican parks and the western portion of Churn Creek protected area occur here; as well as the Chilanko Forks Wildlife Management Area.

- **FRB - Fraser River Basin Ecosection:** This is a deeply incised trench area that divides the lower portion of the Fraser Plateau in two. Damming of the Fraser River during the periods of glaciation caused a large lake to form that was filled with deep layers of silt. Subsequent down-cutting by the Fraser River and smaller side tributaries has left a series of exposed buff-coloured silt cliffs just above the Fraser River the entire length of the ecosection. In addition to the Fraser River that cuts this ecosection in two, it is drained on the east side by the: Sheridan, Hawks, Williams Lake, Alkali, Dog, Canoe, and Big Bar creeks; and on the west side by: Riske, Chilcotin, Gaspard, Churn, Grinder, Lone Cabin and French Bar streams.

Within this ecoregion this ecosection has its own unique climate caused by exposure to the sun heating the steep grasslands with rising warm air currents forcing the clouds onto the adjacent plateaus. This freeing the valley from clouds further enhances the sun's effects. It has the warmest and driest climate in the ecoregion and is seldom affected by the moist Pacific air. In the winter large Arctic air masses that move down across the interior of the province can bring cold weather and occasionally deep snow. The vegetation zones reflect the warm dry conditions that prevail here. The Bunchgrass Zone with big sagebrush, bluebunch wheatgrass and needle-and-thread, at the lowest elevations give way to dry steppe that is dotted with trembling aspen copses. At the highest elevations at or near the plateau edge, a meadow-steppe occurs that, in addition to bunchgrasses, has many herbaceous plants. Douglas-fir grows in the deep gullies, on north-facing slopes and near the plateau rim where moisture is increased.

Except for community centre of Riske Creek and the Toosey Indian Reserve, most alienation is in the form of large ranches and several smaller Indian Reservations. Access is limited to the Chilcotin Highway (No 20) that passes across the north portion of the ecosection and to resource roads that traverse the Fraser River from the Caribou to the Chilcotin Plateau. Free-ranging cattle have been a long-standing tradition here. There are two significant protected areas, the Junction Sheep Range and the Churn Creek parks. In addition there is a large wildlife reserve against alienation at Deer Park between the Chilcotin Highway and the mouth of Riske Creek that was established for California Bighorn Sheep management.

- **NAU - Nazko Upland Ecosection:** This is a rolling upland with several areas of higher relief that is situated in the north-central portion of this ecoregion. In the west it contains the Fawnie and the Nechako ranges shield volcanoes. During glaciation cordilleran ice moved northeasterly across this area depositing vast quantities soil and rock. Melting ice at the end of the glaciation created many long, melt-water channels that filled with gravel and coarse rock and have subsequently contain slow moving streams and wetlands. Streams include: the Entiako, Chedakuz, Big Bend and Chilako streams flowing northward into either the Nechako Reservoir or Nechako River proper; and the West Road/Blackwater, Nazko, Baker, Narcosli streams flowing eastward into the Fraser River; as well there are many smaller streams. Tatelkuz, Tsacha, Entiako, Eliguk, Kuyakuz, TtauK, Naltiesby and Pantage are a few of the larger lakes here, as well, there are many smaller lakes, scattered across the ecosection.

The area has a typical sub-continental climate: cold winters, warm summers, and a precipitation maximum in late spring or early summer. However, the moderating influences of Pacific air can occur throughout the year. In summer there is intense surface heating of the many wetlands, lakes and streams that bring sporadic convective showers. As well this area can lie under a blanket of moist Pacific air that brings heavy cloud cover and rain. In the winter there are frequent outbreaks of Arctic air. They are less frequent than in areas to the north, but there is no effective barrier to slow the invasion of cold air. This ecosection has increased snowfall over other ecosections to the south caused by moist Pacific air masses meeting cold Arctic air from the north. Vegetation zonation reflects the moister conditions with the lodgepole pine dominated Sub-Boreal Pine - Spruce zone occurring along the West Road and Nazko river valleys in the south, and the white spruce, subalpine fir, lodgepole pine dominated forests occurring north of that. While on the highest areas the Engelmann Spruce - Subalpine Fir zone occurs. . It must be noted that almost all of the lodgepole pine forests within this ecosection have been hit by the current pine beetle epidemic.

Except for Baldy Hughes, there are no community centres here, although ranches and Indian Reservations are common in the Blackwater River area. Logging with its attendant roads have been extensive throughout outside the Provincial parks. Resource extraction roads provide the main access for the small ranches and Indian Reserves. A portion of South Tweedsmuir Park and most of Entiako Park in the western portion of the ecosection and Finger Tatuk and Kluskoil Lake parks are the largest protected areas. As well, the Naxalk-Carrier Grease Trail (also referred to as the Alexander Mackenzie Heritage Trail) cuts east-west across the ecosection.

- **QUL - Quesnel Lowland Ecosection:** This is a lowland trench, lying between the Nazko Upland to the west and the Quesnel Highland to the east, in the northeastern portion of this ecoregion. Cordilleran glaciers flowed generally northward across this ecosection from out of the Quesnel Highlands to the east and from the Coast Mountains further south. Ice blockage of the major

rivers to the south, west and north created a large lake that when it drained left behind deep silt and gravel sediments. This ecosection is divided by the Fraser River that flows from north to south through this ecosection; as well it is drained by the Quesnel and Cottonwood rivers that flow north- eastward into the Fraser; the West Road/Blackwater River flows eastward into the Fraser. There are no large lakes here, however there are many small ones as well as wetlands.

Cold Arctic air invades this area from the Fraser Basin more readily than it does other ecosections in this ecoregion. Precipitation is enhanced by the eastward flowing, moist Pacific air as it rises over the Columbia Mountains, or by, summer heating of lakes, streams and wetlands in the adjacent uplands. The Sub-Boreal Spruce Zone is the dominate one here, but the forests vary; from Douglas-fir on the dry south-facing slopes of the Fraser River south of Australian to trembling aspen, lodgepole pine, white spruce and subalpine fir forests with rising elevation. . It must be noted that almost all of the lodgepole pine forests within this ecosection have been hit by the current pine beetle epidemic.

Quesnel is the only city, but smaller communities include: Hixon, Australian and Alexandra. The Cariboo Highway (No. 97) links this area with Prince George and the Lower Mainland. The Barkerville Highway (No. 26) links Quesnel to Barkerville. Numerous secondary highways and forest development roads provide access to the small communities, farms, ranches and forests. Logging has been extensive throughout. Fraser River Park on the west side of the Fraser River, east of Hixon is the only significant park in this ecosection.

- **WCU - Western Chilcotin Upland Ecosection:** This is a rounded upland dominated by two large shield volcanoes lying in the west - central portion of this ecoregion, as well there is a large lowland formed by past glaciation. Cordilleran ice moved eastward across this area. The uplands were severely rounded, and large areas of outwash gravels and sands were deposited in the wide intermountain areas. Drainage radiates away from this ecosection to the north and east via the West Road and Nazko rivers; to the southeast via the Chilcotin River; and to the west via the Dean River. Charlotte Lake is the largest one, but others include Nimpo, Anahim, Kappan and Hotnarko, as well there are many small lakes and wetlands on the lowland surface

The area generally has a sub-continental climate with cold winters, warm summers, and a precipitation maximum in late spring or early summer. However, the moderating influences of Pacific air can occur throughout the year. In summer there is intense surface heating of the many wetlands, lakes and streams in the lowlands and adjacent ecosections that bring sporadic convective showers. As well this area can lie under a blanket of moist Pacific air that brings heavy cloud cover and rain. There is also a strong mountain affect to the shield volcanoes that brings increased precipitation and cool conditions. In the winter there are frequent outbreaks of Arctic air. They are less frequent than in areas to the north, but there is no effective barrier to slow the invasion of cold air. This ecosection has increased snowfall over other ecosections to the south caused by moist Pacific air masses meeting cold Arctic air from the north. Vegetation zonation reflects the moister conditions with the lodgepole pine dominated Sub-Boreal Pine - Spruce zone occurring in the wide intermountain plain of the upper Dean River. Above that and across most of the eastern flank of the ecosection the Montane Spruce Zone of lodgepole pine and white spruce occurs. While the Engelmann spruce - Subalpine Fir Zone occurs on the higher forest slopes. The alpine zone occurs as a gently rolling landscape on the mountain summits it ranges from extensive shrubfields at lower elevations, through herb/grass dominated stands to

barren rock near the summits. It must be noted that almost all of the lodgepole pine forests within this ecosection have been hit by the current pine beetle epidemic.

Anahim Lake is the largest community, but extensive development has occurred at Nimpo Lake, but there are not settlements over most of this ecosection. This ecosection is traversed in the south by the Chilcotin Highway (No. 20) as it passes from Williams Lake to Bella Coola. Access to other reaches of the ecosection, outside the provincial parks, is by to the resource development roads for logging and to service the many small ranches that occur on the lowland meadows. The significant Itcha - Ilgachuz Park and Ilgachuz Range Ecological Reserve are the only protected areas here, they occur over the large shield volcanoes in the center of the ecosection.

SBI - Sub-Boreal Interior Ecoprovince

Location – The Sub-Boreal Interior Ecoprovince is located in the north-central portion of the province, to the east of the Coast Mountains and to the west of the Interior Plains. It consists of several physiographic systems: the low-lying plateau area of the Nechako Lowlands, the northern portion of the Nechako Plateau, and the McGregor Plateau, and the southern portion of the Northern Rocky Mountain Trench. The mountains to the west and north include the southern Skeena and Omineca mountains, while those to the east include the Hart Ranges and associated foothills, the Misinchinka Range and associated foothills.



In this ecoprovince, logging is the most extensive industry based on renewable resources; there are many mines. Agriculture is restricted to the area of finer textured soils in the Fraser Basin; it is limited to grazing and some forage and few cereal crops.

Climate – The area has a sub-continental climate, typified by cold winters, warm summers, and precipitation that is equal in summer and winter. It is strongly influenced by the moderating Pacific air; in addition, summer rain is largely due to surface heating, which leads to convective showers. In winter and spring cold Arctic air can easily invade from the east and north to dominate the entire area.

Prevailing westerly winds bring Pacific air to the area over the Coast Mountains by way of the low Kitimat Ranges or the higher Boundary Ranges. Much of the region is in a rainshadow. Coastal air has low moisture content by the time it reaches the ecoprovince. Moisture does enter the area when there is a southwestern flow over the low Kitimat Ranges. Summer surface heating, which leads to convective showers, and winter frontal systems result in precipitation that is evenly distributed throughout the year. Rain shadows occur in some of the Skeena and Omineca mountains and Rocky Mountain Foothills, but heightened precipitation occurs on the western side of the Skeena Mountains and Hart Ranges.

Outbreaks of Arctic air are frequent during the winter and early spring, the cold air moving unhindered from the north to the south. The southern edge of the ecoprovince is near the typical southern extent of the Arctic air mass in January. The mountains are an area of relatively high snowfall.

Physiography -This ecoprovince consists of several physiographic systems. The low-lying plateau area is comprised of the Nechako Lowlands, the northern portion of the Nechako Plateau, and the southern portion of the Northern Rocky Mountain Trench. The mountains to the north and west include the southern Skeena and Omineca Mountains, while the mountains in the east are comprised of the Hart Ranges and associated foothills, the southern Muskwa Ranges and foothills and the McGregor Plateau.

The Interior Plateau portion is a broad area of low relief, with expanses of flat or gently rolling country. In places it is almost completely undissected, but elsewhere it is incised to the level of the Fraser, Nechako and other rivers. The Fraser Basin is of lower relief than the Nechako Plateau. Much of its drainage is poorly organized, and there are numerous lakes and wetlands. The Nechako Plateau is of higher relief with long low ridges. In the Interior Plateau area, the Rocky Mountain Trench is similar in appearance to the Fraser Basin. During the past ice-age, large glaciers moved across the region leaving various deposits and 3 larger areas of fine-textured, lake-bottom silts.

The southern Skeena and Omineca mountains are a complex series of mountain ranges that occur north of the Interior Plateau and east of the coastal mountains. These mountains appear to rise from the plateau surface in long, rounded ridge and eventually to peaks and high ridges with the serrated and jagged profile created by intense alpine glaciation. The zigzag course of the Skeena River, downstream from Kludo Creek, which cuts across the northern Babine Range in 3 places, was determined by ice barriers in adjoining valleys. The present drainage of Babine Lake northward into the Skeena River below Atna Range rather than through the old portage route across to Stuart Lake must also be the result of damming by ice or moraines. The Omineca Mountains are composed of harder, erosion-resistant granitic rock; their lateral boundaries are a series of depressions and valleys. Drainage is generally to the east, while drainage in the Skeena Mountains is to the south and to the west.

The lower elevation central Rocky Mountains are comprised of the Hart Ranges, the southern portion of the Muskwa Ranges, and the adjacent foothills. They contrast sharply with the majestic mountain groups to the south and north. They are a narrow range that separates the Interior Plateau of central British Columbia from the Interior Plains. The Peace River dissects those mountains with a deep gorge, the only such crossing of the Rocky Mountains from the Liard River in northern British Columbia to the Missouri River in central Montana. Other than the Peace, rivers generally are short and flow westward into the Parsnip and Fraser rivers or eastward into the Peace River. The upper surface of the continental ice-sheet once lay 1,800 m to the 2,100 thick on the mountains. Some of the rounded summits were overridden, and some were little affected by alpine and valley glaciation. The combination of greatly lessened elevation and relief, of different bedrocks and structure, and reduced alpine and valley glaciation has resulted in a subdued topography. The Rocky Mountain Foothills to the east are similar to the adjacent Rocky Mountains except that their height diminishes towards the Interior Plains and they have a trellis pattern of drainage. In the foothills, the valleys have eroded along belts of soft rock and fault zones and are generally wide and flaring.

Biogeoclimatic Zonation - Vegetation is dominated by the Sub-Boreal Spruce Zone (SBS) on the Nechako Plateau, Nechako Lowlands, Northern Rocky Mountain Trench, and many of the valleys; the Engelmann Spruce - Subalpine Fir Zone (ESSF) occurs on the middle slopes of all mountains; and the Boreal Altai Fescue Alpine Zone (BAFA) occurs on the upper slopes of those mountains; the Interior Cedar - Hemlock Biogeoclimatic Zone occurs in the wetter valleys of the Skeena Mountains and southern Hart Ranges; the Spruce - Willow - Birch Zone (SWB) occurs in the upper Ospika valley; and the Boreal White and Black Spruce Zone (BWBS) occurs in the valley of the foothills and Omineca Mountains.

Vegetation - Vegetation in this ecoprovince reflects increased coolness and moisture with an increase in latitude when compared to the Central Interior Ecoprovince, to the south. The dominant vegetation is

dense coniferous forest, from valley bottom to timberline, with increased shrub and tree cover on the scattered wetlands. Deciduous forests are more common here than in southern ecoprovinces.

Three primary vegetation zones occur:

1. The lower zone that has a potential climax of white (hybrid) spruce and subalpine fir covers the greatest portion of the ecoprovince. The predominance of fine-textured landforms results in moist soils and diverse understories. The transitional vegetation is sensitive to changes of both summer warmth and soil material. Soils are less weathered than in the higher elevation or more northern areas, where lodgepole pine is common. On finer soils, where clay accumulation impedes moisture movement, trembling aspen and paper birch may form extensive deciduous forest before climax species can become established. Common plants of the understory include prickly rose, soopolallie, willows, black twinberry, thimbleberry, devil's club, bunchberry, arnicas, twinflower, fireweed, trailing raspberry, oak fern, creamy peavine, and asters. Wetlands are extensive in lower relief areas. Sedge fens are common, as well as organics dominated by scrub birch, willows, and sedges. Of special interest are sphagnum bogs with black spruce, Labrador tea, and sedges that are more typical of areas further north. Floodplain areas have black cottonwood and white spruce, with a lush understory of red-osier dogwood, highbush cranberry, black gooseberry, horsetails, and bluejoint. The current pine beetle epidemic has hit most the lodgepole pine stands within this ecoprovince.
2. The middle vegetation zone is dominated by subalpine forests of Engelmann spruce and subalpine fir. Lodgepole pine is usually dominant. Common understory species are white-flowered rhododendron, black huckleberry, mountain-ash, black gooseberry, bunchberry, arnica, twistedstalks, and a carpet of moss. In steeper terrain with high snowfall, there are avalanche areas marked by stands of Sitka alder. At higher elevations where the forest opens, the landscape may be intermixed with tree clumps and meadows of valerian, Indian hellebore, ragwort, and sedges. Subalpine soils are strongly acidic but well drained. They have a medium texture and a greater surface accumulation of litter than do lower forest soils.
3. An extensive alpine tundra belt occurs at higher elevations of the northern mountains, where rolling topography results in a variety of alpine communities. The alpine is composed of moist meadows of herbs such as Indian helebore, ragwort, Indian paintbrush, and sedge, moist heath of mountain-heathers, and drier areas of Altai fescue, other grasses, sedges, dwarf willows, and lichens. In the eastern mountain area, the alpine has a greater component of exposed rock, with drier communities composed of dwarf willows, grasses, woodrushes, moss campion, louseworts, and white mountain-avens. Soils are strongly acidic, often with turfy topsoils, and frequently disturbed by frost churning and heaving.

Fauna - Moose are the most abundant and widely distributed ungulate, Woodland Caribou occur throughout the mountains, Mountain Goats occur in the more rugged mountains, and Stone's Sheep only occur in the Misinchinka Range and associated foothills. Mule Deer and White-Tailed Deer are uncommon and occur mainly in the very southern lowland areas. American Black Bears and wolves are common throughout, while Grizzly Bears are abundant in the mountain forests. Lynx, Fisher and Muskrat are widely distributed throughout this region.

Fifty-seven percent of the bird species known to occur in British Columbia and 45% of all species known to breed in the province are found in the Sub-Boreal Interior. The Boreal Owl is a typical resident species. Highest breeding numbers of Herring Gull and Black Tern occur here. Two passerine species of note are the Rusty Blackbird and Magnolia Warbler.

The only reptile is the rare common garter snake which occurs in the lowlands and mountain valleys. While four amphibians occur here: the Western Toad, Wood Frog, and Spotted Frog occur throughout, while the Long-Toed Salamander is restricted to the warmer valleys and lowlands.

This ecoprovince supports both anadromous fish such as, Chinook and sockeye salmon. Native and introduced, rainbow trout, lake trout, bull trout, lake and mountain whitefish, Arctic grayling (in the Peace River watershed), longnose sucker, slimy sculpin and torrent sculpin are important fish that occur in the Sub-Boreal Interior.

Ecoprovince Subdivisions

The Sub-Boreal Interior Ecoprovince is subdivided into four ecoregions containing 14 ecosections.

CRM - Central Canadian Rocky Mountains Ecoregion

This ecoregion consists of steep-sided, but round-topped mountains and foothills that are lower than ranges of the Rockies to either the south or the north. Pacific air spills over these mountains bringing moist, mild air to the eastern valleys, while Arctic air passes from east to west bringing very cold, dense air to the western valleys and lowlands. Low-pressure systems in central Alberta can push moist air westward causing heavy precipitation events, especially in the Rocky Mountain Foothills. The Boreal White and Black Spruce zone occurs in the outer eastern valleys; the Sub-Boreal Spruce Zone occurs in the interior and western valleys, the Engelmann Spruce – Subalpine Fir zone occurs on all the middle and upper mountain slopes; and the Boreal Altai Fescue Alpine zone occurs on the mountain summits. The current pine beetle epidemic has hit most the lodgepole pine stands within this ecoregion. It contains five ecosections.



- **HAF - Hart Foothills Ecosection:** This ecosection consists of low, rounded mountains and wide valleys area on the east side of the Hart Ranges of the Rocky Mountains. They are composed of limestone sedimentary rocks; the western boundary with the Hart Ranges is a structural line, while the eastern boundary with the Albert Plateau is quite indistinct and dissected by eastward flowing rivers. Northeastward moving Cordilleran ice moved across these ranges and down the valleys, meeting the southwestward coalescing with the Laurentide ice along the eastern margin. This ecosection is drained by the Moberly, Pine, Sukunka, Wolverine and Murray rivers all which ultimately drain into the Peace River in BC; and by Redwillow, Wapiti, Red Deer, and Belcourt rivers which all flow into Alberta before joining the Peace River; Gwillim and Wapiti lakes are the only large lakes.

This ecosection is in a rainshadow of easterly flowing Pacific air coming over the main Hart Ranges, however, when low-pressure systems build up in central Alberta moisture can be pushed westward into this area bringing considerable moisture. In the winter, cold dense Arctic air often stalls along the eastern margin or in the valleys, bring periods of intense cold and

considerable snowfall. Boreal white and black spruce forests occur in the valleys of the eastern boundary with the Alberta Plateau; Sub-Boreal Spruce forests occur in the valley bottoms along the western boundary as well as on the lower slopes throughout; Engelmann Spruce – Subalpine Fir forests occur on all the mid to upper slopes throughout; alpine tundra occur on the highest ridges and summits and become more continuous towards the western margin with the Hart Ranges.

There are no communities here. The John Hart Highway (No. 97) linking the Peace River with the interior of the province was built through the northern portion; Don Phillips Way (No. 29) from Chetwynd to Tumbler Ridge passes through the northeast portion of this ecosection. The British Columbia Railway crosses these foothills in two places: from the west to east via Pine Pass and along the Wolverine River. Coal mining occurs at Bull Moose and Quintette mountains along the eastern boundary. Gwillim Lake Park and the northern third of Wapiti Lake Park are the main larger parks that occur within this ecosection.

- **MIR - Misinchinka Ranges Ecosection:** This is a rugged, rounded mountain area, with deep narrow valleys. This area is transitional in height with the higher Muskwa Ranges to the north. Some of the rounded summits were overridden by northeastward moving ice, however some areas were little affected by either alpine or valley glaciation. The Peace Reach of the Williston Lake (Reservoir) divides this ecosection into two terrestrial units. On the south side of the Williston Reservoir this ecosection is drained by the lower Clearwater River and by Scott, Weston, Colin, Selwyn and Point creeks; while on the north side it is drained by – the western tributaries of the Nabesche, West Nabesche, Bernard, Wicked streams which flow southward into the Peace Arm; the Ospika, Davis and Lafferty rivers and creek flow into the Finlay Arm; and the Horn and Poutang creeks join to form the Graham River and flow eastward.

Moist Pacific air often stalls over these mountains, bringing high precipitation, both summer and winter. In the winter cold Arctic air often lays in the Peace River Reach, and often overrides the entire area bringing very cold and heavy snowfall weather. There are no communities here; logging has proceeded into the Ospika watershed. The damming of the Peace River has flooded the Peace canyon making a barrier for movement of terrestrial animals. Boreal White and Black Spruce forests occur in the Ospika valley; Sub-Boreal Spruce forest in all the other valleys and on the lower mountain slopes; Engelmann Spruce – Subalpine Fir forests occur throughout on the mid to upper slopes. The tops of the ridges and mountains have extensive alpine vegetation.

There are no settlements or highways here. Logging with its attendant roads has occurred along the Parsnip Arm of the Williston Lake reservoir; in the Ospika valley and other wide valleys, such as the Clearwater River valley. Placer mining has occurred in the Peace River canyon. The western two thirds of the Graham-Laurier Park have been established in the northeastern portion of this ecosection.

- **NHR - Northern Hart Ranges Ecosection:** This is a rounded mountainous area that has a rather low profile composed of limestone sedimentary rocks that have been overridden and rounded by glaciers moving from the interior of the province eastward.. This ecosection is drained by the upper Clearwater River, and western portion of the Ducette Creek which flow northward; the shorter Cut Thumb, Chichouyenily, Gagnon, Mischiochinka, Misinchinka, Renolds, Anzac and Table streams that flow westward into either the Parsnip River or the Parsnip Arm of the

Williston Reservoir; and the upper Pine, Burnt and upper Sukunka rivers that flow eastward through the Hart Foothills Ecoregion. Hook Lake is the only large lake here.

It is often overridden by eastward moving Pacific air or southwestward moving Arctic air. They bring heavy precipitation as rain or snow. Sub-Boreal Spruce forests dominate the valley bottoms and lower slopes; impressive wetlands have developed in several flat-bottomed valleys, such as, in the Hominka, Table and Anza valleys. Engelmann Spruce – Subalpine Fir forests dominate the middle and upper slopes. Alpine is more prevalent towards the highest ridges to the south and along the higher eastern margin with the foothills.

There are no communities here: the John Hart Highway (No. 97) linking the Peace River with the interior of the province lies near the middle of this ecoregion. The British Columbia Railway crosses these mountains in two places: from the west to east via Pine Pass and along the Table River into the upper Sukunka River valley. The only large protected area, Pine Lamoray Park has been established on the south side of Pine Pass, it includes all the watershed of Mountain Creek.

- **PEF - Peace Foothills Ecoregion:** This is a rounded, blocky mountain area that lies on the east side of the Rocky Mountains. This ecoregion was overridden by eastward moving glaciers that coalesced with Laurentide glaciers moving west across the Interior Plains. The Peace Reach of the Williston Lake reservoir divides this ecoregion in two: south of the Peace Arm this ecoregion is drained by the Carbon, Gaylard, Dowling, and Johnson creeks; while on the north side it is drained by the eastern portion of the Nabesche, Schooler, Aylard, and Dunlevy streams that flow southward; and by the eastward flowing Graham, Chowade and Cypress streams.

A strong rain shadow exists, but cold, Arctic air can stall along the eastern margin, and invade into the eastern-facing valleys, especially the Williston Lake. As well low pressure systems over central Alberta and push moist air westward bringing heavy rain events here. The eastern-facing valleys are dominated by Boreal White and Black Spruce forests; at the furthest ends of those valleys and on the lower slopes Sub-Boreal Spruce forests dominate; at mid and upper slopes Engelmann Spruce – Subalpine Fir forests dominate. Alpine is most prevalent on the higher ridges and mountain summits in the western margin near the adjacent ecoregions.

There are no communities here. The dam for Williston Lake reservoir was constructed near the eastern boundary; it is serviced by a road from Hudson's Hope. Logging and its attendant roads has occurred in many of the valleys, especially the Graham River and Carbon Creek watersheds. Three large protected areas have been established here: the eastern third of Graham-Laurier Park has been located in the watersheds of Needham and lower Emerslund creeks; Butler Ridge Park is located on the eastern boundary just north of the Peace Reach; and Bock Peak and Klin-se-za parks have been established in the upper watershed of Carbon Creek.

- **SHR - Southern Hart Ranges Ecoregion:** This is a transitional mountain area situated between the lower Northern Hart Ranges to the north and the rugged Canadian Rocky Mountains to the south. It is comprised of limestone bedrock. These ranges are topographically and structurally similar to the Front Ranges to the south, although they become lower to the north. Eastward moving glaciers overrode this area, rounding the contours and upper slopes and some glaciers remain at the highest elevations in the south. This ecoregion is drained by the upper Parsnip River a stream that ultimately flows into the Parsnip Arm of the Williston Lake (Reservoir); by streams that drain into the upper Fraser River, such as, the McGregor, Torpy and Herrick rivers;

and by streams that flow into the Peace River, such as, the Imperial, upper Murray, upper Wapiti and upper Red Deer streams. Monkman Lake is the only lake of any size.

This ecosection forms a barrier to the eastward moving Pacific air or southwestward moving Arctic air. Pacific air can stall along the western margin bringing heavy rain and snow. Moist forests of the Interior Cedar – Hemlock zone occurs on the lower slopes of the southern valleys. Elsewhere Sub-Boreal Spruce forests occur in most valleys and lower slopes; Engelmann Spruce – Subalpine Fir forests dominate the middle and upper slopes. Alpine vegetation is most common on the higher ridges and mountains in the south and along the eastern margin with the foothills.

There are no communities here. Logging with its attendant roads has occurred throughout the valleys. In addition to smaller protected areas several large mountain parks have been established here: almost all of Monkman Park, two-thirds of Wapiti Lake Park and the southwestern half of Kakwa Park occur along the higher eastern boundary; Arctic-Pacific lakes Park is located between Herrick Creek and the Parsnip River.

This ecosection consists of low, rounded mountains and wide valleys area on the east side of the Hart Ranges of the Rocky Mountains. They are composed of limestone sedimentary rocks; the western boundary with the Hart Ranges is a structural line, while the eastern boundary with the Alberta Plateau is quite indistinct and dissected by eastward flowing rivers. Northeastward moving Cordilleran ice moved across these ranges and down the valleys, meeting the southwestward coalescing with the Laurentide ice along the eastern margin. This ecosection is drained by the Moberly, Pine, Sukunka, Wolverine and Murray rivers all which ultimately drain into the Peace River in BC; and by Redwillow, Wapiti, Red Deer, and Belcourt rivers which all flow into Alberta before joining the Peace River; Gwillim and Wapiti lakes are the only large lakes.

This ecosection is in a rainshadow of easterly flowing Pacific air coming over the main Hart Ranges, however, when low-pressure systems build up in central Alberta moisture can be pushed westward into this area bringing considerable moisture. In the winter, cold dense Arctic air often stalls along the eastern margin or in the valleys, bring periods of intense cold and considerable snowfall. Boreal white and black spruce forests occur in the valleys of the eastern boundary with the Alberta Plateau; Sub-Boreal Spruce forests occur in the valley bottoms along the western boundary as well as on the lower slopes throughout; Engelmann Spruce – Subalpine Fir forests occur on all the mid to upper slopes throughout; alpine tundra occur on the highest ridges and summits and become more continuous towards the western margin with the Hart Ranges.

There are no communities here. The John Hart Highway (No. 97) linking the Peace River with the interior of the province was built through the northern portion; Don Phillips Way (No. 29) from Chetwynd to Tumbler Ridge passes through the northeast portion of this ecosection. The British Columbia Railway crosses these foothills in two places: from the west to east via Pine Pass and along the Wolverine River. Coal mining occurs at Bull Moose and Quintette mountains along the eastern boundary. Gwillim Lake Park and the northern third of Wapiti Lake Park are the main larger parks that occur within this ecosection.

- **MIR - Misinchinka Ranges Ecoregion:** This is a rugged, rounded mountain area, with deep narrow valleys. This area is transitional in height with the higher Muskwa Ranges to the north. Some of the rounded summits were overridden by northeastward moving ice, however some areas were little affected by either alpine or valley glaciation. The Peace Reach of the Williston Lake (Reservoir) divides this ecoregion into two terrestrial units. On the south side of the Williston Reservoir this ecoregion is drained by the lower Clearwater River and by Scott, Weston, Colin, Selwyn and Point creeks; while on the north side it is drained by – the western tributaries of the Navesche, West Navesche, Bernard, Wicked streams which flow southward into the Peace Arm; the Ospika, Davis and Lafferty rivers and creek flow into the Finlay Arm; and the Horn and Poutang creeks join to form the Graham River and flow eastward.

Moist Pacific air often stalls over these mountains, bringing high precipitation, both summer and winter. In the winter cold Arctic air often lays in the Peace River Reach, and often overrides the entire area bringing very cold and heavy snowfall weather. There are no communities here; logging has proceeded into the Ospika watershed. The damming of the Peace River has flooded the Peace canyon making a barrier for movement of terrestrial animals. Boreal White and Black Spruce forests occur in the Ospika valley; Sub-Boreal Spruce forest in all the other valleys and on the lower mountain slopes; Engelmann Spruce – Subalpine Fir forests occur throughout on the mid to upper slopes. The tops of the ridges and mountains have extensive alpine vegetation. There are no settlements or highways here. Logging with its attendant roads has occurred along the Parsnip Arm of the Williston Lake reservoir; in the Ospika valley and other wide valleys, such as the Clearwater River valley. Placer mining has occurred in the Peace River canyon. The western two thirds of the Graham-Laurier Park has been established in the northeastern portion of this ecoregion.

- **NHR - Northern Hart Ranges Ecoregion:** This is a rounded mountainous area that has a rather low profile composed of limestone sedimentary rocks that have been overridden and rounded by glaciers moving from the interior of the province eastward.. This ecoregion is drained by the upper Clearwater River, and western portion of the Ducette Creek which flow northward; the shorter Cut Thumb, Chichouyenily, Gagnon, Misichiochinka, Misinchinka, Renolds, Anzac and Table streams that flow westward into either the Parsnip River or the Parsnip Arm of the Williston Reservoir; and the upper Pine, Burnt and upper Sukunka rivers that flow eastward through the Hart Foothills Ecoregion. Hook Lake is the only large lake here.

It is often overridden by eastward moving Pacific air or southwestward moving Arctic air. They bring heavy precipitation as rain or snow. Sub-Boreal Spruce forests dominate the valley bottoms and lower slopes; impressive wetlands have developed in several flat-bottomed valleys, such as, in the Hominka, Table and Anza valleys. Engelmann Spruce – Subalpine Fir forests dominate the middle and upper slopes. Alpine is more prevalent towards the highest ridges to the south and along the higher eastern margin with the foothills.

There are no communities here: the John Hart Highway (No. 97) linking the Peace River with the interior of the province lies near the middle of this ecoregion. The British Columbia Railway crosses these mountains in two places: from the west to east via Pine Pass and along the Table River into the upper Sukunka River valley. The only large protected area, Pine Lamoray Park has been established on the south side of Pine Pass, it includes all the watershed of Mountain Creek.

- **PEF - Peace Foothills Ecoregion:** This is a rounded, blocky mountain area that lies on the east side of the Rocky Mountains. This ecoregion was overridden by eastward moving glaciers that coalesced with Laurentide glaciers moving west across the Interior Plains. The Peace Reach of the Williston Lake reservoir divides this ecoregion in two: south of the Peace Arm this ecoregion is drained by the Carbon, Gaylard, Dowling, and Johnson creeks; while on the north side it is drained by the eastern portion of the Nabesche, Schooler, Aylard, and Dunlevy streams that flow southward; and by the eastward flowing Graham, Chowade and Cypress streams.

A strong rain shadow exists, but cold, Arctic air can stall along the eastern margin, and invade into the eastern-facing valleys, especially the Williston Lake. As well low pressure systems over central Alberta and push moist air westward bringing heavy rain events here. The eastern-facing valleys are dominated by Boreal White and Black Spruce forests; at the furthest ends of those valleys and on the lower slopes Sub-Boreal Spruce forests dominate; at mid and upper slopes Engelmann Spruce – Subalpine Fir forests dominate. Alpine is most prevalent on the higher ridges and mountain summits in the western margin near the adjacent ecoregions.

