
Capital Region Profile

Regional Planning Services

CRPD "Local Governments
Working Together"

Physical Setting

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As well as being extremely attractive for human settlement, the Capital Region's physical setting and attributes are very diverse and in some cases unique. This volume presents an overview of the Region's physical setting, relative location and natural features.

Physiography

The Region consists of two physiographic divisions:

The countryside in the northern and western portions consists of the Insular Mountains and San Juan Ridge, an area characterized by steep slopes and frequent outcrops of dark volcanic bedrock. Elevations above sea level in this area vary dramatically from 0 to 1,100 meters.

The remaining area of the Region, which includes the Saanich Peninsula and the Gulf Islands, consists mostly of a coastal plain varying in elevation from sea level to 200 meters. The plain is marked by rolling hills, "kettle" topography (dips and hillocks) and marine basins with an essentially unaltered glacial drift-type relief. The area is, for the most part, well-drained but a wide range of moisture conditions may be observed in most localities.

Much of the shoreline of the Region is ragged, being



*Finlayson Arm from the Gowlland Tod Provincial Park
A deep fjord whose steep banks are heavily forested*

characterized by wave-cut cliffs, steep promontories, offshore rocks, and small islands.

Geology¹

The geologic history of the Capital Region is complicated, and to some extent it remains a mystery. A combination of complex rock structures, erosive features and forces, multiple geologic processes, and climatic change have contributed to the topography, and continue to affect the area.

To summarize, about 100 million years ago, Vancouver Island together with parts of Alaska, the Queen Charlotte Islands, and part of the southwest BC coast were

formed as the Wrangellia land mass by volcanic rocks forced northward from the equator. Meanwhile, the mountains predating the arrival of this new land mass were eroding and washing sediments southwestward into an ocean trench and basin, now the Georgia Basin. A portion of the eroded material was later put under great pressure from the weight of the rocks forced over them (metamorphosized), while other sedimentary deposits remained unaltered. Fossilized vegetation of that period formed the coal seams in the Region.

Erosion of the landscape continued, revealing bedrock beneath. Volcanic and subsurface activity continued. Where the plates that form the earth's crust met, faults

formed and moved as intense pressures were exerted. By 38 million years ago the basic geologic features found today had been laid down.

On top of this incredible mixture of rock formations came the glaciers of the Ice Ages which covered the Region four times in the last two million years. The ice sheets scratched and gouged the rock formations, scraping off sediment deposits. Their weight caused the land mass on which they travelled first to drop and then as the ice sheets retreated, to rebound and rise. This caused variations in the coastline. Sediments picked up during the glaciers' movements were deposited as the sheets moved forward, then receded. The last glacier left the Region 9,000 years ago, but the height of the land mass continued to rise for the next 1,500 years after the ice's weight was removed. Some of the dry land thus created was flooded again as worldwide temperatures increased, submerging some coastlines.

In present times, severe winter storms (usually from the southeast), ocean currents, tides and waves can be observed as they continue to have dramatic effects on the Region's beaches and headlands.

The movement of the plates that make up the Earth's crust continues to affect the Region today. To the west of Vancouver Island, the Juan de Fuca plate is pushing itself (not always smoothly) under the North American plate. As a result, this area like most of the continent's west coast is subject to earth tremors of varying magnitude. The Region is also criss-crossed with fault lines: the San Juan Fault



The Saanich Peninsula looking toward Sidney Island from Bear Hill Regional Park - coastal plains lie in the rainshadow of the Malahat Ridge

crosses the Island from a point northwest of Port Renfrew, continues eastwards along the deep trench of the San Juan River, and into the Strait of Georgia north of Swartz Bay. The Leech River Fault runs east-west below Sooke Lake and just offshore south of Saxe and Clover Points. Perpendicular to that are the

Malahat Fault, running from Goldstream along Findlayson Arm through to Sidney, and the Shawnigan Fault, running beside Sooke Lake, through Shawnigan Lake, and Patricia Bay. Depending on the type of quake, its location, and duration, the damage caused to the natural landscape may include cracking of the surface, landslides,



Beechy Head in East Sooke Regional Park - a good example of typical rugged coastline in the Western Region.

liquefaction of fine-grained soils (clay, sand and gravel), water inundations (caused by quake-generated waves called tsunamis), and shoreline and high watermark changes. (Earthquake potentials and readiness will be discussed further in the volume on Protective Services).

Climate²

The climate of Vancouver Island is strongly influenced by the ocean, topography and latitude. It is characterized by hot and relatively dry summers, and mild wet winters resulting in a frost-free season of roughly 202 days in Victoria. At the Victoria International Airport, average temperatures range from a January low of 0.3°C to a July high of 21.8°C. The highest temperature recorded at the Airport was 36.1°C in 1941, and the lowest, -15.6°C in 1950.

