

# Develop with Care



Environmental Guidelines for Urban and Rural Land Development in British Columbia

March 2006

## Section Five

### REGIONAL INFORMATION PACKAGES: VANCOUVER ISLAND REGION

#### 5.1 Vancouver Island Region

5.1.1	Regional Features .....	4
	Geology and Topography .....	4
	Climate .....	6
	Ecology .....	7
	First Nations Interests .....	8
5.1.2	Ecosystems at Risk .....	9
5.1.2.1	Coastal Douglas-fir Zone .....	9
5.1.2.2	Sensitive Ecosystems .....	9
5.1.2.3	Garry Oak and Associated Ecosystems .....	11
5.1.3	Species at Risk .....	12
5.1.4	Regionally Significant Species .....	13
5.1.4.1	Fish .....	13
	Salmon and Trout .....	13
	Enos Lake Stickleback .....	14
	Other Fish .....	14
5.1.4.2	Birds .....	14
	Great Blue Heron .....	14
	Bald Eagle .....	15
5.1.4.3	Mammals .....	15
	Vancouver Island Water Shrew .....	15
5.1.4.4	Amphibians and Reptiles .....	16
	Red-legged Frog .....	16
	Sharp-tailed Snake .....	16



Alligator Lizard .....	17
5.1.5 Alien Invasive Species .....	17
5.1.6 Useful Sources.....	20
General Information .....	20
Regional Resources .....	20

Links to:

**5.2 Lower Mainland Region**

**5.3 Okanagan Region**

**5.4 Kootenay Region**

**5.5 Thompson Region**

**5.6 Cariboo Region**

**5.7 Skeena Region**

**5.8 Omineca Region**

**5.9 Peace Region**

**Table of Contents**



## Ministry of Environment Regions

This section of *Develop with Care* offers information on issues and species of concern that are unique to each region. This section is not a stand-alone guide to environmentally sensitive development in each region—reference to other sections of this document will be essential for a full understanding of the recommended environmental guidelines.

Figure 5.1-1: Ministry of Environment regions.





## Vancouver Island Region

The Vancouver Island Region includes all of Vancouver Island and the Gulf Islands (except those in Howe Sound and Texada Island), as well as a portion of the Central Coast (Figure 5.1-2). Low-lying areas suitable for development are experiencing rapid population growth and enormous development pressures.

**Figure 5.1-2: Vancouver Island Region.**



### 5.1.1 REGIONAL FEATURES

#### GEOLGY AND TOPOGRAPHY

The Vancouver Island Region includes about 48,000 km<sup>2</sup> of predominantly steep, rugged topography ranging from sea level to over 3000 m in the Coast Mountains. The central and largest part of Vancouver Island is comprised of the steep Vancouver Island Ranges. Deep fjords and long inlets dissect the western coast, while lowlands frame the northern tip and the eastern coast from Campbell River to



Victoria. Glaciation has modified the landscape, rounding and smoothing lowlands and carving steep U-shaped valleys and fjords in the mountainous areas. Areas where urban and rural development can occur are limited by the steep uninhabitable terrain throughout most of the region. The majority of urban and rural development is concentrated along the eastern coast of Vancouver Island and on the Gulf Islands where sandstones, shales, and conglomerates create a relatively flat landscape. The underlying rocks affect development choices, ranging from very dense basal tills that are difficult to excavate (and commonly known as ‘hardpan’) to the deep loose sand and gravel deposits known as the Quadra Sands, which are notoriously unstable and subject to wave erosion.

Island View beach in Victoria and the Wilmar Bluffs in Courtenay are examples of sandy areas susceptible to wave erosion.

The underlying rock and soil formations also affect an area’s vulnerability to hazards. Some areas have finer, ‘plastic’ soils or clays that lose strength when they are saturated with water, causing major stability problems on slopes. Unfortunately, these less stable sediments are often associated with steep cliffs and shorelines that are attractive for residential development because of their views.

Zeballos and Horne Lake are vulnerable to rock slides because of their close proximity to steep, failing rock cliffs.

Other terrain hazards include rock falls and slumping (landslides), commonly seen on the east coast of Vancouver Island in association with development along shorelines, as well as debris flows. Earthquakes and tsunamis are also potential hazards in this region.

Port Alice has constructed a large debris flow training berm and has a warning system for debris flows that might reach the town

Information on many hazards is available from the [Provincial Emergency Program](#) website. The Ministry of Environment has prepared maps showing the geomorphology of Vancouver Island, including descriptions of the terrain and some terrain hazards. It includes maps of areas with landslide risk and of alluvial rivers vulnerable to destabilization and damage when the riparian vegetation is removed.<sup>1</sup> See the [Pacific Geoscience Centre](#) website for information about Vancouver Island’s seismic environment.

The Ministry of Environment has recently completed a [study of lakeshore erosion](#) on lakes with fluctuating water levels, using Horne Lake as a case study. This report presents a method for determining and mapping the shoreline erosion hazard around a lake and suggests appropriate protection measures. It will help lakeshore owners and planners to choose where to place their protection efforts, and offers

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<sup>1</sup>Available from [http://www.env.gov.bc.ca/wld/documents/techpub/rr01/rr01\\_geom\\_vi.html](http://www.env.gov.bc.ca/wld/documents/techpub/rr01/rr01_geom_vi.html) and [http://www.env.gov.bc.ca/wld/documents/techpub/rr02/rr02\\_geom\\_vi.html](http://www.env.gov.bc.ca/wld/documents/techpub/rr02/rr02_geom_vi.html).