There are no communities here. The dam for Williston Lake reservoir was constructed near the eastern boundary; it is serviced by a road from Hudson’s Hope. Logging and its attendant roads has occurred in many of the valleys, especially the Graham River and Carbon Creek watersheds. Three large protected areas have been established here: the eastern third of Graham-Laurier Park has been established in the watersheds of Needham and lower Emerslund creeks; Butler Ridge Park is located on the eastern boundary just north of the Peace Reach; and Bocoock Peak and Klin-se-za parks have been established in the upper watershed of Carbon Creek.

- **SHR - Southern Hart Ranges Ecoregion:** This is a transitional mountain area situated between the lower Northern Hart Ranges to the north and the rugged Canadian Rocky Mountains to the south. It is comprised of limestone bedrock. These ranges are topographically and structurally similar to the Front Ranges to the south, although they become lower to the north. Eastward moving glaciers overrode this area, rounding the contours and upper slopes and some glaciers remain at the highest elevations in the south. This ecoregion is drained by the upper Parsnip River a stream that ultimately flows into the Parsnip Arm of the Williston Lake (Reservoir); by streams that drain into the upper Fraser River, such as, the McGregor, Torpy and Herrick rivers; and by streams that flow into the Peace River, such as, the Imperial, upper Murray, upper Wapiti and upper Red Deer streams. Monkman Lake is the only lake of any size.

This ecoregion forms a barrier to the eastward moving Pacific air or southwestward moving Arctic air. Pacific air can stall along the western margin bringing heavy rain and snow. Moist forests of the Interior Cedar – Hemlock zone occurs on the lower slopes of the southern valleys. Elsewhere Sub-Boreal Spruce forests occur in most valleys and lower slopes; Engelmann Spruce – Subalpine Fir forests dominate the middle and upper slopes. Alpine vegetation is most common on the higher ridges and mountains in the south and along the eastern margin with the foothills.

There are no communities here. Logging with its attendant roads has occurred throughout the valleys. In addition to smaller protected areas several large mountain parks have been established here: almost all of Monkman Park, two-thirds of Wapiti Lake Park and the southwestern half of Kakwa Park occur along the higher eastern boundary; Arctic-Pacific lakes Park is located between Herrick Creek and the Parsnip River.

FAB - Fraser Basin Ecoregion

This is a broad, lowland and rolling upland area, located in the southwestern portion of the Sub-Boreal Interior Ecoprovince. The climate is sub-continental with even precipitation amounts throughout the year: easterly-flowing moist Pacific air coupled with summer surface heating of lakes and streams bring summer rains, while in the winter, southward flowing cold Arctic air meeting moist Pacific air bring persistent snowfall events. The Sub-Boreal Spruce zone dominates much of this area: with the Engelmann Spruce – Subalpine Fir zone on the upper slopes of the few higher ridges; while the Boreal Altai Fescue Alpine zone occurs only on Tsisutl Mountain. The current pine beetle epidemic has hit most the lodgepole pine stands within this ecoregion. It contains three ecosections.



- **BAU - Babine Upland Ecosection:** This is a rolling upland with low ridges; much of the intrusive bedrock has been obscured by glacial debris, such as, eskers, meltwater channels, and drumlins. Glacial ice moved southward out of the Omineca Mountains to coalesce with north-eastward flowing ice from the Chilcotin Plateau. This ecosection is drained by the Sutherland and Fulton rivers that flow into Babine Lake; by the Babine River which drains Babine Lake and flows into the Skeena River; by the Nation River which flows into the Parsnip Arm of the Williston Lake; and by the Hautete, Middle, and Tacho rivers that drain into the large lakes which ultimately drain into the Nechako River. Many small streams and wetlands and several very large lakes in the depressions, such as Babine, Tochcha, the Northwest Arm and southern reach of Takla, Trembleur, Tezzeron, Cunningham, and Stuart lakes occur here.

This area is affected by easterly-flowing, moist Pacific air and by surface heating of the many lakes, wetlands and streams, bringing humid and rainy conditions that are sub-continental in effect. In the winter dens, cold Arctic air can settle over this area for long periods bringing extreme cold weather and snow events. Sub-Boreal Spruce forests dominate all the valleys and lower slopes; Engelmann Spruce – Subalpine Fir forest occur only on the upper slopes. Alpine communities are rare and occur on only a few of the highest summits. The current pine beetle epidemic has hit most the lodgepole pine stands within this ecosection.

There are no communities in this ecosection although, Fort St James is located on the southeastern boundary, and summer residences and fishing lodges have been established in many places such as: at Pinchi, Middle River, Donald Landing, Smithers Landing, Topley Landing, Granisle and Fort Babine. Logging is the main resource industry and has been extensive throughout the ecosection; however Copper Mining occurred on Copper Island in the middle of Babine Lake east of Granisle. Rubyrock Lake, Sutherland River and the eastern half of Babine River Corridor parks are the three largest of many protected areas that have been established here.

- **MCP - McGregor Plateau Ecosystem:** This is rolling upland adjacent to the Hart Ranges. It is a displaced portion of the Rocky Mountain Trench that is higher than the Trench to the north or to the south. Glacial ice moved eastward over this plateau and the Hart Ranges to the east. Many small lakes, wetlands, and streams occur here. This ecosystem is drained by the western portion of the upper Fraser River that cuts through the southern area, and by the lower Parsnip River that flows northward into the Parsnip Arm of the Williston Lake; the Chuckinka and Angusmac creeks flow into the north flowing Crooked River; by the Seebach creek and lower McGregor River that flow southward into the Fraser River; and by the lower Bowron and lower Willow rivers that flow northward into the Fraser River. Large lakes include Eagle, Purden, Tacheeda and Morfee lakes.

This plateau area has a cool moist climate caused by moist Pacific air rising over this plateau as it moves over the Hart Ranges to the east. In the winter dense, cold Arctic air can invade from the north down the Northern Rocky Mountain Trench or from over the Hart Ranges to bring long periods of intense cold and snow. Wet Interior Cedar – Hemlock forests occur only along the eastern margin, especially in the Fraser River valley; elsewhere the area is dominated by Sub-Boreal Spruce forests. The current pine beetle epidemic has hit most the lodgepole pine stands within this ecosystem.

Mackenzie the largest community is located partly in this ecosystem in the far north extent; many other smaller settlements, such as: Willow River, Giscome, Aleza lake, Upper Fraser, McGregor and Sinclair Mills have been established south of the Fraser River. In addition to the many roads that service small communities in the south, the Yellowhead Highway (No. 16) is located across the southern portion; the John Hart Highway (No. 97) lies in the northern portion in the Misinchinka and Crooked river valleys, and the Mackenzie Highway (No. 39) connects Mackenzie to the John Hart Highway. Logging is the main resource industry and its attendant roads have been built throughout the ecosystem, however the current pine beetle epidemic has hit most the lodgepole pine stands within this ecosystem. Purden Lake Park is the only large protected area here.

- **NEL - Nechako Lowland Ecosystem:** This is a flat or gently, rolling lowland with some dissection by the Fraser and Nechako rivers and by past glaciation. Glaciers from the north, west and southern mountains coalesced in this ecosystem before moving eastward to the Hart Ranges. They left behind many eskers, drumlins and meltwater channels. This ecosystem is drained: to the north into the Parsnip Arm of Williston Lake by the Crooked/Pack, McLeod and Weedon streams; to the south to the Fraser River by the Stuart, lower Nechako, Salmon and Muskeg rivers. There are myriad small lakes, wetlands and streams across the surface; as well there are several large lakes, such as, Carp, Great Beaver, and McLeod lakes and the eastern halves of Tezzeron and Pinchi lakes and the very southern portion of the Parsnip Arm of the Williston Lake reservoir.

The climate here is typically is sub-boreal, with moist Pacific air moving eastward across the lowland and summer surface heating of the many bodies of water create humid conditions during the summer. In the winter dense, cold Arctic air can invade from either the north or from over the Hart Ranges to the east bring long periods of intense cold and snowfall. The southern half of this ecosystem has a milder climate than any other in this ecoprovince. The entire lowland is dominated by Sub-Boreal Spruce forests. The current pine beetle epidemic has hit most the lodgepole pine stands within this ecosystem.

Prince George is by far the largest community here, smaller ones include: Vanderhoof and Fort St James, as well as many small settlements, such as Mud River, Salmon Valley and McLeod Lake. The John Hart Highway (No. 97) lies along the eastern boundary servicing many small communities and connecting the Peace River and Mackenzie with Prince George; the Yellowhead Highway (No. 16) lies near the southern boundary and services Vanderhoof and also connects this region with both Prince Rupert and Alberta; Vanderhoof – Stuart Highway (No. 27) connects Fort St. James with Vanderhoof. Logging is the main resource industry. Agriculture, such as hay, cereal crops and livestock, occurs along the southern-most lowland area. The two largest protected areas are: Carp Lake Park located in the northern portion is largest protected area here; as well the Stuart River Park is divided into upper and lower sections have been established along the Stuart River; smaller protected areas include: Dahl Lake, Mount Pope and Eskers parks.

OMM - Omineca Mountains Ecoregion

This ecoregion consists of several mountain groups that are dominantly rounded, isolated ranges that build in height from the south to north, wide valleys often separate these ranges. Cold Arctic air is common in the winter. The Sub-Boreal Spruce Zone occurs in all the valleys, except in the north central ones where Boreal White and Black Spruce forests become dominant; the Engelmann Spruce - Subalpine Fir Zone occurs on the mountain slopes; and the Boreal Altai Fescue Alpine Zone occurs on the mountain summits. This ecoregion consists of four ecosections.

- **ESM - Eastern Skeena Mountains**

Ecosection: This ecosection has a wide valley in the centre that is surrounded by high isolated and often rugged mountain ranges. The mountains are largely folded sedimentary rocks that are extremely complex with many overturned and recumbent outlines. Glaciers moved south and east out of these mountains meeting easterly flowing ice from the mountains and plateaus to the south. This ecosection is drained mainly by the upper Skeena and Sustut rivers, but also by smaller streams such as: the Birdfat, Squingula, Asitka, Duti, Kluatahtan, and eastern Slamgeesh rivers all of which flow into the Skeena River. There are no large lakes here.

This area is in a rainshadow of the higher Northern Skeena Mountains Ecosection to the west, which has resulted in lower precipitation amounts. However, moist easterly flowing Pacific air can often meet cold southerly flowing Arctic air causing increased snowfall events. Sub-Boreal Spruce forests dominate the valley bottoms and lower mountain slopes; Engelmann Spruce – Subalpine Fir forests occur throughout the mid-slopes. Alpine of the Boreal Altai Fescue Alpine type occurs on all the upper slopes and ridges. The current pine beetle epidemic has hit most the lodgepole pine stands within this ecosection.



There are no communities or settlements and little logging here. The British Columbia Railway right of way although never completed, is located in the lower Sustut and upper Skeena rivers valleys. The northern two thirds of the Sustut Park is the largest to have been established in this ecosection, but another protected area is the northern portion of the Damdochax Park.

- **MAP - Manson Plateau Ecosection:** This is an area of rolling upland that lies south of the higher Omineca Mountains and north of the lower Nechako Lowland. This area was occupied by glaciers moving south from the Omineca mountains then coalescing with north-eastward flowing ice from the south, all then flowed eastward across the Hart Ranges. This ecosection is drained: to the east into the Parsnip Arm of Williston Lake via the Nation River by the Manson, Klawli and Kwanika rivers; into the Stuart River and then the Fraser River by the Driftwood River system and Lion Creek that flow first into Takla Lake. The north arm of Takla Lake is by far the largest here, other smaller lakes of note are: Bear, Tsayta and Indata.

Moist easterly-flowing Pacific air coupled with surface heating of the many streams and lakes in the Interior Basin can bring precipitation as rain in the summer and snow in the winter as well as a high humidity. Cold Arctic air that invades from the north or east can bring long periods of intense cold and snow. The large valley bottoms are dominated by Sub-Boreal Spruce forests; while the mid to upper mountain slopes are dominated by Engelmann Spruce – Subalpine Fir forests. Extensive areas of alpine of the Boreal Altai Fescue Alpine type occur on the higher slopes and ridges. The current pine beetle epidemic has hit most the lodgepole pine stands within this ecosection.

There are no communities, only a few settlements along Takla Lake here. Roads are mainly industrial for logging and mining, but a main road runs from Fort St. James to Germansen Landing through this ecosection. The British Columbia Railway right of way although never completed, is located along the north shoreline of Takla Lake and northward up the Driftwood Valley. Three large protected areas have been established here: Nation Lakes Park, most of Mount Blanchet Park and the southern portion of Sustut Park.

- **PAT - Parsnip Trench Ecosection:** This is a wide intermountain plain that lies between the Omineca Mountains to the west and the Rocky Mountains to the east. It is part of the Northern Rocky Mountain Trench, a fault controlled basin that extends from the Liard Basin in the north to the Fraser River in the south. Glacial ice moved into this valley from the adjacent mountains then moved southward to coalesce with the eastern moving ice from the interior of the province to move over the Hart Ranges. Streams in this ecosection are small; most just pass through from adjacent upland ecosections into the reservoir, or short streams that originate in the western and eastern ridges of this ecosection. Manson and Nation are the only two free flowing large Rivers left in this ecosection. There are several smaller creeks that originate in the muskeg on the southwestern portion of the ecosection, such as: the Muscovite, Blackwater, Dastaiga, Tsadeka and Scovil. Williston Lake reservoir (the Parsnip and Finally reaches and Omineca Arm) occupies about 40% of this ecosection.

Warm, moist Pacific air flows in from the south and cold Arctic air often moves south down the Northern Rocky Mountain Trench bringing either heavy snowfall or rain. In addition surface heating of the reservoir and wetlands and streams bring convective showers throughout the

Ecosection: This ecosection consists of high rugged mountains and a moist, coast/interior transition climate. They are composed of folded sedimentary rocks with complex folds and recumbent outlines. Typically, the valleys and saddles are characterized by tight complex folding, whereas the broader massifs are commonly gently contorted or even flat lying. The peaks and ridges present a serrate and jagged profile that has developed under intense glaciation. Glaciation was heavy with much ice originating here then flowing northward or southward to coalesce with other moving ice. Many glaciers persist especially in the north. This ecosection is drained to the south by both the Skeena River and its tributaries: the Canyon, Sheladamus, Kuldo and upper Kispiox; or via the Nass River by the: lower Damochax, Vile, Sallysout, Shandalope, Kotsinta, Muckaboo, Taylor, Bell-Irving and Treaty streams. In the north this ecosection is drained by the Iskut by: the upper Iskut, Ningunsaw, Mare and Burrage streams; and into the Stikine by the upper Klappan River and Tumeka Creek. Tumeka Lakes is the largest in this ecosection.

Westward flowing moist Pacific air can bring heavy cloud cover and precipitation either as rain in the summer or deep snow in the winter. Cold Arctic air is often stalled outside this ecosection, but it can often push westward over these mountains bring intense cold conditions. Interior Cedar – Hemlock forests occur in the lower western slopes and valleys; while Sub-Boreal Spruce forests occur in some of the northeastern valleys. Engelmann Spruce – Subalpine Fir forests occur on all the middle slopes and alpine vegetation or bare rock occur on the upper slopes and ridges; small glaciers occur on the upper slopes in the northwest nearest the Boundary Ranges.

There are no communities here. The Kitimat - Cassiar Highway (No. 37) passes through the western valleys of the Bell-Irving, Snowbank and Ningunsaw streams, connecting northern British Columbia with the Yellowhead Highway (No. 16). Logging has occurred on some of the southwestern valleys and lower slopes. Three large protected areas have been established here: the Ningunsaw Park, Ningunsaw River Ecological Reserve and the northern portion of the Swan Lake – Kispiox River Park.

- **SSM - Southern Skeena Mountains Ecosection:** This ecosection consists of a narrow range of mountains to the east of the Nass Basin and west of the Nechako Plateau. This ecosection consists of high rugged mountains and a moist, coast/interior transition climate. They are composed of folded sedimentary rocks with complex folds and recumbent outlines. Typically, the valleys and saddles are characterized by tight complex folding, whereas the broader massifs are commonly gently contorted or even flat lying. The peaks and ridges present a serrate and jagged profile that has developed under intense glaciation. Glaciation was heavy with much ice originating here then flowing eastward to coalesce with other ice moving across the interior of the province. Many glaciers persist especially in the north. This ecosection is drained northward into the upper Skeena by the Sicintine River; into the Babine River by the Nilkitkwa, Shelagyote and Shedi streams; and into the Bulkley River by the Suskwa and Harold Price rivers. There are no large lakes here only smaller ones such as the Gunanoot and Onerka.

The climate is variable being wetter and milder on the west side and drier and colder on the east side. Moist Pacific air often stalls along the western portion bringing heavy clouds and rain the summer and snow in the winter; while cold Arctic air often stalls along the eastern portion bringing intense cold and dry snow. The western valleys and lower slopes are dominated by Interior Cedar-Hemlock forests, while the eastern valleys are dominated by Sub-Boreal Spruce forests. Engelmann Spruce – Subalpine forests occur throughout on the middle slopes of the

mountains. Alpine vegetation and bare rock occur on the upper slopes and ridges, while at higher elevations in the north small glaciers persist.

There are no communities or settlements here. Logging and its attendant roads has occurred on many of the lower slopes and valleys, especially adjacent to the Nass Basin and the Nechako Plateau. Two large protected areas, the Babine Mountains Park occurs in the southernmost mountains and the west half of the Babine River Corridor Park occurs on the east side in the centre of this ecoregion.

SIM - Southern Interior Mountains Ecoprovince

Location - The Southern Interior Mountains Ecoprovince consists of the Columbia Mountains and associated highlands, the Southern Rocky Mountain Trench, and the Continental Ranges of the Rocky Mountains and associated foothills. It lies east of the interior plateaus and west of the Interior Plains. In British Columbia it extends eastward to the British Columbia - Alberta boundary, however the Ecoprovince does extend as far east as the Interior Plains. The southern boundary in British Columbia is the 49th parallel or the Canada-USA border, however the Ecoprovince extends southward into northeastern Washington, northern Idaho and northwestern Montana as far south as the limit of Interior Cedar - Hemlock forests.



Forest-based industries are important and include a rapidly expanding tourism and recreation element. Coal mining occurs in the Elk River Valley and metal mining occurs in the lowlands and mountains. Extensive reservoir impoundments have occurred throughout this Ecoprovince on the Columbia and Kootenay rivers and their tributaries. Agriculture is restricted to the Rocky Mountain Trench, the Creston Valley, the southern Columbia Valley and the Robson Valley. It is largely based on grazing and forage crops, except in the extreme southwest where lowlands and floodplains have been developed for orchards and cereal crops.

Climate - there are two distinct climate regimes - one in the mountains and the other in the Rocky Mountain Trench. Although there are strong temperature and precipitation gradients over the entire area, the climate regimes of the mountains are largely the same. Air masses generally approach from the west and lose moisture first, as they pass over the western Columbia Highlands and Columbia Mountains and again as they pass over the Rocky Mountains. The rainfall in the ecoprovince is obtained from three main sources: by way of lower passes in the southern coastal mountains, by way of the low Kitimat Ranges, and through evaporation from surface waters on the interior plateaus. Surface water within the Southern Rocky Mountain Trench is a minor contributor to precipitation in the adjacent Rocky Mountains. This process is reversed in the summer when low pressure systems lay in the adjacent Interior Plains, forcing air masses westward over the Rocky Mountain Foothills and Mountains, bringing rain or snow and often high winds to these mountains..

The Rocky Mountain Trench bisects two large mountain blocks with significantly different physiography and macroclimatic processes. A strong rain shadow effect exists leeward of the Columbia Mountains.

During the summer, intense surface heating creates strong updrafts in the mountains, the resulting downdraft over the centre of the valley clears the sky and enhances the sunny conditions that characterize the trench's summer climate.

During the winter and early spring months, the Rocky Mountain Trench serves as an access route for outbreaks of cold, dense Arctic air. During minor outbreaks, the cold air remains in the trench, but during severe outbreak events, it passes into the valleys of the upper Columbia, lower Columbia, Elk and Kootenay Rivers.

Physiography - The Southern Interior Mountains Ecoprovince consists of several mountain ranges, valleys, trenches, and highlands. There are five main physiographic systems: the Columbia Highlands on the western flank, the Columbia Mountains, the Southern Rocky Mountain Trench, the Continental Ranges of the Rocky Mountains and the Rocky Mountain Foothills that are mainly in Alberta.

The highlands consist of the Quesnel Highlands and the higher, eastern portion of the Okanagan and Shuswap highlands. The highlands represent a transition between plateaus and mountains and occur where the amount of dissection is fairly high and where the flat and gently sloping upland surfaces of the higher elevations are small. Glacial ice covered most of the high areas during the past ice ages and consequently most summits are rounded. Cirques which developed on the northern and northeastern sides have sharpened the profiles of the highest peaks, whereas the valley sides were steepened and the valley bottoms broadened.

The Columbia Mountains consist of a series of ranges and alternating trenches of a complex geological origin. The mountain ranges get progressively higher from the southwestern Selkirks to the northern Cariboo Mountains. The high mountains, especially in the northern ranges, are mostly massive and have bold, sharp peaks separated by deep, steep-sided valleys. Lower summits were covered by glacial ice and subsequently have been sculptured by cirque and valley glaciers to sharp peaks and sawtoothed ridges. It is only in the southern ranges at elevations below 2,100m that rounded and moderately pointed summits prevail. The profiles of many valleys have been strongly modified by glaciation and its after effects. The retreating ice left moraines and other debris. Ice dams created large glacial lakes that disappeared as the melting progressed but have left extensive terraces of silts and compact gravels along the sides of the valleys.

The Southern Rocky Mountain Trench is a large, faulted valley that lies between the Columbia and Rocky mountains. It is open to the Nechako Lowlands to the north and the Flathead Basin in Montana. Since it has been eroded and in-filled by glacial debris, it resembles a long, narrow plain with few bedrock outcrops. Several large rivers (Fraser, Canoe, Columbia, and Kootenay) meander along the valley floor, forming large floodplains and wetlands. Much of the middle portion has been flooded by the McNaughton Lake reservoir and the Koochanusa Lake reservoir fills the floodplain of the southernmost of the trench in British Columbia.

The Continental Ranges of the Rocky Mountains are comprised of a series of longitudinal ridges and deeply dissected valleys. These mountains are highest and most rugged in the north portion that is drained by the upper Fraser and Canoe rivers. Here short, steep rivers and streams flow down into the Rocky Mountain Trench. Southward the mountains become open with isolated ridges, and the valleys become wider. The rivers often flow for long distances before draining into the trench.

Biogeoclimatic Zonation - Vegetation is dominated by three zones; the Interior Cedar - Hemlock Zone in the lower to mid slopes of the Columbia Mountains and wetter localities in the Rockies and trench, the Engelmann Spruce -Subalpine Fir Zone occurs on the middle slopes of all mountains and the Interior Mountain-Heather Alpine Zone occurs on the summits of those mountains. The Ponderosa Pine Zone occurs in the Southern Rocky Mountain Trench, as does the Interior Douglas-fir Zone, but this zone also

occurs sporadically in the main valley of the Shuswap and Okanagan highlands. The Montane Spruce Zone occurs in the valleys and lower slopes of the southern Rocky Mountains and eastern Purcell Mountains, while the Sub-Boreal Spruce zone occurs in the upper Fraser River watershed.

Vegetation - The Southern Interior Mountains Ecoprovince encompasses great habitat diversity because of combinations of very wet mountains and very dry rain shadow valleys. There are seven vegetation zones present, but they are best described in three parts: the dry southeastern area on either side of the East Kootenay Trench and surrounding mountains, the area including the main portions of the Columbia Highlands, Northern Columbia Mountains, and Selkirk-Bitterroot Foothills ecoregions, and the rest of the Rocky Mountain Trench and surrounding mountains.

East Kootenay Trench - In the lowest vegetation zone, the climax forest is Douglas-fir. However, widespread fires, and logging and extensive grazing history have created many transitional woodlands and open areas. In the valley bottom, ponderosa pine is the main seral species, giving way at higher elevation and increasing moisture to western larch and lodgepole pine. Persistent shrub-grasslands have saskatoon, antelope-brush, redstem ceanothus, and grasses, including rough fescue, bluebunch wheatgrass, junegrass, Kentucky Bluegrass, Canada bluegrass, needlegrasses, and cheatgrasses. In the forest, common shrubs include rose, kinnikinnick, saskatoon, soopolallie, and birch-leaved spirea. Pinegrass is common. Soils often have dark surface horizons and are moderately weathered. Floodplains may have black cottonwood, spruce, red-osier dogwood, false Solomon's-seal, and horsetails. Of special note are the extensive marshes along the upper reaches of the Columbia River, intermixed with riparian forests that are important to moose, elk, white-tailed deer and waterfowl.

Southern Continental Ranges - the climax montane forests consist of Engelmann spruce, and subalpine fir. The zone is relatively dry, with Douglas-fir, western larch, and lodgepole pine as important seral species. Understories are shrubby, with Utah honeysuckle, soopolallie, saskatoon, birch-leaved spirea, false azalea, pinegrass, bunchberry, and mosses. Soils have clay layers that improve moisture retention. Widespread fires have been common, creating extensive stands of lodgepole pine.

The subalpine vegetation zone has open to closed Engelmann spruce and subalpine fire forests, although seral lodgepole pine predominates. Understories support white-flowered rhododendron, grouseberry, false azalea, thimbleberry, queen's cup, bunchberry, pinegrass, and mosses. Soils are strongly weathered and acidic. Moister sites may have horsetails and meadowrue. Avalanche areas with dense Sitka alder and herbaceous cover are common throughout the zone. At the higher elevations, forest cover becomes discontinuous and in the Fording River valley rough fescue grasslands occupy southerly-facing slopes and ridge tops. Whitebark pine and alpine larch may be found at timberline. Meadows may be intermixed with the forest.

The Interior Mountain-Heather Alpine vegetation zone is mainly rock-dominated, with pockets of grass-sedge meadows and heath or white mountain-avens dominated vegetation. These upper slopes often consists of only barren or lichen covered rocks.

Columbia Mountains and Highlands - for most of the ecoprovince, the climax forests of the lower vegetation zone is western hemlock and western redcedar. Seral forests are common in the drier areas, with Douglas-fir, western larch, grand fir, western white pine, lodgepole pine, paper birch, or trembling aspen. Common plants include blueberries, false box, devil's club, Utah honeysuckle, twinflower, queen's cup, oak fern, other ferns, and mosses. However, in the wetter valleys, forests succeed directly to the climax species. Soils are usually deeply weathered, reddish in colour, and very acidic. Of special note are the extensive wetland complexes associated with the floodplain and delta of the Kootenay River in the Creston Valley.

The subalpine vegetation zone here is dominated by subalpine fir and Engelmann spruce, sometimes with mountain hemlock at higher elevations. Seral forests are uncommon. Understory plants include white-flowered rhododendron, black gooseberry, false azalea, twisted stalk, Sitka valerian, bunchberry, and dense moss. Avalanche chutes dominated by Sitka alder and herbs, occur frequently. At higher elevations, the forest cover is mixed with lush herbaceous meadows. In southern area, whitebark pine and alpine larch may occur at timberline.

The Interior Mountain-Heather Alpine vegetation zone is mainly rock and glacier dominated, with patches of heath, or grass-sedge meadows.

Fauna - Mountain goats are perhaps the most widely distributed wild ungulate in the ecoprovince but mule and white-tailed deer are also widely distributed. Rocky Mountain elk are very abundant throughout the mountains and valleys adjacent to the southern third of the Rocky Mountain Trench. Small, herds of mountain caribou occur in old-growth spruce and subalpine fir forests in the Northern Park Ranges ecoregion and the Columbia Mountains and Highlands Ecoregions; the herd in the southern Selkirk Mountains is the southern most population of caribou in the province. In British Columbia bighorn sheep are common in the Southern Park Ranges Ecoregion and adjacent trench, but in Alberta they are common throughout the Park Ranges and adjacent foothills. Grizzly and black bears are common throughout the area, as are coyotes and cougars; grey wolves have been increasing their distribution in recent years. Small carnivores, such as Canada lynx, wolverine and martin are common throughout, while bobcats, fisher and American badger are locally common, especially towards the southern areas of the ecoprovince.

Small mammals include the long-eared myotis, pika, hoary marmot, Columbian ground squirrel, golden-mantled ground squirrel, and water vole.

This ecoprovince supports 70% of the bird species known to occur in British Columbia and 62% of all breeding avifauna of the province - the second highest diversity of breeding species. It contains the only breeding location of Forster's Tern and one of the highest breeding concentrations of Ospreys in the world. It is also one of the few areas in British Columbia where the Western Grebe and Long-billed Curlew breed. The Black-billed Cuckoo occurs regularly. Significant autumn and winter populations of waterbirds, especially American coots, are found on large ice-free lakes. The extensive waterbodies are important migration staging areas for Tundra Swans, Canada Geese, and dabbling and diving ducks, particularly redhead. The area is the centre of breeding abundance for the White-breasted Nuthatch. Large flocks of Clark's Nutcracker appear in the valley bottoms during autumn and winter.

The painted turtle, and common and western terrestrial garter snakes are typical reptiles. The long-toed salamander, western toad, and spotted and northern leopard frogs are the characteristic amphibians.

This ecoprovince supports both anadromous and freshwater fish. Anadromous species include: Chinook salmon and white sturgeon. Freshwater fish include: rainbow trout (both native and introduced populations), brook trout (introduced), bull trout, mountain whitefish, mottled sculpin and Yellowstone cutthroat trout.

Ecoprovince Subdivision

The Southern Interior Mountains Ecoprovince is divided into 8 ecoregions containing 23 ecoregions.

COH - Columbia Highlands Ecoregion

This ecoregion is a rolling highland area that rises from uplands, highlands and isolated ridges on the west and south to culminate in higher mountains along the northeastern margin. Moist Pacific air rising over these highlands, bring intense precipitation especially from fall to early spring. This Ecoregion contains three ecosections in British Columbia.



- **BOV - Bowron Valley Ecosection:** The Bowron and Willow valleys are surrounded by low highlands and ridges to the west and rugged mountains to the east, while in south there is a rounded hilly area. During the Ice Ages glaciers moved north down these valleys to coalesce with glaciers from the south over the Fraser Plateau and with ice from the northern portion of the Rocky Mountain Trench to eventually move eastward over the Rocky Mountains. During their movement, they moved lots of rock and soil and when the glaciers stagnated they left behind many eskers, drumlins and meltwater channels. This ecosection is drained by several streams, including: the Bowron and Willow rivers which flow northward into the Fraser River; the Naver, Abbey and Sovereign streams which flow westward into the Fraser. In addition to many small lakes and wetland, the largest lakes here include: Stony, Bowron, Ahbau, the western portion of Indianpoint and the northern portion of Spectacle lakes.

This is a moist cold area, with a wide Bowron River valley, and narrower Willow Creek valley, both of which open northward exposing the interior of the ecosection to northerly weather systems. Moist Pacific airdrops it moisture as it rises over the hills to the west and the Cariboo Mountains to the east. In the winter cold, dense Arctic air brings intense cold and heavy snowfall. Sub-Boreal Spruce forest occur throughout the wide valleys and lower mountain slopes; while Engelmann Spruce – Subalpine Fir forests occur on the middle and upper slopes. The alpine zone is uncommon and occurs mainly in the higher mountains in the south.

Wells and the historic village of Barkerville are the only communities here. The Barkerville Highway (No. 26) connects Barkerville and Wells to Quesnel. Logging, with its attendant roads has occurred throughout most of the lower elevation forests; placer mining has been intensive in the upper Willow River watershed since the middle of the nineteenth century. The western third of Bowron Lake Park is the largest protected area in this ecosection.

- **NSH - Northern Shuswap Highland Ecosection:** This is a gentle to moderately sloping highland area, intermediate between the plateaus to the west and the mountains to the east. Most ridges and summits have been rounded as glacier activity was heavy as ice moved west and then south across this ecosection from the higher adjacent Columbia Mountains. The valley sides are commonly steep because of the glacial erosion and the total relief may be fairly great even though the local relief in the uplands is moderate. This ecosection is dissected by the lower Clearwater, North Thompson (from Blue River to Birch Island), upper Adams, lower Seymour

and Eagle rivers, all of which are situated in wide valleys; in addition to the five mentioned above this area is also drained by the Raft, Mud, Barriere, Cayenne and Kwikoit rivers and creeks. There are several large lakes of note: Upper Adams, northern Shuswap (Seymour and Anstey arms) and south Murtle lakes; plus a number of smaller lakes, like: Humamilt, North and South Barriere and Tumtum.

The climate here is warmer and winters are milder than the Quesnel Highland Ecosection to the north. Eastward flowing, wet Pacific air brings significant rain and snow to this area throughout the year. Cold Arctic air can invade from either the northwest or from over the Columbia Mountains to the east, although such outbreaks are not as common as they are in the Quesnel Highland Ecosection to the north. The moist forest type of Interior Cedar – Hemlock dominates the valley bottoms and lower slopes; while Engelmann Spruce - Subalpine Fir forests occupy the middle and upper mountain slopes. Alpine is rare occurring on only a few of the highest summits.

Blue River and Vavenby are the only communities in this ecosection. The Yellowhead South Highway (No. 5) and the Canadian National Railway follow the North Thompson River and connect Clearwater with Valemount. There is also highway access to Wells Gray Park via the Clearwater and Blue river valleys. Logging and its attendant roads have been extensive throughout, except for the provincial parks. Of the several protected areas, the southern portion of Wells Gray Park is the largest, but others include: Upper Adams River, Anstey – Hunakwa, Momich Lakes and the eastern third of Dunn Peaks parks.

