



TAKING NATURE'S PULSE

THE STATUS OF BIODIVERSITY IN BRITISH COLUMBIA

2008

SUMMARY REPORT



Biodiversity: What Is It and Why Is It Important?

Biodiversity (short for “biological diversity”) refers to the variety of life in all its forms. It includes the diversity of ecosystems, species and genes and the natural processes that link them – an ensemble that many people think of as Nature.

Biodiversity is essential for sustaining both environmental and human well-being. It supports vital ecological processes such as regulating the climate, maintaining adequate oxygen in the atmosphere, filtering and purifying water, pollinating plants, decomposing waste and regulating population abundance.

Biodiversity also provides natural resources that support industries such as forestry, fishing and agriculture, and landscapes that attract residents and tourists to the outdoors for recreational enjoyment and spiritual renewal.

Many people believe that biodiversity has intrinsic value regardless of the presence of humans, and that we have a moral and ethical responsibility to look after it.

ECOSYSTEMS WITHIN ECOSYSTEMS

As small as a drop of lake water or as vast as planet Earth, ecosystems are nested one within another. British Columbia has 25% of Canada’s supply of flowing fresh water. Accessible fresh water in lakes, streams, reservoirs and wetlands provides vital habitat for a disproportionate number of B.C.’s species, including a wide variety of plants, fish, mussels, crayfish, snails, reptiles, amphibians, insects, micro-organisms, birds and mammals living in, on or around water. PHOTO: ERIC HOOD



B.C.'s Rich Biodiversity Heritage

BC.'s diversity is extraordinary and largely intact, thanks to the province's unusual geological history, wide climatic variations and brief industrial history.

Although human settlement and development have had a significant impact, especially in biodiversity-rich valleys, much also is intact. In a province larger than France and Germany combined, about 14% of its area (collectively larger than all of England) is under protected area status.

A Starting Point for Conserving Biodiversity

Taking Nature's Pulse: The Status of Biodiversity in British Columbia provides a comprehensive, science-based assessment of the current condition of biodiversity in British Columbia.

The 268-page report was prepared by Biodiversity BC, a partnership of governments and non-government conservation organizations created to improve biodiversity conservation in B.C. The report is available on Biodiversity B.C.'s website (www.biodiversitybc.org) together with two companion documents: *The Biodiversity Atlas of British Columbia* and *Ecological Concepts, Principles and Applications to Conservation*.

Taking Nature's Pulse considers threats to biodiversity due to human impacts following European contact. The report describes the status of terrestrial and freshwater biodiversity in the province as well as the overlap between the marine realm and both the freshwater and terrestrial realms. It does not, however, assess purely marine biodiversity, such as whales and marine phytoplankton, as this falls within the mandate of Fisheries and Oceans Canada.

The report concludes with 23 major findings grouped under six themes:

- Ecosystem Diversity
- Species Diversity
- Genetic Diversity
- Key and Special Elements of Biodiversity
- Threats to Biodiversity
- Capacity and Knowledge

These findings support the report's conclusion that British Columbia's biodiversity is globally significant because of its variety and integrity, but without immediate action is vulnerable to rapid deterioration, especially in light of climate change.

▲ The western yellow-bellied racer is one of nine species of snake inhabiting British Columbia. Of all Canadian provinces and territories, B.C. has the largest number of reptile species found in only one province or territory.

PHOTO: JARED HOBBS

British Columbia's biodiversity is globally significant because of its variety and integrity, but without immediate action is vulnerable to rapid deterioration, especially in light of climate change.



GLACIAL REFUGES

Haida Gwaii / Queen Charlotte Islands, encompassing 250 separate islands in total, has been called the Galapagos of the North because of the high levels of biodiversity, including numerous species that are endemic (existing nowhere else). Haida Gwaii owes its unique biodiversity in large part to the fact that it escaped some of the glaciations that once spread across British Columbia.

PHOTO: VILLAGE OF SKEDANS, DAVID GREER



**▲ LOW-ELEVATION GRASSLANDS:
B.C.'S MOST THREATENED
ECOSYSTEMS**

Grassland ecosystems are among the most widely threatened in B.C., primarily as a result of conversion for agriculture and human settlement. In addition, the spread of alien plant species – particularly knapweed, which could spread to more than a million hectares of land in the province if left unchecked – has choked out native grasses.

PHOTO: LAURE NEISH



The mountain bluebird depends on conservation of grassland habitat.

