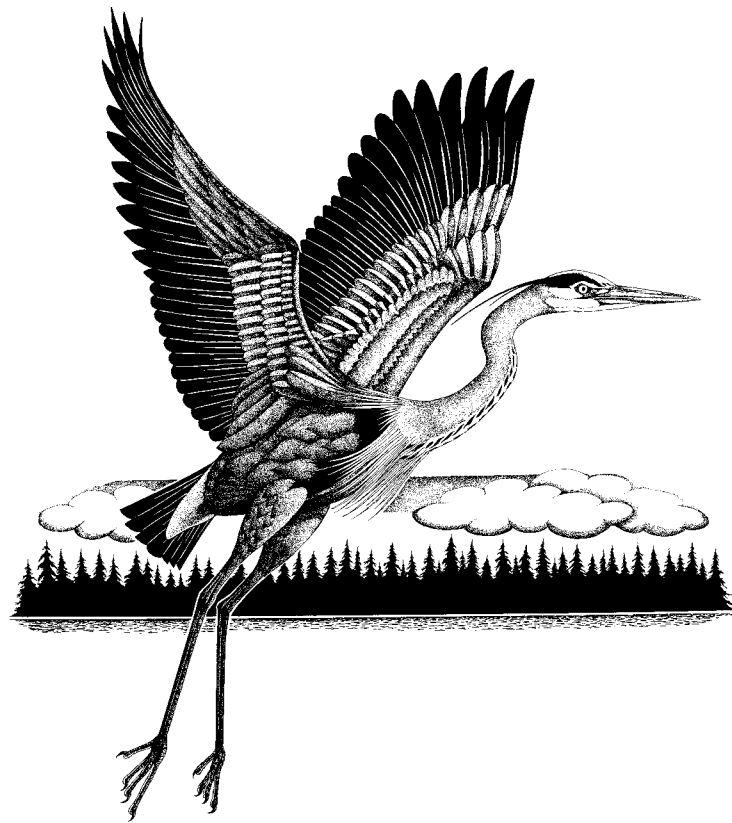


Environmental Trends in British Columbia



BRITISH
COLUMBIA

Ministry of Environment,
Lands and Parks

State of Environment
Reporting

ON THE COVER

The Great Blue Heron, *Ardea herodias*, is a large distinctive bird commonly seen in coastal and southern British Columbia. Information on the Great Blue Heron appears in several places throughout *Environmental Trends in British Columbia, 1998*. Levels of chlorinated hydrocarbons, such as PCBs and DDE, have been monitored since the 1970s in Great Blue Heron eggs and are depicted as an indicator of toxic contaminants in wildlife on page 38. Other chlorinated hydrocarbons, such as dioxins and furans, have been monitored in Great Blue Heron eggs since the 1980s and are shown on page 39. The Great Blue Heron is listed as 'vulnerable' by the Conservation Data Centre and its numbers have been declining over the past 30 years (page 32).

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A technical compendium documenting methodologies and presenting the data behind each indicator is available from the Internet web site or in hardcopy on request.

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Introduction

Statistical measures of human well-being, presented in the form of economic and social trends, have long been used as powerful tools for gauging the status of economic and social systems. Indicators such as gross domestic product, unemployment rates and the consumer price index are routinely used by decision-makers in government, industry, small business and communities to shape policies and redirect resources. Less pervasive, but equally important, are indicators of ecosystem or environmental well-being.

Environmental Trends in British Columbia presents twelve key indicators (page 4) of the state of British Columbia's environment. Each indicator provides a picture of the status or trends for one issue. When viewed together, these twelve indicators provide: an overview of the condition of British Columbia's environment; important links between seemingly disparate issues; and a picture of the way in which British Columbians are collectively responding to environmental challenges.

The development of environmental indicators is rapidly emerging as an important tool to encourage the incorporation of environmental information into all decision-making. They are being used by international organizations, such as the Organisation for Economic Co-operation and Development (OECD); by national organizations, such as Environment Canada and the US Environmental Protection Agency; and by many provincial organizations. With the publication of *Environmental Trends*, British Columbia is establishing itself as a leader in the development and presentation of environmental indicators.

