2010 STATE OF THE ENVIRONMENT

CVRD
ENVIRONMENT COMMISSION

Environment Commission | Cowichan Valley Regional District
December 2010

Front Cover Photo: Chris Junck, Garry Oak Ecosystems Recovery Team

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A letter from Gerry Giles, Chair of the CVRD Board of Directors

In 2007, the CVRD Board established an Environment Commission to provide it with advice for addressing environmental issues that fall within the Board's jurisdiction.

In a previous major report, the Commission worked with the CVRD to put forward "12 Big Ideas" to indicate where our communities should focus their efforts to have a positive influence on the condition of our regional environment.

During the past year a significant focus of the Commission has been on developing a means to measure the progress that is being made within the regional district to ensure that our environmental assets are healthy and sustainable. This inaugural State of the Environment Report – developed in collaboration with the CVRD – establishes a scientific baseline and a process for measuring and reporting the status of our important environmental values into the future.

The Commission contracted an experienced scientific team to develop sets of measurable indicators for a variety of environmental values. The team then searched for existing information that could be used to tell us where things currently stand. Their task was to use both historic and current data to analyze current conditions and emergent trends, and to suggest what would be needed in the future to fill information gaps that they discovered.

Their report is a sobering one. The team examined the status of water, air, fish, agricultural land, biodiversity, population and growth, the implications of climate change and the management of waste. The story that emerges is that the wonderful environment that has attracted so many of us to the Cowichan region is under stress and most trends are negative. Although we are addressing some of the critical issues, we continue to degrade many of our most precious assets and we need to pay attention.

The Commission believes that we need to re-double our environmental stewardship efforts, both to arrest the negative trends that have been measured and to restore values that are in danger of dipping below recovery thresholds. Fortunately, while the message is extremely cautionary, it is being delivered to a region that is already alive to the issues and organizing to address them. The Commission is aware of many initiatives from federal, provincial, regional district and municipal

levels that are leading in the right direction. It is also aware of a host of civic organizations that are actively pursuing programs of conservation, water management, food security, energy efficiency, greenhouse gas reduction, lakeshore management, recycling and estuary health among many others. None of these organizations can solve environmental issues alone. We have in front of us a major task that requires collaboration, cooperation and coordination.

In our collective best interest, the job we have to do is to turn each of the troublesome indicator measurements from negative to positive. Good water, abundant local food, efficient use of energy sources, sustained natural ecosystems, effectively reduced waste, revived salmon populations, well-designed settlements, healthy air quality and strong resilience to climate change are goals worthy of our concentrated effort. This State of the Environment Report starts us on a path of measuring how well we are doing and pointing toward areas that most need our attention.

The Commission intends to use the State of the Environment Report to organize its annual work plan and structure its advisory functions to the CVRD Board. The Commission's 2010/11 work plan will focus on priority environmental values, establish teams to develop suitable public education and other initiatives, and develop recommendations for the CVRD Board where our contribution is relevant and our leadership is required. The Commission will also engage with and support existing community organizations in each relevant sector, and work with federal, provincial, regional and community governments on their programs of managed development, sustainability, conservation and restoration.

On behalf of the Board of Directors, I want to congratulate the Environment Commission on producing this vital and important report.

Gerry Giles, Chair

CVRD Board of Directors

Executive Summary

State of the Environment Report Executive Summary

The Cowichan Valley Regional District (CVRD) Environment Commission prepared this inaugural State of the Environment Report to assess the status of a variety of environmental indicators and issues that signal the health of the environment within the regional district. Using the principle "if you don't measure, you can't manage," this ground-breaking report identifies numerous reliable and repeatable measures of how the environment is doing.

The Report strives to answer questions such as:

- Are our ecosystems and species adequately protected?
- Are we living within natural ecological thresholds?[1]
- Do the biodiversity and related ecological services that sustain the region have the resilience to respond to climate change and population growth?
- Are water resources adequately protected to safely provide for people, plants and animals?
- Is the air quality good?
- Are we making good use of available land and creating smart, flexible, and resilient communities?
- Are we producing enough local food?
- Are we proactively addressing the challenges of climate change?

Overall, this report identifies a number of areas where we face major challenges. We have dramatically changed the natural landscape, and in so doing have compromised natural ecosystems including native plants and animals. Many native species and ecosystems are at risk, and there are too many invasive species. Coho and chinook salmon stocks have crashed. Water is polluted and scarce in some places and at some times of the year. While the region's air quality seems to be good, high hospital admission rates for children with respiratory problems may signal a problem. Climate change already creates challenges with floods and drought, and further stress on native species and ecosystems is imminent.

1 Example of an ecosystem threshold: species diversity of a landscape may decline steadily with increasing habitat degradation to a certain point, and then fall sharply after a critical threshold of degradation is reached.

Low-density development (sprawl) has fragmented ecosystems, negatively impacted watersheds and created car-dependent communities that contribute to climate change through use of fossil fuels. Continued population growth in the region will place further stress on the natural environment and human use of its resources.

Much is unknown. Many residents rely on wells for water – but there are few data on how much water is being withdrawn and whether withdrawal rates are sustainable for the long term. While data for sensitive ecosystems exist for the eastern part of the region (i.e., the Coastal Douglas-fir forest), there are few studies of the ecology of the equally sensitive Coastal Western Hemlock forests to the west. There is no water quality information for many lakes and streams. Furthermore, data on populations of iconic species such as Roosevelt elk are limited, and data for less well-known species – including "species-at-risk" – are frequently sparse.

But the news is not all bad. Agriculture is a thriving industry in the Cowichan Region, providing the opportunity for the region to move towards self-sufficiency in food production. Chum salmon returns are the highest in 60 years. Rates of recycling are soaring. And although data are somewhat lacking, there appears to be reasonably good quality water within most of the region most of the time.

Simply by starting to report out on the State of the Environment, the CVRD, associated municipalities, non-government organizations, businesses and individuals have an opportunity to better understand the natural environment and human impacts, and gain a competitive advantage over areas that have not had the foresight to take this initial step. Indeed, this report is an important first step in "measuring so we can manage".

As well, it is clear that many steps are being taken to address some of the problems. Reports such as the Cowichan Basin Water Management Plan have identified steps to address some of the water issues in the area, and a Cowichan Watershed Board has now been established to undertake this work. The municipalities of Ladysmith, Duncan and Lake Cowichan have installed (or plan to install) meters so that they can track drinking water consumption. The CVRD is bringing small sewage treatment plants up to standard to avoid water quality issues. The Regional District and several municipalities have undertaken energy and emissions assessments and have begun work to reduce their carbon footprints. Regional residents are knowledgeable and passionate about environmental issues, and are working in many ways to make and keep this region a healthy and desirable place to live.