PHOTO: LAURE NEISH

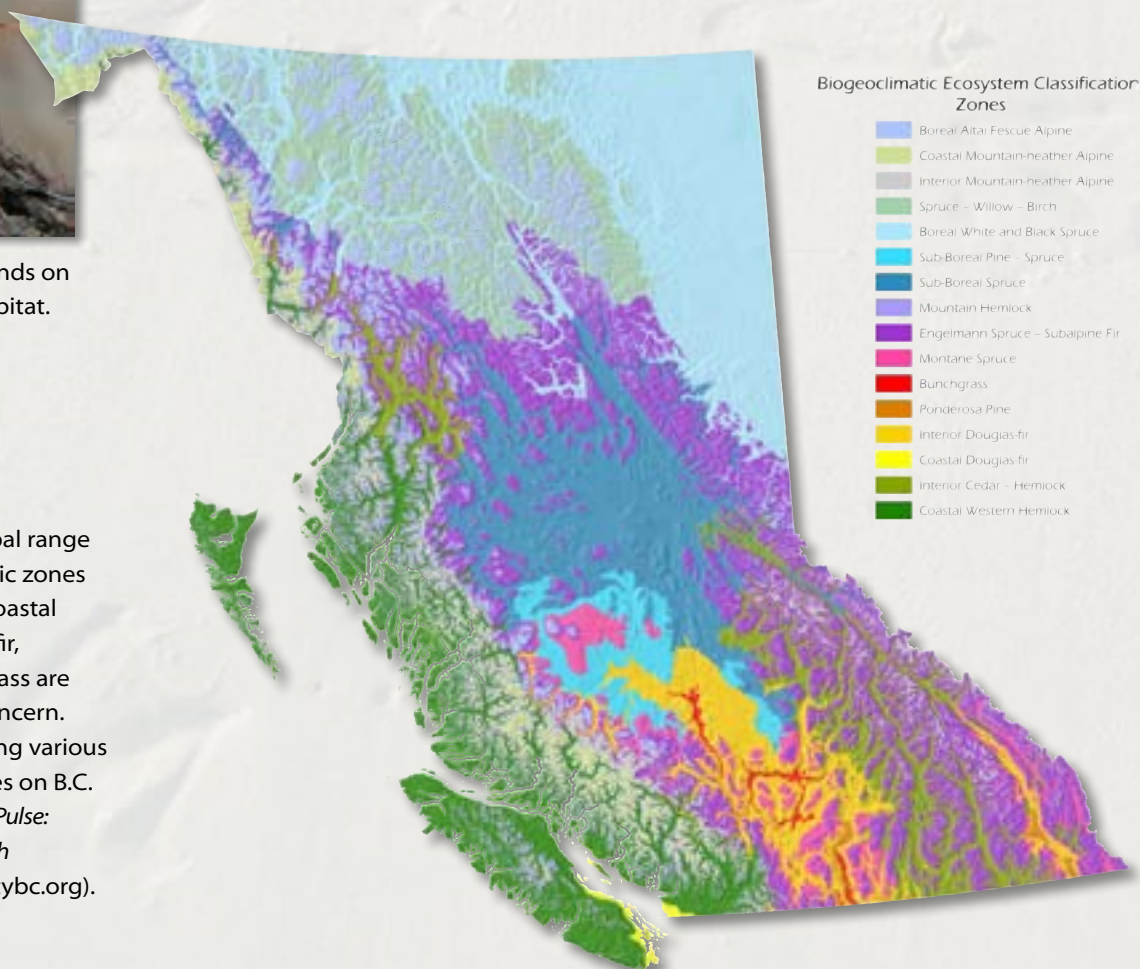
BIOGEOCLIMATIC ZONES

B.C. has a majority of the global range for six of the 16 biogeoclimatic zones that occur in the province. Coastal Douglas-fir, Interior Douglas-fir, Ponderosa Pine and Bunchgrass are of provincial conservation concern. This is one of 22 maps detailing various components of and influences on B.C. biodiversity in *Taking Nature's Pulse: The Status of Biodiversity in British Columbia* (at www.biodiversitybc.org).

Ecosystem Diversity

Ecosystems are complex, dynamic and adaptive systems that are continually evolving. When they become simplified through the loss of component parts or processes, they lose their ecological resilience – the ability to withstand and adapt to natural or human-caused disturbances, including climate change. Simplification can be the result of numerous factors, including human activity (such as settlements, natural resource use, and transportation corridors) and the impact of alien invasive species.

For the purposes of this report, terrestrial ecosystems were assessed at a broad provincial scale using the Biogeoclimatic Ecosystem Classification (BEC) system, which was developed specifically for B.C. Biogeoclimatic zones are broad geographic areas sharing similar climate and vegetation. Twelve of B.C.'s 16 biogeoclimatic zones are forested, three are alpine and one is dominated by grasses.



The finest scale used in the report is ecological communities – recurring plant communities with characteristic species and structure, such as the antelope-brush / needle-and-thread grass ecosystem in the Okanagan Valley. The Garry oak ecosystem in the Coastal Douglas-fir BEC comprises several different ecological communities, such as Garry oak–arbutus and Garry oak–oceanspray. To date, 611 separate ecological communities have been described in B.C.

The assessment of aquatic biodiversity in *Taking Nature's Pulse* is based on the nine Major Drainage Areas into which all surface freshwater in the province flows, feeding large rivers like the Skeena, Taku, Peace and Fraser (which drains roughly one-quarter of the province). Freshwater and terrestrial ecosystems overlap with the marine realm in intertidal zones and estuaries – areas that are both highly productive and important for biodiversity in all three realms.