A commitment to accountability

In 1995, the Auditor-General of British Columbia recommended enhancing the accountability of government through the development of performance measures. One recommendation was that performance measures focus on the outcomes of government efforts, rather than on the efforts themselves. This means, for example, that it is more important to know the concentration of atmospheric pollutants than the number of permits issued or the number of regulations introduced. *Environmental Trends* is, in part, the Ministry of Environment, Lands and Parks' response to the Auditor-General's challenge.

It is not possible for any one organization to be accountable for the condition of the natural environment. Managing the environment is a collective activity in which all British Columbians are engaged. Improving the quality of the natural environment will require a change in attitude and actions from all elements of society. However, the publication of *Environmental Trends* signals a commitment on the part of the Ministry of Environment, Lands and Parks to be a leading partner in monitoring the state of the environment, protecting the condition of the environment and improving the quality of the environment.

Development of environmental indicators

The development of meaningful environmental indicators is not an easy task. It is as much an art as it is a science. A set of indicators must be broad enough to represent the main dimensions of the environment, yet be few enough to present an easily understandable picture of environmental quality.

The most effective environmental indicators are:

- representative
- sensitive to environmental change
- relevant to public policy
- easily understood by a non-technical audience

Recognizing that the development of environmental indicators is in its infancy, the Ministry of Environment, Lands and Parks is proposing this initial set of twelve key environmental indicators. Some of the indicators in this first set will meet the criteria and be adopted for continued use, and others will not. Public discussion and endorsement is needed to encourage widespread adoption of the best indicators and replacement of the weaker indicators with more powerful ones.

Establishing goals and setting targets

Environmental Trends is unique for an indicator document. It goes beyond a simple presentation of scientific information to provide a measurement of progress towards attaining environmental goals.

The goals articulated for each environmental indicator were established by the Ministry of Environment, Lands and Parks as part of the strategic planning process, and are intended to provide direction for managing the environment. They were established with a sensitivity to public opinion and are meant to reflect the direction needed to achieve a clean, healthy, naturally diverse environment for present and future generations. It is expected that the release of *Environmental Trends* will stimulate public

MINISTRY GOALS

Natural Diversity

Protection, conservation and restoration of a full range of biological and physical diversity native to British Columbia.

Healthy and Safe Land, Water and Air

Clean, healthy and safe land, water and air for all living things.

Sustainable Social, Economic and Recreational Benefits

Provision of social, economic and outdoor recreational opportunities consistent with maintaining a naturally diverse and healthy environment.

Responsive and Adaptive Organization

Supporting innovative and responsive ministry programs and staff who seek the best results and service for the public.

discussion and encourage the adjustment of goals to better reflect the vision of a wide cross-section of British Columbians. Although these broad goals have been set by government, they cannot be achieved without the full participation of British Columbia's citizens, communities and industries.

In many cases, specific and quantifiable targets have been set to guide the province towards achievement of broad goals. In some cases, targets have been set by the provincial government. These targets provide milestones by which the province can gauge its progress in protecting the environment. An example of a target set in this way is the target for waste reduction: 50% reduction in the amount of waste going to landfills or incinerators by 2000. In other cases, British Columbia has adopted targets set by external processes, such as national and international agreements. An example of a target set in this way is the target for protected areas: protect 12% of the land base of the province by 2000. This target was suggested by the World Commission on Environment and Development in their 1987 report, *Our Common Future*.

Next steps

Environmental Trends will stimulate discussion and provide the impetus for action on several fronts. As a first step, the best environmental indicators will have to be updated regularly, so that they become a familiar tool for incorporation into everyday decision-making.