Regular updates to this State of the Environment Report can help residents of the region stay informed and aware, and help governments and others set priorities for action.

A summary of the key findings from the report are listed below.

The Landbase

> The human footprint (including development and logging) now covers over 75% of the total landbase and affects its ability to supply and maintain ecological values and services.

> On the east coast, 50% of the landbase is no longer forested and little or no older forests remain. Despite being regarded as unique and sensitive, very few areas of Coastal Douglas-fir ecosystems have protected area status. Less than 20% of the historic Garry oak ecosystems remain, and less than 5% of those are in a "natural" condition.

> At higher elevations, and towards the west coast, there are more forested lands. However, the total amount protected (<8%) within the CVRD is well below standards (~50%) set for maintaining ecological values into the future.

> Ongoing development along shorelines is resulting in continued loss and degradation of those habitats.

Biodiversity

> The proportion of animals, plants and ecological communities at risk in the CVRD is high compared to many other areas of the province. Ecological communities at risk, such as the massive riparian Sitka-spruce forests in the western part of the region, are not legally protected from harvesting.

> The CVRD has a large and growing number of invasive plant and animal species, especially in the drier east-side areas of the region. The negative impacts of invasive species are particularly evident in Garry oak ecosystems, riparian areas and wetlands.

> In the last five years, the number of returning salmon spawners for two of the Cowichan River's primary salmon runs – fall coho and chinook – have been reduced to roughly 10% of numbers documented during the last 80 years. At the same time, chum salmon returns are at some of the highest levels seen in the last 60 years. Chinook salmon in particular are often considered to be indicators of broader ecosystem health, since their survival and reproductive success are affected by a wide range of factors.

Water

> Measuring, monitoring and understanding patterns and trends for water are complex and difficult. However, there is a general sense that water is abundant and water quality is reasonably good throughout most of the CVRD, most of the time.

> Some of the key aquifers in the Cowichan Region are naturally vulnerable and are increasingly becoming heavily developed.

> At critical periods, and particularly in limited dry years, water supplies can lead to the potential for significant impacts on crucial aquatic resources such as fish spawning, or on industrial processes. Climate change is expected to exacerbate this situation.

> Pollutant levels are typically low, but waters of major rivers are no longer fit to drink, and cumulative downstream impacts have led to closure of shellfish fisheries since the 1970s.

> Naturally vulnerable lakes – such as Quamichan – already show significant impacts of pollution from a variety of sources. Cowichan Lake is buffered by its large size and depth. Unfortunately, cumulative effects can be difficult to detect and may not observed until significant events such as "fish kills" occur.

> Most areas lack the ability to track volumes of drinking water consumption. However, the Town of Ladysmith has introduced water meters to homes, and has seen a significant reduction in water consumption as a result. North Cowichan has also been quite progressive and the municipalities of Duncan and Lake Cowichan are in the process of introducing water meters.

Air Quality

> Air quality in the Cowichan Region is generally good, and pollution levels are well within provincial standards. However, hospital admission rates for children with respiratory problems in the region are consistently more than 20% higher than the provincial average, and at times twice the average.

> Air quality diminishes significantly in the fall and winter months, due to increases in seasonal combustion (open burning and woodstove use). Sources of low-level air pollution throughout the year include vehicle exhaust and commercial/industrial emissions.

Population and Growth

> The Cowichan Valley Regional District has a population of about 77,000, and its population continues to grow. While some of the population is concentrated in higher density areas (such as Duncan), there are fewer than 200 people/km^2 in most parts of the region. This makes "smart growth" development very hard to achieve.

> About three-quarters of the population live in communities where they are dependent on cars for most daily needs and errands. About 90% of commuters travel to work by personal vehicle – the vast majority as single occupant drivers.

> If maximum build-out under current zoning were to occur, two-thirds of the region's watersheds would have 10–30% impervious surface coverage, with consequent significant ecological impacts on local waterways.

Agriculture

> Agriculture is a thriving and valuable industry in the Cowichan Region, and there is an opportunity to achievement of regional food security objectives. However, current rates of reported productivity fall short of food security targets.

> Key barriers to achieving these targets include access to irrigation water (and natural constraints on available water volumes), lack of skilled labour, an absence of processing and distribution facilities, high land prices, and restrictive production quotas.

Climate Change Mitigation and Adaptation

> The CVRD and its member municipalities, together with many groups and individual citizens, have recognized climate change as an issue that needs to be addressed. Major region-wide strategic and sectoral approaches have yet to occur.

Waste Management

> The CVRD has set a long-term goal of Zero Waste, with a more immediate goal to achieve a 50% per capita reduction in the disposal of solid waste (over 1990 levels), and has an extensive recycling program to support this.

> The volume of recyclables has risen significantly in the past ten years, both in terms of total volume and per capita volumes. At the same time, however, total and per capita volumes of solid waste (garbage) have also increased, indicating that while people are recycling more, they are also buying (and disposing of) more "stuff".

> The CVRD is taking over and bringing up to standard many smaller liquid waste or sewage treatment plants,
thus addressing some of the issues related to leaking septic fields. However, many septic fields remain and continue to contribute to water quality issues in the region.

12 big ideas for a strong, resilient Cowichan

Here are our 12 big ideas on which to build a sustainability plan for the Cowichan region, and some examples of what our big ideas would look like 'on the ground'. Some of these things you could do personally, and some we could do together as a community and through local government. Are we on the right track? How would you prioritize our big ideas? Are you ready to do your part, and to support local government to do theirs?

Let us know at **www.12things.ca**

Get real about climate change.

- Plan for the uncertainty ahead (more winter rain, summer drought, violent winds)
- Make new development and redevelopment designs 'climate smart'

Eat local because food security matters.

- Support small-scale agriculture (rural and urban)
- Develop a regional agricultural plan

Be energy smart.

- Conserve energy wherever possible by using efficient systems and appliances
- Produce our own power (solar, geothermal, excess heat from industry)

Get up to speed on the new green economy.

- Promote green businesses like agro-forestry, alternative energy and eco-tourism
- Account fully for the cost of products and services, shift taxes to reward low-impact activity

Clear the air to reduce carbon emissions.

- Plant carbon-eating vegetation, upgrade wood burning stoves
- Pass air quality bylaws, regularly monitor and enforce air quality

Don't hog the water so there is enough for all.

- Price water to encourage conservation, use efficient systems and appliances
- Manage industry and 'green infrastructure' to protect aquifers and wetlands

Grow up, not out.

- Put people, jobs and transportation closer together
- Establish and enforce urban containment boundaries and add natural values (shade trees, raingardens)
- Adopt a green building code that reduces water and energy use and site impacts

Revive biodiversity.

- Restore and protect valuable habitat and ecosystems
- Eliminate invasive species, allow only zero impact development
- Acquire key tracts of land, forge land partnerships like farms with cluster housing or community forest

Get serious about zero waste.