Flooding can be a problem when developments are within floodplains. PHOTO: RICK GUTHRIE

In the Cowichan Basin, a partnership of local and seniors governments, First Nations, community groups and resource users are preparing a long-term Water Management Plan, recognizing that summer droughts are likely to become of increasing concern due to climate change and population growth in the area ([http://www.cvrld.bc.ca/water\\_cowichan/index.htm](http://www.cvrld.bc.ca/water_cowichan/index.htm)).

alternatives that will help maintain the ecological integrity of the land–water interface, while protecting property and property owners.

### CLIMATE

Precipitation on Vancouver Island varies widely, from less than 700 mm/year around Victoria to nearly 6000 mm/year on the west coast. In general, the east coast lowlands of Vancouver Island receive about 1600 mm/year<sup>2</sup>, mostly as rain. Occasionally, rain and wind from a winter storm melts snow, producing a storm with unusually high runoff known as a ‘pineapple express’ or ‘rain-on-snow event.’ Most slopes of Vancouver Island drain rapidly, resulting in the ‘flashy’ response of streams following a storm. Flooding problems are a chronic concern in communities where development has occurred within the floodplain along these streams.

Climate change in the region is already bringing warmer temperatures year round, with more rain in the spring but less during the rest of the year (Table 5.1-1). This trend is expected to continue. This brings implications for the ecosystems and species, as well as for development. Winter snow packs—which usually provide a water source until early summer—are being affected by the higher winter temperatures.

**Table 5.1-1: Climatic trends at Victoria International Airport, 1950–2001<sup>3</sup>**

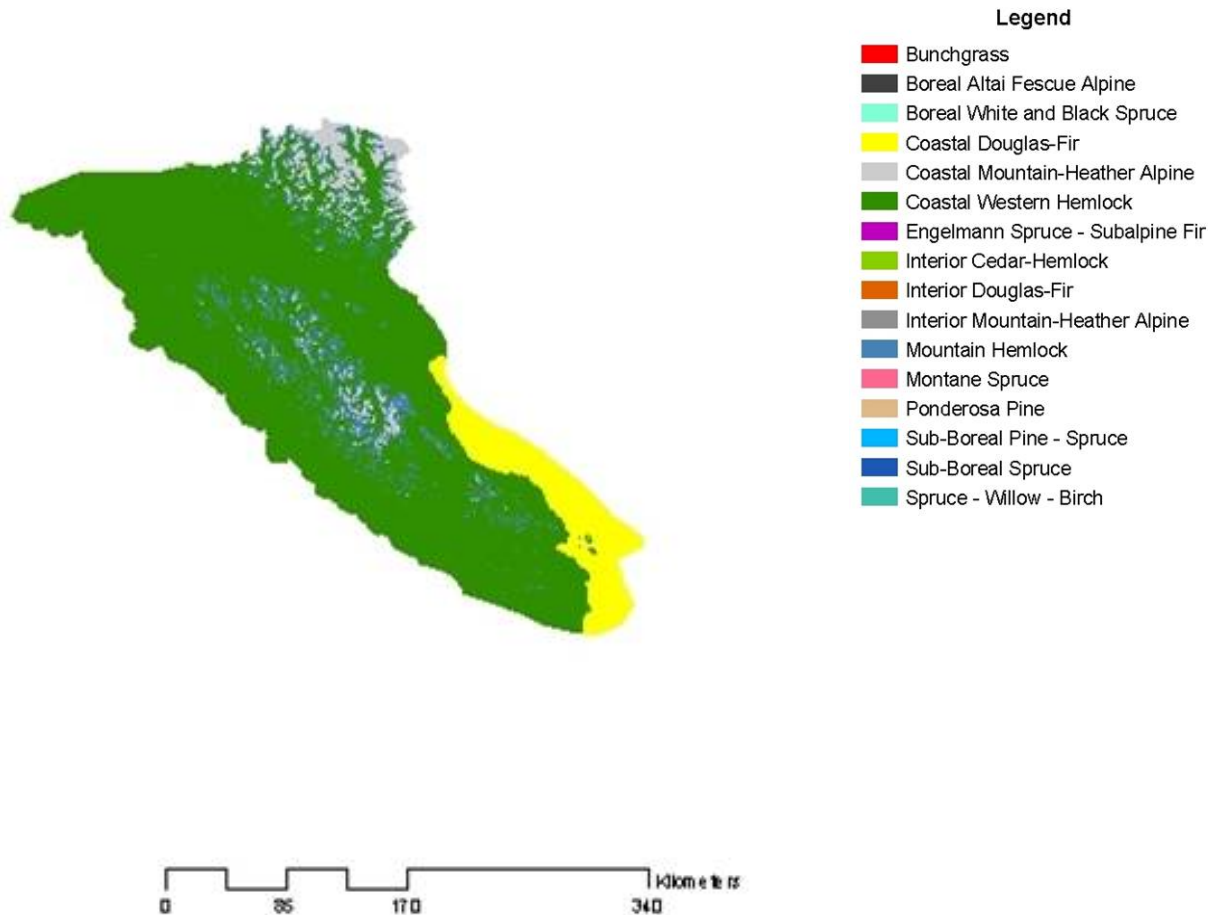
Trend 1950-200)	Winter	Spring	Summer	Autumn	Annual
Change to minimum temperature (°C/decade)	+0.19°	+0.36°	+0.19°	+0.08°	+0.17°
Change to maximum temperature (°C/decade)	+0.20°	+0.25°	+0.21°	+0.15°	+0.20°
Precipitation (% change)	-16.75	13.26	-3.86	-3.33	-3.11

<sup>2</sup> Environment Canada 1993

<sup>3</sup> Environment Canada Environmental Indicators.2003. [http://www.ec.gc.ca/soer-ree/English/Indicator\\_series/default.cfm](http://www.ec.gc.ca/soer-ree/English/Indicator_series/default.cfm)



Figure 5.1-3: Biogeoclimatic Zones in Vancouver Island Region . Source: [Ministry of Forests](#).