In the areas where the indicators demonstrate positive results, continued monitoring will be needed to ensure that the gains made are maintained. Without continued environmental monitoring, British Columbians will not have the

most basic tool to ensure that we are headed in a sustainable direction. However, monitoring is costly, and in these times of budget constraints it is difficult to argue for monitoring in areas where current results are already positive. Through the process of public discussion and stewardship initiatives, strategic partnerships will need to be forged to ensure that the cost of monitoring is shared fairly and appropriately.

The legislative and policy framework is now in place to address some of the environmental problems that have been identified by these twelve indicators. Systematic and vigilant environmental monitoring will be required to ensure that desired environmental results are being achieved. Environmental responses are always full of unexpected surprises. British Columbians will have to adopt an attitude of adaptive management, whereby new approaches are tried when the results of monitoring indicate that current approaches are not working. This may be difficult, especially when it requires changing policies for which people fought hard.

Some indicators show that a more concerted effort is required to improve the condition of the environment. In these cases, directed actions will have to be taken by all elements of British Columbia society. Governments can provide incentives for a stewardship ethic, but they cannot force the growing population to live more sustainably — to drive their cars less; to maintain their septic tanks; and to generate less garbage.

Finally, new environmental challenges will undoubtedly arise. British Columbians, along with all levels of government, will have to develop mechanisms for detecting and responding to early warning signals and a willingness to experiment with creative solutions for emerging issues.

SUMMARY OF INDICATORS

Protected Areas

measured as the percentage of the land base having protected area status

Solid Waste

measured as the kg/person/year solid waste generated — proportion disposed of, reduced or recycled provided

Fine Particulates

measured as the 24-hour maximum concentration of fine particulate matter (PM₁₀) at the station with the highest concentration and the station with the lowest concentration of PM₁₀

Stratospheric Ozone Depletion

measured as percentage departures from 'normal' (the pre-1980 mean) of stratospheric ozone over southwestern British Columbia

Greenhouse Gases

measured as megatonnes of greenhouse gas emissions in carbon dioxide equivalents

Water Quality

measured as the number of water bodies in excellent, good, fair, borderline or poor condition as rated by the water quality index

Groundwater

measured as the percentage of groundwater observation wells with declining water levels

Species at Risk

measured as the percentage of known species threatened or endangered (for amphibians, mammals, birds, reptiles, vascular plants, and freshwater fish)

Forest Species

measured as the percentage of known forest species threatened or endangered (for amphibians, mammals, birds, reptiles, vascular plants, and freshwater fish)

Wildlife

measured as the percentage of historic range that is either no longer occupied or has declining populations for five key species (Mountain Caribou, Sharp-tailed Grouse, Grizzly Bear, Black-tailed Deer and Moose)

Fish

measured as the percentage of salmon stocks extinct or at high to moderate risk of extinction

Toxic Contaminants in Biota

measured as the concentration of organochlorines (DDE and PCB) in Great Blue Heron eggs

Highlights of the Indicators

British Columbia is making measurable progress towards achieving both broad goals and specific targets in several areas. Improvements in air quality, toxic contaminants and water quality have all been observed. As well, improvements have been made in the stress that British Columbians place on the environment, particularly in waste generation.

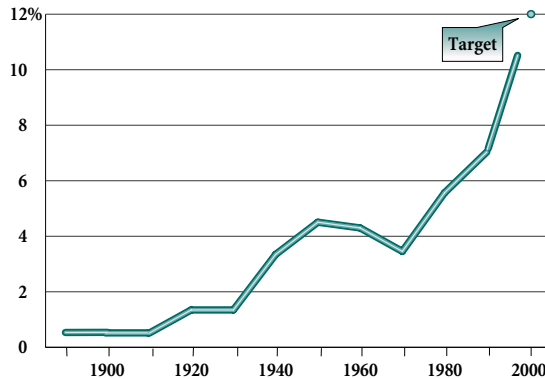
Progress towards achieving legislative, policy and program targets designed to have a long-term impact on the environment has also been encouraging. Through the Protected Areas Strategy, the government has not only significantly increased the protected areas in the province, but has also ensured that the province's rich ecosystem diversity is better represented. British Columbia has introduced many measures to reduce the numbers of threatened or endangered species and to rehabilitate populations that have deteriorated. To date, the success has been in development of a regulatory and program framework to address biodiversity issues, as well as establishment of a database (Conservation Data Centre) to monitor progress. It is too early, however, to detect the direct effects of these efforts on plants and animals.