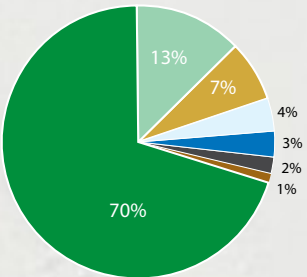
ESTUARIES: BIOLOGICALLY RICH RIVER OUTLETS ON THE B.C. COAST

Estuaries are partly enclosed bodies of coastal water where salt water is diluted by river and stream runoff. The ceaseless mixing of ocean, land and river nutrients in constantly flowing water makes estuaries a very rich biological environment. Even though estuaries make up only 2.3% of the length of B.C.’s coastline, they are used by an estimated 80% of all coastal wildlife. B.C.’s 440 plus estuaries are rare ecosystems, threatened by conversion to human uses and by potential impacts of climate change such as erosion, sedimentation and flooding.

PHOTO: TRUDI CHATWIN

MAJOR FINDINGS ON ECOSYSTEM DIVERSITY:

1. At the broad scale, four biogeoclimatic zones [Coastal Douglas-fir, Interior Douglas-fir, Ponderosa Pine, and Bunchgrass], representing approximately 5% of British Columbia’s land base, are of provincial conservation concern (critically imperilled, imperilled or vulnerable).
2. At the fine scale, more than half of the ecological communities described in British Columbia are of provincial conservation concern.
3. British Columbia has a majority of the global range for six of the 16 biogeoclimatic zones that occur in the province [Coastal Douglas-fir, Interior Cedar–Hemlock, Montane Spruce, Mountain Hemlock, Sub-boreal Pine–Spruce, and Sub-boreal Spruce].
4. The Coastal Douglas-fir biogeoclimatic zone is the rarest biogeoclimatic zone in British Columbia and is of great conservation concern.
5. Low-elevation grassland communities are the rarest land cover type in British Columbia and are concentrated in the biogeoclimatic zones of conservation concern [See Major Finding 1].
6. Significant areas of wetlands in British Columbia have been converted or degraded, particularly in the two Major Drainage Areas of greatest conservation concern [those of the Columbia River and Fraser River].
7. Estuaries are of concern in British Columbia because of their rarity and the level of human impacts to them.



- FOREST
- ALPINE
- WETLANDS
- GLACIERS
- FRESHWATER
- HUMAN DOMINATED*
- GRASSLANDS

* Areas mapped as: urban, agriculture, recreation (e.g., golf courses) or mining.

LAND COVER TYPES IN B.C. AS A PERCENTAGE OF TOTAL LAND AREA



▲ TINY MITES PLAY A BIG ROLE

Most animals are so tiny you can barely see them at all. Scientists estimate that about two million soil invertebrates (animals without backbones such as mites) live in every square meter of ground in the Pacific Northwest. These unimposing creatures perform vital ecosystem functions such as nutrient cycling. Fellow invertebrates like the banana slug are massive by comparison.

PHOTO: JARED HOBBS



WINGED MIGRATIONS ALONG THE PACIFIC FLYWAY

Almost the entire world population of western sandpipers (which breed in Alaska and Siberia) migrates along the B.C. coast. Up to 1.2 million sandpipers (roughly twice the human population of Vancouver) passes each year through the Fraser delta, a key area of species concentration for many birds migrating along the Pacific Flyway, which extends from Alaska to Mexico.

PHOTO: TOM MUNSON

Species Diversity

A species is a genetically distinct group of organisms that are capable of successfully interbreeding. Each species plays a unique role in nature. Of all the Canadian provinces and territories, B.C. is home to the richest diversity of vascular plants, mosses, mammals, butterflies and breeding birds, and the largest number of species of reptiles, tiger beetles and amphibians found in only one province or territory.

More than 50,000 different species (not including single-celled organisms) exist in B.C., but only about 3,800 of these have been assessed for their conservation status. Some parts of the province (primarily unroaded and unsettled areas) have not been surveyed for species occurrence and some taxonomic groups remain largely unstudied.

Some species that have disappeared from other jurisdictions still flourish here. For example, B.C. has the largest population of grizzly bears (estimated at about 17,000) of any province or state apart from Alaska. By contrast, California once had an estimated 10,000 grizzlies and now has none.

MAJOR FINDINGS ON SPECIES DIVERSITY:

8. Of the species assessed to date in British Columbia, 43% are of provincial conservation concern, and these are concentrated in the four biogeoclimatic zones of conservation concern [Coastal Douglas-fir, Interior Douglas-fir, Ponderosa Pine, and Bunchgrass].
9. British Columbia is known to have a majority of the global range for 99 species.



OLD EXTINCTIONS AND NEW

Woolly mammoths like the one in this photo as well as mastodons, giant bison and giant ground sloths roamed throughout what is now B.C. about 12,000 years ago and became extinct just around the time that humans began to settle the area.

Species extinctions have occurred throughout the history of the planet, but the rate of extinction today is up to 1,000 times what it was in prehuman times and may increase a hundredfold more in the future as a result of human and climate change impacts.

PHOTO: ANDREW NIEMANN



**SPECIES SLIPPING
TOWARDS EXTINCTION**

The World Conservation Union has ranked 40% of the species it has evaluated as being threatened with extinction. Forty-three percent of the slightly more than 3,800 species assessed to date in B.C. are of conservation concern.

The 14 species that have disappeared altogether from B.C. include birds like the greater sage grouse and passenger pigeon, the western pond turtle (pictured here), the pygmy short-horned lizard, a freshwater mollusc and seven plants. Another 28 species are considered "historic," meaning there has been no verified record of their presence in the past 40 years.