### ECOLOGY

There are three [biogeoclimatic zones](#) in the region (Figure 5.1-3).

Much of the region is in the [Coastal Western Hemlock](#) biogeoclimatic zone. These ‘temperate rainforests’ are complex and highly productive ecosystems, with a variety of habitats for birds and mammals. Fungi and seedlings depend on fallen trees, while the forest canopy provides habitat for lichens, mosses, and insects. Where there are gaps in the canopy, understory vegetation flourishes, supplying forage for Roosevelt elk and other wildlife. The many streams are excellent habitat for fish and other aquatic species.

On higher ground, the [Mountain Hemlock](#) biogeoclimatic zone predominates. At lower elevations there are dense, closed-canopy forests; but higher up the forests thin out into alpine meadows. The growing season in this zone is shorter, with colder climates and more snow. The Mountain Hemlock Zone provides habitat for many species such as



Meadow birds-foot trefoil.  
PHOTO: © CHARLES THIRKILL

ptarmigan, black tail deer, Roosevelt elk, cougar, and black bear, especially during the warmer summer months. The red-listed Vancouver Island marmot is found in this zone.

The [Coastal Douglas-fir Zone](#) is found only in the southwest corner of British Columbia (Figure 5.1-4), along the east coast of Vancouver Island, the Gulf Islands and parts of the Lower Mainland. In upland areas Douglas-fir are found in combination with salal and Oregon grape. Garry oak and arbutus grow with the Douglas-fir in rocky outcrop areas, together with other drought-tolerant species such as wild rose, snowberry and oceanspray. Moister areas support grand fir, western redcedar, and bigleaf maple together with swordferns, salmonberry and trillium as the understory. The mild climate in this zone supports many species that are typical of Washington and Oregon.

The Coastal Douglas-fir Zone is one of the smallest biogeoclimatic zones in British Columbia and has the highest number of species at risk per unit area of any zone in B.C. (Holt 2001).



### FIRST NATIONS INTERESTS

The natural ecology of this region has changed considerably with European settlement. This continues to have a significant impact on First Nations cultures and traditions. Developers and local governments should always [contact First Nations](#)<sup>4</sup> prior to development planning, to identify sites and features of importance.

### HALALT NATION GUIDELINES

The Halalt First Nations on Vancouver Island have prepared guidelines to help developers and local governments to plan projects that take their cultural values and customs into account, and to approach each First Nation with respect. Developers and local governments should contact the Halalt (and other First Nations as appropriate to their area) before development planning begins, to identify culturally valuable resources such as burial sites and plants used for medicinal purposes.

Contact information for First Nations in British Columbia is provided by the [Ministry of Aboriginal Relations and Reconciliation](#).

<sup>4</sup> For First Nations contact information, see Ministry of Aboriginal Relations and Reconciliation website (link from [www.gov.bc.ca](http://www.gov.bc.ca)).



## 5.1.2 ECOSYSTEMS AT RISK

### 5.1.2.1 Coastal Douglas-fir Zone

The mild climate and flatter topography of this zone attracts people as well as wildlife, and this area is the most affected by urban and rural development in the Vancouver Island Region.

Due to forestry activities and land development patterns, mature and old-growth Douglas-fir forests have become rare—less than one percent remains.<sup>5</sup> The Conservation Data Centre identifies 37 plant communities as red- or blue-listed in this area. The Coastal Douglas-fir zone contains a wide diversity of ecosystems including woodlands, rocky outcroppings, coastal bluffs and wetlands. These remaining natural ecosystems are mapped in the [Sensitive Ecosystem Inventory](#), because of their sensitivity to disturbance and because of the species that they support.

Some [older trees](#) still exist singly or in small groups within urban and rural areas, and these ‘veteran’ trees and pockets of old forest provide critical habitat for many wildlife and plant species.

The ongoing invasion of alien plant and animal species into this zone is a major concern (see [Section 5.1.5](#)). Invasive plant and animal species are second only to urbanization and other forms of land conversion in the threat they pose to natural ecosystems.<sup>6</sup>

Most of this zone is under private ownership, as result of historical E&N Railway land grants. This means that local governments and private landowners have especially important roles to play in the protection of ecosystems and species.

### 5.1.2.2 Sensitive Ecosystems

The Ministry of Environment and Environment Canada have mapped ‘sensitive ecosystems’ along the east coast of Vancouver Island and adjacent Gulf Islands, primarily within the Coastal Douglas-fir zone. These rare and fragile ecosystems include seven sensitive ecosystem types: [wetland](#), [riparian](#), [older forest](#), [woodland](#), [coastal bluff](#), [terrestrial herbaceous](#), and [sparsely vegetated](#). As part of this [Sensitive Ecosystems Inventory](#), two additional ecosystem types ([older second-growth forests](#) and [seasonally flooded fields](#)) were also mapped because of their high biodiversity values. The 1997 Sensitive Ecosystems Inventory (SEI)

[Wildlife Tree Stewardship Program \(WiTS\)](#) staff and volunteers locate and monitor important nesting and habitat trees for bald eagle and other wildlife species in urban and rural areas. These trees are usually old ‘veterans’ found in scattered locations, especially near the coast. WiTS is a joint partnership with Federation of B.C. Naturalists, BC Hydro, Environment Canada and Ministry of Environment.

<sup>5</sup> Cadrin 2003.

<sup>6</sup> IUCN 2000.