- **QUH - Quesnel Highland Ecosection:** This is a transitional highland area, intermediate between the lower level plateaus to the west and the higher rugged mountains to the east. Here there are remnants of a highly dissected plateau of moderate relief, which rise gradually from west to east. This area is underlain by sedimentary rocks which contain some volcanic rocks, while limestone and quartzite form many of the higher peaks. Glaciers covered all of this area moving north-westward to coalesce with north flowing ice from the Fraser Plateau. The glaciers resulted in greatly rounded summits, but cirque basins have developed on north sides. At the south end of these highlands are several volcanic landforms that include cinder cones and lava flows. This ecosection is drained to the west: via the Fraser River by the, Cariboo, Matthew, Little, Roaring and upper Horsefly streams; and into the North Thompson River by the Molybdenite, Canim and Spanish streams. There are several large lakes in this ecosection, Quesnel Lake is by far the largest, but others of note are: Horsefly, Cariboo, crooked, Hobson and Clearwater lakes.

Precipitation is higher here than in the Shuswap Highland Ecosection to the south. Easterly flowing moist Pacific air rising over this area drops considerable moisture as rain in the summer and snow in the winter. In addition cold, dense Arctic air can build up against the western margin or invade into the valleys and mountains giving intense cold for extended periods. Wet Interior Cedar – Hemlock forests dominate all the valleys and lower slopes; colder Engelmann Spruce – Subalpine Fir forest dominates the upper slopes including the lower mountain summits. Alpine occurs on the highest ridges and mountains in the middle and eastern sections of this ecosection.

There are only small settlements here, such as Likely, but there are many resorts and summer cabins on the lakes outside the provincial parks. There are no highways into this ecosection, but logging with its attendant roads have occurred throughout the non-park forests. The western

portion of Wells Gray Park is the largest protected area, and the Cariboo River Park occupies most of the upper Cariboo River floodplain.

- **SRH - Shuswap River Highland Ecoregion:** This moist highland consists of steep-sided, gentle or moderate rolling uplands and ridges that are dissected by the circuitous Shuswap River and Shuswap Lake waterways. Glacier moved westward out of this area before moving south, coalescing with southward moving ice in the Thompson Plateau. The Eagle and the lower Shuswap rivers drain this ecoregion westward into Shuswap Lake. In addition to the streams mentioned above, this ecoregion is also drained by the Sicamous, Kingfisher and Tsuis streams. There are several large lakes, of which, Salmon Arm of Shuswap Lake is the largest others include: Mara, Mabel, and Sugar lakes.

Valleys that are oriented to the west, allow moist Pacific air to penetrate deep into the interior valleys, otherwise that moist air rises over this highland creating rainshadows or alternately slopes with heavy precipitation. In the winter that system brings heavy snowfall especially when coupled with cold Arctic air. Wet Interior Cedar - Hemlock forests dominate the valleys and lower slopes; cold Engelmann Spruce – Subalpine Fir forests occur on the upper slopes and ridges. Alpine is rare, occurring mainly along the eastern boundary with the higher Monashee Mountains.

Among the communities located here are: Sicamous and Malakwa, although there are several such as, Mabel Lake and Cherryville that are established along the border with the North Okanagan Highland Ecoregion to the south. Most of the shorelines of the large lakes contain lodges and recreational home sites. The Trans Canada Highway (No. 1) passes through Sicamous from Salmon Arm to Revelstoke while the Vernon to Sicamous section of highway (No. 97A) passes along the eastern shore of Mara Lake. Logging with its attendant roads has occurred throughout this ecoregion. There are several smaller protected areas, including: Silver Star and Mount Griffin parks.

ECR - Eastern Continental Ranges Ecoregion

This ecoregion lies on the east side of the southern Canadian Rocky Mountains, mainly in Alberta although a small segment of one ecoregion extends northwestward into British Columbia. It is comprised mainly of the Front Ranges physiographic unit, which are tilted limestone-based mountains that usually have a gentle west side and steep east side. This area lies in a rain shadow, caused by both the Columbia Mountains and the western Park Ranges physiographic unit, but it is also quite cold in the winter and early spring caused by outbreaks of cold Arctic air lying either along the eastern margin or invading the into the valleys. This Ecoregion is represented by only one Ecoregion in British Columbia.



- **FRR - Front Ranges Ecosystem:** Most of this ecosystem is in Alberta and only small, northernmost portion extends into British Columbia on the eastside of the Rocky Mountains. This ecosystem consists of parallel rows of ridges and valleys that is underlain entirely by sedimentary limestone rocks. These ranges follow major faults that have resulted in thick limestone cliffs and wide valleys. All the rivers drain north-eastward into Alberta; in British Columbia this ecosystem is drained by the Belcourt and Narraway rivers that flow into the Wapiti River before entering the Peace River; the upper Kakwa and upper Smoky rivers join as the Smoky River before it to drains into the Peace River. As well, this ecosystem is drained in Alberta by the Snaring and Snake Indian rivers that flow into the Athabasca River. There are no large lakes in this ecosystem; in British Columbia Belcourt and Cecelia lakes are the largest; while in Alberta, Twintree and Rock lakes are the largest.

This area is in a rainshadow of the eastward moving, moist Pacific air as it has risen over the Hart and Park ranges. In the winter, dense cold Arctic air often lies unimpeded over these mountains, bringing extreme cold temperatures. This climate has resulted in the Interior Mountain-Heather Alpine Zone occurring at mid-upper elevations, lower here than in the rest of the Southern Interior Ecoprovince. Forests in the outer, northeast-facing valleys are predominantly Boreal White and Black Spruce Zone types; otherwise Engelmann Spruce – Subalpine Fir forests dominate most of the lower and middle slopes.

There are no settlements or roads in British Columbia in this ecosystem; in Alberta, Grand Cache is located at the eastern margin and the Yellowhead Highway (No. 16) from Jasper to Hinton, Alberta passes along the southern boundary. The northern half of Kakwa Lake Park is located in British Columbia where it occupies nearly one third of the ecosystem. The Alberta portion of this ecosystem is protected almost entirely by either the Willmore Wilderness or the northern portion of Jasper National Park.

NCM - Northern Columbia Mountains Ecoregion

This ecoregion is a rugged, often ice-capped mountain area that rises abruptly from the Southern Rocky Mountain Trench to the east and the Columbia Highlands to the west. These mountains include a variety of rocks, ranging from metamorphic of sedimentary derivation, through volcanic origins, to a large number of granitic batholiths. This block of mountains intercepts eastward flowing moist Pacific air, making these the wettest mountains in the interior of the province. They are also an effective barrier for southerly flowing cold Arctic air masses preventing that air from reaching the southern valleys unless under a large pressure system. This ecoregion contains five ecosystems.



- **CAM - Cariboo Mountains Ecosystem:** This is an area of high, very rugged, ice-capped mountains with narrow valleys. From the north the mountains gradually increase in height southward reaching their highest in the Premier

Range at the heads of the North Thompson, Raush and Azure rivers. The high total relief and massive boldness of the mountains provide striking mountain scenery. These mountains are composed of sedimentary and metamorphosed sedimentary rocks, although some limestone is present. Where underlain by metamorphic rocks, the peaks are sharp and the ridges continuous. Where underlain by granite, the peaks are more massive and rounded and the ridges irregular or radiating from a central mass. This ecoregion lies at the north end of the ecoregion. It is drained via the upper Fraser River by the Slim, Haggen, Dome, Wolverine, Goat, Milk, Dore, Castle, Raush streams; via the main Fraser River by the Ghost, upper Cariboo and Penfold rivers; via the Columbia River (Kinbasket Reservoir) by the upper Canoe River; via the North Thompson River by the Stormking upper North Thompson, Lampiere, north Blue, upper Murtle, Azure, Hobson and upper Clearwater streams. There are a number of large lakes: such as, upper Murtle, Azure, Mitchell, Lanezi, and Isaac lakes, all of which are in protected areas.

Moisture arrives via the easterly flowing Pacific air rising directly over these mountains in the north or after passing over the Quesnel Highland to the west. That air usually creates wet and humid conditions. In the winter dense, cold Arctic air can stall along the northern margin, but under large systems invade the entire area bring periods of intense cold and snow. The northwestern valley bottoms east of the Bowron Valley have Sub-Boreal Spruce forests; elsewhere the lower valleys all have the wet Interior Cedar – Hemlock forest types. The mid to upper slopes are dominated by moist Engelmann Spruce – Subalpine Fir forests. Alpine is usually barren rock and many glaciers still occur on the highest summits, especially in the Premier Range.

There are no settlements here; Yellowhead South Highway (No.5) and the Canadian National Railway pass through the southern portion in the North Thompson valley. Logging and its attendant roads occur in the north and wherever the terrain allows road building. This ecoregion is represented by three large protected areas on the western side, being the northern and eastern portion of Wells Gray Park, Cariboo Mountains Park and the eastern three quarters of Bowron Lake Park; as well there are a number of smaller parks, such as: Upper Raush, West Twin and Sugarbowl – Grizzly Den parks on the eastern side.

- **CCM - Central Columbia Mountains Ecoregion:** This is an area of high ridges and mountains, with mainly narrow valleys and trenches, except for the wider Arrow and Kootenay lakes. This area is underlain by a variety of rocks, including sedimentary, metamorphic, gneiss and granitic batholiths. Glaciers built up along the central core moving to the west over the Okanagan Highland, or east and down the Purcell Trench, in its process it rounded the summits and deposit debris in the valleys. It is drained by streams flowing into different bodies of water: into the Kootenay Lake by the Lardeau, Lake, Glacier, Hamill, Fry, Carney, Campbell, Kaslo, Keen, and Kokanee streams; via the lower Kootenay River by the Slocan River; and eastward into the Arrow Lake reservoir by the Burton, Snow, Goathaven, Caribou, Slewiskin, Kuskanax, Halfway and Crawford streams; on the west side of the Arrow Lakes reservoir it is drained by the Begbie, Mulvehill, Cranberry, Fosthall, Arrow Park and Whatshan streams. There are two large lakes formed by damming the Columbia and Duncan rivers, namely, the upper Arrow Lakes reservoir and the south Duncan Lake reservoir; other large lakes include: Slocan, Trout, northern Whatshan and the north arm of Kootenay Lake.

This is a moist area; precipitation is high, from the valley bottoms to the upper slopes by the Pacific air moving over these mountains from either the west across the interior of the province

or from the south from across the Columbia Basin in Washington. Such moisture brings high humidity and rain in the summer or deep snow in the winter. Cold Arctic air seldom invades this area, being protected by mountain systems on all sides, but sometimes that cold air can move down either the Purcell Trench or the Columbia River Trench and affect this area. Under large systems that Arctic air can overwhelm the entire area for short periods in the winter. The valleys and lower slopes are dominated by moist Interior Cedar-Hemlock forests; the middle mountain slopes have a moist Engelmann Spruce – Subalpine Fir forest. Alpine vegetation is moist, but barren rock occurs on the highest areas and in Glacier Creek large glaciers persists.

Revelstoke in the northwest portion is the largest community, others include: Nakusp, Needles, New Denver, Trout Lake, Lardeau, and Kaslo. There are several highways here: the Trans Canada Highway (No. 1) passes through the northwestern portion from Revelstoke to Golden; the Nakusp – Mica Creek Highway (No. 23) passes along the east shore of the Upper Arrow Lakes with a ferry connecting the two sides of the reservoir, and the highway continues on the west shore to Revelstoke; the Slocan – Vernon Highway (No. 6) is located up the Slocan Valley to Nakusp, south to Fauquier; the Kaslo – New Denver Highway (No. 31A) passes over the Kokanee Range; and the Balfour – Kaslo – Galena Bay Highway (No. 31) passes along the west shore of the north arm of Kootenay Lake, upper the Lardeau Valley, past Trout Lake to the east shore of the Upper Arrow Lake at Galena Bay. Logging with its attendant roads has occurred over much of the lower elevation forests outside the parks. Extensive mineral exploration and mining was conducted throughout this ecoregion from the early 1800's to present. There are a number of large protected areas, including: the west half of the Purcell Wilderness Conservancy, Kokanee Glacier, Valhalla, Goat Range and Monashee parks.

- **NKM - Northern Kootenay Mountains Ecoregion:** This is an area of high, rugged mountains, many of which are ice-capped. These mountains are metamorphic rocks of sedimentary and volcanic in origin, there are also erosion resistant quartzite and limestone that form many of the highest peaks. This ecoregion is drained via the North Thompson River by Mud Creek; into the Adams River by the, uppermost Adams River; into Shuswap Lake by the, upper Seymour and Crazy streams; into the Kinbasket Lake (reservoir) by the, Foster, Encampment, Windy, Bachelor and Beaver streams; into Revelstoke Lake (reservoir) by the Bigmouth, Goldstream, Downie, Jordan, Scrip, Pat, Soards and Nagle streams; into the Duncan Lake (reservoir) and Kootenay lake by the, Duncan, Westfall, Geigdrich, Lake, Healy, upper Lardeau and Howser streams; and finally into the Columbia River systems below Revelstoke by the, Illecillewaet, Tangier, Incomappleux and Akolkglax streams. There are two reservoirs in this ecoregion, the Revelstoke dam generates electricity and the upper Duncan dam is for water control for downstream power generation. There are no other large lakes here.

This ecoregion has the some of the highest precipitation, as both rain and snowfall in this ecoregion. Moist Pacific air reaches it greatest high rising over these mountains bringing intense rain or snowfall and generally humid conditions. In the winter, dense Arctic air can move down the eastern side in the Rocky Mountain Trench or down the middle via either the Columbia River Trench or the Purcell Trench bringing cold weather to the valleys. Occasionally large Arctic air systems can engulf the entire ecoregion for extended periods before being pushed out by the dominant Pacific air.

There are no permanent settlements here, although there is housing for maintenance of the Mica and Revelstoke dams, and park management at Rodgers Pass. The Trans Canada Highway

(No. 1) from Revelstoke to Golden passes across the Rodgers Pass, as does the Canadian Pacific Railway. The Nakusp to Mica Creek Highway (No. 23) follows the eastern shore of Revelstoke Lake from Revelstoke to the Mica Dam. Logging with its attendant roads has occurred outside the parks in the low to mid elevation forest throughout this ecosection. Three large parks represent this ecosection: Glacier National Park is the largest, but this ecosection also includes Mount Revelstoke National Park and most of Upper Seymour River Park.

- **SCM - Southern Columbia Mountains Ecosection:** This is an area has more subdued and rounded mountains than do ecosections to the north in this ecoregion and do not show their high rugged ridges. The mountains in this ecosection are the Nelson Range, commonly referred to as the southern Selkirks, and the northeastern half of the Bonnington Range, both of the Selkirk Mountains and the southern Purcell Trench that includes the south arm of Kootenay Lake and Creston Valley. The rocks are predominantly granitic in origin but also contain a variety of other rock types. This ecosection is bounded by the West Arm of Kootenay Lake in the north, the Purcell Trench in the east the, Columbia River Fault in the west and the lower mountains of the Idaho panhandle. It extends southward into eastern Washington and northern Idaho as far south as the Pend d'Oreille valley. In British Columbia this ecosection is drained by the north-flowing Kootenay River (spelled Kootenai in the U.S.A.) as it drains into Kootenay Lake, but also by: Midge, Cultus, Summit and Boundary creeks on the east side; and by the lower Kootenay River, upper Salmo River and Stagleap Creek on the west side. In Idaho and Washington, in addition to the Kootenai River, it is also drained by Priest River that flows into the Pend Oreille River. Moyie and St. Mary lakes are the two largest lakes in this ecosection.

Pacific air moving over these mountains arrives either from the interior of British Columbia or from the southwest over the Columbia Basin. Precipitation is high on the mountain slopes but the Creston Valley (extending south to Bonners Ferry Idaho) is in a strong rain shadow. Cold Arctic air seldom envelopes this ecosection and when it does it is usually of short duration. The valleys and lower slopes are dominated by moist Interior Cedar – Hemlock forests; the upper slopes have moist Engelmann Spruce – Subalpine Fir forests. Alpine is limited to the higher ridges and is usually sparsely vegetated or barren rock.

The main communities in British Columbia are Nelson, and Creston, but many small settlements occur along the east shore of the South and West Arms of Kootenay Lake in the Creston Valley and along Highway No. 6. In Idaho, Bonners Ferry is the largest community, but there are many settlements south of there to Sandpoint; and many settlements along the priest River. Washington has no communities here. There are several highways that cross this ecosection: In B.C. the Crowsnest Highway (No. 3) from Salmo to Creston passes over the Selkirk Mountains; Castlegar to Creston (No. 3A) passes east up the Kootenay River to Nelson and along the shore of the West Arm of Kootenay Lake to Balfour and the south along the east side of the south arm of Kootenay Lake to Creston. The Nelson to Nelway Highway (No. 6) passes through the Salmo River Valley from Nelson to Salmo. In the U.S.A. Interstate Highway 2/95 is located in the Purcell Trench and Interstate Highway 2 is located on the east side of the Pend Oreille River; there are no major highways in Washington. Logging with its attendant roads have occurred over the more gentle terrain, and mineral exploration, since the late 19th century has occurred throughout this ecosection in both Canada and the U.S.A. West Arm Park and Creston Valley Wildlife Management Area are two of the larger protected areas established in British Columbia. In addition, the large private holdings of Dark Woods Forest have been purchased by Nature Conservancy Canada for the benefit of wildlife conservation. In Washington and Idaho the

higher ridges surrounding Priest Lake have been designated as the Salmo-Priest Wilderness Area.

- **SPM - Southern Purcell Mountains Ecoregion:** This is a rounded upland and mountain area that is higher in the north and diminishes in height southward into northern Idaho and northwestern Montana. The rocks here are predominantly sedimentary, having been eroded from the North American Craton into a shallow sea, long before mountain building created the Rocky and Columbia mountains. Ice moved down the higher mountains to the north and also the adjacent Purcell Trench reaching into the Idaho panhandle and northwestern Montana before stopping. These glaciers rounded the mountains and widened the valleys. The ice damming of the Clark Fork in Montana created a large body of water, Lake Missoula, that worked its way through the ice releasing an extreme flow of water that scoured the Columbia Basin creating the Scablands; this damming and erosion happened many times before the ice sheet finally waned over 13,000 years ago. This ecoregion is drained to the east into the Rocky Mountain Trench by St Mary's River; south into the Kootenay River by the Moyie, Yahk (spelled Yaak in the USA) and Goat/Kianuko rivers, and west into Kootenay Lake by the shorter, creeks. In Idaho and Montana it is drained by the Kootenai (USA spelling) River and by streams flowing into the Clark Fork. Moisture and higher summer temperatures usually enter this ecoregion by way of the Columbia Basin to the southwest and by the southern portion of the Purcell Trench; or by way of the higher Columbia Mountains to the west. Cold Arctic air seldom reached this area, except via the Purcell Trench or the Southern Rocky Mountain Trench; however sometimes that Arctic air is forced under a large system then it invades the entire area, but such cold weather is usually of short duration. Moist Interior Cedar – Hemlock forests grow in all the valleys and on the lower mountain slopes; Engelmann Spruce – Subalpine Fir forests occur on the middle and most upper slopes. Alpine areas are restricted to the higher portions of the St. Mary's/ Kianuko area in British Columbia; and to the higher portions of the Cabinet and Yaak mountains in Montana.

This ecoregion contains no large communities, only small settlements, such as Yahk and Kitchener in British Columbia and Clark Fork and Yaak in Montana. The Crowsnest Highway (No. 3) from Creston to Cranbrook passes through the centre of this ecoregion and Highway (No. 95) south of Yahk goes south to the Canada/USA border; Interstate 2 follows the Clark Fork in Montana. Logging has occurred in all the gentler terrain in British Columbia as well as Idaho and Montana. In British Columbia several protected areas represent this ecoregion: the southwestern portion of Purcell Wilderness Conservancy, St. Mary's Alpine, Lockhart Creek, Kianuko, and Gilnockie parks. In Montana the Cabinet Mountains have been designated as a Wilderness Area and all the upper elevation forests and ridges have been placed in a roadless area category.

NCD - Northern Continental Divide Ecoregion

This ecoregion is an area of wide valleys and rounded mountains that is interspersed with higher ridges of less erodable bedrock. Geologically it was part of the deep sea sedimentary rocks that were uplifted when the first superterrane collided with the core the North American Continent about 200 million years ago. This area is in a rainshadow from the moist Pacific air moving eastward and cold Arctic air may influence this area from both the Southern Rocky Mountain Trench to the west and the Interior Plains to the east. This Ecoregion contains three ecosections in British Columbia:



of

- **COC - Crown of the Continent Ecosection:** This ecosection occurs mainly in Montana and a segment that occurs in Alberta, there is only a minor segment that enters into British Columbia along the south-easternmost border with Alberta or Montana. This is a bold mountainous area, consisting of the Clark Range that rises abruptly in the east from the surrounding Prairie in Alberta and Great Plains in Montana; or in the west from the Flathead Basin in British Columbia and Montana. This ecosection is drained in British Columbia to the west by the Akamina/Kishinena, Sage, Commerce, Haig and Cate streams into the Flathead River. In Alberta, it is drained to the east by the Carbondale, Castle, Waterton and St. Mary rivers into the Oldman River. While in Montana it is drained to the east via the Missouri River by the Milk, Medicine, Marias and Sun rivers; and to the west via the Clark Fork River by the three forks of the Flathead and Blackfoot rivers. There are several large mountain lakes in Alberta and Montana, of note, are the Waterton and Cameron lakes in Alberta, and upper Waterton, Sherburne, Saint Mary, and Two Medicine lakes on the eastside in Montana and Kintla, Bowman, Logging, McDonald, Swan and Seeley lakes and Hungry Horse Reservoir on the west side.

This area is affected by moist Pacific air arriving from the west over the Columbia Basin and Columbia Mountains, much of its moisture having been precipitated out. Cold Arctic air often stalls along the eastern margin in Alberta and Montana but can invade this area under large pressure systems bringing periods of intense cold and snow. High winds can blow through the low mountain passes. Engelmann Spruce – Subalpine Fir forests dominate the slopes throughout, except on the lower slopes, eastern slopes in Alberta and Montana where the Aspen Parkland occurs. Vegetated alpine and barren rock occur on the higher slopes and ridges and in Montana a few small glaciers persist.

There are no communities or settlements in British Columbia; Waterton Park is located in Waterton Lakes National Park in Alberta; in Montana there are no settlements although there is a lodge at McDonald Lake. There are no major highways in Canada in this ecosection, but there are a number of paved roads in Waterton Lakes National Park; in Montana, the Going to The Sun Highway is located through Glacier National Park and Interstate Highway 2 follows the low pass up the Middle Fork of the Flathead and Summit Creek. Logging and its attendant roads have

occurred throughout this ecosection outside the protected areas. Akamina-Kishinena Park is the only protected area in British Columbia; Waterton Lakes National Park covers a large portion of this ecosection in Alberta and Glacier National Park occupies almost all of this ecosection in Montana.

- **ELV - Elk Valley Ecosection:** This is mainly a wide valley, with soft sedimentary rocks, bounded by harder limestone and dolomite ridges. Its main centre is in the Elk Valley of British Columbia, but it also includes the southern upper Bull River in B.C. and the upper Oldman River watershed in Alberta. Glaciers override this area moving south down the Elk and Bull river valleys and eastward over the continental divide into Alberta. In British Columbia this ecosection it is drained to the south into the Kootenay River by the Elk, Morrissey, Alexander, Line, Fording, Bull (only the southern upper portion), Sulphur and Sand streams. While in Alberta it is drained to the southeast by the Oldman, Livingstone and Crowsnest rivers; and to the east by the Highwood River. There are no large lakes and only a few smaller ones.

This area is in a rainshadow of easterly moving moist Pacific air, but it is often influenced by low pressure systems in Alberta forcing cold air westward in this area those systems cause increased moisture to occur in the lower Elk and lower Bull river areas. High winds can blow through the low passes, especially the Crowsnest Pass. It is exposed to cold Arctic air from Alberta via the low Elk, Crowsnest, Oldman and Highwood valleys, creating extreme cold and snow conditions. Moist Interior Cedar – Hemlock forests occur at the western areas of the Bull, Elk and Morrissey valleys. In the upper Elk Valley Montane Spruce forests occur in the valley bottom; dry Engelmann Spruce – Subalpine Fir forests occur elsewhere in the upper valleys and mountain slopes. Alpine consisting of dry vegetation types bare rock occur on all the upper slopes and mountain tops, although an alpine grassland occurs on some of high elevations in the Fording River watershed. Further east in Alberta along the eastern margin with the Prairie, Aspen Parkland occurs on the lower slopes.

In British Columbia the major communities include: Fernie, Sparwood and Elkford; while in Alberta the Crowsnest Pass Municipality includes the communities of Coleman, Blairmore and Hillcrest. The Crowsnest Highway (No. 3) passes through from Elko, British Columbia to Fort McLeod, Alberta and the Elk Valley Highway (No. 43) connects Elkford with Sparwood. Coal mining has occurred here for more than a century, first with underground mines but since the mid-1960's with open pit mines; elsewhere logging has extended a network of roads through all the assessable areas in both British Columbia and Alberta. The two largest protected areas in BC are the Elk Lakes Park and the southeastern portion of Height of the Rockies Park. In Alberta there is only a small, southern portion of the Peter Lougheed Park in this ecosection.

- **FLV - Flathead Valley Ecosection:** This is a wide basin unit with considerable erosion resistant limestone ridges, that separate the Flathead valley from the Wigwam valley (MacDonald and Inverted ranges) and the Wigwam from the Rocky Mountain Trench (Galton Range); in Montana it is the Whitefish Range that separates the north Fork of the Flathead. From the Rocky Mountain Trench, this ecosection is separated from the Elk Valley to the north by Limestone, Leech, Morrissey and Flathead ridges. It extends southward into Montana as far as Whitefish Lake and the junction of the three forks of the Flathead River. It does not occur in Alberta. Glaciers moved south down this valley into northwestern Montana before stalling. In British Columbia this ecosection is drained southward by the Flathead River and its tributaries; while the tributaries of the Wigwam River are the Desolation, Bighorn and Lodgepole creeks drain

westward into the Elk River. In Montana tributaries of the North Fork of the Flathead are the Trail, Red Meadow, Goat, Big and Canyon Creeks; while Swift Creek drains southward into Whitefish Lake, the only large lake in this ecosection.

Moist Pacific air moves over this area primarily from the southwest over the Columbia Basin and the southern Columbia Mountains, the complex topography here creates many rainshadows or alternatively wetter west facing slopes. Dense, cold Arctic air often stalls along the Rocky Mountain Foothills to the east, but under large systems can override the mountains bringing periods of intense cold and snowfall. The forests in the main Flathead Valley are the dry Montane Spruce types; Engelmann Spruce – Subalpine Fir forests dominate the mountain slopes. Alpine consisting of dry vegetation types or barren rock occur on the mountain tops and higher ridges.

In the BC portion there are no major settlements; while in Montana, Polebridge is the only settlement well within this ecosection; Whitefish and Columbia Falls are situated partly on the southern margin and many home-sites have been established along the North Fork of the Flathead River. There are no major highways in this ecosection. Logging, with its attendant roads has been extensive throughout this ecosection. There are no large protected areas in either British Columbia or Montana.

PTR - Purcell Transitional Ranges Ecoregion

This ecoregion lies east of the main Columbia Mountains it rises from the Rocky Mountain Trench in the east in a series of foothills that build in height, finally rising into rugged mountains in the northern ecosection, where it achieves a grand stature. The climate is one of a partial rain shadow from the Pacific westerlies, but it still receives considerable moisture by low-pressure systems lying over the Canadian Prairies and Southern Canadian Rockies to the east. In addition, cold Arctic air invades this area in the winter and spring via the Rocky Mountain Trench. There are two ecosections in this ecoregion:



- **EPM - Eastern Purcell Mountains**

Ecosection: This is a rugged, mountain area with high valleys, and rounded foothills that lie west above the Southern Rocky Mountain Trench. These mountains are underlain by sedimentary and metamorphic rocks of great age that were laid down in a shallow sea on the western margin of the North American Craton before the mountain building episodes of about 200 million years ago. Glaciers flowed eastward out of these mountains into the Southern Rocky Mountain Trench before moving south into northern Montana. It is located on the leeward side of the Purcell Ranges from the height of land eastward to the Rocky Mountain Trench and from the head of the Purcell Trench in the Beaver River valley south to the St. Mary River. This ecosection is drained by the upper Mather, Skookumchuck and Findlay streams that flow east into the Kootenay River; and by the Dutch, Toby, Horsethief, Forster, Francis, Bugaboo, Vowell, Spillimacheen and Quartz streams that flow

east into the upper Columbia River. Whitetail and Lake of the Hanging Glacier are the only two lakes of any size.

- This ecosection is within a distinct rain shadow of the Pacific air that pass over the Columbia Mountains, although it still receives considerable moisture at certain times of the year. In the winter cold, dense Arctic air that invades the Southern Rocky Mountain Trench can build up in the lower eastern valleys, under some conditions large Arctic air can build up to envelope the entire Columbia and Rocky Mountains bring extreme cold weather and snow for short periods. The lower outer valleys of the Findlay, Dutch, Toby and Horsethief creeks have dry Interior Douglas-fir forests; while in the north against the lower slopes of the Dogtooth Range and in the outer Spillimacheen and Bobby Burns streams, wet Interior Cedar – Hemlock forest grow. Elsewhere cool montane forest of Montane Spruce occur in all the main valleys; and on the middle to upper mountain slopes, Engelmann Spruce – Subalpine Fir forests dominate. The mountains here are high enough to have alpine on all the upper ridges and mountain tops, although vegetation is usually sparse and barren rock is common. Large mountain glaciers remain on the highest mountains along the crest of the Purcell Mountains from Dutch Creek north to Spillimacheen River.
- There are no settlements, nor highways in this ecosection, although a wilderness lodge has been established in Bugaboo Creek. Logging and its attendant roads have occurred in all the valleys that lie outside the Purcell Wilderness Area, in addition heli-hiking and heli-skiing are popular, especially in the northern, heavy snowfall areas. This ecosection is represented by Bugaboo Park and the eastern portion of Glacier National Park that has been established in the northern portion of this ecosection; while the east half of the Purcell Wilderness Conservancy has been established in the southwest.
- **MCR - McGillivray Range Ecosection:** This is a small area of subdued ridges and foothills located in the southeast of the Purcell Mountains. This ecosection extends southward just into northern Montana, but it lies mainly within British Columbia. These mountains are underlain by sedimentary and metamorphic rocks of great age that were laid down in a shallow sea on the western margin of the North American Craton before the mountain building episodes of about 200 million years ago. Glaciers flowed eastward out of these mountains into the Southern Rocky Mountain Trench before moving south into northern Montana. This ecosection is drained by the Perry, upper Moyie, Joseph, Gold, Bloom and Yahk (spelled YAAK in Montana) streams. There are no large lakes here.

This ecosection lies in a partial rain shadow of the higher Columbia Mountains to the west, but it can receive moisture from low-pressure systems lying over the western Prairies or over the southern Rocky Mountains; or from moisture arriving from over the Columbia Basin to the southwest. Cold Arctic it can arrive via systems the move down the Southern Rock Mountain Trench or by large, cold air masses that engulf the entire Columbia and Rocky Mountains, but such systems are usually short-lived. Some moist Interior Cedar – Hemlock forests grow in the Yahk River valley, but usually dry forests prevail. Dry Interior Douglas-fir forests occur in the eastern facing valleys in St. Mary, Peavine and Gold creeks; and dry Montane Spruce forests occur elsewhere in the valley bottoms and lower slopes. On the middle to upper slopes Engelmann Spruce – Subalpine Fir forests dominate. Alpine vegetation is sparse and restricted to a few higher ridges.

There are no towns or settlements in this ecosection. The Crowsnest Highway (No. 3) from Creston to Cranbook passes through the northwestern portion. Logging with its attendant roads has occurred throughout most of this area, in addition placer mining has occurred in Perry Creek. There are no representative protected areas in this ecosection.

SBF - Selkirk - Bitterroot Foothills Ecoregion

This ecoregion is an area of rounded mountains and wide valleys, lying on the southwestern side of the Southern Interior Mountains Ecoprovince. This area lies between the warm moist highlands to the west and wet, cool mountains to the east. This ecoregion extends southeasterly into Washington and the Idaho Panhandle. Only one ecosection represents this ecoregion in British Columbia:

- **SFH - Selkirk Foothills Ecosection**

This is a transitional mountain area that is situated between the rolling uplands of the Okanagan Highlands to the west, and the rugged mountains of the Selkirk Mountains to the east. It is underlain by granitic batholiths and by sedimentary rocks, particularly to the south. Glaciers overrode the uplands and moved down the Columbia River valley into northern Washington, rounding the mountain profiles and leaving vast quantities of glacial debris on the valley floor, especially south of Castlegar. This ecosection is divided in two by the British Columbia - Washington border. In British Columbia this ecosection is drained by the Columbia, Granby, Burrell, Eagle, Sandner, Big Sheep, Beaver, lower Salmo and lower Pend Oreille streams; the Columbia River has been dammed at Robson creating a reservoir out of Upper and Lower Arrow Lakes, as well dams in the lower Kootenay River and the Pend Oreille at Waneta provide run of the river power; Christina and Whatshan lakes are the only natural large lakes here. In Washington it is drained by the Columbia, Pend Oreille, Deep, Onion, Rocky, Lost, Sullivan and Harvey streams; the Pend Oreille river has been dammed at Metaline Falls for un of the river power and the Columbia River has been dammed at Grand Coulee, Washington creating a large reservoir that backs up into this ecosection; there are few natural large lakes Sullivan and Thomas being the largest two.



This ecosection receives considerable moisture from northwesterly Pacific storms coming across the Columbia Plateau; as well it receives increased summer temperatures because of its proximity to the Columbia Basin to the south. The Columbia River valley in British Columbia receives the highest summer temperatures in the entire ecoprovince. The area is only receives cold Arctic air when large systems override the entire interior of the province and even it is usually only short-lived. The driest type of Interior Cedar – Hemlock forests occur in the Columbia River valley south of Castlegar and the lower Granby River valley, elsewhere the valleys are dominated by moist forests; at higher elevations on the middle and upper slopes moist Engelmann Spruce – Subalpine Fir forests dominate. Alpine vegetation is rare here only occurring in the northwestern ridges of the upper Granby River watershed. The dry Interior Cedar – Hemlock forests are more widespread in Washington in the Columbia and Pend Oreille valleys and the moist Interior Cedar – Hemlock forests dominate the uplands. Moist Engelmann

Spruce – Subalpine forests are rare, only occurring on the highest ridge between the Columbia and Pend Oreille valleys. The vegetation in the Columbia valley, especially from Castlegar to the Canada/U.S.A. border, has been severely impacted by acid rain from the Trail smelter.