No matter how ordinary a plant or animal might look, every species plays an important role in the functioning of biodiversity. Biodiversity is a little like a clock where every tiny component is needed for the instrument to keep proper time. PHOTO: GARY NAFIS



▲ IN DIVERSITY LIES STRENGTH – FOR PACIFIC SALMON

There are more than 400 genetically distinct populations among five species of Pacific salmon in B.C. This variability has allowed salmon to use all available stream systems in the province, adding to their ability to adapt to changing conditions. It also increases the odds that at least some populations may be able to adapt to stream and ocean warming and thus ensure continuity of the species.

PHOTO: ROBERT KOOPMANS

B.C. has a disproportionately high level of genetic diversity relative to its species diversity.

Genetic Diversity

Genetic diversity is the foundation of biodiversity. Genes are the functional units of heredity and genetic variation, which enable species to adapt to changing environments. B.C. has a disproportionately high level of genetic diversity relative to its species diversity. The province's glacial history, complex topography and varied climate have contributed to the evolution of a wide variety of adaptations to different environments. As a result, many species occur in the province as geographically distinct subspecies, which differ from each other in appearance, environmental tolerances and behaviour. These differences reflect differences in genetic make-up.

Due to B.C.'s large size and biophysical variability, the province is home to many species that are at the edge of their range. Such populations are often genetically distinct from populations at the core of the species range and potentially may be better able to adapt to environmental stresses such as those caused by climate change.

MAJOR FINDING ON GENETIC DIVERSITY:

10. British Columbia has a high level of genetic diversity within species, which is critical for adaptation and resilience.

THE KERMODE BEAR EXPLAINED IN BLACK-AND-WHITE

Biodiversity is made up of ecosystem, species and genetic diversity. Genetic diversity within a species is part of nature's toolkit for adapting to variable and changing conditions. In black bears, one example of genetic variability is different colour morphs, including the white coastal morph known as the Kermode or spirit bear (there are also bluish, cinnamon and black morphs).

PHOTO: IAN MCALLISTER





**SUBSPECIES AND HYBRIDS:
ELEMENTS IN THE GENETIC MIX**

Genetic variation within a species takes several forms. Just as coho salmon populations in different streams are genetically different, genetic variations within bird species are also common.

Three of the six subspecies of the Steller's jay (B.C.'s official bird, inset) inhabit B.C., and the subspecies unique to Haida Gwaii / Queen Charlotte Islands has a vulnerable provincial conservation status, meaning it's at moderate risk of extinction.

Ninety-five percent of northern flickers (large photo) between B.C. and Texas are hybrids between the red-shafted and yellow-shafted subspecies or between the red-shafted and closely related gilded flicker. PHOTOS: BRUCE WHITTINGTON



▲ THE KEY ROLE OF ROT: FUNGI AT WORK

Fungi decompose dead animals and plants by sending parts of their bodies (hyphae) directly into their food, secreting chemicals to break down big molecules into smaller ones, then absorbing the food directly into their cells. If fungi suddenly disappeared from ecosystems, carbon and other molecules essential for life would be locked into molecules too large for plants to absorb.

PHOTO: ORANGE PEEL FUNGUS, VIRGINIA SKILTON



BIRDS DO IT, BEES DO IT . . .

Birds, bees, beetles, moths and mosquitoes all play a crucial role in pollinating the world's plants – trees, flowers, even food crops. In fact, one of every three bites of food we take has resulted from successful animal-plant pollination. Declines in biodiversity lead to declines in insect species – our most valuable pollinators.

European honeybees (a non-native species) like the one in this picture play a small role in pollination compared to other insects. The blue camas that the bee is pollinating is common in Garry oak ecological communities, and its roots were an important food source for early First Peoples.

PHOTO: DAVID GREER

Key and Special Elements of Biodiversity

Key elements are species and ecosystem components and the processes performed by them that have a fundamental or disproportionate influence on how ecosystems function. Examples include pollination (vital to plant reproduction); connectivity within ecosystems (allowing movement of species); the ability of wetlands to filter, cleanse and replenish water supplies; and the important role of broadleaf trees in ensuring forest health.

Special elements are uncommon components that in some cases are found only in B.C. Examples include seasonal concentrations of species, such as stopover points for migrating birds and rookeries where Steller sea lions gather to breed; special communities, such as temperate rainforests and intact large mammal predator-prey systems; and noteworthy features, including karst cave systems, hot springs, saline lakes and fishless lakes, all of which are inhabited by rare and specialized species.

MAJOR FINDINGS ON KEY AND SPECIAL ELEMENTS OF BIODIVERSITY:

11. The flow of water in lakes, streams, wetlands and groundwater systems is being seriously impacted in British Columbia by dams, water diversions, logging, stream crossings and climate change.
12. The natural disturbance processes that shape British Columbia's forests [such as wild fire and insects] are being disrupted by human activities.
13. British Columbia's mainland coast features a number of interconnected key and special elements of biodiversity: intact temperate rainforest, an intact large mammal predator-prey system, glacially influenced streams and salmon-driven nutrient cycling.
14. The majority of British Columbia has intact or relatively intact predator-prey systems, but a major threat to them is motorized access and associated human activities.
15. British Columbia has many significant seasonal concentrations of species [e.g., migratory birds, spawning salmon] that are vulnerable to human impacts.