Another area in which British Columbia is working for change is that of stratospheric ozone depletion. The province has been a leader in introducing measures to restrict the use of ozone-depleting substances. However, the environment will be slow to respond to initiatives on this global issue. For example, in southwestern British Columbia, stratospheric ozone levels have been below normal since monitoring began five years ago. As a result, exposure to harmful ultraviolet radiation has been increasing.

For three of the twelve indicators, little progress has been made towards achieving goals and targets. Areas needing more sustained effort include groundwater protection, loss of wildlife habitat, and greenhouse gas emissions. Addressing some of these areas will be difficult, as they are compounded by interactions with issues such as increased population pressure, reduced resource availability and global change.

Environmental Trends provides the opportunity to highlight areas where further work is needed and to encourage not only governments but all British Columbians to mobilize resources to improve the condition of the natural environment on which the social and economic well-being of the province depends.

Percentage of province in protected areas



SOURCE: British Columbia Land Use Coordination Office, October 1997, and BC Parks 1995.

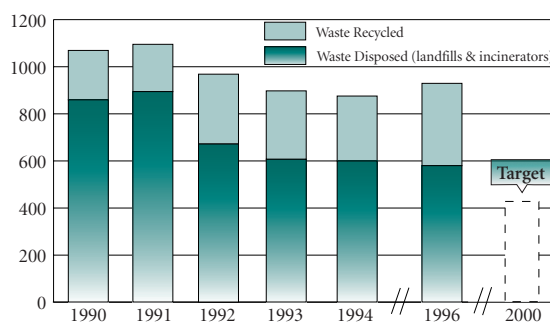
Protected Areas

Protected areas are a key element in British Columbia's strategy to protect the province's biological and cultural heritage. In 1992, the Protected Areas Strategy was introduced to oversee the creation of new protected areas and to ensure that the province's diverse ecosystems are adequately represented. Regional and sectoral input from land-use planning processes played a key role in identifying new areas to protect.

As part of the Protected Areas Strategy, British Columbia set a target to protect 12% of the land base by 2000. Since this target was set in 1992, the percentage of land protected has increased from 6.3 to 10.6%. As well, the representativeness of the province's rich ecosystem diversity has substantially improved. From 1991 to 1997, of the 100 terrestrial ecozones, the number with over 12% of the land base protected has increased from 16 to 30. In the same period, the number of ecozones with less than 1% of the land base protected has decreased from 53 to 23.

Solid Waste

Solid waste generated (kg/person)



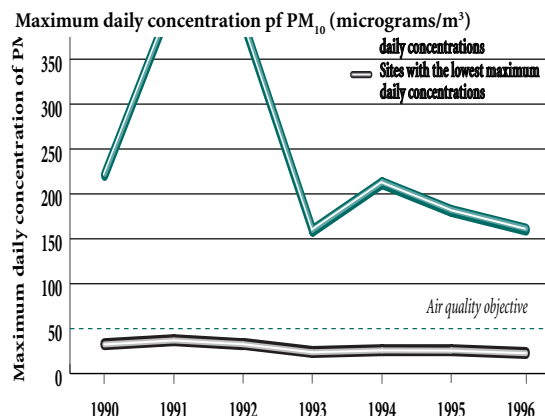
SOURCE: Ministry of Environment, Lands and Parks, 1998. BC Municipal Solid Waste Tracking Report 1996; Municipal Solid Waste Reduction Data Summary Report 1991, 1992, 1993 and 1994.

In 1990, British Columbia set a target to reduce the per capita weight of solid waste disposed to landfills and incinerators by 50%, to 430 kg/person/year by the year 2000. From 1990 to 1996 solid waste disposed of was reduced by 33%, to 580 kg/person/year. Both reductions in the total amount of waste disposed (from 2.8 million tonnes to 2.2 million tonnes), and increases in the proportion of waste being recycled, (from 20 to 38%) have contributed to this success.