Bright sunshine is a feature of the area, particularly adjacent to

Victoria Airport where an annual average of 2082 hours has been recorded, second only to the Canadian Prairies for annual hours of sunshine.

Winds average 10 km/h from the west throughout the year. Strongest winds occur in the winter months, and are from a southwest and southeasterly direction.

The climate of the southeast portion of the Island is influenced by the Olympic and Insular Mountains to the south and west respectively resulting in what has been called the Inner Coast climate.

Precipitation and cloudiness are reduced and the temperature range is somewhat increased from the west coast of the Island. Victoria (Airport), near the junction of the Straits of Georgia and Juan de Fuca, benefits from the rain-shadow



McKenzie Bight - Mt. Work Regional Park

effect of the Olympic Mountains, and receives 85.8 cm of precipitation annually (rarely anything but rainfall). Of that amount only 10.6 cm fall during the months of June to September inclusive. Victoria (City) receives an average of 61.9 cm of precipitation annually, 8.5 cm of this in the summer months.

The climate throughout the Saanich Peninsula and adjacent islands is in many respects similar to that of much of the Northern Mediterranean region. The summer temperature is somewhat lower but the drought during the summer months is generally just as pronounced. The deep north-south valley of which Findlayson Arm is a flooded part helps create both the dryness of the Peninsula, and the near-rainforest conditions of Goldstream Park and parts of the Highlands which receive an

Climate Statistics: Major Canadian Centers

City	Mean Jan. Temp.(°C)	Mean July Temp.(°C)	Precipitation* (cm)	Precipitation No. of Days*	Sunshine (Hrs)*
Victoria (City)	+5	+15	61.9	135	2185
Charlottetown	-7	+18	112.8	229	1803
Sidney	-4	+18	138.1	178	1824
Quebec	-12	+19	109.9	231	1708
Montreal	-9	+22	99.9	225	1959
Ottawa	-11	+21	85.1	212	1995
Toronto	-4	+22	79.0	175	2045
Winnipeg	-18	+20	53.5	178	2230
Regina	-17	+19	39.8	170	2277
Calgary	-11	+17	43.7	174	2208
Edmonton	-15	+18	45.7	184	2237
Vancouver	+2	+17	106.8	169	1931

* Annual Averages

Source: Environment Canada Document No. 00 0063 9010

average of 137 cm (54") of precipitation annually.

Port Renfrew on the western edge of the Region is more directly exposed to weather arriving from the Pacific. Though the weather station records for this location have only been kept for long enough to provide average conditions for the period from June to October, in that dry portion of the year the average rainfall is 80.1 cm, nearly as much as the Peninsula gets in the entire year. One day in February 1986, 29.3 cm (nearly a foot) of rain fell. Temperature averages are slightly lower than those experienced on the Peninsula.

Natural History³

The Capital Region is one of the most biologically rich and variable areas in Canada. The major differences in terrain and climate between west and east, have shaped the very different



Sea lions use the rocky shores as "haul-outs"

ecological conditions and characteristics of the Region.

The western portion of the Region is rugged and 'wild'. The shoreline is rocky and pounded by surf. The character of the forest changes markedly from the lush coniferous coastal and valley bottoms to the steep sub-alpine ridges. Streams chisel down from the ridge tops to

rivers and the ocean. Large mammals such as wolves, cougar, bear, wolverine and elk roam the area.

The east is much drier and contains the majority of the human population. The shoreline is rocky but sheltered. Bays and inlets are common. The terrain is gently rolling. Dry 'rainshadow' forests rise to scattered low rocky hilltops. Many plants found in this portion of the region are dry- and warm-climate species at the northern extension of their range.

A diverse range and mosaic of terrestrial, freshwater and marine ecosystems occur within these contrasting ecological zones. Forest communities change markedly from moist valley bottoms to nutrient-poor uplands. Meadow and stunted trees occur where soils are shallow and growing conditions are severe. Floodplain forests are found along the margins of rivers and some lakes and streams. A variety of wetland types occur singly or in complexes along these freshwater



*Elk/Beaver Lake Regional Park
"Elk/Beaver Lake is important habitat for wintering waterfowl"*

systems. Highly productive tidal marshes and flats are found where major rivers and streams meet the sea. Cobble and sand beaches and spits accumulate sediments carried by ocean currents. Shallow bays and nearshore areas support aquatic vegetation like eelgrass and seaweeds.

Each of these ecosystem types provides valuable habitat for the rich diversity of animal species in the Region. Some animal species specialize in a specific habitat type, or a particular habitat characteristic such as standing dead trees. Most animal species have broader needs and move between areas, although they may have very specific habitat requirements at critical times in their life cycle, such as breeding or surviving the winter. Other species, such as migratory birds and fish, visit our Region only to breed, or to feed and rest on their way to other places.



