

REVISED AND EXPANDED THIRD EDITION

# BRITISH COLUMBIA

A NATURAL HISTORY OF ITS ORIGINS,  
ECOLOGY, AND DIVERSITY  
WITH A NEW LOOK AT CLIMATE CHANGE

RICHARD CANNINGS AND SYDNEY CANNINGS



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Greystone Books is committed to reducing the consumption of old-growth forests in the books it publishes. This book is one step towards that goal.

Page ii: Sagebrush Mariposa Lily.

Right: These colourfully oxidized rocks above the Bonaparte River were formed by ancient hot springs.

Pages vi-vii: Sunrise on the Coast Mountains above Duffey Lake.






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# PREFACE



**W**HEN WE WROTE *British Columbia: A Natural History* in 1996, we left many stories unwritten, and many that we had written were edited out for space considerations. In 1998 and 1999 we expanded and rewrote seven chapters to create four smaller books (*Mountains and Northern Forests*, *The World of Fresh Water*, *Geology of British Columbia*, *Life in the Pacific Ocean*) that addressed some of these shortfalls. Much of that material was incorporated into the second edition in 2004. *Geology of British Columbia* was extensively revised in 2011. This revised third edition adds new information and images throughout the volume, including the revisions from *Geology* and material regarding climate change and how it is expected to affect the ecosystems of British Columbia.

British Columbia is a large, diverse province, and the natural history of British Columbia is correspondingly immense; it is simply too big a subject for one book to cover in depth. This book, therefore, is neither an exhaustive collection of facts about the natural history of British Columbia nor a species-by-species guide to the plants and animals of the province. Rather, it is intended to provide an introduction to the ecosystems of the province and to tempt readers to learn and explore more by offering a few intriguing, in-depth stories about life in those ecosystems.

We have used English names of plants and animals wherever possible, and the names of distinct species are capitalized throughout for clarity. The scientific names of all species mentioned are provided in the index.

Each chapter was written predominantly by one of us. Richard wrote most of Chapters 2, 4, 5, 6 and 8, and Sydney wrote most of Chapters 1, 3, 7, 9 and 10. The personal anecdotes contained in each chapter are those of the major author of the chapter. Some of the new material added to Chapters 1, 4 and 10 was written in collaboration with JoAnne Nelson, Marja de Jong Westman and Robert Cannings, respectively.

Each chapter stands on its own; thus, you need not read the chapters in order. However you choose to read the book, we hope that it will help you understand and appreciate the richness and diversity of our province.







# ACKNOWLEDGEMENTS

**T**HIS BOOK WAS inspired by many years of conversations along forest trails, around campfires and in university coffee rooms and government offices. The naturalist tradition in British Columbia is largely an oral tradition, and many knowledgeable people have freely shared their stories with us. We could not have begun to write this book without them.

In particular, we would like to thank Trevor Goward, who provided inspiration and insightful comments on all parts of the book. Chapter 1 was written in collaboration with JoAnne Nelson, and the best prose of that section is hers. Similarly, portions of Chapters 4 and 10 were written in collaboration with Marja de Jong Westman.

Margaret Holm, Leah Ramsay, Douglas Leighton, Nancy Baron, David Stirling, Deanna McLeod, Robert Cannings and Bette Cannings all gave valuable suggestions on the content and style of the original manuscript.

Others that gave freely of their knowledge were Bruce Archibald, Jack Bowling, Tom Carefoot, Maurice Colpron, Dennis Demarchi, Ray Demarchi, Doug van Dine, Graham Gillespie, Carlo Giovanella, Dave Green, Mike Hawkes, Richard Hebda, Catherine Hickson, Darren Irwin, Gail Kenner, Rick Kool, Ken Lertzman, Al Lewis, Don McPhail, Sandra Millen, Jim Monger, Judy Myers, Bill Neill, Tom Northcote, Laurence Packer, Don Reid, June Ryder, Geoff Scudder, Tony Sinclair, Terry Taylor, Howard Tipper, Tongli Wang, Marja de Jong Westman and Grant Zazula. Their comments and suggestions greatly improved the depth and accuracy of the book. Any remaining errors, however, are ours alone.