KEYSTONE SPECIES: NATURE'S BALANCE OF OTTERS AND URCHINS

Keystone species play a role that holds whole ecosystems in place just like the keystone at the centre of a stone arch. Remove the keystone and the edifice (or ecosystem) crumbles.

Sea urchins look innocuous when nestled in a tidal pool in the intertidal zone, but they feed aggressively on kelp. By keeping sea urchins in check, sea otters (a keystone species) help preserve kelp forests, which shelter fish and invertebrates that are important sources of food for eagles, cormorants, mink and many other marine and terrestrial species.

When fur trade hunters completely wiped out sea otter populations in B.C., kelp forests were overrun by sea urchins and began to vanish. Recent reintroduction of the sea otter to B.C. from Alaskan populations has in turn allowed kelp forests to re-emerge.

SEA OTTER PHOTO: KLAAS LINGBEEK-VAN KRANEN; SEA URCHIN PHOTO: TAMMY PELUSO



▲ Satin flowers are a common sight in spring in Garry oak meadows in the Coastal Douglas-fir biogeoclimatic zone. The rarest of B.C.'s 16 biogeoclimatic zones has been rapidly diminishing as a result of conversion for human settlement and other uses.

PHOTO: DAVID GREER



ALIEN INVASIVE SPECIES

Alien species are non-native species that have been accidentally or deliberately introduced to British Columbia. Many aliens readily adapt, prospering to the detriment (and possible extinction) of native species that have had no chance to evolve defences to these intrusions.

The B.C. Conservation Data Centre lists 809 alien species in the province. An estimated 10% of alien species become invasive, meaning their presence has become so widespread that they pose a threat to biodiversity.

Alien invasive species are out in the wild and in just about everyone's backyard. They include plants like yellowflag iris (pictured above), purple loosestrife and knapweed, birds like European starlings, fish like the yellow perch that threatens native trout populations, mammals like the rats, raccoons and European rabbits ravaging the specialized ecosystems of coastal islands.

PHOTO: YELLOWFLAG IRIS, DAVID GREER

Threats to Biodiversity

B.C.'s biodiversity is in better shape than in many other places on the globe only because of the province's relatively short history of large-scale development and its mountainous terrain, but the threats to its species and ecosystems are clearly increasing.

Expanding human settlement and development are the most obvious but not the only threats to biodiversity in B.C. today. Settlements are typically located in the valleys where species are most diverse; the agriculture industry focuses on soils that are naturally fertile and grow an abundance of native grasses; the timber industry seeks out forests where trees are largest and, coincidentally, harbour the widest array of species; and transportation corridors crisscross and block wildlife migration routes.

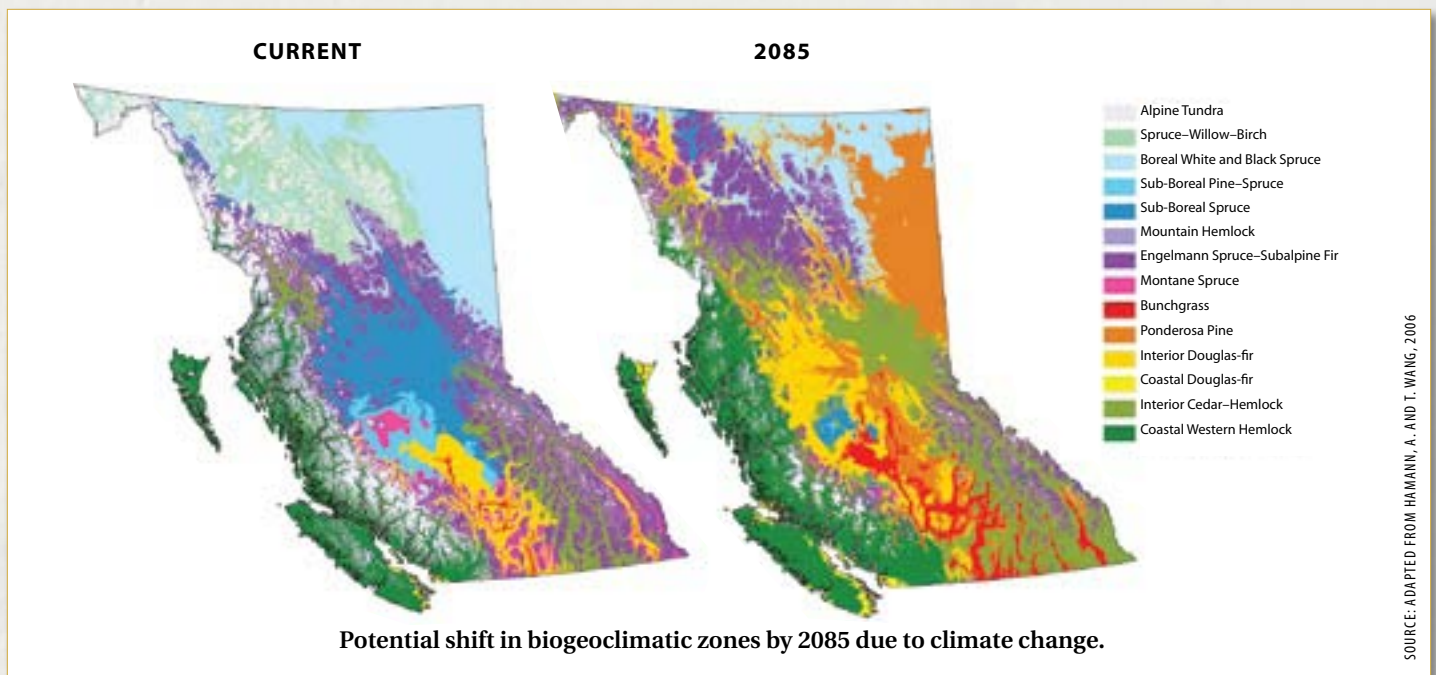
Of the six major stresses that threaten biodiversity in B.C., the three most significant ones are ecosystem conversion, ecosystem degradation and alien species. Ecosystem conversion (the direct and complete conversion of natural ecosystems to landscapes for human uses), has mainly occurred in valley bottoms and coastal regions. Ecosystem degradation (changes to the structure of a natural system from activities such as forest harvesting or water diversion) has occurred throughout B.C. around human settlements, reservoirs and in forested areas. Alien species pervade ecosystems virtually everywhere humans have settled and then move far beyond human settlements to threaten even remote ecosystems. And over all these threats looms climate change – the magnitude of its threat, which may in the end dwarf all the rest, can still not be accurately calculated.