In British Columbia cities include Castlegar, Trail and Rossland and smaller communities and settlements of include Fauquier, Needles, Robson, Fruitvale, Salmo and Christina Lake; while in Washington Colville is the largest settlement, others include: Northport, Lone, Newport and Chewelah. The Crowsnest Highway (No. 3) crosses the southern area in British Columbia from Grand Forks to Creston; Highway 3A connects Castlegar with Nelson; Highway 3B connects the Crowsnest Highway at Nancy Greene Lake to Fruitvale; and Highway 6 connects Vernon to Nakusp and Salmo to Nelway. There are numerous highways in Washington following all the major river valleys as well, State Highway 20 runs across the uplands from the Okanogan Valley to the Pend Oreille valley. This area has been heavily industrialized and impacted by: sulphur fumes from the smelter at Trail, ponding of the Pend Oreille River in both British Columbia and Washington and by logging. There are three large protected areas in British Columbia: Granby, Gladstone and Syringa parks. There are no large protected areas in Washington.

SRT - Southern Rocky Mountain Trench Ecoregion

This ecoregion is a long wide, flat-bottomed valley that dissects the Southern Interior Mountains Ecoprovince into two unequal mountain blocks. The origin of the Southern Rocky Mountain Trench was not created by either lateral displacement or strike-slip faulting, like its northern counterpart. Rather it seems to be a weak, erosional line between the older continental margin and the accreted terranes in the Cassiar Belt that has been eroded by downwasting of streams and glaciation into an apparent linement. Cold Arctic air from the sub-boreal part of the province is able to move down the Trench easily, while in the summer months the southern part of the Trench is the driest part of the ecoprovince, being in a rainshadow of easterly flowing Pacific air and by being affected by hot air invading from the Great Plains in Montana. It contains four ecosections:



- **BBT - Big Bend Trench Ecosection**

This is the narrowest section of the Southern Rocky Mountain Trench it is located in the central part of that Trench. Most of this intermountain plain has been flooded by the Kinbasket Lake reservoir, leaving only the upper slopes in a natural state. The boundaries between its two mountain neighbours is purely physiographic. This Ecosection has high precipitation, as moisture rises over the Rockies to the east. Historically this ecosection was drained by the northward flowing Columbia River and the southward flowing Canoe River, and other than a few streams that end in the Trench, only the Succour and Whitepine creeks now run free. Logging has occurred upslope from the reservoir. Donald Station is the only settlement in this ecosection. There are no large protected areas here.

- **EKT - East Kootenay Trench Ecosection**

This is a broad, flat, glacial intermountain plain that lies in the southern portion of the Rocky Mountain Trench. It extends from Dutch Creek on the west side of Columbia Lake, past Canal Flats south onto the Tobacco Plains of Montana. Most of the sedimentary bedrock outcrops are of Purcell Mountain volcanic origin that were laid down in a shallow sea on the western margin of the North American Craton before the mountain building episodes of about 200 million years ago. Glaciers moved southward down this valley pushing into Montana, when the ice stalled and began to melt lakes formed along its margin filling with buff-coloured silts or depositing deep sands and gravels. This ecosection is drained by the Kootenay River flowing southward, it is joined by the Findlay, Skookumchuck, Lussier, Wolf, Wasa, St Mary, Wildhorse, Bull, Little Sand, Elk and Gold streams. In Montana it is drained by the Tobacco River that flows into the Kooconusa Lake. The southern area of this ecosection has been flooded by a dam in Libby, Montana; the Kooconusa reservoir extends north as far as the mouth of the Bull River; Premier and Wasa are the two largest natural lakes.

This area is in a distinct rainshadow from Pacific air moving over the Columbia Mountains to the west; or from low pressure systems in Alberta and Montana pushing moist air over the Rocky Mountains to the east. Surface heating in the summer moves the clouds from this valley giving clear skies and hot temperatures. During the winter and early spring months, the Rocky Mountain Trench serves as an access route for outbreaks of cold, dense Arctic air coming from the central interior of the province. During large outbreaks, the cold air remains in the trench often trapped in a temperature inversion by Pacific air thus giving the valley dense cloud cover while the adjacent mountains are cloud-free. The dry, sandy sites on the Tobacco Plains, Wycliffe Prairie and Premier Ridge are dominated by dry Ponderosa Pine forests; the remainder of this areas has dry Interior Douglas-fir forests; Montane Spruce forest occur on only the highest parts of Premier and Wasa ridges.

There are two city in British Columbia: Cranbrook and Kimberly; as well there are many smaller communities and settlements, including, Canal Flats, Skookumchuck, Tata Creek, Wasa Lake, Fort Steele, Marysville, St. Eugene, Bull River, Wardner, Jaffray, Elko, Baynes Lake and Grasmere; while in Montana, Eureka is the largest community. This area has been logged and burned extensively throughout the past century, agriculture - mainly free-ranging livestock grazing and hay production has also taken place throughout and much of the trench is privately owned. The Crowsnest Highway (No. 3) passes through the southern portion from Cranbrook to Elko; the Roosevelt to Radium Highway (No. 93) passes north up the Trench from Whitefish, Montana to Canal Flats. Highway 95A connects Kimberly with Cranbrook and Tata Creek. In Montana Highway 37 connects Eureka with Libby along the east side of Kooconusa Lake. There are no large protected areas in this ecosection; however, several private ranches have been purchased for their wildlife production and conservation purposes of Kooconusa Lake. There are no large protected areas in this ecosection.

- **UCV - Upper Columbia Valley Ecosection**

This ecosection is a broad intermountain plain, that is widest in the southern portion and becomes much narrower in the northern portion past Parson. Most of the sedimentary bedrock outcrops are of Purcell Mountain volcanic origin that were laid down in a shallow sea on the western margin of the North American Craton before the mountain building episodes of about 200 million years ago. Deep glacial lacustrine deposits occur along the banks of the southern area; and a large meltwater channel occurs in the lower Spillamacheen River - Francis Creek area. The main stream in this ecosection is the northward flowing upper Columbia, but portions

of Dutch, Toby, Horsethief, Francis, Forester, Bugaboo, Bobbie Burns. Spillamacheen, Kicking Horse, Blaeberry, Kindersley, Sinclair, Stoddart, Shuswap and Windermere also cut through this ecosection. The most significant water body is the Columbia wetlands that extend uninterrupted from Athalmer to just south of Donald Station; Columbia and Windermere lakes are the two largest here.

This area is in a distinct rainshadow from Pacific air moving over the Columbia Mountains to the west; or from low pressure systems in Alberta and Montana pushing moist air over the Rocky Mountains to the east. Surface heating in the summer moves the clouds from this valley giving clear skies and hot temperatures. During the winter and early spring months, the Rocky Mountain Trench serves as an access route for outbreaks of cold, dense Arctic air coming from the central interior of the province. During large outbreaks, the cold air remains in the trench often trapped in a temperature inversion by Pacific air thus giving the valley dense cloud cover while the adjacent mountains are cloud-free. The dry, silty and sandy sites on the benchlands have dry Interior Douglas-fir forests; these forests become moister further north from Brisco to Golden. Montane Spruce forests occur on the higher benches on the western side against the Purcell Mountains and in the Spillimacheen/Francis valley. Moist Interior Cedar – Hemlock forests on the higher benches against the Dogtooth Ranges in the northwest and the Brisco Range in the northeast. Moist Engelmann Spruce – Subalpine Fir forests occur only on the highest portions of Steamboat and Jubilee mountains.

There are three cities in this ecosection: Invermere, Radium Hot Springs and Golden; and several smaller settlements that include: Fairmont Hot Springs, Windermere, Wilmer and Edgewater. This area has been logged, including Christmas tree production and farmed, generally hay crops and free-ranging livestock and more recently it has seen the impact of recreational development, especially above Windermere Lake, but also in the Radium Hot Springs area. The Roosevelt to Radium Highway (No. 93) and the Kootenay - Columbia Highway (No. 95) is located on the east side of the Trench, they connect Cranbrook with Golden; as well the Westside Road has been upgraded along the western benches from Dutch Creek, past Invermere to Spillimacheen. The Columbia Wetlands Wildlife Management Area is the largest protected area; as well the lower portion of the East Side Columbia Lake Wildlife Management Area and a small western portion of Kootenay National Park have also been established here.

- **UFT - Upper Fraser Trench Ecosection**

This is a broad, flat, intermountain, glacial plain. Glacier moved down from the adjacent Cariboo Ranges and Rocky Mountains or entered from the central interior all coalescing and moved southward down the trench it left behind deep glacial sediments. This Ecosection is the northern-most portion of the Southern Rocky Mountain Trench and extends from the Blackman River in the south north to Sinclair Mills, south of the mouth of the Bowron River, in the north; it is bounded on both sides by steep mountains. This ecosection is drained by the upper Fraser River that runs north-westward through the northern two-thirds of this ecosection; while the McLennan/Canoe rivers flowed southeast in the southern third, (however, only the McLennan River now runs free, the Canoe River has been flooded with the erection of the Mica Dam). Many streams that begin in the adjacent mountain join the Fraser River, the larger streams include: the upper Fraser, Rausch, Holmes, Morkill, Torpy, and Goat rivers; Canoe Reach of the Kinbasket Lake reservoir occupies much of the southern third of the valley.

The climate is moderately moist and cool, however there is an area with a distinct rainshadow from Valemount to McBride. Moist air arrives from the central interior bringing moist conditions to much of this area as that air is forced to rise over the adjacent mountains. Cold Arctic air invades from the central interior providing periods of extreme cold and heavy snow conditions for considerable periods during the winter and early spring. Cold, moist Sub-Boreal Spruce forests occur above the Fraser River and on the adjacent benchlands from the Torpy River to the Canoe River; in the northern portion extensive wetlands and muskegs have developed. Elsewhere wet Interior Cedar – Hemlock forest grow on the benchlands throughout the ecosection.

The major communities are McBride and Valemount. The Yellowhead Highway (No. 16) from Prince George to Jasper passes through here, and the Yellowhead South Highway (No. 5) connects Valemount with Kamloops. Logging has occurred on the productive forest land, and agriculture has been developed in the rainshadow areas around McBride. The east half of Grizzly Den – Sugarbowl and the northern half of West Twin parks are the only large protected areas here.

WRA - Western Continental Ranges Ecoregion

This ecoregion has high, rugged mountains, with deep narrow valleys. There are a number of bold mountains that typify the Park Ranges (the dominant ranges throughout most of this ecoregion) - Mount Robson, the highest in this ecoregion, presents a bold front, typical of the Park Ranges, to viewers driving the Yellowhead Highway, but there is also several others such as Stephen, Assiniboine, King George, little known Harrison, Joffre, Abruzzi and Marconi mountains which typify the Park Ranges. The climate here is mainly continental, but rain shadows do occur within the internal valleys, as the Pacific air masses rise over these ranges on its journey eastward. Cold Arctic air often stalls along the eastern boundary in Alberta, but occasionally invades this area bring cold air and wind. Most of this ecoregion occurs in British Columbia, but the southern two ecosections extend over into Alberta. It contains three ecosections:



- **CPK - Central Park Ranges Ecosection**

This is an area of high, rugged mountains of the Park Ranges, many of which are ice-capped, including one of the largest icefields – Columbia, in the southern Rocky Mountains. The mountains are underlain by deep layers of sedimentary limestone and quartzite rocks that have been little deformed, thus presenting bold faces and steep slopes. Valleys are often short and steep. Glaciers moved down the slopes to the Rocky Mountain Trench to the west or into the North Saskatchewan and Bow river valleys to the east. Several large icefields remain along the Continental Divide, the Columbia Icefield is perhaps the best known, other large ones include: Chaba, Clemenceaux, Lyell and Freshfield. This ecosection is located mainly in British Columbia, but it includes part of Alberta lying on the west side of the Athabasca-Summit-North Saskatchewan-Bow lineament from Whirlpool River south to near Kicking Horse Pass. In the British Columbia portion streams such as, Dawson, Wood, Sullivan, Bush, Valanciennes,

Bluewater, Waitabit and Blaeberry all rush westward into the Kinbasket Lake reservoir; in Alberta the main streams are the northward flowing Whirlpool, Athabasca, and the southward flowing Alexandria, Arctomys, and Howse streams.

The climate is cold and wet; moist air rising over the entire ecoprovince to the west drops considerable moisture to this area; as well low pressure weather systems centered over Alberta can stall over this ecosection bringing moisture from the east. Arctic air can arrive via the Athabasca Valley in Alberta or the Rocky Mountain Trench in British Columbia bringing periods of intense cold and snow. The lower, west facing valleys are dominated by wet Interior Cedar – Hemlock forests; with the upper slopes have wet Engelmann Spruce – Subalpine Fir forests in both British Columbia and Alberta. Alpine of sparse vegetation, but more often, barren rock and icefields dominate the upper ridges and mountain summits.

There are no settlements or highways in this ecosection. The lower Bush, Sullivan and Wood valleys have all been flooded by the Kinbasket Lake reservoir. Logging has occurred in the Sullivan, Bush and Blaeberry valleys. In British Columbia, Cummins Lakes and Hamber provincial parks have been established here; while in Alberta portions of Jasper and Banff national parks are long-standing parks.

- **NPK - Northern Park Ranges Ecosection**

This is an area of high, rugged mountains of the Park Ranges, some with mountain glaciers, and moderately wide valleys. The mountains are underlain by deep layers of sedimentary limestone and quartzite rocks that have been little deformed, thus presenting bold faces and steep slopes. Valleys are often short and steep. At 3,954 meters, Mount Robson, the highest peak in the Canadian Rockies, epitomizes the bold front of the Park Ranges. Glaciers moved down the slopes to the Rocky Mountain Trench to the west; or to the northeast to coalesce with the Laurentide Glacier in the Interior Plains. This ecosection lies entirely in British Columbia; the eastern boundary is well defined by the Continental Divide, the British Columbia – Alberta border. In addition to the upper Fraser, this ecosection is drained by: the Forgetmenot and upper Morkill rivers that flow into the Fraser River; and by Ptarmigan and Hugh Allen rivers that flow into the Columbia River via Kinbasket Lake. Moose and Yellowhead lakes are the only large lakes here.

The climate is cold and wet; moist air rising over the entire ecoprovince to the west drops considerable moisture to this area; as well low pressure weather systems centered over Alberta can stall over this ecosection bringing moisture from the east. Arctic air can arrive via the Athabasca Valley in Alberta or the Rocky Mountain Trench in British Columbia bringing periods of intense cold and snow. The upper Fraser River valley contains cold, dry Sub-Boreal Spruce forests; lower, west facing valleys are dominated by wet Interior Cedar – Hemlock forests; while the upper slopes have wet Engelmann Spruce – Subalpine Fir forests in both British Columbia. Alpine of sparse vegetation, but more often barren rock, dominate the upper ridges and mountain summits.

Except for the lodge at Mount Robson, there are no settlements in this ecosection. The Yellowhead Highway (No. 16), the only major access here, follows the upper Fraser River from Tete Jaune Cache to Jasper. Logging with its attendant roads has occurred in the Morkill, Holmes, and all the short valleys that enter into the Rocky Mountains Trench, including the Ptarmigan and Hugh Allen watersheds. Mount Robson is the largest representative Provincial

Park, while Small River, Swift Current River, Mount Terry Fox and Holliday Creek Arch are four smaller provincial Parks that have been established.

- **SPK - Southern Park Ranges Ecoregion**

This is a rugged mountainous area that is dissected by long rivers, forming moderately wide linear valleys. It consists of the bold Park Ranges that lie through the western side and middle of the ecoregion, and the Front Ranges that occur between the Elk and Bull-White river valleys. While the Park Ranges are little deformed and consist of old sedimentary and metamorphic rocks, often with thick, cliff-forming limestone and quartzite. The Front Ranges, which are, controlled by fold and fault structures that consist of a succession of overthrust sheets that present gentle slope to the southwest and a steep limestone faces to the northeast, the Front Ranges form striking mountains that rise abruptly above the broad, glaciated valleys that separate them. The mountains in this ecoregion are almost parallel, with structural ridges, which are deeply incised and partially dissected by long transverse valleys. Glaciers eroded much of the upland surface and left deep deposits in the valley bottoms. This ecoregion lies mainly in British Columbia with only small areas occurring in Alberta as far east as the upper Bow and Kananaskis valleys. This In British Columbia this ecoregion is drained by the Kicking Horse, Ottertail, Beaverfoot, Upper Kootenay, Vermilion, Simpson, Cross, Albert, Palliser, Windermere, Fenwick, White, North White, East White, Upper Bull, Forsyth, Coyote, Quinn, Blackfoot, Lussier, Diorite, Wildhorse, Brule, Galbraith and Tanglefoot streams; in Alberta it is drained by the tributary streams of the Bow and Kananaskis rivers. Whiteswan Lake is the largest lake in this ecoregion.

Pacific air moving eastward over these mountains have created rainshadows on the leeward sides and moist forests on the windward slopes. Cold Arctic air seldom intrudes into this ecoregion, but when it does it brings intense cold and snow that can become trapped by moist Pacific air resulting in temperature inversions in all the major valleys. Moist Interior Douglas-fir forests enters only in southern-most portion of the Upper Kootenay valley; however in the upper Galbraith and Beaverfoot valleys wet Interior Cedar – Hemlock forest grow. Elsewhere cool Montane Spruce forests occur in the valley bottoms and lower slopes. Dry Engelmann Spruce – Subalpine Fir forests are established on all the middle and upper slopes. The alpine occurs on the upper ridges and mountains, but here it is sparsely vegetated and mainly consists of barren rock.

Field is the only settlement with these mountains. There are two highways that cross this ecoregion – Trans Canada Highway (No. 1), which cuts through Yoho National Park along with the Canadian Pacific Railway, from Golden to Banff; and the Kootenay Parkway (No. 93) that cuts through Kootenay National Park. In addition, logging with its attendant roads has occurred in all but the most inaccessible valleys and slopes outside of the protected areas. There are several large protected areas, in British Columbia this ecoregion is represented by: Yoho National Park, Kootenay National Park, Mount Assiniboine, Height of the Rockies, Top of the World and Whiteswan Lake Provincial parks; in Alberta portions of Banff National Park and Peter Lougheed occur over the mountains just east of the Continental Divide.

SAL - Southern Alaska Mountains Ecoregion

Location – This Ecoprovince is located on the north side of the Gulf of Alaska. It extends from Lynn Canal in the east, across the Asek, St. Elias, Wrangell, and Chugach Mountains to the Kenai Mountains in the west.

Climate – The climate is cold maritime, caused by moist air in the Gulf of Alaska rising over the high mountains. Intense precipitation in the form snow occurs on the upper slopes and summits. Cold temperatures are the result of latitude and long winters with a short growing season.

Vegetation – The Coastal Western Hemlock zone is reduced to a narrow band near sea level, the subalpine or Mountain Hemlock zone is similarly a narrow belt on the lower slopes. And while the Alpine Tundra zone is extensive most of that is snow or icefields, the vegetative alpine belt is quite narrow and low.

Fauna – Mountain Goats occur in the alpine and subalpine vegetation belts, Sitka Black-Tailed Deer occur in the riparian habitat and along the coast, and Moose occur mainly in the riparian habitat. American Black Bears, including an uncommon phase the Glacier Bear, and Grizzly Bears occur throughout the vegetated areas; the large Kodiak Bear occurs only on Kodiak Island.

In Alaska, Sea Otters once very abundant have been adversely affected by the large oil spill in Prince William Sound; Northern Sea Lions, and Harbour Seals occur near shore and on haul-outs, while Orca, and Humpback Whales occur in the many sounds and Gulf of Alaska.

White-Tailed, Rock and Willow ptarmigan occur in the alpine and subalpine zones. Prince William Sound supports many waterbirds in the winter.

Dolly Varden char are resident fish, and Pink, Chum, Sockeye and Spring Salmon enter the streams and rivers to spawn.

Ecoregion Subdivisions

There is only one Ecoregion and one Ecosection in the British Columbia portion of this Ecoprovince.



CMI - Chugach Mountains and Icefields Ecoregion

This is a rugged mountain area (several of Canada's highest mountains, such as Fairweather, St. Elias, and Logan, occur here). There are large icefields, including Fisher, Malaspina, Seward, Bering, and Yahtse glaciers, and the Bagley Icefield. Vegetation consisting of western hemlock forests is restricted to low coastal areas and the Alsek River floodplain.

There is only one ecoregion in British Columbia.



- **ALR - Alsek Ranges Ecoregion**

This is an area of isolated, very, high rugged ice-capped mountains that lie in the northeastern curve of the Gulf of Alaska and are readily affected by moist, Pacific air. Except for the Alsek River valley, the British Columbia segment is mainly upper slopes and rugged mountain summits, icefields and glaciers; the valleys and lower slopes lie primarily to the south in Alaska. Mount Fairweather, at 4663 m is the tallest mountain in British Columbia. As the Grand Pacific Glacier recedes Tarr Inlet is advancing into British Columbia. The streams in this ecoregion are mainly glacier-fed streams, the largest, the lower Alsek River flows through the centre of this ecoregion in Alaska.

Pacific air circulating over the Gulf of Alaska brings periods of heavy rain, such storms can occur throughout the year. Cold Arctic air can override this ecoregion, and can easily flow down the Alsek/Tatshenshini valley bringing high winds and extreme cold temperatures for long periods. The coastline outside of B.C. is often less affected than are the uplands. In British Columbia there is only barren rock and large icefields, but to the south, in Alaska, wet cold Coastal Western Hemlock forests grow above the coast and cold, wet Mountain Hemlock subalpine grows just above the lower slopes. Alpine can be densely vegetated, but quickly turn to barren rock with any rise in elevation.

The First Nations village of Yakutat, Alaska, the only community here is located on the south shore of Yakutat Bay. This Ecoregion is almost all in protected areas: in British Columbia it is part of the Tatshenshini – Alsek Park; in the Yukon it is all part of the Kluane National Park; in Alaska, south of the Alsek River it is Glacier Bay National Park and Glacier Bay National Preserve and north of Yakutat Bay it is in the Wrangell – St. Elias National Park. In Alaska the Tongas National Forest is located south of Yakutat Bay to the Lower Alsek River and Dry Bay and on the eastern side of Chilkat Peninsula, where the only roads in this ecoregion are located.

Dry Ecodomain

This Ecodomain covers the southern interior plateau and is an extension of the dry climate regime that occupies the interior of northern Mexico and the northwestern United States. Its two most commonly recognized climates are arid desert (south of Oregon and Idaho) and semiarid steppe (north of Nevada and Utah into British Columbia). In British Columbia this Ecodomain is represented by only one ecodevision.

Semi-Arid Steppe Highland Ecodivision

This Ecodivision occurs within the Dry Ecodomain in southern British Columbia and includes the leeward ranges of the Coast Mountains, the Thompson Plateau, the Clear Range, the Okanagan Range, and the western side of the Okanagan and Shuswap highlands. Winters are cold and the summers are warm to hot. Vegetation in the valleys and basins is typically steppe or bunchgrass prairie that usually contains big sagebrush or occasional ponderosa pine or Douglas-fir. At higher altitudes, montane forests of Douglas-fir and lodgepole pine are extensive, while subalpine coniferous forests of subalpine fir, spruces and lodgepole pine occur at even higher elevations. Alpine areas are usually small and discontinuous. In British Columbia this ecodivision is represented by only one ecoprovince.

SOI – Southern Interior Ecoprovince

Location - the Southern Interior Ecoprovince lies east of the crest of the Coast and Cascade Mountains and west of the Columbia Mountains. In the north it abuts the Central Interior Ecoprovince, and it extends southward across the Canada-USA border to the northern edge of the dry Columbia Basin. It is the southernmost part of the Interior Plateau system. The leeward portion of the coastal mountains and the drier portion of the Columbia Highlands are included because they share much of the same climate as the main plateau.



The largest human population in the interior of British Columbia occurs in this Ecoprovince. Agriculture is largely based on grazing and forage crops, but orchards and vineyards are integrated with a large and successful tourist industry in the Okanagan Valley.

Climate - Because this Ecoprovince lies in the rain shadow of the Coast and Cascade mountains it contains some of the warmest and driest areas of the province in the summer. Air moving into the area has already lost most of its moisture on the west facing slopes of the Coast Mountains, reducing precipitation and contributing to clear skies, particularly in summer. The air moving across the plateau surface tends to be level, resulting in little precipitation, except through surface heating of lakes and streams.

In winter and early spring, there are frequent outbreaks of cold, dense Arctic air because there is no effective barrier in the north, once that Arctic air enters the interior plateaus of British Columbia. However, such events are less frequent, and of shorter duration, than on the plateaus further north. This cold air can get trapped in the large basins once the eastward flow of moist air resumes, causing the valleys to be much cloudier than the uplands. When the cold air fills a valley and is subsequently capped with warmer moister air, deep inversions and prolonged periods of cold weather at middle and low altitudes results. At the same time, milder weather will occur at higher altitudes and in areas away from the main valleys. There are occasional irruptions of hot, dry air from the Great Basin in the summer. They bring clear skies and very warm temperatures to the entire Ecoprovince.

Annual distribution of precipitation is similar to other plateaus in the interior of the Province. Surface heating in summer results in characteristic convective showers. The river valleys have high temperatures and strong convective currents and, with their local sources of moisture, contribute to showers on the surrounding hills. Skies over the valleys in summer are often free of clouds, even though there is extensive cloud cover over the uplands.

There are several north-south trending valleys, such as: the Fraser River, Okanagan Valley and Louis Creek faults that have created deep valleys and which play a role in allowing warm air from the Columbia Basin to the south to easily invade this ecoprovince, bringing dry conditions. Sagebrush-steep, bunchgrass-steppe and ponderosa pine forests benefit from such dry warm air.

Physiography - This Ecoprovince includes the Thompson Plateau, the Pavilion Ranges, the eastern portion of the Cascade Ranges, Okanagan Highland, and the western margin of the Shuswap Highland.

The whole area was glaciated during the Pleistocene and there are many surface features remaining, such as moraines, glacial lake deposits, and terraces. Most of the valley floors contain more recent floodplain deposits.

The Thompson Plateau is a gently rolling upland of low relief that is transitional with adjoining mountains. The rise of the plateau towards the mountains is gradual, with greater dissection of the surface as the slope increases. Lava beds obscure large areas of older rocks. The surface has been subdivided by the Thompson, Nicola and Similkameen rivers and the Okanagan River and Lake creating two large basins - the Thompson and Okanagan basins and two smaller ones, the Similkameen and Nicola basins. The Marble and Clear Ranges of the Pavilion Range form a high transitional zone between the Coast Mountains and the Interior Plateau; they have a steep front along the Fraser River to the west and a somewhat gentler slope into Hat Creek on the east.

The Okanagan and Hozomeen ranges of the Cascade Mountains are composed of folded and metamorphosed sedimentary and volcanic rocks that have been intruded by granitic batholiths. The peaks and high ridges are serrated and show the effects of intense alpine glaciations. Cirque basins are particularly noticeable on north and northeast slopes. At lower elevations there are rounded ridges and dome-shaped mountains, which were overridden by ice. To the east, the mountains become lower and grade into the plateau surface. The ranges are deeply dissected by the Similkameen and Ashnola rivers.

The Okanagan Highland and the western portion of the Shuswap Highland lie in the eastern boundary of the Ecoprovince. These highlands form a gently sloping plateau that is transitional in height between the Thompson Plateau to the west and the Columbia Mountains to the east. This highland area has several rounded ridges separated by deep streams.

Vegetation - This ecoprovince supports a diverse set of upland and aquatic habitats that vary from open grasslands to dense coniferous forests and from small alkaline ponds to large, deep lakes. The vegetation communities are transitional with the most diverse grasslands occurring in the southern areas, with species such as antelope-brush, prickly phlox, threetip sagebrush, and many-spined prickly-pear cactus restricted to the southern-most grasslands. Many of these grasslands are now dominated by weedy invader species, such as spotted and diffuse knapweeds, summer cypress and Loesel's tumble mustard. Forest communities reflect the moisture and elevational gradients from the high coastal mountains, across the interior plateaus, to the eastern Columbia Highlands. There is also a north-south gradient, with dry, hot climate tolerant forests in the south and cold, humid tolerant forests in the north. Much of the plateau upland is has been frequently burned, resulting in extensive lodgepole pine forests.

There are eight distinct vegetation zones. - Most of the valley bottoms are characterized by sagebrush-steppe and steppe (Bunchgrass Zone), the largest such occurrence in the province. Many of the glacial

benches in the valleys are covered by big sagebrush. Grasslands of bluebunch wheatgrass with some big sagebrush occur at the lowest elevations in the four river basins. It has largely been reduced by excessive livestock grazing and is frequently replaced by extensive stands of big sagebrush dominated communities. The rate of succession in the big sagebrush/steppe communities is very slow because of severe summer drought. In the very dry valley bottoms of the southern Okanagan, antelope-brush and prickly-pear cactus dominate the lower sites. Grassland soils are dominant, having developed on sites varying from coarse gravel to silt. Those soils are often calcareous, with dark brown to black surface layers, and are rich in organic matter.

In most other valleys, the vegetation forms an open parkland zone with ponderosa pine (Ponderosa Pine Zone) and Douglas-fir intermixed with shrub-grassland communities (Interior Douglas-fir Zone). The common plants include saskatoon, big sagebrush, bluebunch wheatgrass, Idaho fescue, rough fescue, pinegrass, needlegrasses, and lupines. Floodplains have stands of black cottonwood, spruces, and trembling aspen, and a dense shrub growth of red-osier dogwood and black gooseberry. Horsetails are abundant at the edges. Soils vary from grassland soils to moderately weathered forest soils.

A lower montane vegetation zone occurs at slightly higher elevations (the Interior Douglas-fir Zone). The climax is normally the Douglas-fir forest that covers much of the Ecoprovince. The common plants include saskatoon, soopolallie, birch-leaved spirea, roses, pinegrass, twinflower, balsamroot, and kinnikinnick. Lower elevations within the zone support open, successional ponderosa pine and moderate elevation upland basins support meadow steppe habitats. The communities at higher elevations are typically closed lodgepole pine and pinegrass forests. Although forest regeneration is fairly fast, meadow steppe communities of Idaho fescue, bluebunch wheatgrass, and various forbs are persistent on southern exposures and rolling plains. The soils are generally weathered and calcareous.

The climax forest in the upper montane zone (Montane Spruce Zone) is a dense growth of white, Engelmann, or hybrid spruce. It is frequently mixed with subalpine fir. Transitional forests are dominated by lodgepole pine and Douglas-fir. The common understory plants include trapper's tea, grouseberry, falsebox, pinegrass, arnicas, kinnikinnick, and lupines. Fireweed communities occur on disturbed areas. In addition the Interior Cedar - Hemlock zone occurs on the upper slopes or the east-facing slopes in the northeastern area of this Ecoprovince.

In the subalpine zone (The Engelmann Spruce - Subalpine Fir Zone), the climax is a dense forest of Engelmann spruce and subalpine fir but frequent fires have allowed the development of lodgepole pine forests. Many of those forests have now matured and have been damaged insects. Common understory plants include black huckleberry, white-flowered rhododendron, grouseberry, arnica, and Sitka valerian. Alpine larch and whitebark pine may occur near timberline. The open forests at higher elevations are intermixed with sedge-grass meadows. Soils change in the forested vegetation zones with increasing elevation and the associated cooler and moister climatic conditions. Soils at lower levels tend to be calcareous but with increasing elevation there is a gradient from weakly leached, moderately acid to increasingly leached and strongly acidic types. Forest litter accumulation also increases with elevation.

The Interior Mountain-Heather Alpine Zone is dominated by low sedge-grass communities and pockets of heath. Common plants include sedges, alpine timothy, trisetum, alpine fescue, mountain-avens, dwarf willows, and lupines. The soils are often a shallow layer over bedrock. They are strongly acidic, coarse in texture, and have turfy, dark-coloured surfaces underlain by reddish or brownish layers. Outcrops of bedrock are common.

Fauna - The Southern Interior Ecoprovince provides a vital link for forest-living wildlife species such as Lynx, Marten, Fisher and American Black Bear, from the boreal forests of central British Columbia, southward to the montane forests of Washington and Idaho. As well, it also provides a similar link for

grassland species, such as Burrowing Owl, Long-billed Curlew, Gopher Snake and Western Rattlesnake, from the deserts and grasslands of the Great Basin and Columbia Plateau of Nevada, Oregon and Washington, northward to the grasslands of southern and central British Columbia. The grasslands of the Southern Okanogan Basin Ecosection have a fauna that is particularly interesting from a national perspective. Blotched Tiger Salamanders and Great Basin Spadefoot Toads breed in saline ponds, while Sage Thrashers and Brewer's Sparrows sing from the fragrant sagebrush covered benches. Canada's only population of Western Harvest Mice and Great Basin Pocket-mice are found in these grasslands habitats as well. The rocky cliffs along the valley walls provide habitat for Northern Scorpions, Western Rattlesnakes, Night Snakes, and Prairie Falcons.

The Southern Interior Ecoprovince marks the northern limits of ponderosa pine forests, and these forests also have a distinct fauna. White-headed Woodpecker and Gray Flycatchers are found nowhere else in Canada, while Flammulated Owls, Common Poorwills, Lewis Woodpeckers and Pygmy Nuthatches are commoner here than anywhere else in the country. The steep slopes and rocky cliffs provide habitats for Peregrine Falcon, white-throated Swifts, Canyon Wrens and California Bighorn Sheep.