Fine Particulates

Fine particulate matter (PM_{10}) is an indicator of general air quality. PM_{10} is the component of the air quality index most often out of compliance with provincial air quality objectives. As well, it provides a good link between air quality and human health.

In 1996, air quality objectives for fine particulates were met at 38% of monitoring stations. Between 1990 and 1996, significant improvements in maximum daily fine particulate concentrations were observed at 12% of stations. Fine particulate levels were still within the provincial objective for the one station showing an increase in maximum daily concentrations.



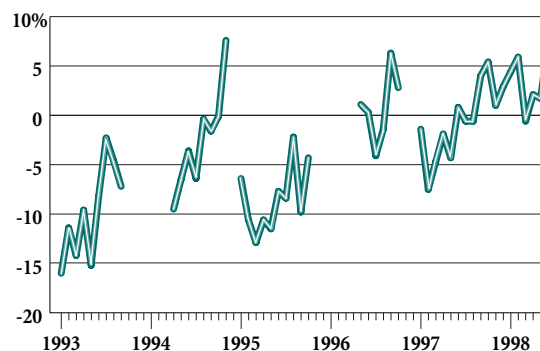
SOURCE: Ministry of Environment, Lands and Parks, Air Resources Branch, Air Data and Monitoring System Database, 1998.

Stratospheric Ozone Depletion

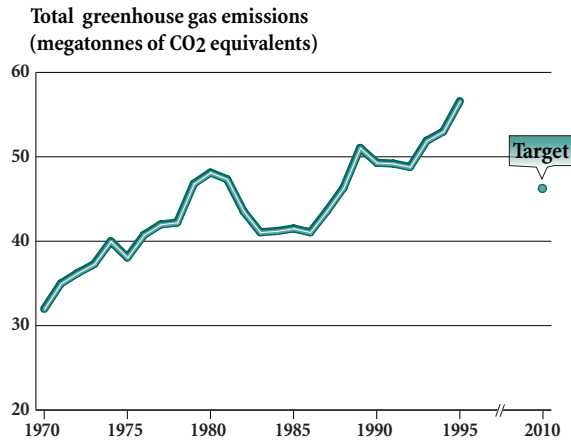
Levels of stratospheric ozone over southwestern British Columbia have only been monitored since 1993 – too short a time to assess long-term trends. Since 1993, the stratospheric ozone layer over southwestern British Columbia has been thinner than 'normal' (defined as the pre-1980 mean) most of the time. Some indications are that exposure of British Columbians to harmful ultraviolet radiation, which is a function of both the thickness of the ozone layer and weather conditions, is worsening.

British Columbia enacted the Ozone Depleting Substances (ODS) Regulation in February 1993. In October 1997, British Columbia became the first jurisdiction to ban charging and re-charging motor vehicle air conditioners with all ozone-depleting substances.

Departures from normal stratospheric ozone levels



SOURCE: Environment Canada, Science Division, 1998.

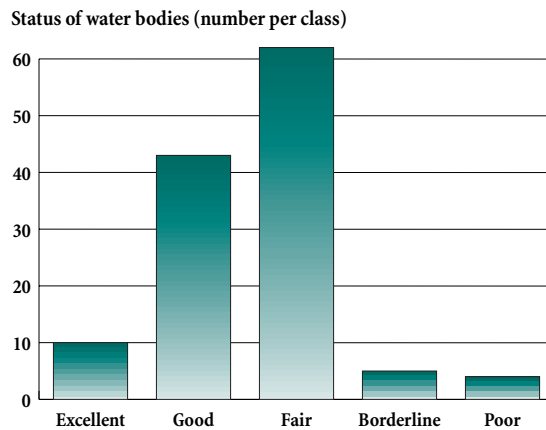


SOURCES: Ministry of Environment, Lands and Parks, 1998; Ministry of Employment and Investment; and Environment Canada, 1996.