Source: Adele Curtis

Old growth forest, where moss-covered douglas firs are underlain by ferns and other lush vegetation.



Source: Joel Ussery

*Uplands Park, Oak Bay
Garry oak meadow, a habitat particular to southern Vancouver Island, supports a variety of indigenous wildflowers.*

Land and Fresh Water Ecosystems

Prior to European settlement, the forests of the Region were very different. Wind and fire shaped the structure of the forest and the age and species of the dominant trees. Many forest stands were very old.

Ancient rainforest grew along the coast in the western portion of the Capital Region. There have been no fires for hundreds, maybe thousands of years. Blowdown in windstorms is the main forest disturbance. Mostly the forest developed slowly, through an individual-by-individual replacement of trees. Western hemlock is the dominant tree, growing with Pacific silver fir and western red cedar. The structure of these forests is complex with many canopy layers, a wide range of tree ages and sizes, standing dead trees, and downed trees in every stage of decay covering

the forest floor. Mosses, lichens and ferns grow everywhere, on living trees and fallen logs. The lush forest floor supports a dense cover of shrubs.

Lakes and wetlands are dotted throughout the western portion of the region. Major river and stream systems drain the uplands. Rich and productive forest, wetland and tidal marsh are found where the San Juan River broadens out and meets the ocean. The lakes, rivers, wetlands and tidal marshes are critical fish and wildlife habitat.

Such a complex forest structure, diverse ecosystem and abundant plant life support a wide range of animal species, many of which require older forest and standing or fallen dead trees for all or part of their life cycle. Large mammals such as wolves, bears, elk and deer frequent the forests, but most species are too small to be noticed. They are the decomposers, the organisms responsible for turning dead wood into living forests.

The lush coastal and valley bottom forests rise steeply up the ridges. Fire has played a larger role in these drier forests and Douglas-fir may be the dominant tree species. On the ridge tops there is a deep, long-lasting cover of winter snow. Here the forest becomes subalpine, dominated by mountain hemlock, yellow cedar and Pacific silver fir. At the highest elevations the forest is more stunted and thins to isolated clumps and patches among open meadows of wild flowers and grasses and heaths of dwarf shrubs.

The dry mild mediterranean climate and relatively gentle terrain of the Gulf Islands and southeastern Vancouver Island support an entirely different rainshadow forest. Fire has also played a major role in shaping the composition and structure of vegetation in this area. Douglas-fir is the dominant species in the coniferous forest. Due to the history of fire, the height and diameter of most trees is quite similar. Shade-tolerant western red



Witty's Lagoon Regional Park
"The tidal flats, lagoon and salt marsh are important bird habitat along the Pacific flyway"

cedar, grand fir, broadleaf maple and alder grow on moist sites and on areas fires have missed.

The most distinctive ecosystems in this rainshadow area are the Garry oak and arbutus stands with spectacular displays of colourful spring wildflowers. Large expanses of meadow with scattered

Garry oak covered what is now Victoria, Oak Bay and the southern portion of Saanich. These sites were maintained as meadows by frequent fires. These fires were set by the aboriginal peoples to favour the abundant camas lily which they harvested for food. The dry, rocky hilltops have similar wildflower displays. These woodland, meadow and outcrop areas are also home to distinctive groupings of birds and insects.

Lakes, streams and freshwater and tidal wetlands are important ecosystems in the rainshadow, particularly during the summer drought. These systems support populations of cutthroat trout and smaller native fish species. The lower reaches of some watercourses, such as the Goldstream River, are spawning areas for a several species of salmon. Freshwater streams, wetlands and lakes are critical habitat for amphibians such as salamanders, frogs and toads.



Island View Regional Park
Sandy beaches are found on more sheltered coasts and bays

This combination of dry meadow, rock outcrop, forest and freshwater and tidal wetland areas in the east and south contains the highest diversity of plant species in the region. Although large mammals (with the exception of deer) have largely been displaced by human settlement, a host of species are attracted by the variable environment and the milder climate of the east. This portion of the region is also on the major Pacific flyway bird migration route. As many as 90% of the bird species which are found in B.C. breed or pass through the eastern portion of the region.

Marine Shoreline

The marine shoreline and nearshore waters have a tremendous influence on the biological richness of the region. The intertidal areas and shallow marine waters support an incredible diversity of seaweed and invertebrate species. Seaweeds form undulating underwater forests. Many of these marine plants can be found clinging to the rocks in the harsh intertidal environment. Invertebrate animals are everywhere, attached to every available surface, burrowed beneath the beaches and mudflats. Their lifestyles are as varied as their physical appearance. Many are food for fishes, marine birds and shorebirds. Rich fish populations in the nearshore waters support other bird species and marine mammals such as seals, sealions, porpoises and orcas (killer whales).