The montane forests provide habitat for Mule Deer, White-Tailed Deer, Moose, Lynx and Bobcat, Cougar, Coyote and American Black Bear. Grizzly Bears, while never abundant in this ecoprovince they still occur in the Coast Mountains, Columbia Highlands and a few even remain on the northeastern portion of the Western Okanagan Upland. Mule Deer are the most abundant large ungulate in this Ecoprovince, although White-Tailed Deer have been extending their range westward from the Okanagan Basin and the Okanagan and Shuswap highlands. Bighorn Sheep, both native California Bighorn and the introduced Rocky Mountain Bighorn, occur on the rugged grasslands throughout the Thompson and Okanagan valleys and in the Clear Ranges.

Characteristic small mammals include spotted bats, pallid bats, Nuttall's cottontails, white-tailed jackrabbits, Great Basin pocket mice, and western harvest mice.

This ecoprovince has the greatest diversity of birds in the interior of British Columbia and the most breeding species of all the ecoprovinces in the province; it holds 75% of all bird species known to occur and 70% of those species known to breed in the province. It is the centre of breeding abundance in the province for Swainson's Hawk, California Quail, Mourning Dove, Burrowing Owl, Long-eared Owl, White-throated Swift, Lewis' Woodpecker, Williamson's Sapsucker, Pygmy Nuthatch, Western Kingbird, Yellow-breasted Chat, and Lark Sparrow. Some species breed nowhere else in British Columbia; Ferruginous Hawk, Prairie Falcon, Gray Partridge (introduced), Chukar (introduced), California Gull, Flammulated Owl, Common Poorwill, Black-chinned Hummingbird, and White-headed Woodpecker; others breed nowhere else in Canada: Canyon Wren, Sage Thrasher, and Gray Flycatcher. It contains the only site in Canada that supports a major population of Tundra Swans during the winter.

The Racer and Western Rattlesnake are characteristic reptiles. Blotched Tiger Salamanders and Great Basin Spadefoot Toads are found nowhere else in the province.

Wetlands and riparian habitats are very rich in species such as, Painted Turtles, American Bittern, Long-eared Owls, and British Columbia's only Yellow-breasted Chats. While on the South Thompson River hundreds of Tundra and Trumpeter swans, and Canada Geese spend the winter.

This ecoprovince supports both anadromous and freshwater fish. Anadromous species, include Pacific lamprey, steelhead, Chinook salmon, sockeye salmon, and white sturgeon. Freshwater fish include, rainbow trout (both native and widely transplanted populations), brook trout (introduced), bull trout, mountain whitefish, lake chub, redbreasted shiner and northern squawfish.

Ecoprovince Subdivisions

The Southern Interior Ecoprovince is divided into four ecoregions containing 16 ecosections.

ITR - Interior Transition Ranges Ecoregion

This is a rugged, mountainous area that occurs on the leeward side of the Coast Mountains in the northwestern portion of the ecoprovince. It has both coast and interior transition climates. It is generally in a rain shadow, but moist coastal air enters the area via low passes to the west and south. In winter and early spring, cold Arctic air frequently erupts over this area from the Central Interior. Past glaciations were intensive, with the entire area being overridden by cordilleran ice-sheets, which blocked the southward flow of the Fraser River forcing the river to find another route south. The river escaped by way of the Thompson Plateau and ultimately southward through the Okanagan Lake Valley. This ecoregion has three ecosections.



- **LPR - Leeward Pacific Ranges Ecosection**

This is a very rugged mountainous area with deep, narrow valleys in the north, consisting bold mountains of the coastal granitic bedrock. The entire area was covered by Pleistocene glaciers that rounded the landscape and created many cirque-basins that still contain small glaciers and snowfields. This ecosection extends from Gold Bridge in the northwest, southeastward to the west slopes of the Fraser River above Boston Bar and North Bend. This ecosection is drained by: the lower Nahatlatch, Kwoiek, upper Stein, upper Joffre, Gates, Birkenhead, and upper Donelly streams. Lakes include: Birkenhead, Duffy, Nahatlatch and south half of Anderson lakes.

This area is generally under the influence of moist Pacific air, but drying interior systems in the summer and early fall provides for drying conditions. When large Arctic air masses build up in the interior of the province, this area is overridden by that dense cold air. Moist coastal forests dominate the valley bottoms, while drier interior-type forests occupy the mid to upper slopes. Rugged, barren alpine occur on the summits.

There are no permanent settlements in this ecosection. The Duffy Lake Road (No. 99) from Pemberton to Lillooet passes through the centre of this ecosection; a highway from Mount Currie to D'Arcy on Anderson Lake follows the Birkenhead River, as does the British Columbia Railway; and the Hurley Pass road connects Pemberton with Lillooet via Gold Bridge. Logging with its attendant roads has occurred on most of the accessible lower slopes, and mineral exploration and mining has occurred throughout, especially in the Bridge River watershed. The central portion of the Stein Valley – Nlaka'pamux Heritage Park is the largest protected area, others include: Birkenhead Lake, Duffy Lake, Mehatl Creek and Nahatlatch parks.

- **PAR - Pavilion Ranges Ecosection**

This is a mountainous upland area that is transitional with the Coast Ranges to the west and the Interior Plateau surface to the east. In addition to the lower slopes of east side of the Coast Mountains it contains the Marble and Clear Ranges, Edge Hills and the northern extension of the Cascade Mountains. This area contains a large mass of limestone, as well as generally unlikely

associated rocks of basalt, chert and serpentine. The Fraser River canyon, a strike-slip displacement fault, has moved over 140 km relative to each side of the river. This ecosection extends on the west side of the Fraser River, from south of Big Bar Creek past Lillooet to south of Lytton, and on the east side from west of Clinton south past Hat Creek to the west side of the Nicola River canyon, south of the Thompson River. The Fraser and Thompson rivers have dissected the upland surface and their deep, narrow valleys show evidence of a still rising upland surface. In addition to the Fraser and Thompson rivers this ecosection is drained by: the Kosterling, Porcupine, Kelly, Pavilion, Hat, Twaal, Murray, Botanie, Nicoamen, Shakan and Nuaitch streams.

Generally, for most of the year, this area lies in the rainshadow of the Coast Mountains to the west. While hot subtropical area invades this area in the summer months, while cold Arctic air can invade from the north in the winter and early spring. Sagebrush-steppe and ponderosa pine forests dominate the Fraser and Thompson valleys, while Interior Douglas-fir and Montane Spruce forests occur on the upper slopes. Dry alpine vegetation occurs only as small pockets on the highest summits.

Settlements include Lillooet, Lytton and Pavilion. The Trans Canada Highway (No. 1) passes along the lower Fraser River and Thompson valleys from Boston Bar to Spences Bridge; the Lytton to Lillooet Highway (No. 12) passes along the east side of the Fraser River between those two settlements; and the Duffy Lake Road (No. 99) passes from Lillooet east past Pavilion Lake to Highway 97 north of Cache Creek. Logging has occurred throughout, as has livestock grazing; agriculture, mainly hay crops, has been developed on the level terraces above the Fraser River, and in the Kosterling Creek and Hat Creek valleys. A number of protected areas have been established in this ecosection, Marble Range and Edge Hills are the two largest.

- **SCR - Southern Chilcotin Ranges Ecosection**

This is a foothills mountain area with high rounded mountains and deep narrow valleys. Even though most of this ecosection is in the Coast Mountains south of the Carpenter and Seton lakes and Gun Creek valley, it consists of the typical rugged coastal plutonic rocks of the Pacific Ranges, but on the north side, in the Chilcotin Ranges, it contains the more erodable, non-granitic rocks of sedimentary and volcanic origin of the Chilcotin Ranges. Sculpted cirque-basins are common on the southern portion and an extensive icefield persists in the headwaters of the Bridge River. The ecosection includes the Bridge River basin and extends southward across the lower Stein River valley to the mouth of Kwoiek Creek. This ecosection is drained to the east by the Bridge, Lockie, Hurley, lower Relay, lower Yalakom, Seton, Cayoosh, Texas and lower Stein and Kwoiek streams.

This area is under a rainshadow from the easterly moving coastal weather systems, but it is greatly affected by interior weather systems, especially in the winter, when dense Arctic air can invade into this area from the north. Interior Douglas-fir and Montane Spruce forests dominate the valleys and lower slopes while subalpine forests dominate the middle mountain slopes. Extensive alpine tundra, from the rugged glacier dominated areas in the west to rolling alpine meadows in the northeast occurs on the upper slopes.

Gold Bridge and Bralorne are the main settlements, and recreational cabins have been established around Gun Lake. The Hurley Pass Road passes through from Pemberton to Gold Bridge and Lillooet, and Duffy Lake Road (No. 99) passes through from Pemberton to Lillooet via

Duffy Lake. Logging, mineral exploration and hard rock mining have been extensive throughout, Two large protected areas have been established here: the northern portion the Stein Valley - Nlaka'pamux Heritage Park is located in the southeast and the southern half of Spruce Lake Park occurs in the northwestern area of this ecosection.

NCR - Northern Cascade Ranges Ecoregion

This is a mountainous area that varies from rugged to rounded uplands that lies in the strong rain shadow created by the southern Coast Mountains and the northern Cascade Mountains. In British Columbia it is the northern extent of an ecoregion that extends along the east slope of the Cascade Mountains from the Methow Basin, west of the Columbia River in Washington, as far north as the upper slopes of the Fraser River canyon above Boston Bar. Most of the area is in a rain shadow, but moist Pacific air often dominates the western portion through low mountain passes, especially in the Coquihalla and Skagit valleys. Glaciations were light in the south, compared to more northerly environments while heavy glaciation was restricted to the higher mountain summits, with many lower slopes left unglaciated or lightly glaciated. This ecosection contains both wet coastal forests and dry interior types and is really transitional between the two types. This ecoregion is represented by two ecosections in British Columbia.



- **HOR - Hozameen Range Ecosection**

In British Columbia this is a rugged mountainous area lies mainly east of the Fraser River canyon as far north as Ainslie Creek and south to the slopes above Ross Lake; it extends southward just into Washington to Lightning and Castle creeks. The mountains increase in height and ruggedness from north to south and consist of metamorphosed sedimentary and volcanic rock with some granitic batholiths. The peaks are serrate and show the effects of intense alpine glaciation. This ecosection is drained to the east into the Nicola River by southern creeks in Prospect Creek watershed and upper Coldwater River; west into the Fraser River by Anderson and Upper Coquihalla rivers; southwest into the Skagit River by Nepopekum and Lightning Creeks; and southeast into the Similkameen River by Lawless, Tulameen and upper Similkameen streams.

The climate is transitional, although it is greatly affected by moist Pacific air entering this area via the Fraser, Coquihalla and upper Skagit valleys; although dry interior air can likewise enter west and southward from the Fraser, Nicola, and Similkameen valleys. Subalpine forests and rugged alpine dominate the higher slopes and dry montane forests dominate the lower elevations and moist Douglas-fir and western hemlock forests occur in most southwestern valleys.

The lodge, park and highway headquarters in E.C. Manning Park is the only settlement. The Trans Canada Highway (No. 1) passes along the northwestern margin from Boston Bar to just south of Lytton; the Coquihalla Highway (No. 5) passes over in the Coquihalla summit; while the Crowsnest Highway (No. 3) passes through E.C. Manning Park in the southern portion. Logging has occurred in the upland and valleys outside of E.C. Manning Park. There are four provincial

parks of note here: E.C. Manning Park and the east half of Skagit Valley, Cascade and the Coquihalla Summit recreation areas. The small portion of this ecosection that lies in Washington is part of the Ross Lake Recreation Area and the Pasayten Wilderness Area.

- **OKR - Okanagan Range Ecosection**

This ecosection is characterized by high mountains in the south, with deep, dry valleys in the centre and south, lowering to rounded summits north of the Similkameen River. The higher summits show the affects of glaciations with serrate ridges and cirque-basin erosion. In British Columbia this mountain and basin area extends from Otter and Alison creeks and north of Osprey Lakes, south across the Similkameen valley to the international border. In Washington it continues southward, east of the Cascade divide to the south side of the Methow Basin. In British Columbia this ecosection is drained by the Tulameen, Similkameen, Alison, Otter, Hayes, upper Trout, Hedley, Ashnola, Ewart, Keremeos and Snohumption streams; while in Washington it is drained by, Pasayten, Methow, Lost, Chewack, Toats Coulee, Twisp and Gold streams.

This ecosection lies in a rainshadow of the higher Cascade Ranges to the west, although some moist can arrive via the lower Alison Pass. Summer temperatures are warm and hot dry sub-tropical air can arrive via the Columbia Basin to the southeast. Winters are cool, but cold dense Arctic air seldom occurs here unless under a large southward flowing air mass. Subalpine forests and rolling alpine tundra dominate the upper slopes, while sagebrush-steppe habitats occur in the wide, low elevation basins, at Princeton, lower Similkameen and Methow Basin, mainly on the eastern side of the ecosection.

Major population centres in BC include, Princeton, Tulameen, Hedley, Keremeos and Cawston; while in Washington, Twisp and Winthrop and the two major centres. In British Columbia the Crowsnest Highway passes through here in the south from E.C. Manning Park in the Similkameen Valley to Osoyoos; the Keremeos Kaleden Highway (No. 3A) connects the Similkameen and Okanagan valleys via Marron Valley; and the Yellowhead South Highway connects Princeton with Merritt. Outside the protected areas, this ecosystem has been extensively logged, roaded and grazed; agriculture has occurred in the valleys, with orchards being prominent in the Similkameen valley south of Keremeos. Protected areas in British Columbia include: Cathedral and the adjacent Snowy, Brent Mountain and South Okanagan Grasslands parks; the North Cascades National Park and the adjacent Pasayten and Lake Chelan-Sawtooth wilderness areas are the largest protected area in Washington.

OKH - Okanogan Highland Ecoregion

This is a transitional mountain and basin area lying between the Columbia Basin to the south, The Okanogan Valley to the west and the Columbia Mountains to the east. More than 95% of this Ecoregion lies within Washington - therefore the American spelling of Okanogan was used. This is a rugged highland and valley unit with dry forests in the uplands and sagebrush-steppe and bunchgrass-steppe in the valleys. Glaciation was light and restricted mainly to glacial lobes in the valleys, but erosion by the downwasting icesheets to the north give this ecoregion a more ancient appearance than the highlands to the immediate north. This ecoregion contains two ecosections.



- **SOB - Southern Okanogan Basin Ecosection**

This is a wide trench located between the Okanogan Ranges to the west and the Southern Okanogan Highlands to the east. It is underlain by mainly metamorphic rocks. In BC it extends from south of Kaleden and just north of Okanogan Falls to the international border; while in Washington it extends from the international border to just south of Omaka. In British Columbia this ecosection is drained by the Okanogan River and Park Rill Creek; while in Washington it is drained by the Okanogan, lower Similkameen, lower Chopaka, Johnson, Bangparle, Tank, and Mission streams. Three large lakes occur here: the southern half of Skaha, Vaseaux and Osoyoos lakes.

This ecosection is a narrow valley that lies in the rainshadow of the Cascade Ranges and Southern Thompson Upland to the west as well surface heating in the summer creates convective currents that aid in keeping this area cloud-free and dry. Winters are typically cool, but cold dense Arctic air seldom invades here from the north. This ecosection has some of the hottest and driest climates in British Columbia, which is reflected in the extensive grassland communities, many of which have bitterbrush as a component. These grasslands, while often referred to as a 'Pocket Desert', are only a northern extension of the sagebrush -steppe from further south in the Columbia Basin, this area is too moist to be classified as a desert. Douglas-fir and ponderosa pine grow only on north-facing slopes and in draws where there is increased moisture.

In British Columbia, Okanogan Falls, Oliver and Osoyoos are the main communities; while in Washington, Oroville, Tonasket and Omak are the principal centres. The Okanogan – Vernon Highway (No. 97) extends from the international border north up the Okanogan Valley to Kaleden; the Crowsnest Highway (No. 3) passes along the southern portion in British Columbia connecting Keremeos with Osoyoos and Grand Forks; in Washington, Highway 97 extends from the international border south past Omak. Agriculture, especially orchards and grape growing are the main uses of the land and most of the valley bottoms are private land (Including Indian Reservations); there are many roads that service these farms. South Okanogan Grasslands, White Lake Grasslands and Vaseaux are the three largest protected areas in BC; there are no large protected areas in Washington.

- **SOH - Southern Okanogan Highland Ecosection**

This is transitional mountain area of low rounded mountains and narrow valleys. The bedrock here is a complete of granite, metamorphosed and sedimentary rocks, as well as some volcanic rocks. During past glaciation periods this area received smaller glaciers, but was greatly impacted by glacial melting to the north and as a consequence its slopes are highly eroded, giving this area a more ancient appearance than is common in more northerly environments in British Columbia. This ecosection barely enters into British Columbia it is restricted to a narrow area from Anarchist Summit east past the east flowing Kettle River, to the Grand Forks basin. In Washington this ecosection extends all the way from the international boundary south to the slopes above the Columbia River. In British Columbia this ecosection is drained by the lower Rock Creek, east-flowing Kettle, lower Boundary and lower Granby streams. While in Washington it is drained by the Kettle, Bonaparte, Myers, Sanpoil, Coyote, Omak and Columbia (now flooded by the Grand Coulee Dam) streams.

It is less affected by moist Pacific air coming directly from the west over the Cascade Range than moist air arriving from the southwest over the Columbia Basin. In the summer hot subtropical air can overwhelm this area and bring hot dry conditions. This ecosection is the least affected by cold Arctic air invasion from the north of any other ecosection in the Okanagan Valley. Dry ponderosa pine and Interior Douglas-fir forests dominate the valleys in British Columbia; although in Washington, grasslands dominate the large southern facing valleys and montane forest occupy the upland areas.

Major settlements in British Columbia include Bridesville, Rock Creek Midway, Greenwood, Grand Forks and Christina Lake; while in Washington only Republic and Curlew are major settlements. The Crowsnest Highway (No. 3) connects Osoyoos with Grand Forks and Christina Lake; in Washington highway number 20 connects Tonasket with Republic and Kettle Falls, and highway number 21 connects Grand Forks British Columbia with Republic and Grand Coulee in Washington. Logging, with its attendant roads and free ranging cattle has occurred throughout, while farming as been practised only in the lower valleys such as at Grand Forks. There are no large protected areas in either British Columbia or Washington in this ecosection.

TOP - Thompson - Okanagan Plateau Ecoregion

This is a broad forested rolling plateau with low elevation sagebrush-steppe dominated basins. The Ecoregion was heavily glaciated with much rearrangement of drainage of major rivers. The rivers and major lakes are all surrounded by cliffs and terraces of fine glacial-lacustrine materials. Glacial ice moved southward across the Thompson valley. Several large lakes occur in the valley basins, while hundreds of small lakes and ponds occur across the uplands. The plateau contains a great diversity of rocks, from granitic plutonic, to volcanic and sedimentary rocks, some of which lie buried under deep glacial drift. It has the driest and warmest climates in British Columbia, north of the Southern Okanogan Highland. The air is affected by moist Pacific air rising from the northwest or over the low mountain passes and cold Arctic air from the north often overrides the area, but only for short periods during the winter and early spring. Rain shadows and orographic drying occurs in the main basins and valleys. This ecoregion contains nine ecosections.



- **GUU - Guichon Upland Ecosection**

This is a plateau ecosection with steep sides and a rolling upland surface, it has a core of granitic and volcanic rocks that rise to over 1500 m at Fehr and Savona mounts, and to over 1600 m on Mounts Greenstone, Chuwhels, Mabel, Gypsum and Spaist. It is located in the uplands south and east of the Thompson River, northeast of the northern Cascade Mountains (Nicoamen Plateau) and west of Nicola and Stump lakes, upper Campbell and Peterson creeks, and Nicola Creek canyon cuts through the western side. This ecosection is drained to the north into the Thompson River by Durrand Creek; and into the Nicola River by the Droppingwater, Moore, Clapperton, Guichon, and Skuhun creeks.

This area is in a rainshadow of the higher Cascade Ranges and Coast Mountains to the west, although the higher elevations here receive more precipitation than do the lower slopes. Cold Arctic air reaches here unimpeded from further north when such systems overwhelm the Interior of the province. The lower slopes have both bunchgrass-steppe and ponderosa pine forests, while montane and subalpine forests dominate the mid and upper slopes. All the pine forests have been heavily impacted by the current mountain pine beetle outbreak.

Logan Lake is the only settlement, but extensive lodge and cottage development has occurred around many of the upland lakes. The South Yellowhead Highway (No. 5- the northern extension of the Coquihalla Highway) cuts across the upland and connects Merritt with Kamloops; the Merritt to Spences Bridge Highway (No. 8) passes through the Nicola Canyon; and the Highland Valley Road (No. 97 C) Connects Merritt to Ashcroft via Logan Lake. Logging with its attendant roads has been extensive in the upland; open pit mining for copper has occurred in the Highland Valley. Agriculture, mainly as hay crops has occurred in Meadow and Guichon creek valleys, and free ranging of livestock has occurred throughout. Tunkwa Park is the largest protected area.

- **NIB - Nicola Basin Ecosection**

This is an extensive basin, valley and upland area that lies between the adjacent Cascade Ranges, and the surrounding higher Thompson Plateau uplands. It is comprised of at least three separate volcanic units of tuff and lava. During periods of past glaciation a large ice-dammed lake filled the Nicola Valley forcing the Nicola River to drain north-eastward rather north-westward as it now does. In addition to the Nicola River, which divides this ecosection in two, this ecosection is drained by, the upper Campbell, Stumplake, Wasley, Quilchena and Coldwater streams.

This ecosection is in a rainshadow of the Cascade Ranges and Coast Mountains to the west, as well, surface heating in the summer creates convective currents that aid in keeping this area cloud-free and dry. Winters are typically cool, and cold dense Arctic air seldom invades here from the north. Because of its lower elevation (627 m at Nicola Lake) and rain shadow effects this area is dominated by sagebrush-steppe, bunchgrass-steppe and meadow-steppe communities, with dry ponderosa pine stands on the adjacent slopes. Douglas-fir grows as single stands in the moister draws and gullies and as dense stands on north-facing slopes and higher elevations. All the pine forests have been heavily impacted by the current mountain pine beetle outbreak.

Merritt is the largest community and smaller settlements include: Nicola and Shulos, although ranches, such as Douglas Lake and Quilchena boast considerable number of residences and both Stump and Nicola lakes have extensive recreational cottage developments. The South Yellowhead Highway (No. 5 Coquihalla Highway) cuts through the Nicola Valley from upper Coldwater River to Merritt to upper Clapperton Creek; the Merritt to Kamloops Highway (No. 5A) follows the Nicola and Stumplake streams north to Kamloops; in addition Highway (No. 8)

connect Merritt to Spences Bridge as it passes through Nicola River Canyon. Hay farming and livestock grazing are the dominant agricultural enterprises, but golf course developments have occurred where feasible. Roche Lake Park on the northeastern upland is the only major protected area.

- **NOB - Northern Okanagan Basin Ecoregion**

This is a wide trench and foothills area located between the Thompson Plateau to the west and the Northern Okanagan Highlands to the east. The valley is part of the major Okanagan Valley Fault that extends from Omak Washington north to Vernon, it has a large east-west bend between Peachland and Kelowna otherwise here it is generally a north-south trending fault. Much of this area was affected by valley glaciers that when they stagnated at the end of the ice age formed large lakes along its sides, those lakes filled with glacial sediments, especially lacustrine silt, which now form the terraces above the Okanagan and Skaha lakes. The ecoregion extends from middle of Skaha Lake in the south to the Deep Creek valley at Armstrong in the north, it also includes the Coldstream Valley east to Lumby. Large lakes dominate the valley bottom especially Okanagan Lake, but also including: Skaha, Wood, Kalamalka and Swan lakes. This ecoregion is drained by the northward flowing Deep Creek; as well as the streams that flow into Okanagan Lake and River, such as, Coldstream, the lower Mission, lower Trout, and Shingle creeks.

This ecoregion is in a rainshadow of the Thompson Plateau and the Coast Mountains to the west, as well, surface heating in the summer creates convective currents that aid in keeping this area cloud-free and dry. In the summer hot subtropical air can overwhelm this area and bring hot dry conditions. Winters are typically cool, and cold dense Arctic air seldom invades here from the north. Because of its lower elevation (344 m at Kelowna) and rain shadow effects and valley corridor connection to the Columbia Basin to the south this area is dominated by sagebrush-steppe, bunchgrass-steppe and meadow-steppe communities, with dry ponderosa pine stands on the adjacent slopes. Douglas-fir grows as single stands in the moister draws and gullies and as dense stands on north-facing slopes and higher elevations.

The communities of Armstrong, Enderby, Vernon, Lumby, Cherryville, Okanagan Landing, Winfield, Kelowna, Westside, Peachland, Summerland, Naramata and Penticton have all seen a rapid increase in development and subdivisions since the mid-1960's as this valley is the heaviest populated in the interior of the province. The Okanagan Vernon-Monte Creek Highway (No. 97) follows valley bottom from Osoyoos to Vernon; The Vernon-Sicamous Highway (No. 97A) continues north from Vernon to Enderby and Sicamous; the Vernon-Nelway Highway (No. 6) passes up the Coldstream Valley from Vernon to Cherryville. There are numerous paved roads that service the various communities and agricultural enterprises. The area has been extensively farmed for orchards, including vineyards. Kalamalka Lake Park is the largest protected area entirely within this ecoregion, but there are parts of several large protected areas that are shared with adjacent ecoregions, such as: Okanagan Mountain, Myra-Bellevue and Eneas Lakes parks.

- **NOH - Northern Okanagan Highland Ecoregion**

This is a cool, moist, rolling upland, that is transitional in height from the lower plateaus to the west and the higher mountains to the east several river valleys dissect the upland surface. Much of the area is underlain by gneiss bedrock and differential weathering has produced gentle step-like slopes. In addition, glacial ice covered the greatly rounding the summits and upland and deposited a mantle of drift. This ecoregion extends from the Kettle Valley in the south to

Coldstream - Shuswap valley in the north and as well as the Okanagan Highland physiographic unit it includes a portion of the Thompson Plateau in the northwestern area. . This ecosection is drained by a number of streams including: the Craighton, upper Mission, Kettle, lower Granby, Boundary, Rock, upper Ellis, upper Vaseaux, Inkaneep and Kinney streams.

Vegetation zones reflect the higher relief than areas to the west and the moister climate caused by Pacific air rising over the Columbia Mountains to the east. The Douglas-fir zone occurs in the lower slopes of the main valleys. The Montane Spruce zone, with lodgepole pine dominated forests, occurs in the western and southern uplands; Engelmann Spruce - Subalpine Fir Zone occurs on the highest upland areas; and the moist Interior Cedar - Hemlock Zone occurs on valley slopes in the eastern portion of the ecosection.

There are few settlements here only Carmi and Beaverdell in the Kettle Valley. The Rock Creek-Kelowna Highway (No. 33) passes through the southwestern portion and the Vernon-Nelway Highway (No.6) passes by only at the summit in the upper Kettle River Valley. Logging with its attendant roads has been extensive in the upland surface and agriculture for hay crops has been developed only in the Coldwater and Kettle River valleys. Graystokes, Myra-Bellevue and the eastern half of Okanagan Mountain parks are the three largest protected areas in this ecosection.

- **NTU - Northern Thompson Upland Ecosection**

This is an area with rolling upland that is dissected by the North Thompson River and the Louis Creek Fault it rises in height (2633 m) in the Dunn Range, in the north. It extends across the northern portion of the ecoprovince, from lower Adams Lake and Mount Lolo in the south to Barriere, Little Fort and Clearwater and across the North Thompson River to the eastern plateau slopes. It includes the west central part of the Shuswap Highland physiographic unit and a small segment of the Thompson plateau. The valley sides are commonly steep due to glacial erosion and the total relief may be fairly great even though local relief in the uplands is moderate. In addition to the southward flowing North Thompson River this ecosection is drained by: the McGillivray, Lewis, Nisconlith, Sinmax, Barriere, Chu Chua and Joseph and streams. The southern Adams Lake and Dunn Lake are two of the largest lakes here, but there are many smaller lakes.

The climate is transitional between the drier and warmer climates further south and the moister and cooler climates to the north. It has warm, dry summers and wet, cool winters with relatively high snowfall. Vegetation zones reflect the complex climate: with rising moist air on the east; winter Arctic air outbreaks from both the northwest uplands and the east via the North Thompson valley; and the dry valley climates of summer.

Clearwater is the largest community, but other settlements include, Little Fort, Barriere, and Adams Lake. The South Yellowhead Highway (No. 5) cuts through the ecosection in the North Thompson valley from Clearwater to Barriere. Logging with its attendant roads has been extensive on the upland and slopes. Agriculture, primarily livestock and hay farming has occurred mainly in the North Thompson floodplain and in Lewis Creek. The western two-thirds of Dunn Peak Park occurs here and is the only significant protected area.

- **SHB – Shuswap Basin Ecosection**

This is an area with rolling plateau uplands, steep sided plateau walls, and large inter-plateau lowlands. The Bolean Creek Fault, a southern extension of the Louis Creek Fault, divides the ecosection east to west. This is a major geological separation between the Intermontane Belt to the west and the Omineca Belt to the east. In the north this ecosection extends from Enderby and Salmon Arm northwest to Sorrento, Scotch Creek and Little Shuswap Lake; and in the south

to Falkland, Westwold and Monte Lake. In addition to the Salmon River, this ecosection is drained by: the Little, Shuswap (from Enderby to Mara Lake), upper Deep, Chase and upper Monte streams.

It has a dry montane climate, except in areas where topographic shading provides an environment for the Interior Cedar- Hemlock forests. Vegetation zones generally reflect the wide low elevation basins and rolling upland surface. Sagebrush-steppe occupies the slopes, in the South Thompson and upper Salmon rivers basins, above that the Ponderosa Pine, Meadow-Steppe is dominated by Lodgepole pine forests, occurs over most of the uplands and only the higher areas have the colder, moister Engelmann Spruce - Subalpine Fir forests. Both pine species have been adversely affected by the recent mountain pine beetle outbreak.

Salmon Arm is the largest community, but there are many smaller communities and settlements such as: Enderby, Sorrento, Canoe, Grindrod, Falkland and Westwold. The Trans-Canada Highway (No. 1) cuts along the south side of the two Shuswap lakes, the Vernon-Monte Creek Highway (No. 97) passes up Monte Creek and down the upper Salmon River and the Armstrong-Salmon Arm Highway (No. 97B) passes up the northern extension of the Okanagan Valley. Logging with its attendant roads and free ranging cattle have been extensive in the upland and agriculture, including hay, livestock, dairy and fruit trees have been farmed in the Notch Hill to Salmon Arm to Enderby area as well hay and livestock farming has occurred in the upper Salmon valley and elsewhere. Enderby Cliffs Park is the only protected area of any size in this ecosection is located on the east-central boundary.

- **THB - Thompson Basin Ecosection**

This area is a warm and exceptionally dry, broad low elevation basin, one of its characteristics is the cream-coloured silt cliffs, remnants of stagnated glacial ice and the ponding of silt-filled lakes during the waning of past ice ages. Elsewhere deep deposits of sand and gravel indicate were fast moving streams enter the glacial lakes and dropped their load of coarser materials. Volcanic rocks are common on the upland. The ecosection extends from the South Thompson River Chase in the east, the lower North Thompson River in the north and the west to the mouth of the Nicola River. The South Thompson River occupies the valley east of Kamloops, the North Thompson River occupies the valley north of Kamloops, and the Thompson River and Kamloops Lake occupies the valley west of Kamloops. Other streams include the lower segments of: Bonaparte, Deadman, Venables, Carbine, Durrand, Tranquille, Cherry, Peterson, Heffley, Knouff and Monte streams.

In the summer this basin has high temperatures and strong convective currents; skies over the valleys in summer are often free of clouds, even though there is extensive cloud cover over the adjacent uplands. There are occasional irruptions of hot, dry air from the Great Basin in the summer. In winter and early spring, there are frequent outbreaks of cold, dense Arctic air because there is no effective barrier in the north. That cold air can get trapped in the large basins once the eastward flow of moist air resumes, causing the valleys to be much cloudier than the uplands. When the cold air fills a valley and is subsequently capped with warmer moister air, deep inversions and prolonged periods of cold weather at middle and low altitudes results. The vegetation in this ecosection reflects the warm, dry climate with the Bunchgrass zone mainly consisting of sagebrush-steppe and bunchgrass-steppe occupying the valley and lower slopes, giving way to meadow-steppe and finally to Ponderosa Pine forest, at higher elevations, Douglas-fir occurs on the cooler aspects and narrow draws. The pine stands have been adversely affected by the recent mountain pine beetle outbreak.

Kamloops is the largest community, but others include, Chase, Lewis Creek, Pritchard, Savona, Cache Creek, Ashcroft and Spences Bridge. The Trans-Canada Highway (No. 1) cuts across the basin from Spences Bridge to Chase; the South Yellowhead Highway (No. 5) cuts southward from Lewis Creek through Kamloops to Lac Le Jeune; the Merritt-Kamloops Highway (No. 5A) is located from Kamloops past Knutsford to Merritt; and the Vernon-Monte creek and Cache Creek-Cariboo Highway (No. 97) enters the basin down Monte Creek, connects with the Trans Canada Highway as far as Cache Creek, the goes north up the Bonaparte River into the Cariboo, the Highland Valley Road (No. 97C) connects Logan Lake to Ashcroft and Cache Creek. Much of the basin has been settled or developed into livestock and hay production and inter-community roads are extensive. Lac Du Bois Grassland Park lies mainly in this ecosection; it is a large and significant grassland and is the largest protected area in the ecosection.

- **TRU - Tranquille Upland Ecosection**

This is a rolling upland that has a plateau-front with steep sides on the south and east, but towards to north and west it grades onto the Cariboo Plateau and Cariboo Basin, it is the northern portion of the Thompson Plateau physiographic unit. It has thick basaltic lava beds that have been buried under extensive glacial debris, and which has been highly eroded along the south side above the Thompson River valley. Many lakes now fill the glacial depressions. This ecosection is drained by: the upper segments of: Deadman and Tranquille streams, as well as Criss, Watching, Jamieson, Whitewood and Peterson streams.

The climate is moist and cool, except during the summer months, which can be warm and dry. Pacific frontal systems reach this area via the open Chilcotin to the northwest or the Fraser canyon to the southwest. Cold Arctic air can irrupt across the Cariboo moving southward and imbed this ecosection with very cold conditions. Forests reflect the upland nature with Interior Douglas-fir, Montane Spruce and Engelmann Spruce – Subalpine Fir zones dominating. The extensive lodgepole pine forests have been severely impacted by the recent mountain pine beetle outbreak.