CONVERSION OF NATIVE ECOSYSTEMS FOR HUMAN USES

Every year, significant amounts of native land are converted to such human uses as agriculture, settlement and transportation corridors. In the South Okanagan, for example, there was a large increase between 1990 and 2005 in the rate of conversion of grassland to vineyards, like the one in this photo, contributing to the loss of the antelope brush / needle-and-thread ecosystem.

PHOTO: TORY STEVENS



Though ranked lower, the remaining three stresses can have significant impacts on biodiversity, especially in localized areas. These stresses include environmental contamination (the release of contaminants into natural systems), species disturbance (the alteration of the behaviour of species due to human activities), and species mortality (the direct killing of individual organisms).

Climate change is likely to have a bigger and earlier impact on the Pacific Northwest than on many other places on the planet, with the mean average temperature across B.C. expected to rise between 3 and 4.8 degrees Celsius by 2080.



MAJOR FINDINGS ON THREATS TO BIODIVERSITY:

16. Ecosystem conversion from urban/rural development and agriculture has seriously impacted British Columbia's biodiversity, especially in the three rarest biogeoclimatic zones [Coastal Douglas-fir, Bunchgrass and Ponderosa Pine].
17. Ecosystem degradation from forestry, oil and gas development, and transportation and utility corridors has seriously impacted British Columbia's biodiversity.
18. Alien species are seriously impacting British Columbia's biodiversity, especially on islands and in lakes.
19. Climate change is already seriously impacting British Columbia and is the foremost threat to biodiversity.
20. The cumulative impacts of human activities in British Columbia are increasing and are resulting in the loss of ecosystem resilience.
21. Connectivity of ecosystems in British Columbia is being lost and, among other impacts, this will limit the ability of species to shift their distributions in response to climate change.

CLIMATE CHANGE AND SEASHELL FORMATION

In addition to its impact on the land, climate change is starting to affect the oceans as well. Carbon dioxide released into the atmosphere by human activities dissolves into the oceans from the air. This could increase ocean acidity to the point that sea creatures such as mussels, oysters, crabs, starfish and the limpets pictured above can't get the carbonate ions they need to build shells and other types of exoskeletons.

If global emissions follow current trends, ocean waters may be unable to support shell formation by the year 2050.

PHOTO: DAVID GREER



▲ Great blue herons have unerring aim for small prey in shallow waters along the shoreline.

PHOTO: FRANK LEUNG

THE RACE TO DISCOVER SPECIES BEFORE THEY DISAPPEAR

So much emphasis is put on avoiding extinction that we often overlook the importance of identifying and documenting existing but unknown species. Edward O. Wilson made this point well in his comparison of Earth exploration to space exploration:

In one sense we know much less about Earth than we do about Mars. The vast majority of life forms on our planet are still undiscovered and their significance for our own species remains unknown. This gap in knowledge is a serious matter: we will never completely understand and preserve the living world around us at our present level of ignorance. We are flying blind into our environmental future.

Scientists have so far identified about 1.75 million species on Earth, most of them very small creatures such as insects. That's a very small fraction of the more than ten million (estimates range from around three million to a hundred million) species that actually inhabit the planet. By improving our knowledge of these undocumented species, we may discover additional benefits that they provide to humans and the environment.

Capacity and Knowledge

Thousands, if not tens of thousands, of species in B.C. have not been scientifically described or are not documented as being present in the province. Species groups for which such information is particularly lacking include most of the invertebrates and non-vascular plants. This taxonomic knowledge gap is currently being made worse by an 'extinction of experience' as the scientists with the knowledge, skills and inclination to do the work required to fill the gaps are retiring and often are not being replaced.