These seasonally flooded fields in Courtenay are important habitat for trumpeter swans.  
PHOTO: JUDITH CULLINGTON



found that less than 8% of the study area remained in a relatively natural state, and a further 12% had been modified but was still providing important natural values. In other words, human activities had modified 80% of this area to such an extent that the natural ecosystems were no longer present.

Many of the region's species at risk live in the ecosystem types identified in the Sensitive Ecosystem Inventory. Note, however, that this Inventory only mapped sites that were 0.5 hectares or larger, and did not identify many smaller but equally important ecosystems. Vernal pools (a type of wetland which are always very small—see [Section 4](#)), for example, provide critical habitat for 25 plant species at risk.



Many second-growth forests and riparian ecosystems have been disturbed.  
PHOTO: CANADIAN WILDLIFE SERVICE

A recent ortho-photo review of the original SEI, known as [Disturbance Mapping](#), has shown that even more ecosystems have been disturbed by development since the original inventory. Over 8,800 ha (11%) of the area occupied by the nine SEI ecosystem types in the early 1990s had been disturbed by 2002. Of the sensitive ecosystems, older forests had the highest rate of loss at 8.6% (915 ha) followed by riparian (4.6%), woodland (2.6%) and wetland (2.0%) ecosystems. The largest area of loss was 7,360 ha (16.4%) in the older second-growth forest category.

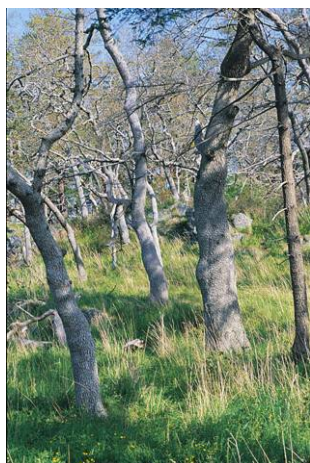
These losses are of concern as they represent not only a loss of the ecosystems themselves, but also the species (including species at risk) that these ecosystems supported. Communities are also affected by this loss because these areas contributed to the viewsapes and characteristics of communities, as well as providing many ecosystem services such as reducing flood flows and maintaining water quality by removing harmful pollutants.

Table 2: Loss of ecosystems by SEI sub-unit<sup>7</sup>, early 1990s to 2002

SEI Sub-Unit	Sensitive Ecosystems			Other Ecosystems (SG, FS)		
	Original SEI (Ha)	Loss (Ha)	% Loss	Original SEI (Ha)	Loss (Ha)	% Loss
Capital	8500.5	140.2	1.6%	11080	865.9	7.8%
Comox	8684.8	483.6	5.6%	9085.6	2649.3	29.2%
Cowichan	4416.9	205.5	4.7%	4066.5	306.4	7.5%
Islands	5128.8	223.6	4.4%	14751.8	1539.3	10.4%
Nanaimo	5779.2	411.3	7.1%	8685.3	2017.5	23.2%
Total	32510.1	1464.2	4.5%	47669.3	7378.4	15.5%

### 5.1.2.3 Garry Oak and Associated Ecosystems

Garry oak and associated ecosystems are found within the Coastal Douglas-fir zone. They include shady woodlands and open meadows with scattered trees. Garry oaks are often found in mixed stands with other trees, mainly arbutus and Douglas-fir. The understory species include spring wildflowers, grasses, mosses, and a variety of shrubs. These ecosystems support many lichens and fungi, and are home to a variety of animals and insects which thrive in these unique environments.



Garry oak meadow.  
PHOTO: MARK KAARREMAA

The Garry oak ecosystems are among the most ‘at-risk’ in Canada. Only an estimated 5% remain in a relatively natural state—most have been lost to urban and rural development.<sup>8</sup> As a result, more than 70 species of Garry oak ecosystem plants, reptiles, birds, butterflies and other insects are provincially red-listed, and another 40 species are blue-listed.<sup>9</sup> Some species have already been extirpated (i.e., they are no longer found here).

One of the challenges with conserving Garry oak ecosystems is that people often focus their attention on the trees themselves, and do not consider the importance of protecting the entire ecosystem, upon which many species rely. In addition, tools such as tree protection bylaws are usually limited to the protection of the mature trees only.

For information on the protection and management of ecosystems at risk, see [Section 2: Community Planning](#) and [Section 3: Site Planning and Management](#). The Sensitive Ecosystems Inventory [Conservation Manual](#) also includes specific recommendations for protecting sensitive ecosystems.

<sup>7</sup> Cake 2005.

<sup>8</sup> McPhee et al 2000.

<sup>9</sup> Fuchs 2001.



Deltoid balsamroot (yellow) is a nationally Endangered species.  
PHOTO: DAVE POLSTER

Some of the birds that have been extirpated from Vancouver Island Region Garry oak meadows are the western bluebird, western meadowlark, streaked horned lark, and Lewis's woodpecker.

### 5.1.3 SPECIES AT RISK

Two-thirds of the 265 [provincially-listed](#) species at risk in the Vancouver Island Region are found in urban and rural areas. Many species—particularly those in the Coastal Douglas-fir zone—have had most of their range converted to human use. Other species are naturally rare and live only in specialized habitats.

Two of these that are present in both the Vancouver Island and Lower Mainland regions are the Vancouver Island beggartick and phantom orchids. Descriptions of these species and guidelines for their protection are included in **Section 5.2: Lower Mainland Region**.

Some other species at risk are described in the following pages. See **Section 4: Environmentally Valuable Resources** for guidelines on protecting species at risk.