Vidette is the only named locality in this ecosection. There are no highways across this ecosection and only a small segment of the South Yellowhead Highway (No. 5) between Barriere and Little Fort follows the northeastern boundary. Logging with its attendant roads has been extensive across this upland area. And while not extensive, hay farming has occurred in the Tranquille Creek and Deadman River valleys; free ranging cattle have been allowed to graze much of the upland. Bonaparte Park is the largest protected area, but Arrowstone, Porcupine Meadows and the higher, forested portion of Lac Du Bois Grassland parks have also been established here.

- **WOU - Western Okanagan Upland**

This is a rounded upland area that rises steeply above the Okanagan Basin to the east and more gently above the Nicola Basin to the west. It intergrades with the Okanagan Ranges to the south and the Monte Hills to the north. It is comprised of several plutonic units, the Okanagan Composite Batholith, that has been overlain by volcanic bedrock. In addition this ecosection has been sculpted and rounded by southeast flowing glaciers, which has caused deeply eroded streams on the eastern slopes. This ecosection is drained to the east into the Okanagan Basin by the upper portions of the Trepanier, Lambly, Shorts, Whitman, and Equis streams; and into the Shuswap systems by the upper Salmon River, into the Nicola system by the upper Nicola, Quilchena and Pothole streams. Pennask Lake is the largest here, in addition many smaller lakes occur here as well.

This area is cool and moist, except during the summer when hot, dry air from the Columbia Basin to the south advects over this area. Moist Pacific air passes over and often shrouds this upland in cloud and brings rain in the summer and fall and snow in the winter. Cold Arctic can invade this area unimpeded from the north and can bring clear cold conditions for weeks on end. Forests are typical montane, upland forests for this ecoprovince and include Douglas-fir, Montane Spruce and Engelmann Spruce – Subalpine Fir, as well wetter forest of Interior Cedar – Hemlock occur on the northeast slopes, where topographic shading is most prevalent. Both lodgepole and ponderosa pine stands have been severely impacted by the recent outbreak of mountain pine beetle.

Other than summer cottages and lodges on many of the lakes there are no permanent settlements here. The eastern extension of the Coquihalla Highway, the Okanagan Connector (No. 97C) from Aspen Grove to Peachland, passes across the southern portion and the Osprey Lake Road from Princeton to Summerland passes by Osprey Lakes on the southern boundary. Logging with its attendant roads has been extensive on the upland, and free-ranging cattle occur throughout. Fintry Park is the largest protected area and smaller ones include: Pennask Creek, the western half of Eneas Lakes and northern two-thirds of Trepanier parks.

Polar Ecodomain

This Ecodomain covers the northern latitudes of North America, Asia, Europe and Greenland. In British Columbia, it occupies the northern plains, mountains, and plateaus. Its climate is characterized by generally low temperatures, a severe winter, and only small amounts of precipitation. In British Columbia it has been subdivided into 3 Ecodivisions.

Boreal Ecodivision

This is one of three parts of the Polar Ecodomain in British Columbia. It extends eastward of the Rocky Mountain Foothills across the Alberta Plateau, in British Columbia and Alberta, the northern portion of the Alberta Plain in Alberta and Saskatchewan; the Saskatchewan Plain in northern and central Saskatchewan; and the Manitoba Plain in Saskatchewan and Manitoba as far as to Lake Winnipeg in Manitoba. It includes plateau, uplands, and the Peace River Lowlands. There is typically a cold winter and a moderately warm summer. There is little precipitation except from surface heating of the vast number of lakes, wetlands and streams. In the lowland areas, moist grassland mixed with trembling aspen develop. White and black spruce, and lodgepole pine dominate the uplands. In British Columbia this ecodivision is represented by only one ecoprovince.

BOP - Boreal Plains Ecoprovince

Location – The Boreal Plains Ecoprovince lies east of the Rocky Mountains, south of the Fort Nelson Lowlands. It occurs on the Alberta Plateau, and consists of plateaus, plains, prairies, and lowlands, and away from the deeply incised large rivers is generally of low relief. It extends eastward, across northern Alberta, Saskatchewan and Manitoba and southern Northwest Territories.



Agriculture is limited to grazing with some cereal and forage crop production in the Peace Lowland Ecoregion. Natural gas production and mining occurs throughout the hinterland and many seismic lines criss-cross the area. Logging of white spruce, lodgepole pine and trembling aspen has been occurring where good timber stands permit, but most forest removal is through clearing for agricultural fields.

Climate - The climate in this ecoregion is typically continental since most of the moist Pacific air has dried crossing successive ranges of mountains before it reaches the area. Air descends from the Rocky Mountains leading to generally dry conditions and sunny skies. In warmer months rain is largely due to surface heating, which leads to convective showers that regularly occur across the area. Winters are cold because there are no barriers to intrusions of Arctic air and because of the low amount of daylight from late November to early February.

Physiography - In British Columbia, the Boreal Plains Ecoregion occurs on the Alberta Plateau. That area consists of plateaus, plains, prairies, and lowlands and is generally an area of low relief away from the deeply dissected riverbeds. The plateau is dissected by the Peace River and its tributaries. The upland surface lies between 900 m and 1,200 m above sea level rising to 1,500 m on the northern boundary. Drainage over part of the upland surface is poorly organized. There are large areas of muskeg, and streams meander across the surface. Several rivers, such as the Moberly, Pine, Kiskatinaw, Halfway, and Beatton have cut through the upland surface into the soft shale bedrock leaving steep-sided canyons.

The plateau was glaciated during the past ice age. Ice from the centre of the Keewatin Ice Sheet moved southwestward across the Alberta Plateau to the foothills meeting the eastward flowing Cordilleran Ice Sheet, leaving a veneer of glacial till. The two ice sheets met just east of the Rocky Mountain Foothills. As the ice waned, the Peace River Valley was occupied by a temporary lake that left fine silt sediment to a depth of 30m.

Biogeoclimatic Zonation – The vegetation is dominated by the Boreal White and Black Spruce Zone, Aspen Parkland occurs in the Peace River Lowland and muskeg occurs throughout most of the upland surface. East of the Rocky Mountain Foothills, on low ridges, more mountainous vegetation develops, the Engelmann Spruce - Subalpine Fir Zone occurs on the summits of these ridges south of the Peace River, while the Spruce - Willow - Birch Zone occurs on those ridges north of the Halfway River.

Vegetation - Most of the Boreal Plains Ecoregion is covered in lowland forests. Fires have been common and seral forests predominate. Two vegetation zones occur. The ecoregion is similar to larger areas in Alberta, where domination by deciduous trees and open shrub-grasslands are commonly referred to as the “aspen parklands”.

The climax vegetation in the lower vegetation zone is white or black spruce, though the latter is more common on coarse textured materials of sand and gravel. Trembling aspen and balsam poplar are dominant seral species on the widespread fine-textured soils of clay and silt (generally lower elevations) whereas lodgepole pine predominates in seral forests on coarser textured soils (generally higher elevations). Other common species are paper birches, high bush cranberry, prickly rose, soopolallie, willows, fireweed, bunchberry, asters, creamy peavine and mosses. Floodplains are composed of balsam poplar and white spruce, with red-osier dogwood and horsetails. The scattered wetlands may be covered with a scrubby forest of black spruce and tamarack, with Labrador tea, horsetails, and sphagnum. Extensive marshes and shallow lakes create habitats important to aquatic birds. A distinctive habitat occurs on steep, south-facing slopes or on dry river breaks, where saskatoon, trembling aspen, roses, wheatgrass, and needlegrass form open shrub-grasslands. A higher area in the northwest portion of this ecoregion contains several valleys dominated by scrub birch that is similar to valleys in the Boreal Mountains and Plateaus Ecoregion.

A subalpine subzone, very small in area, occurs along the western fringe, from the Peace River south to the BC/Alberta boundary. In this forest type, Engelmann spruce and subalpine fir dominate, with lodgepole pine as a seral species. Understories are composed of white-flowered rhododendron, black huckleberry, bunchberry, and mosses. At upper elevations of the zone, forests are replaced by shrub-dominated vegetation, primarily willows and scrub-birch.

Fauna - The most abundant large mammal is the moose. Both Mule Deer and White-Tailed Deer are common in the Peace Lowland Ecoregion and Woodland Caribou occur in the higher areas in the north and in the south. Historically Plains Bison and Rocky Mountain Elk were common, especially in the parkland habitats adjacent to the Peace River. Elk maintained a stronghold in the Moberly River canyon and in recent years have expanded to favourable habitats throughout the ecoprovince. Large carnivores include Grey Wolves, Coyotes, Lynx and American Black Bears. The only small mammal restricted to this region is the Arctic Shrew.

This ecoprovince supports 60% of all bird species known to occur in British Columbia, and 46% of all species known to breed in the province - the fourth lowest total in British Columbia. The many wetlands, ponds, and slow-moving streams on the upland surface provide excellent habitat for breeding and migrating waterbirds. Some of the largest breeding concentrations of Eared Grebe occur in this ecoprovince. Some of the rarest shorebirds in British Columbia regularly migrate through the Peace Lowland Ecoregion. They include the Hudsonian Godwit, White-rumped Sandpiper, and Stilt Sandpiper. The area is the centre of abundance in the province for Broad-winged Hawk, Sharp-tailed Grouse, Upland Sandpiper, Franklin's Gull, common Grackle, and Eastern Phoebe. It is the only breeding area in the province for Philadelphia Vireo, Chestnut-sided Warbler, Black-throated Green Warbler, and Connecticut Warbler. The Boreal Plains Ecoprovince is also the major migratory corridor in British Columbia for Lapland Longspur.

The only reptile to occur in this ecoprovince, the common garter snake, is rare. Only one salamander, the long-toed salamander, and four species of toads and frogs occur here. In British Columbia, one species, the northern chorus frog, has its centre of distribution in this ecoprovince.

This ecoprovince supports only freshwater fish, such as, Arctic grayling, northern pike, walleye, bull trout, slimy sculpin, flathead chub, lake trout, lake whitefish, and pearl dace.

Ecoprovince Subdivisions

In British Columbia, the Boreal Plains Ecoprovince has 3 ecoregions containing 4 ecosections.

CAU - The Central Alberta Uplands Ecoregion

This ecoregion is a rolling plateau that rises slowly to the north of the Peace River. It extends from the Rocky Mountain Foothills eastward into Alberta as far as the north-south Peace River Lowland. Cold Arctic air regularly lies over this area bringing long periods of intense cold. In the summer surface heating of the many lakes, wetlands, muskeg and streams creates convective currents that bring localized rain showers. Oil and gas exploration has been both intensive and extensive here. In British Columbia it consists of two ecosections.

- **CLH Clear Hills Ecosection**

This is a smooth rolling upland that gradually rises in elevation towards the north and east



into Alberta where it reaches over 1070 m in elevation in the Clear Hill (945 m in the Milligan Hills of B.C.). It is underlain by flat-lying sedimentary sandstone that have been buried by the Continental Glaciers that moved across this area from the northeast, moving massive amounts of material and rounding the summits and hills. Streams such as: Gutah, Kahntah and Fontas flow northward to join the Sikanni Chief River on the Fort Nelson River; while streams such as: Cache Creek, Blueberry, Beatton and Doig flow southward into the Peace River. Alberta is drained by the Clear, Eureka and Whitemud Rivers that flow into the Peace. Charlie Lake is the only large lake in British Columbia; there are no large lakes in Alberta, numerous wetlands and muskeg bogs occur throughout.

This area has a continental climate with moist summers and dry cold winters. Surface heating of the many water bodies causes convective currents that bring localized rain showers over the entire ecosection. In the winter cold Arctic air can invade this area bringing long periods of very cold temperatures and clear skies. The forest upland is a mix of White and Black Spruce forests with lodgepole pine on the drier, well drained sites (jack pine occurs in the eastern portion of this ecosection in Alberta), or after fire trembling aspen or willow that is quick to regenerate and may persist for decades.

Small agriculture based settlements such as Montney, Beatton River, Goodlow, are the only settlements in British Columbia; Clear Prairie, Marina and Clear Hills are the main settlements in Alberta. Agricultural development has been extended upslope from the Peace Lowland to the lower margins of this ecosection in both B.C. and Alberta. Oil and gas exploration and pumping has been extensive throughout this ecosection. In British Columbia, Milligan Hills Park, the only protected area in this ecosection, has been established on the height of land between Milligan and Ring Reid creeks; there are no large parks in Alberta.

- **HAP - Halfway Plateau Ecosection**

This is a rolling upland with some higher ridges; it has wide valleys with some dissection by the small, southward flowing streams. This ecosection is underlain by flat-lying sandstones that are typical of the entire ecoprovince. Continental Glaciers that moved across the interior of the continent from the northwest overrode this area stalling along the Rocky Mountain Foothills in the west where it met the Cordilleran Ice Sheet that came off the Rocky Mountains. Those glaciers aided erosion of the uplands and deposited deep glacial debris. Elevation reaches to 1200 m along the northwestern boundary the upper Beatton River area, but generally the elevations are only 800 m over much of the higher areas. The lower Halfway River flows southward along the western boundary with the adjacent Peace Foothills Ecosection, Aitken, Blueberry and Stoddart creeks drain to the east into the Beatton River, Cache Creek flows south into the Peace River and Cameron River and its tributaries flow south into the Halfway River. Charlie Lake is the only large lake as well there are many wetlands and smaller lakes.

This area is well protected from the Pacific air masses, giving rise to a few rain shadows. In the summer months surface heating of the many water bodies causes convective currents that cause localized rainshadows and cumulous clouds. In the winter cold Arctic air and invaded this area bringing long periods of extreme cold but clear skies. Forests are comprised of the cold Boreal White and Black Spruce type; white spruce and trembling aspen, black spruce grows on the wetter, poorly drained sites and lodgepole pine occurs on the drier, well-drained sites. On the higher valleys in the northwest cold-air ponding has allowed dense shrubby stands of birch

and willow to become establish, these stands are more indicative of willow/birch stands that grow in the Boreal Mountains to the northwest.

Small settlements, such as Wonowon and Pink Mountain, have been built up along the Alaska Highway (97) that runs through the middle of this ecosection (along a high ridge); there is a substantial First Nations Village on the Halfway River. Agriculture, in the form of cereal, hay and beef cattle has been practiced in the Halfway River bottoms and in the Farrell/Cache creek benchland. There has only been small-scale logging on the drier uplands. Seismic exploration for oil and natural gas has been extensive and has occurred throughout the ecosection. There are no large protected areas here.

PRB - The Peace River Basin Ecoregion

This is a wide, low elevation plain that lies between rolling uplands to the north and south; it is dissected by the Peace River and its tributaries. It extends eastward from the Rocky Mountain Foothills above the Peace River into Alberta where it turns northward to the base of the Caribou Mountains. In British Columbia this ecoregion consists of only one ecosection.

- **PEL – Peace Lowland Ecosection**

This is a large lowland, of deep sedimentary bedrock, that is deeply dissected by the Peace River and its main tributaries. This ecosection has been heavily glaciated during the past Ice Age, by both the westward flowing Laurentian Ice Sheet and the eastward flowing Cordilleran Ice Sheet, with the boundary being slightly to the east of the Rocky Mountain Foothills; as well, during the waning of the glaciers a large glacial lake formed, covering most of the ecosection with silt. The elevation of the Peace River at the BC/Alberta border is 427 m. while on the immediate benchlands it is 610 m., at its highest it reaches to 975 m north of Moberly Lake and along its southwest boundary with the Kiskatinaw Plateau Ecosection. In addition to the Peace River, this ecosection is drained in B.C. by the Moberly, Pine, Kiskatinaw, Halfway and Beatton rivers; in Alberta it is drained by Pouce Coupe, Clear and Smoky rivers. Moberly Lake is the only large lake in B.C.; Cardinal Lake is the only large lake in Alberta. There are though many smaller lakes, wetlands and muskeg in both provinces.

This ecosection has the mildest climate with the lowest snowfall in this ecoprovince primarily due to it lower elevation. The climate is continental as the Pacific air masses usually pass over without releasing much precipitation. In the summer surface heating of the many bodies of water that scatter this ecosection give rises to convective currents that bring high humidity, localized showers and cumulus clouds. In the winter cold Arctic air can invade this area from the northeast bring long periods of extreme cold temperatures, but clear skies. The Boreal White and Black Spruce forests are the typical type, but trembling aspen/shrub-grasslands are common along the lowest southerly exposures, while white spruce or lodgepole pine occur of the better drained sites and black spruce occurs only in areas of excessive soil moisture such as around wetland and muskeg bogs.

Fort St. John and Dawson Creek, the largest communities in northeastern British Columbia occur here, as are Taylor, Hudson Hope, Pouce Coupe and Chetwynd. In Alberta Grande Prairie and



Peace River are the two largest communities. There are many smaller agriculture based settlements here in B.C. as well as in Alberta. The Hart (No. 97), Hudson Hope (No. 29) and Alaska (No. 97) highways all converge in this ecosection in B.C. In Alberta there are many highways that connect the communities with Edmonton to the southeast, or to the agriculture settlements to one another, such as: Northern Highway (No. 43), Northern Woods and Water Route (No. 49) and Northern Highway (No. 2). Farming, especially for cereal and hay crops and beef production is the dominant enterprise, but extensive oil and natural gas exploration has occurred throughout the ecosection and logging has occurred on the drier upland sites. Two small riverine adjacent parks, Peace River Corridor and Kiskatinaw River are located on opposite banks of the Peace River, just as it leaves the Province for Alberta, these are the only large protected areas in this ecosection.

SAU - The Southern Alberta Upland Ecoregion

This is a rolling upland that rises from the Peace River Basin to the north and culminates in the Rocky Mountain Foothills to the south. It extends eastward into Alberta as far to the east as the Prairie Ecodivision. British Columbia this ecoregion is consists of only one ecosection.

- **KIP - Kiskatinaw Plateau Ecosection**

This is a rolling upland that is underlain by deep and level sedimentary sandstone rocks. Glaciers moving northward out of the Rocky Mountains coalesced the western flowing Continental Ice Sheet before they both retreated, leaving considerable upland dissection and deep deposits of glacial debris. In B.C. this ecosection is drained by the Murray, and Kiskatinaw rivers, that drain to the north, while the smaller Red Deer, Belcourt and Huguenot creeks flow northward into the eastward flowing Wapiti River that eventually flows north into the Peace River in Alberta. Swan Lake is the only large lake of note in B.C.; there are no large lakes in Alberta, There are many smaller lakes, wetlands and muskeg across the upland surface in both provinces.



Pacific air passes over this area, but drops little precipitation, most of the precipitation comes from surface heating of the many water bodies on the upland creating convective currents that give rise to localized showers, high humidity and cumulus clouds. In the winter cold, Arctic air can stall along the Rocky Mountain Foothills bringing extended periods of extreme cold temperatures and generally clear skies. The forests are dominated by Boreal White and Black Spruce types, of which the higher drier sites are occupied by white spruce and even lodgepole pine while the numerous wetlands and muskeg bogs, which are surrounded by black spruce forests.

Tumbler Ridge, located on the western boundary is the only town in B.C., but there are small settlements of Kelly Lake, Tupper and Tomslake along the B.C./Alberta border; there are no settlements in Alberta. This ecosection is crossed by The Heritage Highway (No. 52) that connects Tumbler Ridge to the Hart Highway (No. 97) at Arras, Highway 2 from Pouce Coupe to Beaverlodge, Alberta, and an industrial from Tupper to Stony Lake; as well, the area has been crossed by numerous seismic oil and natural gas exploration lines. Bearhole Lake Provincial Park and the adjacent Bearhole Lake protected area have been established on upper Kiskatinaw River, between the Murray and Redwillow rivers and a small portion of the Gwillim Lake Park

occurs against the ecoprovince boundary above the Murray River. In recent years a dinosaur trackway was found along the river level of Flatbed Creek, this trackway is composed of two dozen tracks that were the product of a large quadrupedal ichnotaxon dinosaur (*Tetrapodosaurus borealis*), a species that has been linked to ankylosaurs.

Sub-Arctic Ecodivision

This Ecodivision lies north of the Boreal Ecodivision and is the second part of three in the Polar Ecodomain in the province. It extends from high ridge between the Peace and Liard watersheds north along the Rocky Mountain Foothills into the Northwest Territories along the eastern front of the Mackenzie Mountains into the Yukon Territory in the lower Peel River basin. It stops at the delta of the Mackenzie River on the Beaufort Sea. On the eastern boundary it extends through the very northwestern portion of Alberta across Great Slave Lake in the Northwest Territories west of the Canadian Shield to Great Bear Lake where it follows the tree line to the Mackenzie Delta. In B.C. it extends from the Fort Nelson River Basin to the border of the Northwest Territories and from the Rocky Mountain Foothills east to Alberta. It is dry and cold. Winters are long and summers brief but plants gain some advantage from longer hours of daylight. There are some discontinuous areas of permafrost. The riparian areas are dominated by balsam poplar. Better drained upland sites have white and black spruce, lodgepole pine (in British Columbia), and tamarack. Extensive wetlands and muskeg occur throughout the area because of poor drainage.

In British Columbia this ecodivision is represented by only one ecoprovince.

TAP - aiga Plains Ecoprovince

Location - This ecoprovince lies to the east of the northern Rocky Mountains in the northeastern portion of British Columbia. It extends into the northwestern portion of Alberta above the Peace Lowland and into the Northwest Territories to Great Slave Lake where it follow the Mackenzie River to the mouth of the Liard River, then south along the eastern flank of the Mackenzie Mountains back into B.C. It is characterized as a large lowland that has been dissected below the Alberta Plateau surface by the Liard River and its tributaries, namely the Fort Nelson and Petitot Rivers.

Climate - The climate is continental. Cold dense Arctic air is unimpeded from the north and may easily blanket the area in winter and spring months. The long sub-Arctic winters are generally dark with little heating by solar radiation. In summer, its location between the Arctic and Pacific air masses give it long periods of cloud cover and unstable weather. In years of colder temperatures or more moisture, some soils remain frozen. Precipitation is light and in warmer months is largely due to surface heating of the wetlands, lakes and streams which leads to convective showers.

Physiography - The British Columbia portion of the ecoprovince is characterized as an extension of the Alberta Plateau, with large lowland areas that have been dissected below the plateau surface by the Liard River and its tributaries, namely the Fort Nelson and Petitot rivers and by higher uplands adjacent to the Rocky Mountain Foothills. The Fort Nelson and Petitot rivers are incised as much as 150 m below the general level terrain of the lowland, which lies near 450 m elevation with the softer shales being eroded prior to the ice-age glacial advance. Elsewhere streams, extensive muskeg, wetlands and small lakes dominate a surface that has remained unmodified since its emergence from the covering of ice.

Biogeoclimatic Zonation - Vegetation is dominated by the Boreal White and Black Spruce Zone. Black spruce bogs and wetlands are extensive.

Vegetation - The Taiga Plains Ecoprovince has the least floral diversity of any of the ecoprovinces in British Columbia. Extensive fire history has resulted in dominance by deciduous seral forests, with numerous wetland areas.

Except for the higher portions of the Muskwa Plateau Ecosection, there is a single vegetation zone across the ecoprovince in BC. Here the climax forest should be white and black spruce, however, the frequency of wildfires across this landscape means that trembling aspen forests are common, often with balsam poplar and paper birch. Lodgepole pine is an uncommon seral tree; jack pine does occur on dry sites only in the northeastern portion of the area. Understories include: prickly rose, soopolallie, highbush-cranberry, willows, twinflower, asters, and mosses. Floodplains are dominated by white spruce and balsam poplar, with alder, willows, red-osier dogwood, and horsetails. Wetlands are extensive, especially on the lowlands, and are mainly black spruce bogs with understories of Labrador tea, cloudberry, and sphagnum (peat) mosses, and tamarack fens with scrub birch, leatherleaf, sweet gale, buckbean, and fen mosses. Soils are usually fine textured, moist to very wet, and calcareous, with shallow to deep accumulations of organic material. Intermittent areas of permafrost may occur.

At the higher elevations of the Muskwa Plateau, a cold subalpine forest, the Spruce - Willow - Birch Zone, is established. Forests here are open, with white spruce and subalpine fir. At the upper elevations of the zone, forests are replaced by shrub-dominated vegetation, primarily willows and scrub birch.

Fauna - Moose are the most abundant ungulate, and American Black Bear, and Lynx are common carnivores. Scattered herds of Caribou spend the winter months in all the upland, muskeg, and boreal forests. The Muskrat, Meadow Vole, Northern Red-Backed Vole, and Meadow Jumping Mouse are widely distributed small mammals.

The Taiga Plains Ecoprovince supports the lowest diversity of birds of any terrestrial ecoprovince in British Columbia with only 40% of all species known to occur in the province having been reported, the area holds only 35% of all species known to breed. Part of the reason for that low diversity may simply be a reflection of the very low level of observer effort in the region. This ecoprovince is the centre of abundance for breeding Lesser Yellowlegs and Solitary Sandpipers. Spruce Grouse are abundant in the extensive boreal forests. This is the only breeding area in the province for the Bay-breasted Warbler and is the centre of abundance for the Swamp Sparrow. Le Conte's Sparrow is locally abundant. Other breeding species of note include Cape May Warbler, Canada Warbler, Black and White Warbler, and Rose-breasted Grosbeak.

No reptiles are known to occur in the ecoprovince and the only amphibians known to occur include the western toad, northern chorus frog, and wood frog.

This ecoprovince supports only freshwater fish, such as, Arctic grayling, northern pike, walleye, bull trout, inconnu, white sucker and lake whitefish.

Ecoprovince Subdivisions

In British Columbia, the Taiga Plains Ecoprovince has three ecoregions consisting of seven ecosections.

HSL - Hay – Slave Lowland Ecoregion

This is an extremely flat to gently rolling, broad lowland area. It lies below the higher portions of the Alberta Plateau to the west, north and south. In British Columbia it extends from east of the canyon of the Fort Nelson River and the lower Prophet River east to the British Columbia-Alberta border. In Alberta it continues eastward to the Peace Lowland and northeastward between the Cameron and Caribou hills into the Northwest



Territories as far as the south shore of Great Slave Lake. There is only one ecosection in British Columbia.

- **FNL - Fort Nelson Lowland Ecosection**

This is a broad lowland area, which at times is gently rolling and in places flat, that has been incised below the level of the adjacent plateau surfaces by the Fort Nelson and Hay rivers. This area has been eroding for a long time prior to the recent ice ages, but the erosion caused by the westerly movement of Keewatin Ice Sheets during the past Ice Age and enhanced by subsequent erosion caused by rivers flowing off the melting ice sheets. Deep flat-lying shales and sandstone underlain this ecosection. The lowland/plateau margin has been pegged at about 610 m elevation along sandstone scarps. The Fort Nelson River which flows northward into the Liard River, is joined by: the Muskwa, Prophet, Sikanni Chief, Klua, Fontas, Kahntah, Snake, Sahtaneh and Kiwigana streams. While the Hay River, which flows eastward into the Peace River in Alberta, is joined by: the Sheklilie, Kotcho, Kyklo, and Ekwan streams in British Columbia. The drainage in this ecosection is not well developed, but in British Columbia it is drained to the north by the Fort Nelson River and to the east by the Hay River. Clarke Lake is the only large named lake in B.C. While hay and Zama lakes are the two largest in Alberta. Extensive wetlands, small lakes, muskeg and small meandering streams dominate this lowland area.

This area is little affected by Pacific air rather surface heating of the myriad bodies of water creates convective currents that cause localized showers, high humidity and cumulus clouds. In the winter cold Arctic air can lay over this area for long periods bringing extensive periods of intense cold which seems to be exasperated by the short day-light. Boreal White and Black Spruce is the only forest type, but much of the area is expressed by wetlands and muskeg that are surrounded by black spruce and tamarack, white spruce goes best on the alluvial soils along the rivers or on drier upland sites.

In British Columbia Fort Nelson is the largest community, smaller settlements include: Old Fort Nelson and Prophet River; while in Alberta, Rainbow Lake, Habey and Chateh are the main communities. In British Columbia the Alaska Highway (No. 97) passes through the southwestern portion and the Liard Highway (No. 77) connects Fort Nelson north to Fort Liard in the Northwest Territories. Winter roads to access gas and oil fields are extensive especially to the north and east and build over frozen ground and utilized ice-bridges to cross rivers and lakes. Oil and gas exploration is the main industry, with extensive seismic activity and drilling throughout the ecosection. Some logging for popular has occurred, but is restricted to the drier upland portions. There is some hay production near Fort Nelson as well as some cattle and Bison ranching. There are several representative protected areas of note, including: Hay River, Ekwan Lake, Klua Lakes, Sikanni Old Growth and Jackpine Remnant parks.

MPL - Muskwa Plateau Ecoregion

This is a rolling and hilly ecoregion that lies between the Rocky Mountain Foothills in the west and the lower Fort Nelson Lowlands in the east. The upland consists of gently folded sedimentary bedrock, which often has been incised by the larger streams, exposing shales that underlie a harder sandstone cap. The gentle slopes generally face east as a result of the gently east-dipping sandstones. This ecoregion lies mainly in British Columbia, but it does extend northward into



the very southeastern area of the Northwest Territories, it consists of two ecosections.

- **MUU - Muskwa Upland Ecosection**

This is a highly dissected upland area that rises above the Fort Nelson Lowland to the east, but is considerably lower than the Rocky Mountain Foothills and Hyland Plateau to the west. The Continental Ice Sheets moved westward across this ecosection to coalesce with the eastward moving Cordilleran Ice Sheet, those glaciers dissected by the Muskwa, Prophet, Dunedin and Liard rivers to form wide, intermountain valleys. It contains the highest upland surface in this ecoprovince that can range from: 250 m along the Liard River to 900 m above Nelson Forks; to 1492 m at Mount Gunnell east of McClennan Creek, north of the Alaska Highway, to 1514 m on the highest ridge east of the mouth of Tuchodi River. In British Columbia this ecosection is drained by the lower segments of many streams such as: the Muskwa, Tenaka, Prophet, Fort Nelson, Tetsa, Dunedin, Toad, Beaver, Crow, La Biche and Liard rivers; while in the Northwest Territories it is drained by the Beaver, La Biche and Kotanellee rivers. There are many small lakes and wetland but no large lakes.

This area is little affected by Pacific air, but surface heating of the many wetlands and streams cause convective currents that result in localized showers, high humidity and cumulus clouds. This ecosection is also affected by low pressure systems centered over northern Alberta with force moist air against the mountains bringing extreme rain events. In the winter cold Arctic air can lie over the entire ecosection bringing extended period of extreme cold, but with clear skies. The dominant forest type is the Boreal White and Black Spruce except for the high ridge between the Muskwa and Prophet rivers where the cold Spruce – Willow- Birch forest can get established.

There are no communities in British Columbia within this ecosection; Fort Liard is located in the Northwest Territories at the mouth of the Petitot River. The Alaska Highway (No. 97) passes through the middle from east to west and the Liard Highway (No. 77) connects Fort Nelson to Fort Liard through the northeastern portion of this ecosection. Guiding and trapping are the most important renewable resource industries; oil and gas exploration, in the form of seismic lines and activity has occurred throughout the area. In British Columbia, the Liard River Corridor Park extends downstream from the Liard River Canyon into this ecosection and the Northern Rocky Mountain Park extends eastward in the Muskwa River valley into the southwestern portion of the ecosection.

- **SCU - Sikanni Chief Upland Ecosection**

This is an extensive upland or plateau area that lies eastward of the Rocky Mountain Foothills, north of the Halfway Plateau and south of the Fort Nelson Lowland. It is similar to the more northerly Muskwa Upland Ecosection only here the upland surface is more gently rounded. The Continental Ice Sheets moved westward across this upland to coalesce with the eastward Cordilleran Ice Sheets coming off the Rocky Mountains, the left behind large amounts of drifted and deeply incised the river beds that have cut through the hard sandstone cap into the underlying shales. This ecosection is deeply dissected by the Sikanni Chief, Buckinghorse and Prophet rivers. In this ecosection is also drained by: the Beatton, La Prise, Conroy, Trutch, Klua, Minaker, and Wenger streams. Klua and Lily are the only two large lakes, but there are myriad small lakes, wetland and muskeg.

This area is little affected by Pacific air, but surface heating of the many wetlands and streams cause convective currents that result in localized showers, high humidity and cumulus clouds. This ecosection is also affected by low pressure systems centered over northern Alberta with

force moist air against the mountains bringing extreme rain events. In the winter cold Arctic air can lie over the entire ecoregion bringing extended period of extreme cold, but with clear skies. The dominant forest type is the cold Boreal White and Black Spruce forest types that have predominantly, cold, moist black spruce with extensive areas of scrub birch in frost pockets and areas with extensive cold air drainage.

There are only a few service establishments such as: Sikanni Chief, Buckinghorse River and Trutch here along the Alaska Highway (No. 97) that passes through from south to north, mainly along a dry ridge that rises east above the Minaker River. Extensive Oil and Gas exploration, mainly seismic activity, has occurred throughout the ecoregion. The southern four-fifths of Klua Lakes and the Sikanni Chief Canyon parks are the two larger representative protected areas here but the southeastern boundary of the Northern Rocky Mountain Park extends into the northwestern portion of this ecoregion.

NUP - Northern Alberta Upland Ecoregion

This is an area of low rolling plateaus that overlay flat-lying sedimentary bedrock it includes several very large meltwater channels, from melting the Laurentian Ice Sheet. It lies in the far northeastern portion of the province and it extends north and east into the Northwest Territories and Alberta. Muskeg and meandering streams predominate but white spruce and balsam poplar stands occur in well-drained riparian areas. Oil and gas exploration is the main industry. In British Columbia it consists of four ecoregions.