- Make use of unused resources and minimize environmental impacts
- Rethink how we handle our sewage and other wastes
- Say no to plastic, and avoid excessive packaging

Be carbon neutral.

- Create better ways to get around (light rail, bike lanes, more buses), set up a regional carbon trading system
- Reforest our communities and watersheds to capture carbon and create jobs

Audit and protect our assets.

- Assess sensitive areas, species at risk, wetlands, watercourses and air and water quality
- Undertake a connectivity analysis to make sure species have room to adapt to climate change

Lead the way.

- Challenge government to embed a sustainable future in every rule and regulation
- Support local government to help us make real changes
- Do your part: join a committee, be a watchdog, voice your concerns and priorities

Thank you for photo contributions to the Town of Ladysmith EDC, Nik West, Andrew Leong, Wayne Taiji and Riley Taiji.

1.0 Cowichan Region State of the Environment

1.1 Introduction

Working with the principle of "if you don't measure, you can't manage," this State of the Environment Report endeavours to establish some reliable and repeatable ways of measuring the condition or health of the environment of the Cowichan Region. This report is the first of its kind for the Cowichan Region, and provides a snapshot of the wide and complex environmental issues facing this area. It has been developed by a partnership between the Cowichan Valley Regional District's Environmental Policy Division and the Region's volunteer Environment Commission.

The development of this report by the regional government marks a shift in responsibility for environmental management; local government has not traditionally been engaged in environmental monitoring and protection. In the past, natural resource stewardship was primarily a federal and provincial responsibility. However, as senior government resources are directed to these areas less and less, the job increasingly falls to local governments. Accompanying this shift have been growing public concerns about the health of the natural environment, and increasing expectations that all levels of government do a better job of managing the environment.

This report relies on existing data from a number of sources, including local, regional, provincial, federal and First Nations governments, as well as information from community organizations. Unfortunately, due to data inconsistencies and access challenges, many data gaps exist which future State of the Environment reports will hopefully be able to fill. Nonetheless, this report provides an important first step to understanding more about the region's environment, and begins to paint a picture of some of the area's successes and challenges.

This State of the Environment Report builds on the Sustainable Cowichan framework developed by the Cowichan Valley Regional District (CVRD) Environment Commission in 2008. This framework contains four goals[2], and suggests 12 strategic actions to achieving sustainability.

For more information, visit **www.12things.ca**

2 The CVRD Environment Commission's four goals are: (1) To protect the environment from harm; (2) To restore, rehabilitate and enhance the natural environment; (3) To encourage economic and social development compatible with environmental stewardship; and (4) To lead by example.

Key Questions

This inaugural State of the Environment Report strives to answer questions such as:

Is the natural environment healthy?

> Are our ecosystems and species being adequately protected?

> Is our biodiversity resilient in the face of change – in particular climate change and population growth?

> Are we approaching, or crossing, the region's natural thresholds?[3]

> Is the water safe? Is there enough for people, plants and animals?

> Is the air quality good?

Are we living within the "natural" capital'?

> Are we effectively balancing the needs of ecological functions and economic activity?

> Is our natural capital[4] (e.g., fisheries and forests) being managed in a sustainable way? Will it be at least as abundant and productive for future generations?

> Are we making good use of available land, and creating smart, flexible, and resilient communities?

> Are we producing enough local food?

> Are we addressing the challenges of climate change?

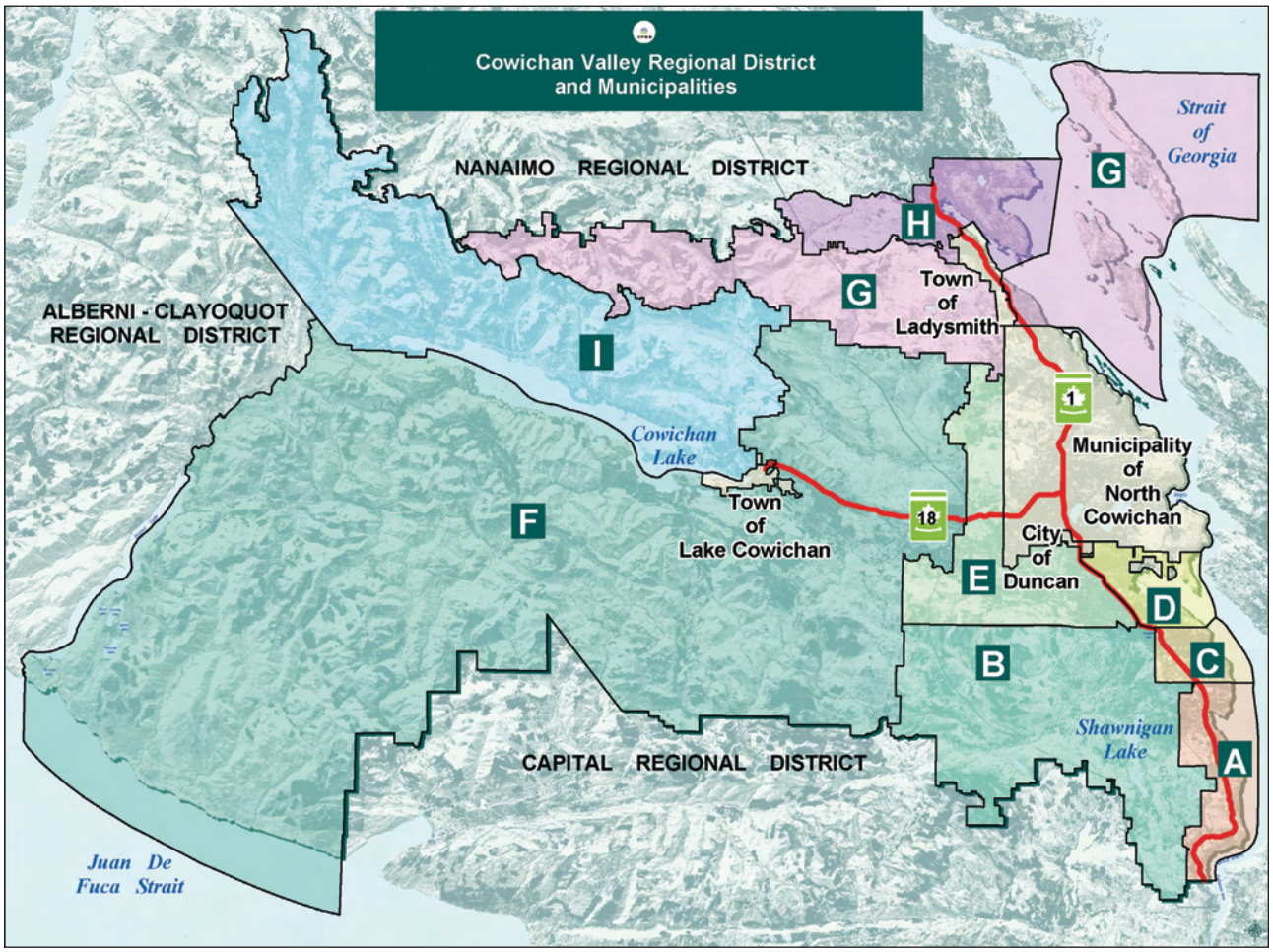
3 Example of an ecosystem threshold: the species diversity of a landscape may decline steadily with increasing habitat degradation to a certain point, and then fall sharply after a critical threshold of degradation is reached.