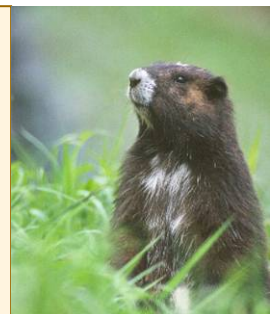
Slimleaf onion (blue-listed).  
PHOTO: © CHARLES THIRKILL

#### VANCOUVER ISLAND MARMOT

The Vancouver Island marmot is found only on Vancouver Island. It differs from other marmot species in behaviour, genetics and ecology and is easily identified by its unique appearance. It is one of the rarest and most endangered mammals in the world, with a current population of about 150 animals.

Habitat changes over a wide area have potentially affected predator-prey dynamics and marmot dispersal patterns, which is having significant implications on a naturally small population.

For more information see <http://www.marmots.org/>.



Vancouver Island marmot.  
PHOTO: ANDREW BRYANT



### 5.1.4 REGIONALLY SIGNIFICANT SPECIES

There are a number of species that are considered ‘regionally significant’ due to their uniqueness, their degree of rarity, or their close association with the region, including the great blue heron, bald eagle, pileated woodpecker, and various fish species. Some of these are discussed below.

Follow the guidelines in [Section 3](#) and [Section 4](#) to protect regionally significant species.

#### 5.1.4.1 Fish

##### SALMON AND TROUT

The Canada [Fisheries Act](#) prohibits the destruction or harmful alteration of fish habitat, including the riparian vegetation that surrounds aquatic habitats.

Most salmon and some trout are ‘anadromous’, meaning that they use the ocean for part of their life cycle and return to fresh water to spawn. Some anadromous species are more affected than others by urban development, particularly those that rely on small fresh water streams, like [cutthroat trout](#) and [coho salmon](#). Coastal cutthroat trout are blue-listed, and several populations (stocks), particularly those on the east coast of Vancouver Island and the Lower Mainland, are in serious decline. [Steelhead trout](#) are also decreasing in numbers, as they need healthy watersheds and stable river channels for their two- to four-year stay as juveniles in fresh water.

As a result of land development and over-fishing, many unique stocks of these three species have gone extinct, and others have suffered dramatic decreases. Each stock represents thousands of years of adaptation to a home watershed, and its loss reduces the diversity of the species as a whole. The cumulative loss of fishing opportunities also affects the multi-million dollar sport and commercial fishery. All aquatic and riparian habitats, including estuaries, ephemeral (seasonal) streams, and small streams should be protected as they are important fish habitats.

#### STOCKS VS. SPECIES

Salmon and trout have strong homing instincts and usually return to the same stream where they were hatched. Populations returning to one watershed or region are usually genetically distinct and are called ‘stocks’. Different stocks (or ‘runs’) of the same species have different behaviours or physical traits that adapt them to conditions in their home river.

‘Species’ are the different types of fish—such as cutthroat trout, coho salmon, Dolly Varden.



Following restoration, salmon are returning to Bee Creek on southern Vancouver Island.  
PHOTO: JUDITH CULLINGTON

"Few other organisms anywhere have contributed as much to our understanding of how new species form in nature and become different from one another. I would rank their scientific importance with that of the Burgess Shale and a few other outstanding natural phenomenon of BC and Canada" (Dr. Dolf Schluter, University of British Columbia, referring to the Enos Lake stickleback).

#### Restore it and they will come:

Coastal cutthroat and other salmonid species are benefiting from a major initiative to restore estuary habitat at the mouth of the Campbell River.

[http://www.stewardshipcentre.bc.ca/caseStudies/cs\\_builder.asp?request\\_no=170](http://www.stewardshipcentre.bc.ca/caseStudies/cs_builder.asp?request_no=170)



Great blue heron.  
PHOTO: JUDITH CULLINGTON

### ENOS LAKE STICKLEBACK

The [Enos Lake limnetic stickleback](#) and the [Enos Lake benthic stickleback](#) are red-listed in British Columbia and listed as Threatened by COSEWIC in Canada. These fish are found nowhere else in the world and have the highest possible rank for Global rarity. Scientists from New York, California and UBC have extensively studied the Enos Lake stickleback as they provide insight into the evolution of species.

These sticklebacks breed in the shallows of Enos Lake, so they are threatened by activities—such as nearby urban development—which change lake levels or cause pollution or siltation.

### OTHER FISH

Other fish species of concern include the lake lamprey in Cowichan Lake and Dolly Varden throughout the region.

#### 5.1.4.2 Birds

### GREAT BLUE HERON

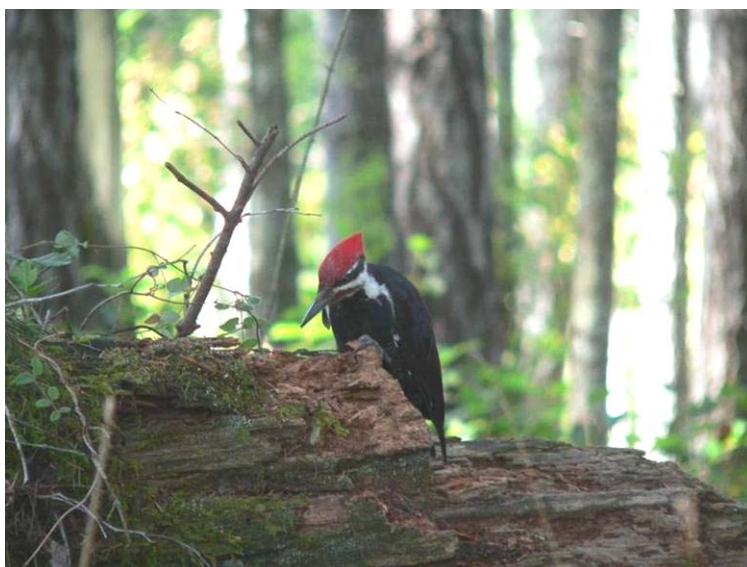
The Vancouver Island Region is home to the Pacific (or *fannini*) subspecies of great blue heron, which is found only on the west coast of North America. Most of the Pacific heron population lives along the Strait of Georgia where high development pressures and expanding human populations are affecting important nesting and foraging habitats. The great blue heron is easily disturbed during nesting season and entire colonies have been known to permanently desert a site. Bald eagles are also taking their toll by preying on the nesting birds and their young. The Pacific subspecies of great blue heron is listed as 'Special Concern' under the Canada [Species at Risk Act](#) due to declining nesting colonies and nesting success.