- **ETP - Etsho Plateau Ecoregion**

This is a rolling upland of gentle eastward dipping sandstones that rises steeply, in an escarpment, above the Fort Nelson Lowland to the south and east; it lies entirely within British Columbia. The Laurentide Ice Sheets moved across this area rounding the features and depositing deep layers of glacial debris with they stagnated and waned. It reaches to 751 m northwest Kotcho Lake, but most importantly the escarpment forms a wall that rises nearly 200 m above the adjacent lowland. Like the Cameron and Hills and Caribou Mountains in Alberta, this area can be considered as an outlier of the Alberta Plateau. On the northern slopes this ecoregion grades into the adjacent upland unit. This ecoregion is drained by the upper Kotcho and Tonga streams that flow eastward into the Hay River; by the Komie, Courvoisier, Lichen and Klenteh streams that flow westward into the Fort Nelson River; and by the Thetlandod, Tsea, Sahdoanah, and Yeshhadle streams that flow north into the Petitot River. There are two large lakes: Kotcho and Kwokullie and many smaller ones and much wetland and muskeg.

Surface heating of the water bodies in the summer creates convective currents that lead to localized showers, high humidity and cumulus clouds. In the winter cold Arctic air can dominate this area, bringing extensive periods of intense cold, but often accompanied by clear skies. Cold Boreal White and Black Spruce forest types is the only one here, but it usually expressed as muskeg and wetlands surrounded by black spruce and tamarack, white spruce is commonly found only on the deep river gravels and on higher and drier ground.

There are no permanent settlements here, nor are there any all-weather roads here. Oil and Gas exploration, by seismic activity has occurred throughout and an industrial road has been built,

from Fort Nelson on to this ecosection, and east past Kotcho and Kwokullie lakes. There are no large protected areas in this ecosection.

- **MAU - Maxhamish Upland Ecosection**

This is a rolling upland that rises above the Forth Nelson Lowland to the southeast; it is slightly below both the Etsho Plateau to the east and the Muskwa Plateau to the west. It lies mainly in British Columbia but it does extend northward into the Northwest Territories to the constriction between the Liard Range and the Interior Plateau at the mouth of the Muskeg River it is much wider in the Petitot/Muskeg river basin, before it narrows to a plain on the east side of the Liard River. It rises above the Fort Nelson and Liard rivers to the west. This area has deep, flat-lying sedimentary sandstone rocks that has been eroded by the western moving Laurentide Ice Sheets. Much of the upland is between 400 and 550 m elevation, but rounded hills can rise to above 600 m to 700 m elevation. In British Columbia this ecosection is drained by: Kiwigana, Delkpay, Capot-Blanc, d'Easum, and Sandy streams; in the Northwest Territories it is drained by: the Big Island, lower Petitot and Muskeg streams. Maxhamish Lake is the largest lake, but here are many small lakes, wetlands, muskeg and small streams.

Surface heating of the water bodies in the summer creates convective currents that lead to localized showers, high humidity and cumulus clouds. In the winter cold Arctic air can dominate this area, bringing extensive periods of intense cold, but often accompanied by clear skies. Cold Boreal White and Black Spruce forest types is the only one here, but it usually expressed as muskeg and wetlands surrounded by black spruce and tamarack, white spruce is commonly found only on the deep river gravels and on higher and drier ground.

In British Columbia, there are no settlements in this ecosection. The Liard Highway (No. 77) an all weather road, connects the Alaska Highway (No. 97) west of Fort Nelson to Fort Liard, and Fort Simpson in the Northwest Territories, it crosses this upland area to the east of Maxhamish Lake. Extensive oil and gas exploration by seismic activity has occurred throughout this ecosection in both British Columbia and the Northwest Territories. Maxhamish Lake Park and Protected Area are the only representative protected areas here.

- **PEP - Petitot Plain Ecosection**

This is a wide meltwater plain that curves, in crescent-shape from the Northwest Territories-Alberta-British Columbia boundary area, southwest then northwesterly across northeastern B.C. and back into the Northwest Territories. Because of its size it presents an unique landform feature in British Columbia, it was undoubtedly formed by the rivers of water running off the melting Laurentian Ice Sheet at the waning of past Ice Ages. In addition to the Petitot River which flows through the centre of the area, this ecosection is also drained by: the upper Muskeg, Fortune, Stanisles, Sahdoanah, Kimes, Hassitl and Thinahtea streams in British Columbia and the Northwest Territories, as well it is drained by the Kakisa and Redknife rivers in Alberta. Its surface is riddled with many small lakes (the four largest are: July, Midwinter, Thinahtea and August) wetlands, muskeg and slow-moving streams.

Surface heating of the water bodies in the summer creates convective currents that lead to localized showers, high humidity and cumulus clouds. In the winter cold Arctic air can dominate this area, bringing extensive periods of intense cold, but often accompanied by clear skies. Cold Boreal White and Black Spruce forest types is the only one here, but it usually expressed as muskeg and wetlands surrounded by black spruce and tamarack, white spruce is commonly found only on the deep river gravels and on higher and drier ground.

There are no settlements or permanent roads, only the winter road that cuts across the western portion from the southwest to the northeast, which connects Fort Nelson with Fort Simpson on the Mackenzie River. Oil and gas exploration by seismic activity has occurred extensively throughout the upland surface. The North and South Thinahta parks are the only two representative protected areas in this ecosection.

- **TLP - Trout Lake Plain Ecosection**

This is a rolling upland plain that extends southward from the Northwest Territories into northeastern British Columbia it is much smaller in British Columbia than in the Northwest Territories. Much of the ecosection in British Columbia rises above 600 m; while in the Northwest Territories it can rise above 694 m of the south side of Trout Lake to 725 m on the west side. In BC this ecosection is drained by only by the upper Hassitl Creek, which flows southward into the Petitot River. In the NWT it is drained by: the upper Muskeg, Arrowhead, Island, Trout, Poplar and many unnamed streams. It is dominated by the large Trout Lake, (many smaller named lakes such as: Trainor, Tetcho and Cormack), a myriad of small lakes, wetlands and black spruce and tamarack muskeg and meandering streams.

Surface heating of the water bodies in the summer creates convective currents that lead to localized showers, high humidity and cumulus clouds. In the winter cold Arctic air can dominate this area, bringing extensive periods of intense cold, but often accompanied by clear skies. Cold Boreal White and Black Spruce forest types is the only one here, but it usually expressed as muskeg and wetlands surrounded by black spruce and tamarack, white spruce is commonly found only on the deep river gravels and on higher and drier ground.

There are no settlements in this ecosection. A winter road form Fort Nelson to Fort Simpson, cuts through the western potion of this ecosection in the Northwest Territories. Like elsewhere in this ecoprovince oil and gas exploration by seismic activity has occurred here. There no protected areas in either British Columbia or the Northwest Territories.

Sub-Arctic Highlands Ecodivision

This Ecodivision is the third part of the Polar Ecodomain in British Columbia. It includes the mountains, high plateaus, and intermontane lowlands that extend from the northern part of the province into the Yukon, Northwest Territories, and Alaska. The area has severe and long winters with short summers. Precipitation does not vary greatly through the year but mountains in the east are generally drier than those in the west. Vegetation is characterized by muskeg and black spruce in low-lying areas with poor drainage. Low valleys often have willow-birch shrublands. White spruce and sub-alpine fir, and occasionally aspen, occur on the middle slope. Alpine grasslands dominate most rounded summits, while barren rock, and mat-vegetation occurs on the highest peaks. In British Columbia this Ecodivision is represented by only one Ecoprovince.

NMB - Northern Boreal Mountains Ecoprovince

Location - This ecoprovince lies east of the northern Boundary Ranges of the Coast Mountains, west of the Alberta Plateau, and south of the Taiga Cordillera of the Mackenzie Mountains. The general character of this ecoprovince is one of mountains and plateaus separated by wide valleys and lowlands that are strongly influenced by Arctic air. The Northern Boreal Mountains Ecoprovince extends from north-central



British Columbia northward across the southern Yukon into east-central Alaska.

There has been little obvious effect of human activity in the area. Mineral exploration, open-pit mining and placer mining, have had the most serious habitat impacts, starting with the rush in the late 1890's to the Klondike gold fields, many prospectors staked claims within this ecoprovince, or supported developments along the lower Stikine River and Dease Lake, but continuing to present with placer mining, jade exploration and base metal exploration, one of the largest mines, now closed was the Asbestos mine at Cassiar, which necessitated building an industrial road to tidewater at Stewart. Logging is restricted to small, local operations. Guiding and trapping remain the most important industries based on renewable resources.

Climate - Prevailing westerly winds bring Pacific air to the area over the high St. Elias Mountains and Boundary Ranges. Coastal air is greatly reduced in moisture when it reaches the area; this ecoprovince is characterized by rainshadow effects that can cause some areas to be very dry. Summertime surface heating leads to convective showers which, together with winter frontal systems, result in precipitation amounts that are evenly distributed throughout the year. Winter climates are long and persistent, while the growing season is relatively short; outbreaks of Arctic air are frequent during the winter and spring. The rugged relief leads to a complex pattern of surface heating and cold air drainage in the valleys.

Physiography - This ecoprovince encompasses several mountain ranges, wide valleys and lowlands, in British Columbia there are physiographic units: the Alsek Ranges, the Teslin, Taku, Tanzilla and Stikine plateaus, the Cassiar Mountains, the Liard Plain, Liard Ranges, the north portion of the Skeena and Omineca Mountains, the Northern Rocky Mountain Trench, and the Muskwa Ranges and associated foothills; the Teslin Plateau, Teslin Basin and Pelly Mountains. There are many additional units in the Yukon Territory, including: the Kluane, Lewes, Klondike Nisutlin and Stewart plateaus and Dawson and Ruby ranges, and into east-central Alaska in the Alaska Range.

The general character of the ecoprovince is one of mountains and plateaus separated by wide valleys and lowlands. Each has a different geological origin or structure. Glaciation was uneven in intensity. The high coastal mountains to the west (in British Columbia) and south (in the Yukon and Alaska) and the Rocky and Mackenzie mountains in the east were centres of accumulation from which valley glaciers moved outward across major lowlands. Late glaciation eroded the mountains further. However, some areas, in the northwestern portion of this ecoprovince, such as northern South Ogilvie Mountains received no glacial ice, this unglaciated area reaches from the Yukon into Alaska. Late glaciation eroded the mountains further. Some areas, such as the foothills, show little or no evidence of glacial erosion and there may have been an ice-free corridor between the continental ice-sheets.

Drainage of this area radiates outward in all directions; through the coastal mountains by the Stikine, Taku, and Alsek rivers; north across the Yukon and Alaska by the Yukon river; through the gorge between the Mackenzie and Rocky mountains by the Liard River; and southward to the Peace Via by the Finlay, Ingenika, Fox and Kwadicha rivers. The mountains show a variety of alpine conditions from rugged, serrated rock to rounded, rolling alpine, which extends a considerable way down the mountains. Valley bottoms and lower slopes contain dense forests of mainly White spruce, Subalpine Fir and Trembling aspen, with Black spruce in the moist sites, while Lodgepole pine although common in British Columbia and the Yukon – Southern Lakes Ecoregion in the Yukon is rare or non-existent in the northern portion this ecoprovince in the Yukon. Lowland areas are often occupied with wetlands, small lakes, and meandering streams, while valley bottoms in the mountains are often filled with glacial debris, in the form of kame deposits, till plains and moraines.

Biogeoclimatic Zonation - Vegetation is dominated by three Biogeoclimatic Zones: the Boreal White and Black spruce Zone occurs throughout the valley bottoms and extensive plains, the Spruce - Willow -

Birch Zone occurs throughout the high valleys and middle slopes of the mountains, while the Boreal Altai Fescue Alpine Zone occurs throughout the middle to upper slopes of most mountains. Sporadic occurrence of two additional zones occurs adjacent to the large coastal valleys; the Sub-Boreal Spruce Zone occurs in the lower slopes of the lower Stikine and lower Taku River valleys, and the Engelmann Spruce - Subalpine Fir Zone occurs on the middle slopes of those valleys.

Vegetation - The Northern Boreal Mountains Ecoprovince is very large but, except for some transitional vegetation from coastal to boreal, it is not very diverse. There are five vegetation zones. The distinctive feature of the ecoprovince is the extensive subalpine and the relatively low elevation alpine habitats.

In the northeastern portion, the in the Liard Basin, extensive fire history and fine-textured soil (silts and clays) have resulted in domination by trembling aspen. The lowest vegetation zone has a climax of white and black spruce. Other common tree species are paper birches and balsam poplar. Understories are dominated, with green alder, highbush-cranberry, soopolallie, prickly rose, twinflower, Altai fescue, wild sarsaparilla, and mosses. On floodplains, young balsam poplar stands give way to white spruce, with alder, red-osier dogwood, and horsetails. Low nutrient black spruce bogs have Labrador tea, cloudberry, leatherleaf, lingonberry, and sphagnum. Organic rich tamarack fens have understories of sweet gale, willows, buckbean, sedges and fen mosses.

The lowest vegetation zone has a climax of white spruce forests, with little black spruce. Lodgepole pine can occur on coarser soils and after fire, and while slowly expanding northwestward it currently occurs only in British Columbia and the southern Yukon Territory. Trembling aspen occurs on finer soils, especially after fire, and Subalpine Fir is commonly encountered throughout this zone. This boreal zone is mainly encountered in lower, broad valley bottoms. Other common tree species are Paper Birch and Balsam Poplar. Understories are dominated, with Green Alder, Highbush-Cranberry, Soopolallie, Prickly Rose, Twinflower, Altai Fescue, Wild Sarsaparilla, and mosses. On floodplains, young Balsam Poplar stands give way to White spruce, with alder, Red-osier Dogwood, and horsetails. Low nutrient Black spruce bogs have Labrador Tea, Cloudberry, Leatherleaf, Lingonberry, and Sphagnum. Rich Tamarack fens have understories of Sweet Gale, willows, Buckbean, sedges and fen mosses. In this low elevation, vegetation zone understories are moss dominated. Wetlands tend to be rich in minerals, or organic matter, with both Black and White spruce cover.

The subalpine vegetation zone is extensive except in the Liard Basin. Wildfires are less frequent than in lower areas. Trembling aspen and lodgepole pine are common on drier sites. The lower elevations are usually forested with white spruce and subalpine fir, which dominates on higher slopes. Understories include willow, soopolallie, crowberry, twinflower, Altai fescue, fireweed, and a well-developed moss layer. Permafrost may be found in some valleys, and massive cold air pooling leads to a mosaic of shrubfields, fens and open grassland complexes. The upper elevations of this zone are essentially a scrub/parkland, dominated by scrub birch and several willow species. Wetlands are usually rich, with white spruce, tall willows, scrub birch, sedges and cottongrass. Subalpine grasslands are frequent, on either steep south-facing slopes, or on flat to gently rolling uplands. Altai fescue is the common grass.

The Boreal Altai Fescue Alpine vegetation zone (alpine tundra vegetation zone) is widespread, and dominated by shrubs such as Dwarf arctic-alpine willows, mountain-heathers, Moss Champion, Mountain-Avens, Altai Fescue, Blackish Locoweed, mosses, and lichens. Habitats range from extensive, upper elevation, sparsely vegetated or lichen-covered rocks to dwarf scrub of prostrate woody plants to alpine grasslands to wet herb meadows.

Fauna - Moose are the most numerous and widely distributed ungulate, but the Thinhorn Sheep (both the pure white Dall's and Stone's) and Caribou best characterize the fauna. Mountain Goats are an abundant species in rugged alpine areas. Grizzly Bears, American Black Bears, and Grey Wolves are common throughout the valleys.

Characteristic small mammals include the Collared Pika, Arctic Ground Squirrel, Tundra Vole, and Brown Lemming. Wolverines and Lynx are common.

This ecoprovince supports only 50% of all bird species known to occur in the province and 40% of all species known to breed. However, many species breed nowhere else in British Columbia including the Pacific Loon, Gyrfalcon, Lesser Golden-Plover, Wandering Tattler, Hudsonian Godwit, Red-necked Phalarope, Arctic Tern, Northern Shrike, Smith's Longspur, Snow Bunting, Common Redpoll, and "Timberline" Sparrow. This area is the centre of abundance for Willow and Rock ptarmigan, Bohemian Waxwing, and American Tree Sparrow, and it supports the only breeding population of the dark race (*harlani*) of the Red-tailed Hawk.

This ecoprovince supports both anadromous and freshwater fish. The fish species vary because of the sea that the watersheds drain into. For example, the Stikine, Taku and Tatshenshini drain into the Pacific Ocean; the Yukon River drains into the Bering Sea; and the Liard and Peace rivers drain into the Arctic Ocean. Anadromous fish are restricted to the Stikine, Taku and Tatshenshini watersheds, and include, Chinook and chum salmon. Freshwater fish include, Arctic grayling, lake trout, lake whitefish, bull trout are common throughout, except in the Yukon River watershed and Dolly Varden char occur in the Stikine and Taku watersheds; in the Liard and Peace river watersheds - northern pike and white sucker; in Teslin Lake and the Liard River - inconnu; in the Pacific watersheds -coastal cutthroat trout and Coast Range sculpin.

Ecoprovince Subdivisions

The Northern Boreal Mountains Ecoprovince in British Columbia consists of eight ecoregions with 23 ecosections.

BMP – Boreal Mountains and Plateaus Ecoregion

This ecoregion is a large area with a complex of rugged mountains and intervening lowlands, and rolling, high plateaus. This ecoregion occurs entirely in British Columbia, it extends from the warmer and wetter mountains of Sub-Boreal Interior Ecoprovince in the south, north along the eastern front of the eastern front of the Stikine Highlands north to the low basin of the upper Yukon River watershed, east skirting the Tuya Ranges and Liard Basin, then south along the western front of the Rocky Mountains. It has a cold, dry boreal mountain climate. The Boreal White and Black spruce zone occurs in the lower, wider valleys and lowlands; while the Spruce – Willow – Birch zone occupies most of this area on the mid-slopes. The extensive Boreal Altai Fescue Alpine occurs on the upper slopes, but at the higher elevations barren rock is abundant. In British Columbia this ecoregion contains seven ecosections.



- **CAR - Cassiar Ranges Ecosection**

This is the area with the highest and most rugged mountains in the ecoregion. It is a broad band of mountains extending from a line of the Upper Frog – Denetiah – Kotcho creeks and rivers northwestward to the Dease River – McNab Creek mountain area. It includes the entire Cassiar Ranges physiographic unit from the Cottonwood-Blue River southeastward to above the Finlay River. These ranges have a core of granitic rocks that have intruded into folded sedimentary and volcanic rocks. Glaciers flowed off these ranges in three basic directions: to the northeast into the Northern Rocky Mountain Trench; to the southeast into the Trench south of the Finlay River; and to the west over the lower plateaus and uplands. Although glaciers covered this area the

obvious glacial effects are largely those of late-stage cirque basin carving. This ecosection is drained by the Rainbow, Frog, Denetiah, Moodie, Turnagain-Cassiar-Dall, and Major Hart streams that flow northeastward into the Kechika River; the Chuckachida, Pitman, Tucho streams that flow westward into the Stikine River; in the north the area is drained by the Eagle, Four Mile, Rapid streams that flow northward into the Dease River; while the McDame Creek drains the northern portion and drains eastward into the Dease River. Meek, Cry, Tucho, Hottah and Spinel are six of the largest lakes, but many smaller ones occur here.

This area is affected by moist Pacific air to the west that brings heavy rain throughout the summer and into the fall there are some local rainshadow areas. In the winter cold Arctic air can invade this area from the north or from over the Rocky Mountains to the east and coupled with the short daylight hours these ranges can have extremely cold temperatures and heavy cloud cover. Snow in this ecosection is high. Cold Boreal White and Black Spruce forests occur in only the lowest valleys of the Dease River, otherwise the valleys and lower to mid-slopes are dominated by scrubby, cold Spruce-Willow-Birch forests. Alpine vegetation is lush and grass rich above tree line, but at higher elevations barren rock fields are the most common.

The town of Cassiar has been closed and only a few people now live in the area year round. The Kitimat - Cassiar Highway (No. 37) passes through the northwestern portion of the ecosection, following the Dease and McDame rivers. Except for the one highway and areas associated with Cassiar Asbestos, there are no roads in this ecosection. Mineral exploration has been extensive since the early 20th Century, but with few developed mines, the largest, Cassiar Asbestos, is now closed, was located on Mount McDame. Chuckachida Protected Area is the only one entirely in this ecosection; large portions of Dune Za Keyih, Denetiah and Finlay-Russel parks have been established along various boundaries with other ecosections.

- **FRT - Finlay River Trench Ecosection**

This Ecosection forms the middle of the Northern Rocky Mountain Trench physiographic unit this is a stick-slip displacement fault. It extends from the north end of Williston Lake reservoir northwestward to Sifton Pass the narrowest section of the entire Northern Rocky Mountain Trench. Glaciers coming down mountains on either side coalesced and moved southward to the Peace River/ The result is a glaciated plain of varying width, from its narrowest south of Sifton Pass to its widest at Ware, It is drained in the northern portion by the southeastward flowing Fox River and in the southern portion by the Finlay River after it has merged with both the Fox and Kwadacha rivers. There are many small lakes, wetlands and streams here the only large lake is the extreme northern end of Williston Lake reservoir.

This area has some large rainshadows as it is protected from moist Pacific air moving over the mountains to the west and from low-pressure storms in Alberta pushing moisture eastward over the Muskwa Ranges. In the summer surface heating of the many water bodies creates convective currents bringing localized showers, high humidity and cumulus clouds. In the winter and early spring, dense, cold Arctic air can invade this area by sliding down the Rocky Mountain Trench to the north and coupled with the short daylight hours this trench can have extremely cold temperatures and heavy cloud cover for extended periods. The only forest type is Boreal White and Black Spruce, black spruce grows commonly around the wetlands and muskeg and white spruce grows on the deeper alluvial soils.

Ware, is the only community here. Roads built for logging extend from the Parsnip Trench Ecosection into the southern portion of this ecosection as far north as Ware. The northern end

of the Williston Lake reservoir occurs in the southern end of this ecosection. Ed Bird-Estella Lakes Park is the only protected area established in this ecosection.

- **KEM - Kechika Mountains Ecosection**

This is an area with high, rounded mountains, lying east of the Cassiar Mountains that is dissected by low, wide valleys. These mountains are built up of folded sedimentary quartzite, limestone and slate. Glaciers built up on these mountains and moved northward joining glaciers from the Cassiar Ranges and Rocky Mountain Trench to move into the Liard Basin. The valley profiles have been modified by the valley glaciers, while the high peaks and ridges have been sharply sculpted by cirque glaciers at the waning of the ice age. These mountains diminish somewhat towards the north, with the Horseranch ridge being the last major summit before the Liard Basin. This ecosection is drained by the Turnagain River that winds its way northeastward through the middle of the ecosection, it is joined by the north flowing Dall River and the east flowing Major Hart River; Denetiah and Moodie creeks flow eastward into the Kechika River Trench; while the Deadwood and Red rivers flow northward before turning east to join the Kechika River in the trench. The three largest lakes are Looncry, Deadwood and Dall; there are many smaller ones and wetlands.

This area has some large rainshadows as it is protected from moist Pacific air moving over the Cassiar Ranges to the west and from low-pressure storms in Alberta pushing moisture eastward over the Muskwa Ranges. In the summer surface heating of the many water bodies creates convective currents bringing localized showers, high humidity and cumulus clouds. In the winter and early spring, dense, cold Arctic air can invade this area by coming over the low Hyland Highland and Liard Plain to the north and coupled with the short daylight hours these mountains can have extremely cold temperatures and heavy cloud cover for extended periods. The cold Boreal White and Black Spruce forests grow in the wider valley bottoms, black spruce grows commonly around wetlands and muskeg and white spruce grows on the deeper alluvial soils. The lower to mid-slopes are dominated by scrubby, cold Spruce-Willow-Birch forests. Alpine vegetation is lush and grass rich above tree line, but at higher elevations barren rock fields are the most common.

There are no roads or settlements here. Most of Denetiah Park has been established in the southern end of this ecosection, in addition, this area is part of the Muskwa-Kechika Wilderness Management Area to protect and manage the high value wildlife and wilderness values that occur here.

- **KRT - Kechika River Trench Ecosection**

This ecosection is an intermountain plain that is oriented north-northwest to south-southeast; it is the northern segment of the Northern Rocky Mountain Trench, a strike-slip displacement fault. It is widest in the north adjacent to the Liard Plain and becomes constricted by the Rabbit Plateau and western Muskwa Ranges to the east and the Kechika Mountains and Cassiar Ranges to the west it is narrowest in the south nearest Sifton Pass. The Kechika River flows northward through the entire ecosection, while the Gataga River, the second largest river here, joins the Kechika near the middle of the ecosection. There are many small lakes, wetlands and streams here and the only large lake is Scoop Lake.

This area has some large rainshadows as it is protected from moist Pacific air moving over the mountains to the west and from low-pressure storms in Alberta pushing moisture eastward over the Muskwa Ranges. In the summer surface heating of the many water bodies creates convective currents bringing localized showers, high humidity and cumulus clouds. In the winter

and early spring, dense, cold Arctic air can invade this area by coming over the low Hyland Highland and Liard Plain to the north and coupled with the short daylight hours these mountains can have extremely cold temperatures and heavy cloud cover for extended periods. The cold Boreal White and Black Spruce forests grow in the wider valley bottoms, black spruce grows commonly around wetlands and muskeg and white spruce grows on the deeper alluvial soils. The only forest type is Boreal White and Black Spruce, black spruce grows commonly around the wetlands and muskeg and white spruce grows on the deeper alluvial soils.

There are no roads or settlements here. Denetiah, Denetiah Corridor and Dune Za Keyih parks, three representative protected areas of note in this ecoregion straddle the ecoregion between the mouth of Rainbow River and that of Matulka Creek to the north.

- **NOM - Northern Omineca Mountains Ecoregion**

This is an area of rounded mountains and wide valleys. These mountains have a core of granitic rocks that have intruded into sedimentary, volcanic and metamorphic rocks. Glaciers covered this area, but with an intensity that varied with elevation and specific location. The lower mountains are well rounded but the higher ones are more serrate and show the effects of cirque sculpting. In the ranges nearest to the Finlay River the valley profiles are U-shaped and hanging valleys are common. Glaciers left deep drift in the valleys bottoms and many low-level lakes, streams and wetlands occur. This ecoregion includes: portions of the Sifton and Finlay ranges in the east, adjacent to the Finlay River Trench; and the northern portion of the Swannell Ranges of the Omineca Mountains physiographic unit. Toodoggone, Firesteel, Finlay and Ingenika rivers to the east; and the Chuckachida River to the west; and the Pelly River to the south drain the ecoregion.

This area is affected by moist Pacific air to the west that brings heavy rain throughout the summer and into the fall there are some local rainshadow areas. In the winter cold Arctic air can invade this area from the north or from over the Rocky Mountains to the east and coupled with the short daylight hours these ranges can have extremely cold temperatures and heavy cloud cover. Snow in this ecoregion is high. Cold Boreal White and Black Spruce forests occur in only the lowest facing the main stem of the Finlay River, otherwise the valleys and lower to mid-slopes are dominated by scrubby, cold Spruce-Willow-Birch forests. Cold Engelmann Spruce - Subalpine Fir forests occur on the mid-slopes in the Ingenika Basin. Alpine vegetation is lush and grass rich above tree line, but at higher elevations barren rock fields are the most common.

There are no settlements here. Logging is carried out from Ingenika Arm to Ware and a resource road for mineral exploration was built in the 1970's into the upper Finlay, Sturdee and Toodoggone watersheds. This ecoregion contains most of the Finlay - Russel Park, the eastern three quarters of Tatlatui Park and the northern half of Chase Park.

- **SBP- Southern Boreal Plateau Ecoregion**

This ecoregion consists of several deeply incised plateaus, wide river valleys and upland summits. Mount Edziza, in the west, is a large compositionally diverse shield volcano; while to the southeast shale and sandstone dominate the southern portion of the Spatsizi and Klappan uplands; north across the Stikine River, the Three Sisters Mountain is a batholith, while other mountains here are volcanic. Glaciers pushed over this ecoregion coming from the Skeena Mountains to the south, filling the valleys, in the west the glaciers moved down the Stikine Valley to the coast, and in the east and central portions the glaciers moved north across the plateaus and lowlands. This ecoregion is drained by the west and southward flowing Stikine River and its major tributaries: Spatsizi, Klappan and Little Klappan, Klastline Rivers and Mess

creek all of which flow northward; and the Iskut River flowing southwestward; while the Turnagain River drains northward to the Liard River. Kinaskan and Eddontenajon lakes are the largest, other large lakes include: Kakiddi, Nuttlude, Cold Fish, Laslui, Tuaton and Eaglehead; there are many small lakes, streams, wetland and muskeg.

This area has some large rainshadows as some of the large north-facing valleys are protected from moist Pacific air moving over the Coast Mountains in the west by the surrounding uplands and mountains. In the summer surface heating of the many water bodies creates convective currents bringing localized showers, high humidity and cumulus clouds. In the winter and early spring, dense, cold Arctic air can invade this area by coming south over lowland and rolling upland from the Yukon Territory to the north and coupled with the short daylight hours these mountains can have extremely cold temperatures and heavy cloud cover for extended periods. The cold Boreal White and Black Spruce forests grow in the large wide valley bottoms; black spruce grows commonly around wetlands and muskeg and white spruce grows on the deeper alluvial soils. The lower to mid-slopes are dominated by scrubby, cold Spruce-Willow-Birch forests. Alpine vegetation is extensive and is lush and grass rich above tree line, but at higher elevations barren rock fields are the most common; remnant glaciers remain on Mount Edziza and along the southern boundary on the Skeena Mountains.

Several small communities and Indian Reserves occur in the Kinaskan-Eddontenajon lakes area. The Cassiar-Kitimat Highway (No. 37) passes by Kinaskan and Eddontenajon lakes and connects this area with the Yellowhead Highway (No. 16) in the south and the Alaska Highway (No. 97) in the north; the BCR rail line was pushing up the Klappan River from Fort St James before construction was stopped in the early 1970's; placer mining in the upper Turnagain have created road access from Dease Lake. Several large protected areas occur here: Spatsizi Plateau Wilderness Park, Stikine River Park, Mount Edziza Park, Gladys Lake Ecological Reserve and the northwestern quarter of Tatlatui Park are the largest protected areas representing this ecosection.

- **STP - Stikine Plateau Ecosection**

This ecosection is a plateau area with variable relief, from lowland to rolling alpine. It is a partly dissected upland formed on folded sedimentary and volcanic rocks. It is an area of wide flaring valleys and rounded ridges; the Level Mountain shield volcano is the most impressive feature in this ecosection. Cirque glaciers have sculpted the summit and the surrounding rim. Glaciers moved eastward from the Boundary Ranges and coalesced with ice moving north from the plateaus to the south. Moving great quantities of material there were eventually dropped here when the ice sheets waned. The upland surface is dominated by a myriad of small lakes, streams, muskeg and marshes. Drainage streams flow to the west via the Stikine River: Tazilla, Tuya, and Tahltan rivers; to the west via the Taku River: Sheslay- Nahlin, and Inklin rivers; and to the northeast via the Liard River, the Dease River. Dease Lake is the largest lake and Tuya, Tachilta, Hluey and Buckley are four other large ones.

This area has some large rainshadows the low elevations along the Stikine, Nahlin and Klastline river valleys are the driest in the ecoregion, but most of the upland is not protected from moist Pacific air moving up the wide Stikine Gap in the Coast Mountains or over the Coast Mountains in the west across the surrounding uplands and mountains. In the summer surface heating of the many water bodies creates convective currents bringing localized showers, high humidity and cumulus clouds. In the winter and early spring, dense, cold Arctic air can invade this area by coming south over lowland and rolling upland from the Yukon Territory to the north and coupled with the short daylight hours these mountains can have extremely cold temperatures

and heavy cloud cover for extended periods. The cold Boreal White and Black Spruce forests grow in the large wide valley bottoms; black spruce grows commonly around wetlands and muskeg and white spruce grows on the deeper alluvial soils. The lower to mid-slopes are dominated by scrubby, cold Spruce-Willow-Birch forests. Alpine vegetation is limited to Level Mountain and a few of the higher ridges, it can be lush and grass rich above tree line, but on Level Mountain wetlands and muskeg predominate.

Dease Lake and Telegraph Creek are the only two communities here. The Cassiar-Kitimat Highway (No. 37) goes through here, past the community of Dease Lake, and connects this community with the Yellowhead Highway (No. 16) to the south and the Alaska Highway (No. 97) to the north; a service road extends west to Telegraph Creek; and a mining road has been put in east of Dease Lake to the Turnagain Lakes. The Telegraph Trail passes through the western portion, this trail was one of the routes used for miners traveling to the Klondike in the late 1890's. Placer mining was extensive in the early 20th Century, especially along Dease Lake. The lower Stikine River Park; the northern third of the Mount Edziza Park; and the southern portion of the smaller Tuya Mountains Park, occur here.

HHI - Hyland Highland Ecoregion

This is a rolling plateau that is transitional between the higher Rocky Mountains to the south and the higher Mackenzie Mountains to the north in the Yukon and Northwest Territories. It also is located between two lowlands to the east is the extensive Alberta Plateau, while to the west is the smaller Liard Basin. It is the southern-most area of the Mackenzie Mountains. Vegetation is mainly Spruce –willow Birch zone in the upland and Boreal White and Black spruce in the Liard River Canyon. In British Columbia this ecoregion consists of only one ecosection.



- **HYP - Hyland Plateau Ecosection**

This is an area of rolling upland that extends from the Liard River canyon in northern British Columbia into the Yukon and Northwest Territories. Sedimentary rocks underlie this highland that for the most part this area consists of rounded and flat-topped mountains. Ice moved east from the western mountains and lowlands to meet the western moving Continental Ice Sheet. This ecosection provides a low barrier between the Interior Plains to the east and the valleys of the Canadian Cordillera to the west. The south floodplain of the Grand Canyon of the Liard forms its southern boundary, and it is also drained by the Smith River in the west and the Grayling, Crow, Scatter and Beaver rivers in the east. There are now large lakes in British Columbia, but there are many small ones, wetland and streams.