We truly appreciate the work of Donald Gunn, whose line drawings are a major part of this book. Gerald Straley and Tom Carefoot provided other sets of illustrations, as did Hannah Nadel, Robert Cannings, Tim Parsons, Nola Johnston, Briony Penn, Alex Peden, Wilf Schofield and Bob Carveth. Many photographers freely offered their images as well, but we would especially like to thank Douglas Leighton, Steve Cannings, Chris Harris, Mark Hobson, Al Grass, Graham Osborne and Elaine Humphrey for their help in that regard. Rolf Ludvigsen and UBC Press kindly gave permission to use photographs of fossils from their fine book *Life in Stone*; the photographs were originally provided by the authors of the chapters of the book: Mark Wilson, James Basinger, Ruth Stockey and Wesley Wehr.





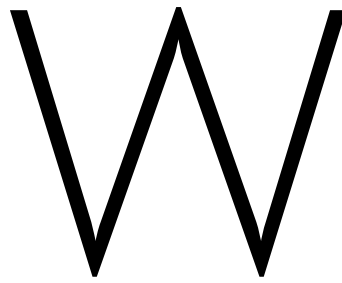




A NATURAL HISTORY

# INTRODUCTION

# INTRODUCTION



WE SPENT A fortunate childhood in the Okanagan Valley, rambling almost every day across wide grasslands and climbing rolling hills covered with flowers and fragrant pines. We took the natural world for granted then; it

was literally our backyard. Only later, after exploring more of British Columbia and the world, did we realize how lucky we were to have had parents who encouraged us to love the natural world and learn its ways and how lucky we were to have grown up in British Columbia.

British Columbia is a marvellous place for anyone who is curious about nature. Whether you are strolling in a neighbourhood wood lot, kayaking on the salt chuck, hiking over an alpine pass or driving along a northern highway, the stunning natural scenery lures you on. But British Columbia is more than scenery. For the naturalist, British Columbia is wonderful because it is wonderfully diverse: one province encompassing ten ecological provinces, each with a multitude of natural communities.

Over the millennia, unimaginably powerful tectonic forces have pushed and piled up mountains and plateaus, and ages of rain and glacial ice have



carved them into complex systems of valleys, canyons, benches, hills, basins and floodplains. Standing on the western edge of the continent, facing the westerly winds, British Columbia's mountain ranges divide this intricate landscape into climatic stripes of cold and hot, wet and dry.

The complex interaction of geology, topography and climate has produced a tremendous variety of natural communities where animals and plants flourish. The West Coast offers the rich Pacific Ocean and its fringing kelp forests, eel-grass beds and big, sandy bays filled with clams; temperate rain forests of spruce, cedar, hemlock and fir draping steep-walled fiords, with Grizzly Bears fishing for salmon in clear, green rivers; dozens of small islands where oak, juniper and arbutus grow on the sandstone shelves and eagles and sea ducks are drawn to spawning herring.

Warm oceanic winds flow up and over ice-capped mountains; meadows are laden with deep snow in winter and blaze with flowers in summer. Aromatic pine and fir forests cloak the eastern slopes where chipmunks chatter and cicadas whine. Hot, sunny grasslands are awash with the smell of sage after a rainstorm; scorpions and rattlesnakes hide in the warm rocks.

In the deep river valleys filled with marshes, Muskrat, Beaver and Moose move through still waters. Endless plateaus are dotted with lakes, where loons dive for trout. In the big northern spruce forests, Lynx and Snowshoe Hares crouch in thickets of wild rose, Highbush-cranberry and Fireweed.

Pages x-1: An autumn evening at the south end of Okanagan Lake, a landscape shaped by the advance and retreat of Pleistocene glaciers.

Below: Zanardi Rapids, south of Prince Rupert. Canada's richest tidal waters flow past its wettest forests along British Columbia's west coast.