4 Natural capital is all of the elements that sustain all forms of life, such as water and oil, the land, and the ecosystems that maintain clean water, air and a stable climate. Most of these elements are irreplaceable and not renewable.

The Cowichan Region

The Cowichan Valley Regional District (CVRD) is located on southern Vancouver Island in British Columbia. It covers an area of more than 3,473 square kilometres stretching from the Pacific Coast to the Strait of Georgia, and includes the southern Gulf Islands of Kuper, Thetis and Valdes. The CVRD is made up of four municipalities – City of Duncan, Town of Lake Cowichan, District of North Cowichan and Town of Ladysmith – and nine electoral areas (Figure 1.1).

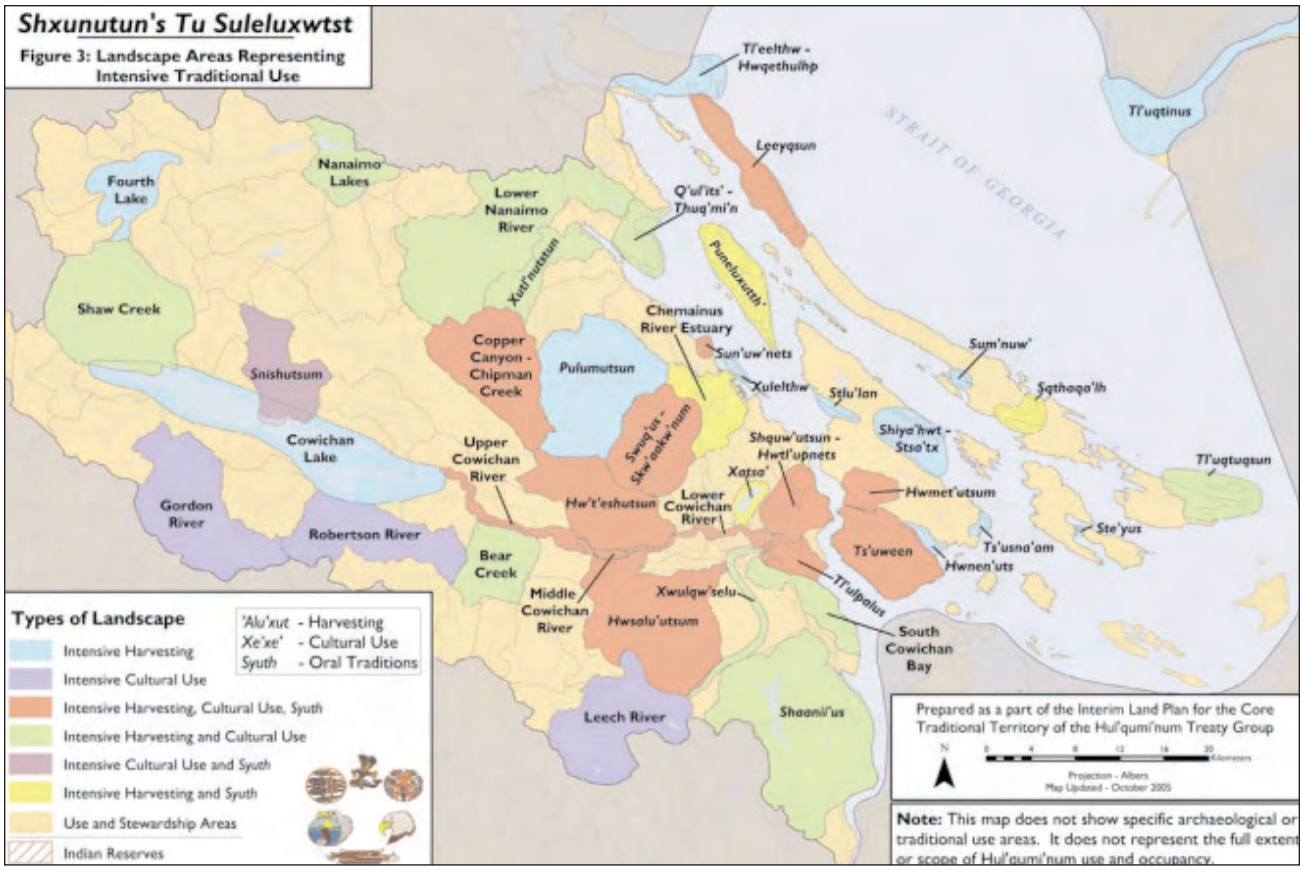
FIGURE 1.1: Cowichan Valley Regional District



Source: CVRD website www.cvrd.bc.ca

The CVRD land is part of the traditional territories of several First Nations, including the Cowichan people (the largest First Nation in the province), Chemainus, Penelakut, Lyackson, Halalt, Malahat, Pauquachin, and Lake Cowichan First Nations. Today, these First Nations make up the Hul'qumi'num Treaty Group. In addition the traditional territories of the Ditidaht First Nations lie within the region. Traditionally, these First Nations occupied overlapping, ecologically based territories that included the Salish Sea and the Fraser River (Figure 1.2). The landscape was a source of both spiritual and physical nourishment.