The bald eagle relies on the largest trees to build its heavy nests.

### BALD EAGLE

The bald eagle is still a common sight in many parts of the region but the gradual loss of nesting habitat is affecting the bald eagle's long-term prospects. In this region eagles generally nest in large, strong trees that are as tall as or taller than the surrounding trees. The highest nesting success rate on Vancouver Island is achieved in the largest trees.<sup>10</sup> In urban and rural areas, these nest trees are often veteran Douglas-fir at least 150 years in age. Although many of these trees are still present in some coastal urban areas, there are few 'recruitment trees': mid-sized trees which will replace the older veterans as they die off or are cut down.



The pileated woodpecker requires large snags and dead or dying trees for food and nesting.  
PHOTO: TRUDY CHATWIN

#### 5.1.4.3 *Mammals*

There are some mammals in the region whose numbers are naturally low or whose numbers are dropping. These include the Vancouver Island water shrew, the ermine, and the wolverine. In many cases, adequate taxonomic and inventory documentation has not been carried out to have these species 'listed'.

#### VANCOUVER ISLAND WATER SHREW

If you find a shrew in the water, it is probably this species. A distinguishing characteristic is its hairy feet. Little is known of their habitat needs at this time.

<sup>10</sup> Bruce Cousens, pers. comm.



Amphibians and reptiles live in valley bottom areas that attract development. Unless measures are taken to preserve the specialized habitats of these species, their numbers will continue to decline.

#### 5.1.4.4 Amphibians and Reptiles

There are 10 native and three introduced amphibian species (frogs, toads and salamanders) and six native and two introduced reptile species (turtles, lizards and snakes) in the region. Land development is concentrated in the lowlands and near water—areas of high amphibian and reptile use—resulting in some species becoming rare. One species—the gopher snake—has been extirpated from the region.

Three species that are typical of the lowlands where urban development is concentrated are the sharp-tailed snake, red-legged frog, and northern alligator lizard. Refer to [Best Management Practices for Amphibians and Reptiles in Urban and Rural Environments in British Columbia](#) for more information on ways to protect these species.

##### RED-LEGGED FROG

The [red-legged frog](#) is widespread in moist forested areas throughout the region, where significant amounts of its habitat have been modified into urban and rural areas. In Canada this species is found only in southwestern B.C., and the Vancouver Island Region forms the majority of its range. Red-legged frogs breed in ponds, wetlands, and some streams. They can use ephemeral (seasonally wetted) wetlands, which is beneficial because these wetlands exclude predators like bullfrogs that require year-round water. The red-legged frog is blue-listed due to declining numbers related to habitat loss and bullfrog predation.

In Canada, the sharp-tailed snake lives only in the dry Coastal Douglas-fir zone in the southeastern part of the Vancouver Island Region. It prefers to live in Douglas-fir – arbutus woodlands and along forest edges. Its small population and susceptibility to harm by development make it an endangered species.

##### SHARP-TAILED SNAKE

The [sharp-tailed snake](#) is a red-listed species whose Canadian range occurs only on the southern Gulf Islands and southeastern Vancouver Island. It is small, harmless, and non-threatening—traits that make it compatible with low-density developments. Sharp-tailed snakes are very secretive and seldom seen. It can co-exist with a limited amount of urban



Sharp-tailed snake (red-listed). PHOTO: TRUDY CHATWIN



or rural development if care is taken to protect its habitat.

### NORTHERN ALLIGATOR LIZARD

The [northern alligator lizard](#) is the largest lizard in Canada, reaching more than 20 centimetres in length. In general, the northern alligator lizard requires only small areas to live in, making it possible to retain populations in urban and rural areas when its habitat needs are recognized, and predation by cats and dogs is controlled. Vancouver Island populations of northern alligator lizards are under additional pressure because of the introduced European wall lizard, which thrives in human-disturbed environments on southern Vancouver Island, and may compete with the alligator lizard for resources.



The northern alligator lizard can be compatible with humans as it needs only small spaces for its habitat.

PHOTO: CHRISTIAN ENGELSTOFT

Alien invasive species can cause massive damage to native ecosystems. Many species are so widespread and persistent that they can only be controlled through public education and with the long-term involvement of all land stewards.

### 5.1.5 ALIEN INVASIVE SPECIES

Modern transportation and commerce has created many opportunities for plants and animals to spread from their places of origin. Although many species are transported by accident, others are deliberately imported for landscaping, as pets, for agriculture, or for pest control. The majority of imported species do not thrive and spread, but a few become a major problem. Once these invasive species arrive, humans often inadvertently assist their spread by carrying seeds on vehicles and clothing.

Invasive species are causing problems in the many parts of the region, including Garry oak ecosystems. The Coastal Invasive Plant Species Committee has recently formed to address these concerns. Information on invasive species can also be found at the [Invasive Plant Council of B.C.](#) website.