Most of the long shoreline in the region is dominated by rocky



Source: Joel Ussey

*Elk/Beaver Lake Regional Park
Freshwater lakes and wetlands, support a variety of amphibian and aquatic plant species such as the yellow pond lily.*

shore. The communities of seaweeds and animals along these shores change with the degree of exposure to wind and waves. Upwelling currents circulate a rich supply of nutrients. In some places, like Active Pass between Galiano and Mayne Islands, the waters are so nutrient-rich that there is literally an explosion of life. Isolated rocky islets near such bountiful food sources are used as nesting areas by colonies of marine birds and ‘haul-outs’ for seals and sealions.

The tidal sand and mud flats and shallow waters of sheltered bays are equally important habitat areas. These are important feeding and resting areas for thousands of shorebirds that migrate along the Pacific flyway in the spring and late summer. Eelgrass beds in these areas are also important spawning sites for herring, which are critical food for many species of diving birds.

In the Future...

The rich and beautiful natural heritage of the Capital Region is a foundation of the economy and a vital part of our quality of life.

Its value is recognized by residents of the Region, who in the 1993 **Regional Values, Goals and Priorities Project**, ranked “High Quality Physical Environment” as their third-highest value (after personal safety and security and good governance). “This includes climate, natural beauty, cleanliness, clean air and water, protection of natural habitat, and appropriate disposal and recycling of wastes. People expressed concern about pollution, degradation of the natural environment and loss of agricultural land...”⁴

The high value placed by residents on the natural environment will be a great advantage in dealing with the issues faced by the Region with respect to its physical setting.

These include:

- first and most immediately, the continued loss of and damage to **natural areas** and fish and wildlife **habitats** (some of them very rare) by human settlement and economic activity;
- on a global scale, changes in **climate** caused by ozone depletion and phenomena such as El Nino which may have negative consequences for the Region's flora and fauna; and
- in terms of **geology**, the eventual certainty of minor - and major - earthquakes and their consequences including the risks to the human population.

Ecosystem functions, remnant natural and semi-natural areas, marine shorelines and the plant and animal populations they support, must remain intact and viable over

the long term. Measures which have been or are being taken to ensure this include:

- maintenance of large tracts as natural areas: federal, provincial, regional and municipal parks conserve examples of regional ecosystems; publicly-owned (e.g. Dept. of National Defence) lands, rural residential area, agricultural lands, and public and privately managed forest lands still maintain relatively large areas of green space in the Capital Region;
- the completion of the CRD Regional Parks/Provincial Capital Commission's Green Spaces Strategy, which will identify regionally significant green space and make recommendations for the conservation of these areas;
- continued dedication of lands for

parks, protection of natural areas, and preservation of the lands in the Agricultural and Forest Land Reserves;

- use of appropriate conservation and enhancement efforts, and standards of performance, to protect and develop land and water resources and species (e.g. forest lands, fish) for future generations;
- requirements for elimination or minimization of environmental degradation due to human settlement and economic activity, including planning for sustainable communities in all aspects of human activity;
- recognition of the importance placed on a high quality physical environment by the Region's residents, through reflection of this value in policies set and decisions made by all levels of government.

Technical Notes and Sources

Notes:

¹ Much of this section is condensed from "Landscapes of Time Around Victoria" by Jim Weston, in Weston, J. & D. Stirling, eds., The Naturalist's Guide to the Victoria Region, Victoria Natural History Society, 1986. This book also describes locations for viewing rocks from various formations and periods.

² Information in this section is taken from the 1985 Economic Profile and Environment Canada, "Canadian Climate Normals 1961-90 - British Columbia"

³ The section entitled "Natural Setting" was prepared by CRD Parks. Additional information on natural history can be found in:

The introductory section of: Pojar, J. and A. MacKinnon (eds.). 1994. *Plants of Coastal British Columbia: including Washington, Oregon and Alaska*. B.C. Ministry of Forests and Lone Pine Publishing.

Meidinger, D. and J. Pojar. 1991. *Ecosystems of British Columbia*. Special Report Series 6. Research Branch. B.C. Ministry of Forests. Victoria, B.C.

The introductory section of: Campbell, R. W., N.K. Dawe, I. McTaggart-Cowan, J.M. Cooper, G.W. Kaiser, M.C.E. McNall (eds.). 1990. *The Birds of British Columbia: Volume 1*. Royal British Columbia Museum. Environment Canada, Canadian Wildlife Service.

⁴ from CRD, "Public Summary - Final Report of the Values, Goals and Priorities Project", Victoria, March, 1993, p. 3.

Photographs, unless otherwise specified provided by CRD Parks.

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Refer to Overview - Volume 1, No. 1, for a general description of the Profile series.

Factsheets providing further detail on this topic are available from Regional Planning Services

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