FIGURE 1.2: Partial representation of the scope of use and occupancy of the Hul'qumi'num Treaty Group's traditional territories



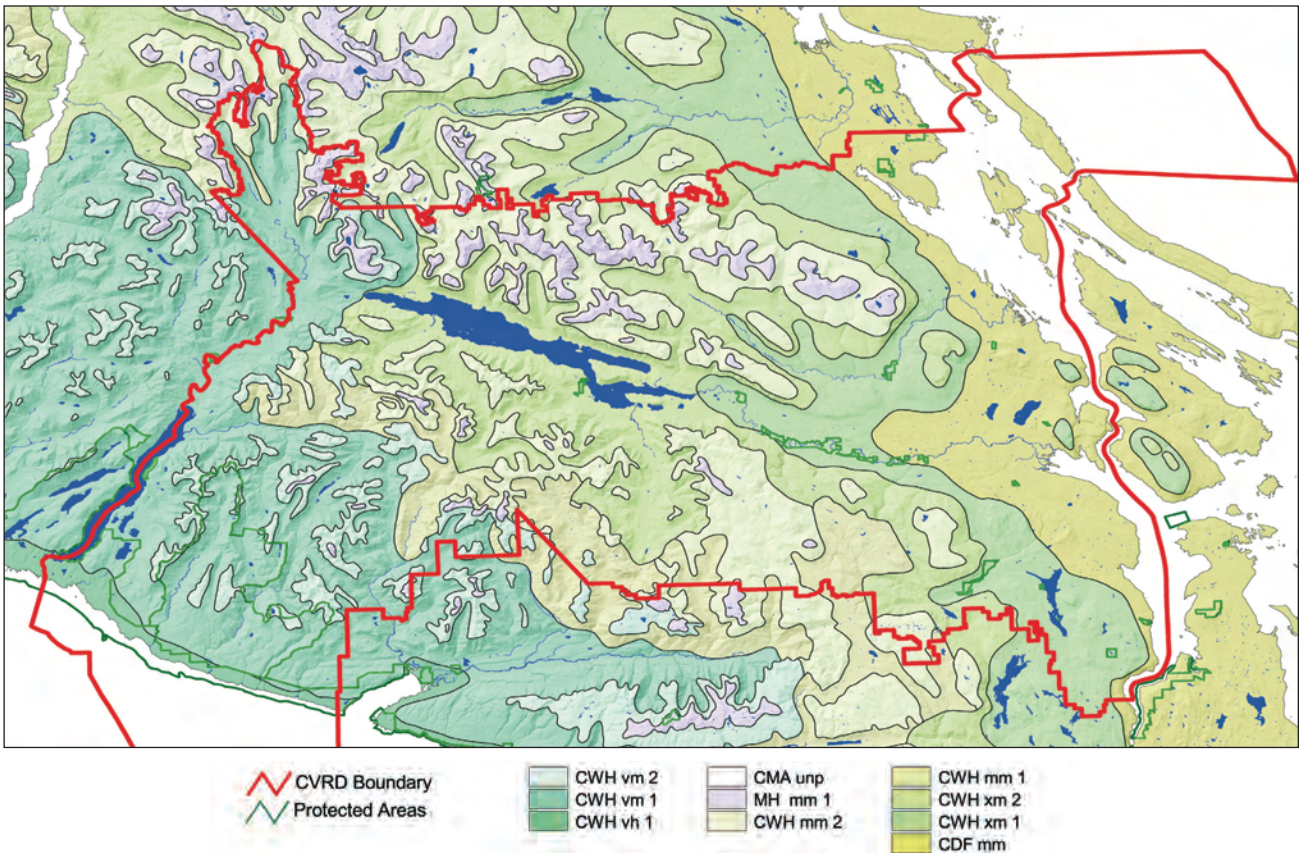
Source: Hul'qumi'num Treaty Group. 2005. Shxunutun's Tu Suleluxwtst. In the footsteps of our Ancestors. Summary of the Interim Strategic Land Plan for the Hul'qumi'num Core Traditional Territory.

Local Ecology

Vancouver Island is classified into four ecosections, and the ecosystems within them are divided into a large number of biogeoclimatic zones (Figure 1.3)[5]. The eastern side of the Island – the Nanaimo Lowland and Leeward Island Mountains – are characterized by dry forests dominated historically by Coastal Douglas-fir (CDF) and Garry oak, which historically burned relatively frequently by both "natural" and First Nation-driven fires.

In contrast, the forests on the west side of Vancouver Island are some of the wettest in the province, and so burn very infrequently – some forests here have escaped any large disturbance for 4,000 years or more. As a result, they are characterized by huge statured and often old or ancient western red-cedar, yellow-cedar, coastal western hemlock (CWH) and Sitka spruce forests. These multi-storied canopy forests (forests with many layers) provide a home to a large diversity of plants and animals and perform many natural functions, including the long-term storage of carbon.

FIGURE 1.3: Vancouver Island biogeoclimatic zones



CWH = Coastal Western Hemlock zone; CMA = Coastal Mountain-heather Alpine Zone; MH = Mountain Hemlock Zone; CDF = Coastal Douglas-fir zone. The letters (e.g., vm2) following these zone titles describe moisture and temperature variability within each broader area.

See Footnote 5 for additional information about these zones.

5 A description of these zones can be found on the Ministry of Forest's Biogeoclimatic Ecosystem Classification (BEC) website: www.for.gov.bc.ca/HRE/becweb/resources/classificationreports/subzones/index.html

The diversity of ecosystems – unique combinations of plants, animals and their physical environment – defines the beauty and richness of the natural world. The CVRD contains a range of rare, sensitive and keystone ecosystems that have very high ecological and social values. For example, the region's Garry oak woodlands are among the most endangered ecosystems in Canada, and provide a home for a wide diversity of species – including seven species of reptiles, seven species of amphibians, 33 species of mammals, 104 species of birds, 694 species of plants and more than 800 species of insects and spiders.[6]

Other sensitive ecosystems in the region include wetlands and riparian[7] habitats, older forests, terrestrial herbaceous areas (rocky outcrops and grassy knolls), coastal bluffs, and coastal dunes and spits, as well as many shoreline ecosystems. Shoreline ecosystems are the interface between terrestrial and marine environments, and allow land species access to the abundance of the ocean, as well as providing critical habitats for many marine and intertidal species.

6 Garry Oak Ecosystems Recovery Team, www.goert.ca

7 A riparian habitat or zone is the interface between land and a flowing surface water body such as a river. Riparian zones play a significant role in soil conservation, and influence biodiversity and aquatic ecosystem health.

FIGURE 1.4: Example of oak savanna – The Nature Conservancy of Canada's Cowichan Garry Oak Preserve

Source: Chris Junck, Garry Oak Ecosystems Recovery Team

1.2 Cowichan Region – A Changing Landscape

> *"You can never step into the same river twice, for it is not the same river and you are not the same person."* [8]

Landscapes are constantly changing, and the Cowichan Region is no exception. All sorts of natural and human forces affect change – including climate, geology and biology. Below is a brief timeline that highlights some major changes that have already taken place in the region.

Ice Age

The term "ice age" is generally used to refer to the period of extreme cold that began roughly 30,000 years ago and resulted in extensive ice sheets covering large parts of North America. During this glacial period the ice was hundreds of metres thick, and so heavy that Vancouver Island was depressed by more than 150 m.

Around 15,000 years ago the climate began to warm, and the ice sheets slowly melted and retreated. The release of the weight of ice eventually caused the land to rebound, evidence of which can be seen in the iconic shapes of Mt Tzouhalem near Maple Bay, and Mt Maxwell and Mt Tuam on Saltspring Island. Moving and melting ice cut major features into the landscape, including the U-shaped Cowichan Valley, the deep depression of Lake Cowichan, and the channels of the Cowichan River.