Greenhouse Gases

Emissions of greenhouse gases increased by 15% between 1990 and 1995. During this same period, per capita emissions increased by less than 1%, indicating that population growth has had a major impact on greenhouse gas emissions.

In the face of high population growth, a growing economy and, particularly, a growing energy component to the economy, the challenges to reduce greenhouse gas emissions are substantial. British Columbia has established a multi-stakeholder advisory group, the BC Greenhouse Gas Forum, to advise the province on ways to achieve a reduction in greenhouse gas emissions. Initiatives such as the Clean Vehicles and Fuels program and the development of Transportation Demand Management plans should help to reduce greenhouse gas emissions and improve local air quality.



SOURCE: Ministry of Environment, Lands and Parks, 1996. *Water Quality Status Report*, and Ministry of Environment, Lands and Parks, Water Management Branch, 1997 for updates.

Water Quality

Protection of drinking water quality and maintenance of the integrity of aquatic ecosystems are important environmental issues for British Columbia.

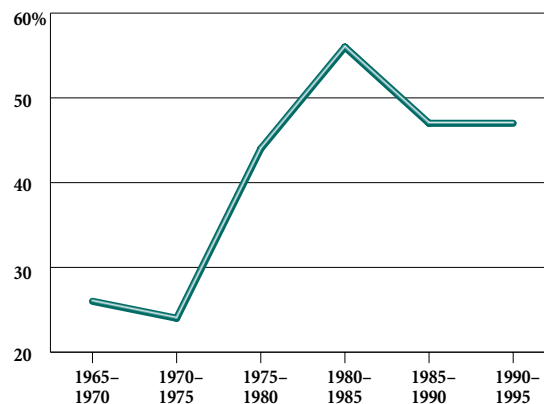
One hundred and twenty-four water bodies are sampled regularly for water quality. Of these, 9 are rated as excellent, 44 good, 62 fair, 5 borderline, and 4 poor. Water quality in British Columbia is generally rated highly. However, to ensure that high standards are maintained and improvements are initiated where necessary, a multi-pronged approach is being taken. Initiatives include: development of a non-point source pollution strategy, upgrades to sewage treatment facilities, restoration of fish-bearing streams and stream-side habitat, development of watershed plans, and designation and protection of sensitive streams.

Groundwater

Approximately 600,000 British Columbians depend on groundwater sources for their drinking water. The percentage of wells showing declining water levels has increased from 26% in 1965 to 47% in 1995.

The government is currently examining non-regulatory approaches to groundwater protection. At the community level, the development of aquifer protection plans can have a large impact on groundwater. As well, the *Forest Practices Code* allows for community watershed protection and the *Water Protection Act* prohibits future bulk groundwater removals from the province.

Observation wells with declining water levels



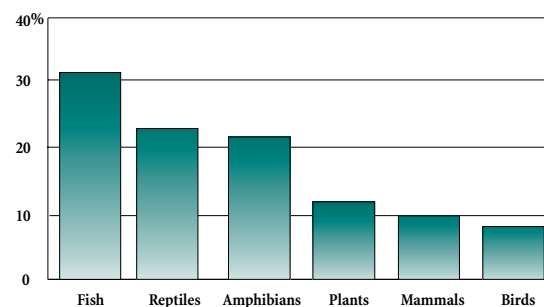
SOURCE: Ministry of Environment, Lands and Parks, Water Management Branch, 1996.

Species at Risk

Approximately 13% of vertebrate animals and 12% of vascular plants are threatened or endangered, or candidates for this designation. A higher proportion of freshwater fish are threatened or endangered than other groups of animals. Freshwater fish are similarly at risk in other jurisdictions in North America.