For amphibians and reptiles, the spread of non-native, invasive species is second only to habitat alteration in adversely impacting populations, particularly on southeastern Vancouver Island.<sup>11</sup> Weedy vegetation such as [purple loosestrife](#) and [reed canary grass](#) can out-compete native aquatic vegetation around important pond and wetland habitats, removing food sources and changing water flows. The American [bullfrog](#), originally imported by frog-farmers for its meaty legs and sold as tadpoles through pet shops, has spread along the east coast of Vancouver Island and preys on native amphibians, ducklings and other wildlife. Introduced fish such as small-mouthed bass also eat tadpoles and eggs. Humans help bullfrogs spread by converting seasonal wetlands into year-

<sup>11</sup> Ovaska et al. 2003.



Bullfrogs are voracious predators that can displace native frogs.  
PHOTO: KEVIN BRUCE

round ponds, and by moving tadpoles. See [Section 3.5.3](#) for guidelines on managing invasive species.

Other invasive species of concern in the Vancouver Island Region include the following:

- ♦ [Carpet burweed](#), a low growing winter annual plant that sheds painful seeds and out-competes surrounding vegetation in open areas and lawns. This plant can become a serious problem in golf courses, lawns and grassy or woodland ecosystems. It is now found in several parks and public areas.
- ♦ [Japanese knotweed](#), a bamboo-like shrub that chokes riparian areas, ditches, wetlands and other moist areas. Once established, it displaces other vegetation and is very difficult to remove. This plant is a major problem in the Lower Mainland and the American Pacific Northwest, and is making incursions into moist areas on the east coast of Vancouver Island. It is found along the Highway 19 corridor and is likely spread through ditch maintenance and by gardeners.
- ♦ [Giant hogweed](#), an invader of moist riparian areas. It forms a dense canopy, out-competing native species and causing streambank erosion. This plant has a highly toxic sap that causes severe photosensitization, resulting in skin damage that can last for years. It has invaded several known areas including roadsides near French Creek, Rock Bay, and Coombs.
- ♦ [Scotch broom](#), [gorse](#), [Himalayan and evergreen blackberry](#) and [English hawthorn](#), plants that thrive on open and disturbed sites, including roadsides and areas awaiting redevelopment. Repeated hand pulling or mechanical cutting can control or eliminate them from sensitive ecosystems and from disturbed sites that act as seed sources.



Scotch broom invades open areas and disturbed sites, displacing native and rare plants in the process.  
PHOTO: JUDITH CULLINGTON

- ◆ [English and Irish ivy](#), laurel-leaved [daphne](#) and holly, species used for landscaping. They often reseed into native forest and woodland ecosystems and displace native species. Ivy grows around the trunks of trees and shrubs and interferes with nutrients and light requirements, causing decline and occasionally death of the tree and understory. Ivy is difficult to remove once established.
- ◆ [Purple loosestrife](#), an attractive purple-flowered plant that displaces native species in wetlands, streams, and ditches.
- ◆ [Orchardgrass](#), a grass commonly used in grass seed mixtures, is the most invasive plant in threatened Garry oak ecosystems. Grass seed mixes used for lawns and disturbed sites should exclude this species.
- ◆ [Eastern grey squirrel](#), a large squirrel that is replacing the smaller native squirrel in urban and rural areas and competing with native species for food in Garry oak ecosystems and other forests.
- ◆ [North American opossum](#), a marsupial that was introduced to Hornby Island in 1986. Its diet includes birds, bird eggs, small mammals and the larvae of species such as the red-listed Edith's checkerspot (a butterfly). If the opossum spreads to Vancouver Island, it will be difficult to control.



Opossums have invaded Hornby Island.  
PHOTO: JENNY BALKE

#### TOP TEN INVASIVE PLANTS IN GARRY OAK ECOSYSTEMS

- |   |   |
|---|---|
| 1. Orchardgrass ( <i>Dactylis glomerata</i> ) | 6. Laurel-leaved daphne ( <i>Daphne laureola</i> )        |
| 2. Scotch broom ( <i>Cytisus scoparius</i> )  | 7. English hawthorn ( <i>Crataegus monogyna</i> )         |
| 3. Gorse ( <i>Ulex europaeus</i> )            | 8. Sweet vernalgrass ( <i>Anthoxanthum odoratum</i> )     |
| 4. English ivy ( <i>Hedera helix</i> )        | 9. Himalayan blackberry ( <i>Rubus discolor</i> )         |
| 5. Velvet grass ( <i>Holcus lanatus</i> )     | 10. Hedgehog dogtail grass ( <i>Cynosurus echinatus</i> ) |

(Murray and Pinkham 2002)

For a complete list of invasive species affecting Garry oak ecosystems, refer to the [Garry Oak Ecosystems Recovery Team](#) website.



## 5.1.6 USEFUL SOURCES

### GENERAL INFORMATION

Ministry of Environment Vancouver Island Regional Office

2080 Labieux Road

Nanaimo BC

V9T 6J9

Phone: (250) 751-3100

<http://www.env.gov.bc.ca/vir/> or <http://wlapwww.gov.bc.ca/vir/><sup>12</sup>

### REGIONAL RESOURCES

Access to many sources of inventory information can be found through the EcoCat (Ecosystems Report Catalogue) website <http://srmapps.gov.bc.ca/apps/acat/>

Regional maps and inventory:

- ♦ Geoscape Nanaimo website <http://web.mala.bc.ca/geoscape/>
- ♦ Geoscape Victoria website [http://geoscape.nrcan.gc.ca/victoria/index\\_e.php](http://geoscape.nrcan.gc.ca/victoria/index_e.php)
- ♦ Guthrie, R. and P. Law. 2005. Lakeshore Erosion Hazard Mapping. Ministry of Environment Technical Handbook No. TH 1. December 2005.  
<http://wlapwww.gov.bc.ca/wld/documents/lakeshore.pdf>
- ♦ Pacific Geoscience Centre website <http://www.pgc.nrcan.gc.ca/pgchome.htm>
- ♦ Sensitive Ecosystems Inventory mapping of East Vancouver Island and the Gulf Islands ([http://www.env.gov.bc.ca/sei/van\\_gulf/ecosystems.html](http://www.env.gov.bc.ca/sei/van_gulf/ecosystems.html)) was first completed in 1997, based on aerial photos taken from 1992 and earlier. A *Technical Report* documents sensitive ecosystem information in detail, and the *Conservation Manual* provides information on ways to protect sensitive ecosystems. ([http://www.env.gov.bc.ca/sei/van\\_gulf/publications.html](http://www.env.gov.bc.ca/sei/van_gulf/publications.html)).
- ♦ Sensitive Ecosystems Inventory disturbance mapping was later conducted using 2002 orthophotos ([http://srmwww.gov.bc.ca/appsdata/acat/html/deploy/acat\\_p\\_report\\_2124.html](http://srmwww.gov.bc.ca/appsdata/acat/html/deploy/acat_p_report_2124.html))

Some useful local sources are:

- ♦ Alberni Clayoquot Regional District 'Alberni Valley Stream Atlas'. For information, contact the regional district planning department (phone 250-720-2700 or e-mail [mailbox@acrd.bc.ca](mailto:mailbox@acrd.bc.ca)).
- ♦ Capital Regional District Natural Areas Atlas (<http://www.crd.bc.ca/es/natatlas/>) and Harbours Atlas (<http://harboursatlas.ca/>)
- ♦ City of Nanaimo Habitat Atlas <http://enviro.nanaimo.ca/>
- ♦ Comox-Strathcona Sensitive Habitat Atlas: A sample map is available (<http://www.shim.bc.ca/atlas/comxsamp.htm>), or go straight to an Interactive Map (<http://www.rdc.bc.ca/notices.asp?id=82>)

<sup>12</sup> Note: Ministry websites are being updated. If the 'www.env.gov.bc.ca' link does not work, try wlapwww.gov.bc.ca.



- ♦ Cowichan Valley Environmental Planning Atlas  
[http://srmapps.gov.bc.ca/apps/idmi\\_cowval/](http://srmapps.gov.bc.ca/apps/idmi_cowval/)
- ♦ Islands Trust/Islands Trust Fund Ecosystem Mapping Project  
<http://www.islandstrust.bc.ca/mapping/ecosystem/abouttheproject.htm>
- ♦ Regional District of Nanaimo Environmentally Sensitive Areas Atlas: A sample map is available (<http://www.shim.bc.ca/atlas/namosamp.htm>), and more information is available from the planning department (<http://www.rdn.bc.ca/cms.asp?wpID=264>).
- ♦ Saanich Environmentally Significant Areas: A sample map is available (<http://www.shim.bc.ca/atlas/saansamp.htm>), and more information is available from the planning office or regional libraries (<http://www.saanich.ca/resident/environment/naturalenv.html>).
- ♦ Wildlife Tree Stewardship (WiTS) locations of wildlife trees is available at a scale of 1:50,000 through the WiTS website <http://www.wildlifetree.org/>. Local governments are encouraged to enter into data sharing agreements with the Ministry that will enable them to access the more detailed wildlife tree data for regional mapping, planning, and development approval purposes. Landowners can also contact the WiTS office directly for more details on individual nest trees and properties.

#### Sensitive Ecosystems Inventory Information:

AXYS Environmental Consulting Ltd. 2005. Redigitizing of Sensitive Ecosystems Inventory Polygons to exclude disturbed areas. Summary Report to Canadian Wildlife Service. Revised June 2005.

[http://www.env.gov.bc.ca/appsdata/acet/html/deploy/acet\\_p\\_report\\_2124.html](http://www.env.gov.bc.ca/appsdata/acet/html/deploy/acet_p_report_2124.html)

Caskey, M. and M. Henigman. 2001. Audit of Selected Polygons of the Sensitive Ecosystems Inventory of East Vancouver Island and the Gulf Islands, 1999 – 2001: Summary Report.  
<http://www.env.gov.bc.ca/vir/pa/seiauditfinal0902s.pdf>

Sensitive Ecosystems Inventory website <http://www.env.gov.bc.ca/sei/index.html>

Sensitive Ecosystems Inventory: East Vancouver Island and Gulf Islands 1993-1997. Volume 1: Methodology, Ecological Descriptions and Results  
[http://www.env.gov.bc.ca/sei/van\\_gulf/publications.html](http://www.env.gov.bc.ca/sei/van_gulf/publications.html)

Sensitive Ecosystems Inventory: East Vancouver Island and Gulf Islands 1993-1997. Volume 2: Conservation Manual [http://www.env.gov.bc.ca/sei/van\\_gulf/publications.html](http://www.env.gov.bc.ca/sei/van_gulf/publications.html)

Sensitive Ecosystems Inventory mapping  
[http://www.env.gov.bc.ca/appsdata/acet/html/deploy/acet\\_p\\_report\\_2124.html](http://www.env.gov.bc.ca/appsdata/acet/html/deploy/acet_p_report_2124.html)

Sensitive Ecosystems Inventory disturbance mapping  
[http://www.env.gov.bc.ca/appsdata/acet/html/deploy/acet\\_p\\_report\\_2124.html](http://www.env.gov.bc.ca/appsdata/acet/html/deploy/acet_p_report_2124.html)