The majority of species in B.C. have not been assessed for their conservation status and the global ranks for many species that have been assessed are out of date. The ecology of most species and the distributions of all but a very few are poorly understood. Coarse-scale ecosystem classifications are complete in B.C., but information at a finer ecosystem scale is incomplete, as is ecosystem information from neighbouring jurisdictions. Trend monitoring is extremely limited and data on distribution and population size are lacking for many species. Information about impacts on biodiversity is generally incomplete or out of date.

MAJOR FINDINGS ON CAPACITY AND KNOWLEDGE:

- 22. Gaps in our knowledge of biodiversity in British Columbia create major challenges for effective conservation action.
- 23. The capacity to address some of the gaps in our knowledge of biodiversity in British Columbia is being impacted by the loss of already limited taxonomic expertise.



PHOTO: CHRIS DARLING



BIODIVERSITY AND PHARMACEUTICALS: LESSONS FROM THE PACIFIC YEW

The Pacific yew tree was long considered an undesirable “weed species” in commercial forests in B.C. – until its bark was discovered to be a valuable source of taxol, one of the most potent anticancer drugs yet to be found. Then there was such a rush for the yew in B.C. that local First Nations, who have valued yew for centuries for its tough wood and medicinal qualities, expressed concern that it might be wiped out.

Most pharmaceutical drugs are originally derived from plants or animals. While advances in genetics play a role, many drugs owe their invention to traditional uses for hundreds or thousands of years by First Peoples, who developed a very detailed understanding of medicinal properties of plants and animals in their communities and carefully conserved them for future generations.

The knowledge that yet-to-be-identified species may yield important cures is a powerful incentive to conserve biodiversity as diligently as possible and should also provide an incentive to respect, conserve and learn from the teachings of B.C.’s First Peoples.

PHOTO: NANCY TURNER



▲ PHOTO: JEFF WILKINSON

The Path Forward: Responding to the Findings of Taking Nature's Pulse



WETLANDS: NATURE'S FILTRATION SYSTEM

Wetlands – including bogs, fens, swamps and marshes – make up 7% of the province's area but provide important habitat for more than 30% of B.C.'s species of conservation concern. They also provide a buffer against environmental extremes such as floods or droughts by absorbing water quickly and releasing it slowly with its quality improved.

PHOTO: BRUCE HARRISON

The 23 findings in *Taking Nature's Pulse* tell us what is important about the current state of biodiversity in our province and why we need to pay attention. While biodiversity in British Columbia is in relatively good condition, all is not well, and many aspects of biodiversity have either deteriorated or are under increasing threat.

The challenges of conserving biodiversity are very imposing but not insurmountable. *Taking Nature's Pulse* is a good beginning, but only a beginning. The report provides a detailed description of the current state of biodiversity in the province and tells us where we need to direct our priorities to biodiversity conservation.

By paying attention to the conclusions of the report – and, most especially, to its 23 major findings – all levels of government, First Nations, industry, communities, non-governmental groups and concerned citizens have an opportunity to take concerted action to address current threats to biodiversity and ensure its richness is maintained for the benefit of future generations. Addressing the challenges identified by the findings of *Taking Nature's Pulse* is not something that can be done by any one organization alone. It will require sincere and energetic collaboration among everybody with a stake in biodiversity conservation.

It is not the place of *Taking Nature's Pulse* to define what specific actions are needed to make this happen. However, to enable a path forward to be charted based on the findings in *Taking Nature's Pulse*, Biodiversity BC has crafted a vision for the future of biodiversity in B.C. and the three goals that it believes need to be met in order to realize the vision described on the following page.

By working together towards the achievement of Biodiversity BC's vision and goals, we can all help to ensure that British Columbia continues to be a spectacular place with healthy, natural and diverse ecosystems that sustain and enrich us all.



A Vision for B.C. Biodiversity in the Year 2100

British Columbia is a spectacular place with healthy, natural and diverse ecosystems that sustain and enrich us all.

We believe our vision for the year 2100 is realistic and can be achieved if British Columbians take to heart the 23 findings described on the previous pages. That means taking the necessary action in coming years to ensure that we conserve the province's rich biodiversity and maintain its ability to provide for our wide array of economic, social and cultural needs.

As a first step, realizing the vision we describe means embracing and making a commitment to achieve three goals that flow from the findings of *Taking Nature's Pulse*.

Goal 1: Conserving the Elements of Biodiversity

To maintain the diversity of genes, species and ecosystems, prevent elements of biodiversity from becoming at risk and contribute to global efforts for biodiversity conservation.

Goal 2: Increasing Awareness of the Importance of Biodiversity and Respect for the Natural Environment

To increase awareness and understanding about the importance and value of biodiversity and encourage British Columbians to take action on conserving biodiversity.

Goal 3: Providing Tools and Incentives to Enable Biodiversity Conservation

To provide tools and incentives to enable governments (including First Nations), industry, conservation organizations and citizens to improve conservation of British Columbia's biodiversity.



▲ PHOTO: JON FAULKNER

Taking Nature's Pulse: The Status of Biodiversity in British Columbia is part of a science foundation that also includes *The Biodiversity Atlas of British Columbia* and *Ecological Concepts, Principles and Applications to Conservation*. All three are available online at www.biodiversitybc.org.