## BRITISH COLUMBIA'S BIOLOGICAL DIVERSITY

British Columbia has more species of living things than any other Canadian province (Table 1). But the diversity goes further, since the mountain and water barriers that divide British Columbia have isolated populations of animals and plants from their relatives. Over the millennia, many of these populations have gone their own genetic ways, creating genetic diversity within each species.

Although the reasons for the existence of this rich assemblage of species can be attributed largely to topographic and climatic diversity, other factors are in British Columbia's favour as well. The fact that British Columbia's western border is a major ocean adds many species to the provincial list, and the fact that its eastern border traverses the Rocky Mountains adds a bundle of Great Plains and eastern forest species as well.

The intricate topography of the province juxtaposes mountains, plateaus, valleys and coastal plains with their associated lakes, rivers and wetlands to

form a myriad of complex and varied ecosystems. Their plant and animal inhabitants tie all these habitats together to form a cohesive and exciting network of ecosystems that awaits discovery by the curious naturalist.

Some species of animals and plants are endemic to British Columbia, meaning that they are not known to occur anywhere else in the world. On the insect level, 168 species are endemic to British Columbia, and more are discovered every year. Six plant species, most of them restricted to the coast, are endemic as well.

For many other species, British Columbia is home to most of the world population. About 80 per cent of all Cassin's Auklets nest on the British Columbia coast, a million of them on Triangle Island alone. Most Trumpeter Swans nest in Alaska, but more than half spend the winter on

British Columbian estuaries. Considering the amount of steep rock habitat in British Columbia, it is not surprising that 60 per cent of the world's Mountain Goats are found there; other impressive tallies for the province include 30 per cent of all Bald Eagles and 25 per cent of all Grizzly Bears.

## LEARNING THE LANGUAGE OF NATURAL HISTORY

How does a curiosity about nature begin? With a high school biology project? A hike in the mountains? Or the birds visiting your backyard bird feeder?

**TABLE 1: NUMBER OF SPECIES OF SELECTED GROUPS OF PLANTS AND ANIMALS**

*Note: Freshwater and marine fish totals include species that are found in both environments.*

	B.C.	Canada
Fungi	10,000	15,000
Mosses	758	1002
Vascular plants	2127	3859
Insects	35,000	55,000
Mites	7000	10,000
Amphibians	22	47
Reptiles	19	48
Mammals	149	218
Birds	509	664
Freshwater fish	99	206
Marine fish	436	1311



Naturalists fall into the study of natural history in many ways. Most of us start as casual observers of nature, enjoying the outdoors without regard to the names, addresses and occupations of its inhabitants—but then one or two questions about a bird or flower will start to open up a whole world of questions.

But the very diversity that makes the natural world fascinating can also make it an intimidating subject to study. A curious person, setting out with eyes and ears wide open, can learn a lot on his or her own, but by far the easiest way to make a start is to find a friend or acquaintance who shares your interest. Studying natural history is also a lot like learning a foreign language. A few guidebooks are necessary to act as dictionaries, frequent practice is a good idea, and it really helps to have friends who are fluent in the subject.

Many people balk at learning names. Although you can certainly enjoy a walk through a forest without knowing the name of a single tree, it helps to learn the names of at least the common trees and shrubs if you want to understand the forest's basic ecology. And it's fun to learn names—because once you've learned them, you will find old friends in new places. Moreover, knowing the names leads to other discoveries. First, your books will be able to tell you about animal and plant acquaintances. And then you will realize that some species are almost always found together in a natural community and that they like their neighbourhood shady or hot or humid—and you will be well on your way to becoming an ecologist. Don't worry that if you learn the scientific name of a plant, you may no longer be able to appreciate it aesthetically—you will find that learning names only enhances the sense of joy and wonder you experience on your explorations of nature.