In place of the ice sheets, large deposits of glacial till (a mixture of soil, clay, sand and gravel) were left behind. Rivers transported this material to the lowlands, forming fertile pockets such as the Cowichan and Chemainus estuaries. Soon, pioneering species, such as pine, and oak savannas and alpine meadows re-colonized the landscape, aided by a mild, coastal climate, and sufficiently watered by winter rains and snow to be able to withstand summer droughts (Figure 1.4).

8 Paraphrase of Heraclitus, Greek philosopher.

FIGURE 1.5: Example of Coastal Douglas-fir ecosystem – Koksilah River Ancient Forest

Source: Warrick Whitehead

Later, forests of conifers, mostly made up of Douglas-fir, colonized the landscape. Other trees that eventually flourished include western hemlock, arbutus, western flowering dogwood, bigleaf maple, grand fir and western red-cedar. These coniferous forests are accompanied by a varied understorey, including Indian plum, salmonberry, western snowberry, Oregon grape, honeysuckle, and salal (Figure 1.5).

Animals, including insects, ducks, eagles, bears and elk, gradually began to fill the ecological niches of the region, Salmon returned to spawn in the gravels deposited in the rivers, and along with other fish found excellent rearing habitat in the lakes and channels of the area. The web of life in the Cowichan Region became complex and resilient.[9]

First Nations Settlement

Aboriginal people reached the Cowichan Region not long after the glaciers receded (8,000 to 10,000 years ago). The people adapted themselves to the seasonal patterns of weather, fish, and plants – moving throughout the region according to the natural cycles (e.g., spawning salmon, or migrating elk and deer). The area's rivers, tributaries and estuaries provided ready access to a plentiful supply of food: the rivers supported abundant salmon and trout populations, the sea was rich in shellfish, marine plants and marine mammals, and the land supported healthy wildlife populations and a variety of edible and medicinal plants and construction materials such as western red-cedar. Garry oak meadows were once very common in this area, and were important food-gathering sites (e.g., for camas bulbs).

This abundance was accessed carefully. First Nations made only minor adjustments to the landscape (e.g., temporary fish weirs, camas "farms", or controlled burns), in recognition of the connectedness to all things and their role as caretakers of the land, animals and resources – and in order to ensure a sustainable supply of these resources for their people.

> *"Our ancestors touched the lands, rivers, and oceans in our territory lightly and with respect. We used only what nature provided, and only what we needed."* [10] *Cowichan Tribes*

9 See Westland Resource Group's 2005 Water Issues report, and the Capital Regional District's website about the geological history of Vancouver Island (www.crd.bc.ca/watersheds/protection/geology-processes/geologicalhistoryVI.htm)

10 Quote from Cowichan Tribes website: www.cowichantribes.com

European Settlement

In the 1800s, European settlers arrived, bringing a different view of the region's landscape. Europeans imported the notion of private ownership and control ("taming of the wild"), and perceived apparently "unused" land as land simply waiting to be made useful. Oliver Wells, the first non-native person to conduct a detailed land survey of the Cowichan Valley (in 1859) described the landscape as: "45,000 acres of superior agricultural land that could be parceled into farms for 500 to 600 settler families." [11]

By the 1860s, logging and land clearing were well underway, and the low-lying areas of the region were being settled by farmers. In 1913, Canadian Pacific extended a rail line to Lake Cowichan. By 1920, 18 logging companies employed 1,200 men in the harvesting of the Cowichan Basin's forests (Figure 1.6).

FIGURE 1.6: Early logging camp in Rounds, BC (near Lake Cowichan)

Source: Kaatza Station Museum and Archives, accession number P983.28.60.

11 Cited in Arnett 1999, 61, on the History of the Hul'qumi'num page of the Hul'qumi'num People website people.www.hulquminum.bc.ca/hulquminum_people/cowichan?print=1

The new residents of the region made substantial modifications to many ecological systems . For example, the hydrologic system[12] was permanently altered, and not only by logging. The mighty Cowichan River was once made up of a series of rapids and waterfalls. Most of these falls were blown up with dynamite and/or removed, to facilitate greater access to and movement for harvesting. Eventually, log jams caused huge losses to logging operations and helped expedite the construction of a railway. The significant ecological impacts of these modifications are still felt today.

Winter floods threatened investments in roads and railroads throughout the Cowichan Basin and the growing settlement at Duncan. Dykes were the answer, and served to greatly narrow the Cowichan River's flood plain. Farmers capitalized on the rich soils that were a gift from the water in the Cowichan Basin; they straightened and deepened streams to hasten drainage, and drilled wells to extract water for irrigation.

With settlements came pavement, storm drains, septic fields, and sewage treatment plants, all of which affected the region's natural water cycles, as well as water quantity and quality. Industry, too, needed water, and soon extensive water licenses were being issued to support growing industries. For example, in the mid-twentieth century, the government agreed that the new pulp mill at Crofton could divert substantial quantities of water from the Cowichan River. A permanent weir was built at the outlet of Cowichan Lake to increase the capacity of the lake in order to store water for the mill.

During a period of roughly 30 years, beginning in the 1860s, virtually all land previously occupied by First Nations peoples came under the control of the region's new European settlers. In the 1860s and 1870s, about 60,000 ha of Hul'qumi'num land on Vancouver Island and the Gulf Islands were claimed and occupied by these settlers, including prime oceanfront and riverfront lands, and areas of the Cowichan and Chemainus valleys. The newcomers were settled among the long-established Hul'qumi'num villages, occupying and inhabiting many of the domestic and resource places previously occupied by Hul'qumi'num peoples. These newcomers brought smallpox, which decimated First Nations populations on the Island. (The estimated population before European contact and smallpox is between 5,000 and 10,000 people.)

In the 1880s, the bulk of Hul'qumi'num land was given to politician and businessman Robert Dunsmuir, in exchange for Dunsmuir's promise to build a railroad between Esquimalt and Nanaimo (E&N railroad). For the Hul'qumi'num peoples, this deal represented a loss of almost 85% of their traditional land and resources, and an almost complete erosion of their way of life (Figure 1.7).[13]

12 Hydrology encompasses the occurrence, distribution, movement, and properties of the waters of the earth. It involves the interaction of water with the physical and biological environment. A hydrologic system is a system of interrelated components, including the processes of precipitation, evaporation, transpiration, infiltration, groundwater flow, streamflow, etc., in addition to those structures and devices that are used to manage the system. A hydrologic system is subject to different kinds of weather pattern and spatial complexity, and is dynamic and random in nature.