A Template for Biodiversity Conservation: The Application of Ecological Principles to Conservation

Effective biodiversity conservation requires careful planning based on certain ecological principles that reflect scientific understanding of how ecosystems work and how to manage them in a way to maintain natural processes. These ecological principles, which provide a basis for best management practices, are rooted in ecological concepts, which are a series of established facts about ecosystems and ecosystem management. These two building blocks are combined into ecological applications to guide conservation actions.

The relationship between ecological concepts, principles and applications is shown in the following table.

OVERVIEW OF CONCEPTS, PRINCIPLES AND APPLICATIONS

ECOLOGICAL CONCEPTS	
ECOSYSTEM CONCEPTS	ECOSYSTEM MANAGEMENT CONCEPTS
<ul style="list-style-type: none">• Levels of biological organization• Native species• Keystone• Population viability/ thresholds	<ul style="list-style-type: none">• Ecological resilience• Disturbances• Connectivity/fragmentation <ul style="list-style-type: none">• Coarse and fine filter approach• Adaptive management• Ecosystem-based management• Risk is an inherent aspect of decision-making• Protected area
ECOLOGICAL PRINCIPLES	
<ul style="list-style-type: none">• Protection of species and species subdivisions will conserve genetic diversity• Maintaining habitat is fundamental to conserving species• Large areas usually contain more species than smaller areas with similar habitat	<ul style="list-style-type: none">• All things are connected but the nature and strengths of those connections vary• Disturbances shape the characteristics of populations, communities, and ecosystems• Climate influences terrestrial, freshwater and marine ecosystems
APPLICATION OF ECOLOGICAL CONCEPTS AND PRINCIPLES	
COARSE AND FINE FILTER APPLICATIONS	PLANNING APPLICATIONS
<ul style="list-style-type: none">• Use coarse and fine filter approaches• Ensure representation in a system of protected areas• Retain large contiguous or connected areas• Maintain or emulate ecological processes• Manage landscapes and communities to be responsive to environmental change• Manage towards viable populations of all native species• Preserve rare landscape elements, critical habitats and features, and associated species• Minimize the introduction and spread of invasive alien species that disrupt ecological resilience and population variability	<ul style="list-style-type: none">• Set objectives and targets for biodiversity in plans• Manage biodiversity at multiple levels of biological organization and multiple time and spatial scales• Incorporate spatial and temporal approaches to land use that are compatible with an area's natural potential• Avoid land uses that convert natural ecosystems and restore damaged ecosystems• Avoid, mitigate or as a last option compensate for the effects of human activities on biodiversity• Employ adaptive management of natural resources to maximize learning• Given that humans are a powerful agent of change, make science based decisions

About Biodiversity BC

The preparation of *Taking Nature's Pulse: The Status of Biodiversity in British Columbia* was coordinated by Biodiversity BC, which includes representation from the following organizations:

- British Columbia Ministry of Agriculture and Lands (Integrated Land Management Bureau),
- British Columbia Ministry of Environment,
- Ducks Unlimited Canada,
- Environment Canada,
- Habitat Conservation Trust Foundation,
- The Land Conservancy of British Columbia,
- Nature Conservancy of Canada,
- The Nature Trust of British Columbia,
- Pacific Salmon Foundation,
- Union of British Columbia Municipalities, and
- Canadian Parks and Wilderness Society (BC) – representing other environmental non-government organizations.

Biodiversity BC receives funding from the BC Trust for Public Lands, established by the BC government in 2004, with matching contributions from land conservation non-government organizations and other levels of government, to support improved conservation planning and more efficient acquisition and management of private lands with unique ecological values.

FOR FURTHER INFORMATION

Please visit Biodiversity B.C.'s website at www.biodiversitybc.org or send us an email at info@biodiversitybc.org.

The biologist Paul Ehrlich once observed that the condition of biodiversity in modern times is much like a plane gradually losing the rivets that hold it together. No one much notices when single rivets pop out, for they don't appreciably slow the flight of the aircraft. It's the continual nature of the popping (the piecemeal erosion of ecosystem, species and genetic diversity) that's cause for concern, for if no one takes action to stop it and reverse the trend while there's still time, the finely tuned machine may fall apart.

To keep every cog and wheel is the first precaution of intelligent tinkering.

— ALDO LEOPOLD, ROUND RIVER, 1953



The cedar has provided many generations of First Nations people with planks for houses; bark for clothing, basketry and art; and fine roots for weaving and is revered as a sacred tree for its many uses. Cedar and salmon, two major natural icons of British Columbia culture, continue to meet many needs. Emily Carr's paintings of the cedar brilliantly capture its majesty and mystery.

PHOTO: TREVOR MILLS, VANCOUVER ART GALLERY



To describe the beauties of this region will, on some future occasion, be a very grateful task to the pen of a skilled [writer]. The serenity of the climate, the innumerable pleasing landscapes, and the abundant fertility that unassisted nature puts forth [renders] it the most lovely country that can be imagined.

CAPTAIN GEORGE VANCOUVER, 1792

The one process now going on that will take millions of years to correct is the loss of genetic and species diversity by the destruction of natural habitats. This is the folly our descendants are least likely to forgive us.

EDWARD O. WILSON, THE DIVERSITY OF LIFE, 1992