After you can answer the simple “What is it?” questions on your explorations of nature, you are ready to go on to the much more interesting questions of where, how, why and when. You are ready to read the landscape, meaning that you keep your eyes and the rest of your senses open for patterns and continually ask yourself questions. Why are all the big trees here Ponderosa Pines but all the seedlings Douglas-firs? Why is this patch of flowers still blooming when all the other ones have gone to seed? Why is this pond ringed with Cattails and that one completely bare of vegetation? Reading



A female Barrow's Goldeneye leaves its nest hole near Riske Creek on the Chilcotin Plateau. Sixty to 90 per cent of the world population of this duck lives in British Columbia, breeding on Interior lakes and wintering on protected coastal inlets.

A crab spider, *Misumena vatia*, waits for an unwary fly on a thistle flower. There are more than six hundred species of spiders in British Columbia, all important predators on insects, yet we know surprisingly little about their distribution and ecology.



the landscape means you can never get bored outside again—it turns every hike and drive into a learning adventure.

## THE NEED TO KNOW MORE

The *Birds of British Columbia*, a four-volume set published between 1990 and 2002, was written using a database of over two million bird sightings (most of them supplied by amateur naturalists) and a bibliography of some 4700 books and articles. Although these volumes are an up-to-date synthesis of all that is known about British Columbia birds, the more one uses these books, the more one realizes that they say just as much about what we don't know as what we do know. Vast areas of northern British Columbia have never been visited by a bird-watcher. The distribution and abundance of many species that are restricted to the far northeast or northwest of the province are known only vaguely. We don't know whether they are common and widespread or breed only in one or two valleys.

But our ignorance lies not only in the remote north. Five hundred thousand Ancient Murrelets, about three-quarters of the world population, nest around the Haida Gwaii. These birds move south along the coast in the fall and early winter, then largely disappear, reappearing in spring at the breeding colonies. They probably winter at sea, but where is still a mystery. Thousands of Harlequin Ducks breed in British Columbia, a significant proportion of the world population, but only five nests have ever been found in the province.

Thousands of Sandhill Cranes fly over British Columbia every spring and fall. These are primarily Arctic-nesting populations, whose migration routes are relatively well known. But how many cranes breed in British Columbia? Even though cranes are large, striking birds, they prefer to nest in remote marshes and bogs, and we simply don't know how many nest here. Although we have a vague idea of their breeding range, we really don't know in detail where they nest either. Cranes that nest south of the Arctic can be categorized into two or more subspecies—but we don't know which subspecies breed where in British Columbia. All these questions are important ones if we want to make rational decisions about the management of cranes.

Birds are probably the best-known group of organisms. If you wanted to find where rare wildflowers are known to bloom, you would have to rely on a few decades-old specimens with vague locality labels. And what about mice or bats? Spotted Bats were discovered for the first time in British Columbia in the south Okanagan Valley in 1979, but after a few naturalists learned what they sounded like, they have been heard up through the dry Interior as far north as Williams Lake. But we still don't know what Spotted Bats do in the winter. In fact, we know very little about the hibernation or migration of any of British Columbia's bat species, even the common ones. And our knowledge of invertebrates and fungi, with their awesome diversity, is on a different plane of ignorance altogether.

HOW DO YOU PLACE A VALUE ON INSPIRATION?  
HOW DO YOU QUANTIFY THE WILDNESS OF BIRDS WHEN, FOR  
THE MOST PART, THEY LEAD SECRET AND ANONYMOUS LIVES?

Terry Tempest Williams, *Refuge*

We live in times of tremendous environmental change. The grasslands and pinewoods we walked through as boys are filling with walled cities of retirement homes; the south Okanagan natural landscape is considered one of the most endangered ecosystems in Canada. Ancient coastal forests have been reduced to a few remnant valleys; deep, clear fiords are closed to shellfish harvesting because of chemical contaminants. Being a naturalist opens your eyes to these daily differences around you. Knowing more about the natural world helps you listen objectively to conflicting media reports about forestry practices, new housing developments and vanishing species. All of us need to know more about this world. We hope this book will provide a little of this knowledge and, more important, pass on an enthusiasm and a love for the natural world.







CHAPTER ONE

# ORIGINS