13 Hul'qumi'num Treaty Group, The Great Land Grab in Hul'qumi'num Territory, www.hulquminum.bc.ca/pubs/HTGRailwayBookSpreads.pdf

FIGURE 1.7: Portion of E&N Railway land grant in traditional Hul'qumi'num territory

Source: Robert Morales. 2007. The Great Land Grab.

Ongoing Change

In the past 150 years, the face of the Cowichan Region has changed more than in the preceding 5,000 years. And the rate of change is accelerating. East-side old growth forests are nearly gone, replaced by young trees that are cut as soon as they become marketable – and long before they replace the functionality of a natural forest and the rich biological system it supports.

More and more water is being diverted from rivers and streams and pumped from aquifers, and natural green infrastructure (e.g., wetlands and watercourses that help recharge underground aquifers) are being filled or paved over. About 77,000 people call this region home, many times the number of people that lived here 100 years ago.

And growth is continuing – the region's population grew by almost 7% between 2001 and 2006,[14] Official Community Plans throughout the region predict more growth, and hundreds of thousands of visitors come here for recreation and tourism each year.[15] Figures 1.8 and 1.9 provide a visual image of some of the change in the region between 1974 and 2009. The extensive areas of yellow/brown are newly logged areas in 1974, and the bright green areas evident in Figure 1.8 represent areas logged in the 1950s. This pattern of extensive harvesting of entire drainage areas has resulted in the current condition of the landbase, with very little older forest remaining anywhere except on the West Coast.

14 Census 2006.

15 431,483 parties visited Tourism Visitor Centres on Vancouver Island in 2006 (Source: Cowichan Region Accommodation Study http://bc-cowichanvalley.civicplus.com/documents/EDC/Pdf/Accommodation%20Study.PDF)

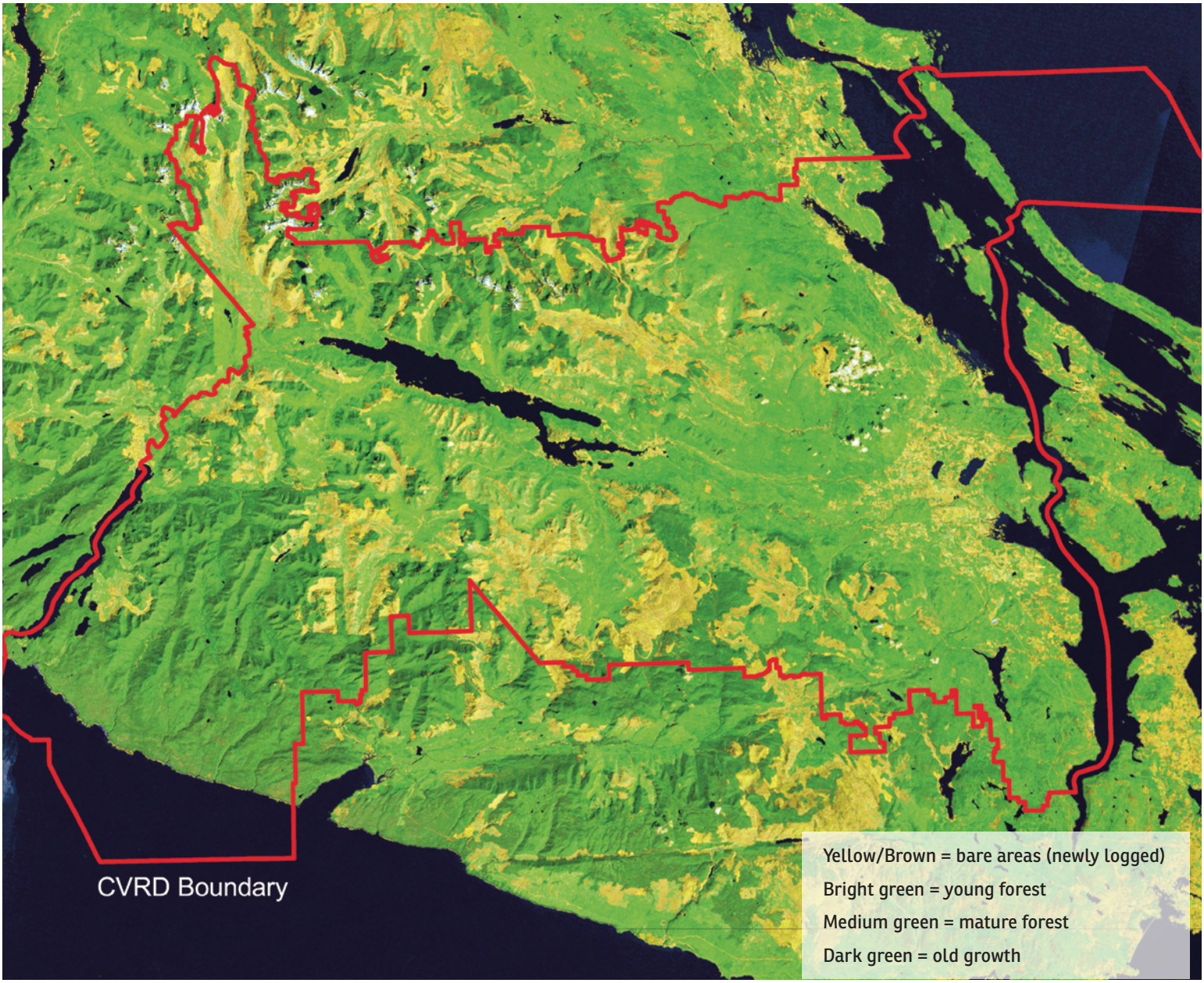


FIGURE 1.8: CVRD 1974, satellite image

Source: www.glovis.usgs.gov

What is less clear from these satellite images, but equally telling, is that the Cowichan Region is unusual compared to many other areas of the Province. Here, a significant proportion of the landscape (with the exception of the outer west coast) has been harvested once or twice already – the image from 1974 shows extensive areas of progressive clearcutting in all the valleys around Cowichan Lake and through to the east coast plain present at that time. In 2009 there is