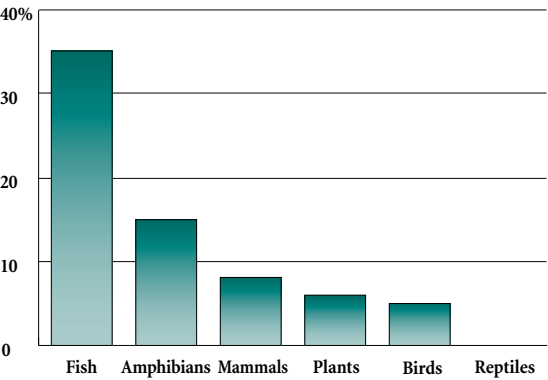
Management of threatened or endangered species involves the preparation of assessments and recovery plans. Currently assessments have been completed for 33 species of threatened or endangered vertebrates and are in progress for 3 species. Recovery plans have been completed for 7 species and are in progress for 1 species and 1 ecosystem. To prevent further endangerment, assessments and recovery plans are also prepared for species considered vulnerable to extinction. Assessments have been prepared for 26 species of vulnerable vertebrates and a further 8 are in progress. Two recovery plans have been completed for vulnerable species and 1 is in preparation.

Threatened or endangered species (as percentage of known species)



SOURCE: Ministry of Environment, Lands and Parks, Conservation Data Centre, 1996.

Threatened or endangered forest species
(as a percentage of known forest species)



SOURCE: B.C. Ministry of Environment, Lands, and Parks, Wildlife Branch, Fisheries Branch, 1997.

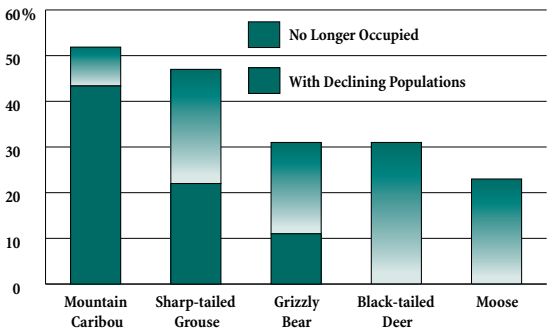
Forest Species

Thirteen percent of forest-dwelling vertebrates, and 6% of forest-dwelling vascular plants are threatened or endangered.

Of particular concern are forest dependent freshwater fish. Sixty-nine species of freshwater fish have a high to medium dependency on forested habitats; of these 24 (35%) are threatened or endangered.

The Biodiversity Guidelines, Riparian Management Area Guidebook, and Identified Wildlife Management Strategy are all parts of the *Forest Practices Code* designed to address the status of biodiversity in the forests. As with species at risk in general, it will be many years before the impacts of these initiatives are fully realized.

Proportion of historic range occupied



SOURCE: Ministry of Environment, Lands and Parks, Wildlife Branch, 1997.

Wildlife

Several species of wildlife, including Mountain Caribou, Columbian Sharp-tailed Grouse and Grizzly Bear, have experienced significant declines in their ranges since the 1950s. The percentage of historic range in which species are extirpated (i.e., no longer exist) is: 43% for Mountain Caribou; 22% for Columbian Sharp-tailed Grouse; 9% for Grizzly Bear.

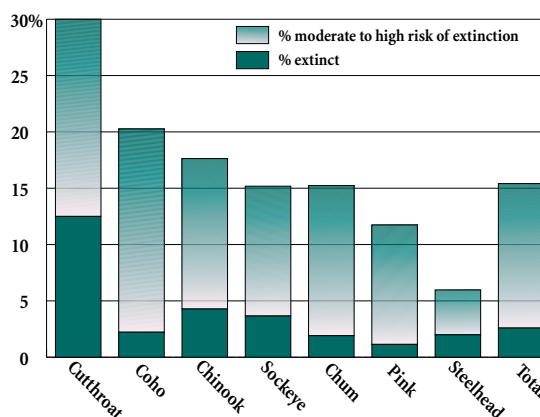
Conservation strategies have been developed for Grizzly Bear and are being developed for Mountain Caribou and the southern interior ecosystem (home to Sharp-tailed Grouse). More than forty species and ecosystems have been designated as Identified Wildlife under the *Forest Practices Code* and will be subject to special management considerations.