This area is protected from moist Pacific air moving over the mountains to the west and from low-pressure storms in Alberta pushing moisture eastward over the Alberta Plateaus to the east. In the summer surface heating of the many water bodies creates convective currents bringing localized showers, high humidity and cumulus clouds. In the winter and early spring, dense, cold Arctic air can invade this area by coming down the Interior Plains to the north and coupled with the short daylight hours these mountains can have extremely cold temperatures and heavy cloud cover for extended periods. The cold Boreal White and Black Spruce forests grow in the wide Liard River valley, black spruce grows commonly around wetlands and muskeg and white spruce grows on the deeper alluvial soils. Spruce-Willow-Birch forests and shrublands dominate

the uplands. Alpine areas are small and isolated in B.C. but become more common further north in the Yukon nearer the higher Mackenzie Mountains.

There are no settlements in this ecosection. A short portion of the Alaska Highway (No. 97) cuts across the southwestern boundary along the Liard River. The Liard River Corridor Park and the Liard River Corridor Protected Area, the two main protected areas in this ecosection, have been established in part in the southern portion of this ecosection.

LIB - Liard Basin Ecoregion

This is an extensive area of lowland to rolling upland that extends from northern British Columbia into the Yukon. It extends from the Kechika and Rocky Mountains in the south north to the Mackenzie Mountains in the north, the Pelly Mountains on the west and the Hyland Highland on the east. It is dominated by the Boreal White and Black spruce zone. The Alaska Highway (No. 97 in B.C.) passes through from the Liard River Hot Springs Park in the east to Watson Lake, Yukon Territory in the northwest; the Cassiar Highway passes through from Boya Lake Park in the south to connect with the Alaska Highway in the Yukon. In British Columbia this ecoregion consists of two ecosections.



- **LIP - Liard Plain Ecosection**

This is a broad, rolling low elevation, inter-mountain glacial plain with a cold, sub-Arctic climate. This ecosection is surrounded on all sides, except the Kechika River Trench, by a ring of plateaus and mountains. Glaciers from the surrounding mountains in B.C. and the Yukon coalesced and moved across the low Hyland Highland to the east. This area clearly shows the affect of that glaciation with extensive drumlins, eskers, and lake-filled kettles. This ecosection is drained chiefly by the Liard River, which flows through the middle of the ecosection, but the Liard is joined by the Dease, Kechika, Rabbit and Trout rivers in the south and the Smith, Coal and Hyland rivers in the north, while the Blue and Rancheria rivers flow from the west. Boya, Horseranch, Aeroplane, Birches and Fishing are the largest lakes in British Columbia; Watson and Simpson lakes are the largest in the Yukon.

This area is protected from moist Pacific air moving over the mountains to the west and from low-pressure storms in Alberta pushing moisture eastward over the Alberta Plateaus to the east. In the summer surface heating of the many water bodies creates convective currents bringing localized showers, high humidity and cumulus clouds. In the winter and early spring, dense, cold Arctic air can invade this area by coming over the Hyland Highland from the Interior Plains to the north and coupled with the short daylight hours these mountains can have extremely cold temperatures and heavy cloud cover for extended periods. The cold Boreal White and Black Spruce forests dominate this lowland black spruce grows commonly around wetlands and muskeg and white spruce grows on the deeper alluvial soils; Lodgepole pine forests are common as the result of frequent wildfires. Spruce-Willow-Birch forests and shrublands occur on the few higher uplands.

There are no large settlements in British Columbia, Lower Post being the largest community; Watson Lake in southern Yukon is a large service centre. The Kitimat – Cassiar Highway (No. 37) passes from Boya Lake Park north to the Alaska Highway in the Yukon. The Alaska Highway (No.

97 in BC and No. 1 in the Yukon) passes from Smith River in the east to the Ranchero River in the west. Six protected areas have been established, in part, in this ecosection, with Boya Lake Park and Smith River and Blue/Dease Rivers ecological reserves being three of the larger ones.

- **SIU - Simpson Upland Ecosection**

This is a transition upland area that rises in elevation between the Liard Basin to the south and west and the higher Selwyn Mountains to the north. This area clearly shows the affect of that glaciation with extensive drumlins, eskers. Small streams flowing into the Thorpe and Grayling rivers drain it. Most of this ecosection occurs in the Yukon Territory, only one small portion of one ridge extends south into British Columbia.

This area is protected from moist Pacific air moving over the mountains to the west and from low-pressure storms in Alberta pushing moisture eastward over the Alberta Plateaus to the east. In the summer surface heating of the many water bodies creates convective currents bringing localized showers, high humidity and cumulus clouds. In the winter and early spring, dense, cold Arctic air can invade this area by coming over the Hyland Highland from the Interior Plains to the north and coupled with the short daylight hours these mountains can have extremely cold temperatures and heavy cloud cover for extended periods. The Spruce – Willow – Birch zone dominates the landscape, with only small areas of Boreal Altai Fescue Alpine on the higher ridges.

There are no settlements or roads in either British Columbia or in the Yukon Territory in this ecosection nor are there any protected areas.

NRM - Northern Canadian Rocky Mountains Ecoregion

This ecoregion is an area of high, rugged mountains, several of which have large glaciers and rounded isolated foothills separated by wide valleys. The Spruce – Willow Birch zone dominates the valleys and lower to mid slopes, while the Boreal Altai Fescue Alpine zone is extensive. The Alaska Highway west from Fort Nelson passes through here past Summit Lake and Muncho Lake parks. Most of this ecoregion is managed under the Muskwa – Kechika Wilderness Management Area. This ecoregion consists of four ecosections.



- **EMR - Eastern Muskwa Ranges Ecosection**

This ecosection is has the highest, most rugged mountains in the ecoprovince. These are bold castellated ranges of considerable relief that have not undergone much late-stage alpine and cirque glaciation. These are composed of primarily limestone rocks that have been thrust up during the first major mountain building episode on western North America 200 million years ago. Glaciers moved down these mountains over the adjacent foothills to the east to meet the Continental Ice Sheet moving west from the Interior Plains. This ecosection is drained by rivers flowing to the south, by: the Kwadacha and Akie rivers in the west and the Halfway River in the east; to the east by: the Sikanni Chief, Prophet and Muskwa; and to the north by: the Gataga, Trout, Toad and Dunedin. Muncho, Moose, Wokkpash, Tuchodi and Redfern are the largest lakes, but there are many smaller ones.

This area is protected from moist Pacific air moving over the mountains to the west however, low-pressure storms in Alberta pushing moisture eastward over the Alberta Plateaus to the east can result in extreme rain events. In the winter and early spring, dense, cold Arctic air can

invades this area by coming down the Interior Plains to the north can lay against the eastern margin and in the lower east-facing valleys and coupled with the short daylight hours these mountains can have extremely cold temperatures and heavy cloud cover for extended periods. The cold Boreal White and Black Spruce forests grow only in the lower slopes of the Liard River canyon. Spruce-Willow-Birch forests and shrublands grow in the interior valleys and lower slopes. Alpine areas are extensive and consist of rugged Boreal Altai Fescue Alpine but vegetation is generally sparse and barren rock is common with elevation. Several large glaciers remain on the highest summits especially in the upper Tuchodi-Muskwa valleys.

The only settlement here is at Mucho Lake. The Alaska Highway (No. 97) passes through from Summit Lake northwest to the Racing River and through Muncho Lake Park and the abandoned resource road up the Racing River are the only two vehicle access roads into this ecosection. This area came under intense scrutiny in the 1990's and as a result, three large protected areas - Northern Rocky Mountains Park, Dune Za Keyih Protected Area, and Redfern-Kelly Park were established to add to the three existing large parks: Muncho Lake, Stone Mountain and Kwadacha Wilderness parks. In addition most of this area has been placed in the Muskwa – Kechika Wilderness Management Reserve that is under the control of a joint land use stewardship process.

- **MUF - Muskwa Foothills Ecosection**

This is an area of rounded, subdued mountains, which are isolated by wide valleys. However it is possible to divide this ecosection into an eastern subdued belt western and an inner belt that is higher and more rugged. These foothills are comprised of limestone, siltstones and sandstones that are folded and cut by southwesterly thrust faults. Glaciers moving down for the higher Muskwa Ranges to the east met with the Continental Ice Sheets from over the Alberta Plateau, when these ice sheets waned they provided an ice-free corridor along their western margin. The ecosection is opened to the east and is drained by the Halfway River in the south and the Sikanni Chief River north of that; then there are a series of rivers, the Nevis, Besa, Prophet rivers coalesce into the larger Prophet River; the Muskwa, Kluachesi, Gathto, Tuchodi and Chlotapecta, Chischa and Testa rivers and creeks that coalesce into the Muskwa River; while in the north the Dunedin flows into the Liard River. Kluachesi and Trimble are the only two large lakes, but there are some smaller ones and many streams and wetlands.

This area is protected from moist Pacific air moving over the mountains to the west and can produce many rainshadows however, low-pressure storms in Alberta pushing moisture eastward over the Alberta Plateaus to the east can result in extreme rain events. In the winter and early spring, dense, cold Arctic air can invade this area by coming down the Interior Plains to the north can lay against the eastern margin and in the lower east-facing valleys and coupled with the short daylight hours these mountains can have extremely cold temperatures and heavy cloud cover for extended periods. The cold Boreal White and Black Spruce forests grow only in the lower east-facing valleys and lower slopes of the Liard River canyon. Spruce-Willow-Birch forests and shrublands are abundant in the valleys and lower to mid-elevation slopes. Alpine areas are small and scattered and consist of rugged Boreal Altai Fescue Alpine and the vegetation is lush and grass-rich; barren rock is common with elevation.

The small community of Toad River is the only one in this ecosection. The Alaska Highway (No. 97) traverses the ecosection in the vicinity of the Tetsa River and from the Racing River to the western boundary of Muncho Lake Park. The Northern Rocky Mountain, Liard Corridor and Redfern-Kelly parks are the three largest protected areas in this ecosection; however, most of this area has been placed in the Muskwa – Kechika Wilderness Management Reserve that is

under the control of a joint stewardship process in order to protect and manage the important wildlife and wilderness resources in this area.

- **RAP - Rabbit Plateau Ecosection**

This area is a rolling upland that is transitional between the higher and more rugged Eastern Muskwa Ranges to the east, and the lower, subdued Liard Plain to the north; the western boundary is formed by the Northern Rocky Mountain Trench. It is composed of folded sedimentary rocks that have been greatly eroded by glaciers moving north up the Rocky Mountain Trench or down the Muskwa ranges before moving into the Liard Basin. Glaciers left many drumlins and glacial deposits that have subsequently filled with small lakes, wetlands and muskeg. The main drainage in this ecosection is by the Rabbit River and its tributaries that flow northward into the Liard River; it is also drained by the Trout River in the east and the Gataga River in the south. Long Mountain and Netson are the only two large lakes.

This area has some large rainshadows as it is protected from moist Pacific air moving over the mountains to the west and from low-pressure storms in Alberta pushing moisture eastward over the Muskwa Ranges. In the summer surface heating of the many water bodies creates convective currents bringing localized showers, high humidity and cumulus clouds. In the winter and early spring, dense, cold Arctic air can invade this area by coming over the low Hyland Highland and Liard Plain to the north and coupled with the short daylight hours these mountains can have extremely cold temperatures and heavy cloud cover for extended periods. The cold Boreal White and Black Spruce forests grow only in the wider Rabbit River valley. Spruce-Willow-Birch forests and shrublands grow dominate the uplands. Alpine areas are uncommon and occur on only the few highest ridges.

There are no roads or settlements in this ecosection. A small portion of Denetiah and Dune Za Keyih parks have been established in the lower Gataga River and adjacent Kechika River Trench, in the south of this ecosection.

- **WMR - Western Muskwa Ranges Ecosection**

This is an area of deep, narrow valleys and rugged mountains that lies west of the higher Eastern Muskwa Ranges and east of the Northern Rocky Mountain Trench. These are composed of primarily limestone rocks that have been thrust up during the first major mountain building episode on western North America 200 million years ago. Glaciers moved down these mountains into the Rocky Mountain Trench in the north half it move northward down the Gataga Valley and Kechika Trench onto the Liard Basin, while in the southern half it moved southward down the Finlay Trench and through the Peace Canyon to the Alberta Plateau. This ecosection is drained to the north by the southern portion of the Gataga watershed and the eastern portion of the upper Kechika watershed and to the south by the McCook, Weissener, Kwadacha, Paul, Del Akie and Pesika rivers and creeks. Weissener, Quentin, Haworth and Chesterfield are the largest lakes here.

This area has a cold, wet climate caused by easterly flowing Pacific air rising over the Muskwa Ranges, it can easily pass through the low ranges between the Stikine and Finlay valleys bringing heavy rainfall or snow. As well low-pressure storms in Alberta pushing moisture eastward over the Alberta Plateaus to the east can enter through low mountain passes. In the winter and early spring, dense, cold Arctic air can invade this area by coming down the Interior Plains to the east come down the Rocky Mountain Trench or over the mountains to the east and when coupled with the short daylight hours these mountains can have extremely cold temperatures and heavy cloud cover for extended periods. The cold Boreal White and Black Spruce forests grow in the

lower west-facing valleys. Cold Spruce-Willow-Birch forests grow in the mid-elevation slopes and interior valleys. Alpine areas are extensive in the north along the higher areas to the east but vegetation is generally sparse and barren rock is common with elevation.

There are no settlements here. This area is unroaded, although industrial roads for logging and mining occur in areas to the south and in the Rocky Mountain Trench as far as Ware. The southeastern portion of the Dune Za Keyih Park occurs in the north in the Gataga Watershed and adjacent Kechika River Trench; and the western half of the Kwadacha Wilderness Park occurs in the central portion of this ecosection.

PEM - Pelly Mountains Ecoregion

This ecoregion is a rolling upland dominated by the Spruce – Willow – Birch Zone, of mainly treeless shrubs, in the valleys and lower slopes, and extensive areas of the Boreal Altai Fescue Alpine zone on the mid to upper slopes. It consists of granitic rocks that have intruded into folded sedimentary and volcanic rocks. It extends north from the low Stikine Upland into the Yukon and as far north as the Tintina Trench from It was heavily glaciated with glaciers originating on the crest and then moving westward across the Stikine Plateau; eastward across the Liard Basin; and northward to the Yukon River Basin. The Alaska Highway passes in the east from the Yukon into British Columbia. In British Columbia this ecoregion contains only one ecosection.



- **TUR - Tuya Range Ecosection**

This is a rolling rounded upland with narrow valleys composed of granitic rocks, including the Cassiar batholith that have intruded into folded sedimentary and volcanic rocks. Glaciers originating in this range moved to the west across the Stikine Plateau and lowlands and to the east across the Liard Basin. This ecosection occurs mainly in British Columbia and entering into the Yukon only along the Rancheria – Smart valleys. In British Columbia the Rancheria, and Cottonwood Rivers flow eastward eventually to the Liard River; and in the west the Jennings and Swift Rivers flow into Teslin Lake. Swan, Tootsee, Jennings, Klinkit, Alec Chief and Kedahda are six of the largest lakes, but there are many smaller ones, wetlands and meandering streams.

This area receives moist Pacific air moving over the mountains to the west. In the summer surface heating of the many water bodies creates convective currents bringing localized showers, high humidity and cumulus clouds. In the winter and early spring, dense, cold Arctic air can invade this area by coming down over the mountains of the Yukon and coupled with the short daylight hours these mountains can have extremely cold temperatures and heavy cloud cover for extended periods. The cold Boreal White and Black Spruce forests grow only in the wider Rancheria valley and a few of the other deeper valleys. Spruce-Willow-Birch shrublands dominate the uplands. Alpine areas are extensive and consists lush and grass-rich Boreal Altai Fescue Alpine; barren rock is common with elevation.

There are no communities in this ecosection. The Alaska Highway (No. 1 in the Yukon) passes east west along the Rancheria – Swift – Morley river valleys. Tuya Mountains Park, in the south, lies mainly in this ecosection, it is the only protected area to be established here.

STE- St. Elias Mountains Ecoregion

This ecoregion is a rugged, bold, ice-capped mountain area lying to the leeward of the Alsek and Icefield Ranges. The highest mountains in Canada occur here. These mountains lie in the curve of the Gulf of Alaska and abruptly rise to great height. These mountains are protected somewhat from Pacific air masses, but that air can invade through the wide Alsek River Valley bringing considerable moisture here. Cold Arctic air can also moved down across the Yukon to stall against these mountains bringing intense cold and heavy snowfalls. It extends northward, east of the Duke Depression, Shakwak Trench and Wellesley Depression across the extreme northwestern B.C., extreme southeastern Yukon into Alaska. In British Columbia it is represented by only one ecosection.



- **KLR - Kluane Ranges Ecosection**

This ecosection represents the eastern or leeward mountains of the higher Chugach Mountains and the Icefield Ranges Ecoregion to the south and west. Glaciers that built up on the higher mountains to the west moved down over this ecosection to the highlands and lower valleys in the Yukon, or those glaciers moved down the Alsek River valley to the Continental Shelf. The serrate peaks have been sculpted by cirque action and the Alsek River valley has been greatly modified by glacial action. While not as formidable as those mountains, the Kluane Ranges are still rugged and glacier-filled. In the Alsek River and its tributary the lower Tatshenshini River drain the southeastern segment of this ecosection in B.C. and the Yukon; the northern segment in the Yukon is drained by the White and Donjek rivers. There are no large lakes here.

These mountains are protected somewhat from Pacific air masses, but that air can invade through the wide Alsek River Valley bringing considerable moisture here, although there are some areas in rainshadows particularly in the Yukon.. Cold Arctic air can also moved down across the Yukon to stall against these mountains bringing long periods of intense cold and heavy snowfalls. Boreal White and Black Spruce forests occur only in the Alsek and Tatshenshini river valleys above those valleys there is a narrow fringe the shrubby Spruce –Willow-Birch. This area is dominated by alpine that has a small fringe of vegetation at it lower levels that quickly gives way to barren rock and glaciers.

There are no roads or settlements in this ecosection. In British Columbia it is entirely protected by the Tatshenshini – Alsek Park, in the Yukon it is protected by the Kluane National Park.

YSL - Yukon Southern Lakes Ecoregion

This ecoregion is a gently rolling upland, with isolated mountains separated by wide valleys. This area was heavily glaciated by glaciers moving northward off the Boundary Ranges to the southwest that coalesced with glaciers from the Skeena Mountains that moved northward. It extends northward into the southern Yukon up the Nisutlin River Valley and as far north down the Yukon River to Lake Laberge. Many large lakes occur here. The Boreal White and Black spruce Zone occurs in the valleys, with the Spruce – Willow Birch on the mid- slopes and Boreal Altai Fescue Alpine zone on the upper



slopes. In British Columbia it is represented by three ecosections

- **TEB - Teslin Basin Ecosection**

This ecosection is a large wide, glaciated basin that is lower than the surrounding mountains and plateaus. It was heavily glaciated by northern moving glaciers that left great quantities of debris as eskers, drumlins and lake-filled kettles, muskeg and wetlands. In British Columbia, isolated ridges and rolling uplands occur along the margins. This ecosection extends northward from the higher Stikine Plateau to the south into the Yukon as far north as the north end of Teslin Lake. In British Columbia this ecosection is drained by the Teslin River in the south; Gladys River in the west; and, Jennings and Swift rivers in the east; they all flow into Teslin Lake which ultimately drains north into the Yukon River. Teslin Lake is the largest and only third of it occurs in B.C. and the remainder, including Nisutlin Bay, is in the Yukon, In B.C. Gladys and Hall lakes are located west of Teslin Lake; in the Yukon Morley Lake is located on the east side of Teslin Lake.

This area receives moist Pacific air moving over the mountains to the west. and in the summer surface heating of the many water bodies creates convective currents bringing localized showers, high humidity and cumulus clouds. In the winter and early spring, dense, cold Arctic air can invade this area by coming down over the mountains of the Yukon and coupled with the short daylight hours this basin can have extremely cold temperatures and heavy cloud cover for extended periods. The cold Boreal White and Black Spruce forests are dominate this lowland black spruce grows commonly around wetlands and muskeg and white spruce grows on the deeper alluvial soils;. Spruce-Willow-Birch shrublands occur only on some of the higher ridges.

The First Nations community of Teslin, the only community in this ecosection, is located on the eastern shore of Teslin Lake in the Yukon. The Alaska Highway (No. 7 in the Yukon) runs through British Columbia into the Yukon along the Morley River. Only one protected area, Charlie Cole Creek Ecological Reserve, has been established in British Columbia.

- **TEP - Teslin Plateau Ecosection**

This ecosection consists of a rolling plateau, with rounded ridges and mountains. It was heavily glaciated by northward moving glaciers that moved off the adjacent Boundary Ranges; they left great quantities of debris as eskers, drumlins and lake-filled kettles, muskeg and wetlands. In British Columbia this ecosection extends northward from the higher Tagish Highlands to the south into the Yukon as far north as Marsh and Little Atlin lakes. The main drainage in this ecosection is from the large lakes - Atlin, Tagish, Tutshi and Bennett north via interconnecting waterways to the Yukon River; drainage also occurs to the Pacific via the Taku-Nakina River. It has several large lakes, including Atlin Lake, the largest lake in B.C. Tagish, Tutshi and Surprise lakes in B.C. and Lower Bennett Lake and the Taku Arm of Atlin Lake in the Yukon..

There are strong rainshadows throughout this area but it can receive moist Pacific air moving over the mountains to the west and in the summer surface heating of the many water bodies creates convective currents bringing localized showers, high humidity and cumulus clouds. In the winter and early spring, dense, cold Arctic air can invade this area by coming down over the mountains of the Yukon and coupled with the short daylight hours this basin can have extremely cold temperatures and heavy cloud cover for extended periods. The cold Boreal White and Black Spruce forests are dominate this lowlands and wide valleys, black spruce grows commonly around wetlands and muskeg and white spruce grows on the deeper alluvial soils;. Spruce-Willow-Birch shrublands occur on the mid-elevation slopes while herb rich Boreal Altai Fescue Alpine on the upper ridges.

The only community in this ecosection, Atlin, is serviced by the Atlin Road (No. 7 Yukon) to Jakes Corner in the Yukon and the Alaska Highway (No. 1) and the South Klondike Highway (No. 2) connecting Skagway, Carcross and Whitehorse passes along the western shore of Tutshi Lake and River. Placer mining is extensive, especially to the east and southeast of Atlin, with several roads built to provide access. The northern, lake portion of Atlin Park, is the only protected area here.

- **WHU - Whitehorse Upland Ecosection**

This ecosection consists of a rolling plateau, with rounded ridges. It occurs mostly in the Yukon Territory. The small British Columbia portion is a wide valley with rolling uplands and extensive wetlands. It extends from Gladys Lake in B.C. north to Takhini River valley, Lake Laberge and the Teslin River. It was heavily glaciated by northward moving glaciers that moved off the adjacent Boundary Ranges; they left great quantities of debris as eskers, drumlins and lake-filled kettles, muskeg and wetlands. This ecosection is drained by the Gladys River in B.C. and by the Teslin, upper Yukon and Takhini rivers, all rivers here flow northward into the Yukon River. The western end of Gladys Lake is the only large lake in B.C., Marsh and Laberge lakes are the two largest in the Yukon. There are many small lakes, wetlands and muskegs in this ecosection.

There are strong rainshadows throughout this area but it can receive moist Pacific air moving over the mountains to the west and in the summer surface heating of the many water bodies creates convective currents bringing localized showers, high humidity and cumulus clouds. In the winter and early spring, dense, cold Arctic air can invade this area by coming down over the mountains of the Yukon and coupled with the short daylight hours this basin can have extremely cold temperatures and heavy cloud cover for extended periods. The cold Boreal White and Black Spruce forests occur throughout lowlands and wide valleys, black spruce grows commonly around wetlands and muskeg and white spruce grows on the deeper alluvial soils; Spruce-Willow-Birch shrublands occur on the mid-elevation slopes while herb rich Boreal Altai Fescue Alpine on only the higher ridges.

There are no settlements in British Columbia; Jakes Corner and Johnson Crossing are located in the Yukon. The highways are all located in the Yukon and include: the Alaska Highway (No.1), crosses the ecosection from Teslin Lake to Whitehorse and then up the Takhini valley to Haines Junction, the South Klondike Highway (No. 2) connects Whitehorse with Carcross and the North Klondike Highway (No. 2) and the Atlin Road (No. 7) is located from Jakes Corner to Atlin. There are no protected areas in the British Columbia portion of this ecosection.

YSH - Yukon-Stikine Highlands Ecoregion

This ecoregion is a transitional mountain area lying east of the rugged Coastal Mountains and the subdued plateaus to the east. This area was heavily glaciated by glaciers moving off the Boundary Ranges over this ecosection onto the plateaus and lowlands of the northern interior of British Columbia. This ecoregion lies mainly in British Columbia, with only the northwestern upland entering the Yukon from Atlin Lake west to the Kluane Ranges. The rugged Boreal Altai Fescue Alpine occurs on the summits and is very extensive in the northwest portion. The lower slopes are mainly dominated by the Spruce-Willow-Birch Zone, but the moist Sub-Boreal Spruce zone can occur in the southern valleys, while Engelmann Spruce – Subalpine Fir zone occurs on the lower slopes and in the



northeastern valleys. This ecoregion consists of four ecosections.

- **STH - Stikine Highland Ecosection**

This is a rugged mountain and plateau area leeward of the rugged Boundary Ranges. It is comprised of extensive volcanic deposits over some of the coastal granitic rocks. Deep erosion has occurred in the Mess Creek and Stikine River valley as it enters the Coast Mountains. Glaciation was heavy with glaciers moving off the Boundary Ranges over these highlands to enter into the northern interior plateaus, resulting in rounded summits and ridges and cirque erosion of the higher summits. In the southern portion this ecosection is drained by the Stikine River and its tributaries the Tahltan River that flows eastward and by Mess Creek that flows northward into the Stikine in the northern portion this area is drained by the watershed of the upper Sheslay River. Yehiniko Lake is the largest one here.

This area has some large rainshadows as some of the large north-facing valleys are protected from moist Pacific air moving over the Coast Mountains in the west by the surrounding uplands and mountains. But moist Pacific air can arrive up the wide Stikine valley bringing considerable moisture to the valley. In the summer surface heating of the many water bodies creates convective currents bringing localized showers, high humidity and cumulus clouds. In the winter and early spring, dense, cold Arctic air can invade this area by coming south over lowland and rolling upland from the Yukon Territory to the north and coupled with the short daylight hours these mountains can have extremely cold temperatures and heavy cloud cover for extended periods. Transitional forests of the Sub-Boreal Spruce occur in the Stikine valley and the east-facing valleys and lower slopes and at higher elevations cold, moist Engelmann Spruce – Subalpine Fir forests grow. The northeastern upland is has Spruce – Willow – Birch shrublands; Boreal Altai Fescue Alpine barrens occurs on all the higher ridges and summits, with lush vegetation giving way to barren rock, and between upper Mess Creek and the Stikine large glaciers occupy the summits.

The only settlement in B.C. is Glenora, located on the banks of the Stikine River at the eastern edge of this ecosection. There is only the Industrial road for the Golden Bear Mine here. The western edge of Mount Edziza Park occurs in the Mess Creek valley.

- **TAG - Tagish Highland Ecosection**

This ecosection is a rugged transitional mountain area, situated to the east and north of the Boundary Ranges and to the west of the Teslin Plateau. It is located equally in British Columbia and the Yukon between Tutshi and Kusawa lakes. This area is comprised of extensive volcanic deposits over some of the coastal granitic rocks. Glaciation was heavy with glaciers moving off the Boundary Ranges over these highlands to enter into the northern interior plateaus, resulting in rounded summits and ridges and cirque erosion of the higher summits. The streams all drain to the north into the Yukon River, and include: the Takhini, Primrose Partridge, Homan, Tutshi, and Swanson rivers. There are several large lakes, including: Nelson, Fantali, Lindeman, Homan and Partridge lakes are located in B.C.; Bennett Lake starts in B.C. but the largest area in is the Yukon; and Fish, Primrose, and Rose lakes are large lakes that occur in the Yukon.

This area has some large rainshadows as some of the large north-facing valleys are protected from moist Pacific air moving over the Coast Mountains in the west and south by the surrounding uplands and mountains. But moist Pacific air can arrive up Skagway valley bringing considerable moisture to areas that are adjacent to that valley. In the summer surface heating of the many water bodies creates convective currents bringing localized showers, high humidity and cumulus clouds. In the winter and early spring, dense, cold Arctic air can invade this area by

coming south over lowland and rolling upland from the Yukon Territory to the north and coupled with the short daylight hours these mountains can have extremely cold temperatures and heavy cloud cover for extended periods. Transitional forests of the Sub-Boreal Spruce occur in the valleys facing eastward to Atlin Lake and as far north as Bennett Lake; at slightly higher elevations cold, moist Engelmann Spruce – Subalpine Fir forests grow. Those forests give way to Boreal Altai Fescue Alpine barrens occurs on all the mid-higher ridges and summits, with lush vegetation grown nearer to the tree line and barren rock dominating the upper slopes and mountains. Whereas in the Yukon those transitional forests give way to extensive Spruce – Willow – Birch shrublands. Many snowfields and large glaciers remain on the summits along the western boundary with the Boundary Ranges.

There are no communities in either the British Columbia or the Yukon in this ecosection. The South Klondike Highway (No. 2) passes through this ecosection along the western shore of Tutshi Lake and River, connecting Whitehorse with Carcross and Skagway. Mineral exploration has been extensive in the Yukon. The middle portion of Atlin Park the only protected area here, is located in this ecosection.

- **THH - Tahltan Highland Ecosection**

This ecosection is a transitional mountain area with a complex drainage system. This area is comprised of extensive volcanic deposits over some of the coastal granitic rocks. Glaciation was heavy with glaciers moving off the Boundary Ranges over these highlands to enter into the northern interior plateaus, resulting in rounded summits and ridges and cirque erosion of the higher summits; some glaciers moved down the Taku River valley to the coast. The streams all drain to the west by the Taku River and its watershed streams, which flow into fjords leading to Stephens Passage in Alaska. The Sheslay, Sutlahine, also drains the area with streams that flow into the Inklin River before joining the Taku. The Nakonake, Stoko, and Horsefeed streams join the upper Taku River, called the Nakina above the mouth of the Inklin. The Tulsequah Glacier flows into the Taku. The lower portion of the Llewellyn Glacier, just above Atlin Lake occurs here; Tatsameninie Lake the only large lake here is located in the south

This area has some large rainshadows as some of the large north-facing valleys are protected from moist Pacific air moving over the Coast Mountains in the west and south by the surrounding uplands and mountains. But moist Pacific air can arrive up the wide Taku valley bringing considerable moisture to that valley which helps to moderate the temperatures in the winter. In the summer surface heating of the many water bodies creates convective currents bringing localized showers, high humidity and cumulus clouds. In the winter and early spring, dense, cold Arctic air can invade this area by coming south over lowland and rolling upland from the Yukon Territory to the north and coupled with the short daylight hours these mountains can have extremely cold temperatures and heavy cloud cover for extended periods. Transitional forests of the Sub-Boreal Spruce occur in the upper Taku valley and the east-facing valleys as far north as Bennett Lake; at slightly higher elevations cold, moist Engelmann Spruce – Subalpine Fir forests grow. Those forests give way to Boreal Altai Fescue Alpine barrens occurs on all the mid-higher ridges and summits, with lush vegetation grown nearer to the tree line and barren rock dominating the upper slopes and mountains. Many snowfield and large glaciers remain on the summits along the western boundary with the Boundary Ranges.

There are no settlements here. Although this is an area of wilderness, mining claims on the lower Tulsequah and elsewhere have been staked. The southernmost portion of Atlin Park has been established in this ecosection.

- **TAB - Tatshenshini Basin Ecosection**

This ecosection is a rugged transitional mountain area, situated to the north of the Boundary Ranges and to the east of the rugged St. Elias Ranges. It is located equally in British Columbia and the Yukon between Kusawa Lake and River and the rugged Kluane Ranges. This area is comprised of extensive volcanic deposits over some of the coastal granitic rocks. Glaciation was heavy with glaciers moving off the Boundary Ranges and St. Elias Mountains over these highlands to enter into the northern interior plateaus, other they passed down to the coast via the lower Alsek River valley resulting in rounded summits and ridges and cirque erosion of the higher summits. The Kusawa River drain to the northeast into the Yukon River; The Tatshenshini River starts in B.C. flows north into the Yukon before turning south back into B.C. to join the Alsek River before it passes in to Alaska; and the small Kelsall River flows south into Alaska and the Chilkat River. Kelsall Lake is the largest in B.C. while Kusawa, Bates and Mush lakes are the largest in the Yukon.

In spite of its close proximity to the Pacific Ocean, this area has a typically northern boreal climate. It has some large rainshadows as some of the large north-facing valleys are protected from moist Pacific air moving over the Coast Mountains in the west and south by the surrounding uplands and mountains. But moist Pacific air can easily arrive up the wide Alsek and Tatshenshini valleys bringing considerable moisture to that valley which helps to moderate the temperatures in the winter. In the summer surface heating of the many water bodies creates convective currents bringing localized showers, high humidity and cumulus clouds. In the winter and early spring, dense, cold Arctic air can invade this area by coming south over lowland and rolling upland from the Yukon Territory to the north and coupled with the short daylight hours these mountains can have extremely cold temperatures and heavy cloud cover for extended periods. Cold, Moist Boreal White and Black Spruce forest of white spruce and lodgepole pine dominate the wide Tatshenshini valley from its lower reaches until it turns back and enters B.C. again in the north, where those forests end. Those forests give way to extensive Spruce-Willow-Birch shrublands on all the interior valleys and then Boreal Altai Fescue Alpine barrens occupy on all the mid-higher ridges and summits, with lush vegetation grown nearer to the tree line and barren rock occurring on the upper slopes and mountains. Many snowfield and large glaciers remain on the summits along the western boundary with the Boundary Ranges and in the mountains between the upper Parton and O'Connor rivers.

There are no settlements in British Columbia, a First Nations community occurs at Klukshu in the Yukon Territory. The Haines Highway (No. 7 in BC and 3 in the Yukon) passes through from Haines, Alaska to Haines Junction, Yukon, and the southward portion of the Tatshenshini is popular with river rafters. The western three quarters of this area in British Columbia is protected by the Tatshenshini – Alsek Park, and the western three quarters in the Yukon is protected by Kluane National Park.

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