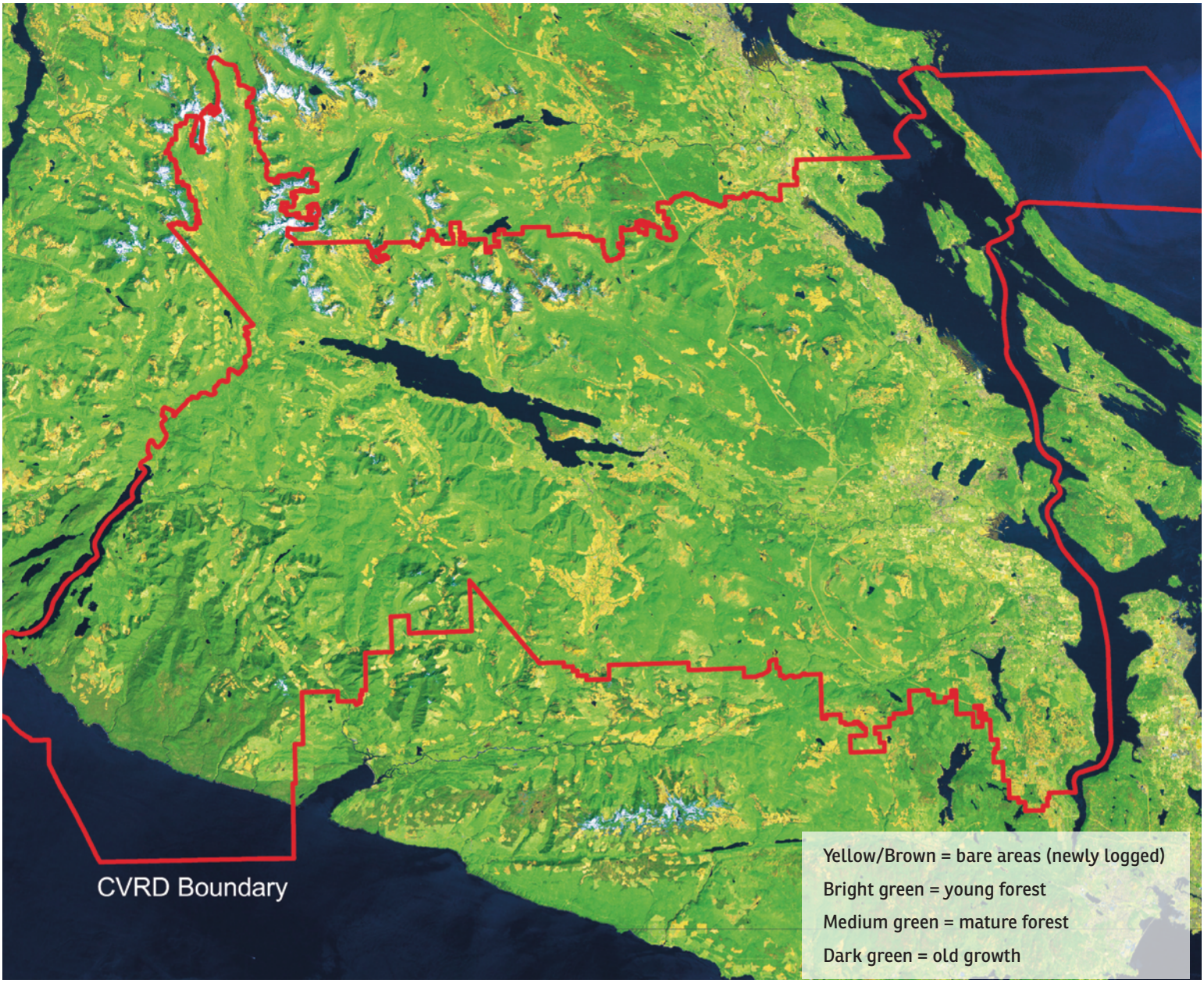


FIGURE 1.9: CVRD 2009, satellite image

Source: www.glovis.usgs.gov

actually more mature forest than was present in the mid-1970s, as these harvested forests have regrown. However, a second or third pass of harvesting is beginning in many of these areas today. There are no intact watersheds remaining, and the area is fully roaded; there are no core protected areas to help maintain ecological systems in this region.

Ecosystems in the east and central part of the region have significantly less than 30% of their historic natural levels of old forest remaining. Drawing down the natural capital so far has a significant impact on ecological resources, including the ability of the landscape to produce clean water and the biodiversity values that are so unique to this region.

Climate Change

Global climate change will significantly affect the Cowichan Valley. The Ministry of Environment notes that many changes are already affecting this region's climate:

> "The average air temperature has become higher in many areas. Air temperature on the coast has been less affected than in the interior and northeast of the province.

> The sea surface temperature has risen along the coast, and deep-water temperatures have increased in some inlets on the South Coast.

> Relative sea level has risen along the BC coast, except in those areas being pushed upward by geological processes."[16]

In general, climate change in the Cowichan Valley is expected to create milder and wetter winters and drier summers, with some local and regional variation. The sea level is expected to rise by at least 1 m by the end of the century – and more recent science predicts that sea level rise will be greater than this.[17] Storm surges – both windstorms and rainstorms – are expected to be more frequent and more intense.

Recent flooding in the Lower Cowichan Basin has raised awareness of the social and economic costs of such events. Changes in surface water temperatures and flow rates (less snow means less storage, more drought means less rain) will have major impacts on the habitat and recharge of lakes and rivers, resulting in cascading systems collapse. For example, during the summer of 2009, the water temperature as it was released into the river from the warm lake[18] measured 26° Celsius (due to low flow, warmer weather and increased evaporation). This is roughly the same temperature that results in "fish kills."

16 Ministry of Environment, State of Environment Reporting, www.env.gov.bc.ca/soe/bcce/03_climate_change/overview.html accessed January 29, 2010.

17 The Copenhagen Climate Science Update identifies significant feedback loops that make the 2007 projections of sea-level and temperature rise very conservative: see www.climatecongress.ku.dk/pdf/synthesisreport

The Ministry of Environment provides some additional predictions for the future:

> "A reduced snow pack in southern BC and at mid-elevations in the mountains

> An earlier spring freshet[19] and reduced water flow in the summer particularly on river systems that depend on snow melt as a source of water

> Warmer water in lakes and rivers

> Changes in ocean temperature, salinity, and density, which, in turn, may affect productivity [and species diversity – especially at the freshwater/saltwater interface]

> Lower soil moisture in the summer

> Increased frequency and severity of natural disturbances, such as fire, and pest outbreaks, such as mountain pine beetle

> Large-scale shifts in ecosystems and loss of ecosystems, such as some wetland and alpine areas

> An increase in number of growing days each season for crops." [20]

Change – For Better or For Worse

Change will continue in the Cowichan Valley, driven by changing climates, growing population, and changing human values and land uses. This State of the Environment report provides a reference point and a way to view these changes – are we maintaining the quality of the natural environment as well as the quality of human life? Are there aspects of our lifestyles that we need to manage differently to ensure that this happens? Overall, are we happy with the trends outlined in this report – and if not, how should we respond?

18 BC Conservation Federation data, provided to Kate Miller by Craig Wightman, Senior Fisheries Biologist, BC Conservation Foundation.

19 A freshet is a sudden rise in the level of a stream, or a flood, caused by heavy rains or the rapid melting of snow and ice.

20 Ministry of Environment, State of Environment Reporting, www.env.gov.bc.ca/soe/bcce/03_climate_change/overview.html accessed January 29, 2010