Fish in British Columbia

A recently released study, conducted for the American Fisheries Society, showed that of over 10,000 salmon stocks assessed in British Columbia, 3% are extinct, 13% are at moderate to high risk of extinction, and the status of 43% is unknown. Of particular concern are Cutthroat Trout, Coho and Chinook. Very little data was available for Steelhead.

The province has made the protection of fish a priority. Several legislative, regulatory and program measures have recently been implemented to address declining fish, and in particular declining salmon populations. These include: the *Fish Protection Act*; the Urban Salmon Habitat Program; cancellation of the Kemano Completion Project; and measures in the *Forest Practices Code* to protect wetlands, rivers, streams and lakes.

Proportion of salmon stocks extinct or at moderate to high risk of extinction



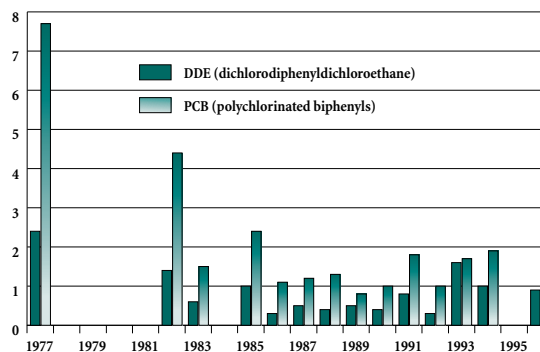
SOURCE: T.L. Slaney et al., 1996. American Fisheries Society, North Pacific International Chapter. *Status of Anadromous Salmon and Trout in British Columbia and Yukon*, Fisheries, Vo.21, No.10, pp 20–35.

Toxic Contaminants

Predators at the top of the food chain, such as Great Blue Herons, are particularly affected by persistent organic pollutants. These toxic compounds include organochlorines such as the pesticide DDT; industrial compounds such as PCBs; dioxins (by-products of industrial processes); and furans. Since the late 1970s, PCB levels in Great Blue Heron eggs have decreased by between 43 and 90% and DDE levels (a breakdown product of DDT) by between 40 and 88%. Dioxins and furans in Great Blue Heron eggs decreased by approximately 80% between 1982 and 1983 and a further 15% between 1983 and 1994. These changes have resulted in increased survival of chicks.

These improvements have been a direct result of legislative initiatives. PCBs were banned in Canada in 1977; DDT was banned in the 1970s although existing stocks have been used up to 1990. Pulp mill regulations introduced in the 1980s encouraged industry to improve manufacturing processes and to reduce the levels of dioxins and furans in effluent.

Contaminants in Great Blue Heron eggs (mg/kg)



SOURCE: Canadian Wildlife Service, Environment Canada, 1998.

The Indicators

The twelve indicators are presented on the following pages. Each indicator is presented on two pages. The first page contains a graph depicting the indicator, information on status and trends, importance, and actions being taken. The second page discusses “secondary measures,” which provide a more detailed look at the issue. Where feasible, secondary measures focus on three areas:

- a sub-regional picture of the issue, with the province divided into ecological units based on *Ecoregions of British Columbia*
- a summary of sources of problems or threats
- a comparison with other jurisdictions

The choice of indicators involved consultation with groups of experts for each issue. Many of the indicators reflect current indicators being used regionally (i.e., Pacific Northwest), nationally or internationally. Other indicators are of specific interest to British Columbia. Together, the twelve indicators represent a balance between provincial, national and global issues.

Categorizing the indicators

Categorizing the indicators is challenging. The most effective indicators often defy categorization because they cross media or issue boundaries. For simplicity of presentation, the indicators have been grouped into four categories: land, air, water and natural diversity. There are two land indicators — protected areas and solid waste; three air indicators — fine particulates, stratospheric ozone, and greenhouse gases; two water indicators — water quality and groundwater; and five natural diversity indicators — species at risk, forest species at risk, wildlife populations, fish, and toxic contaminants in biota.

Comparisons

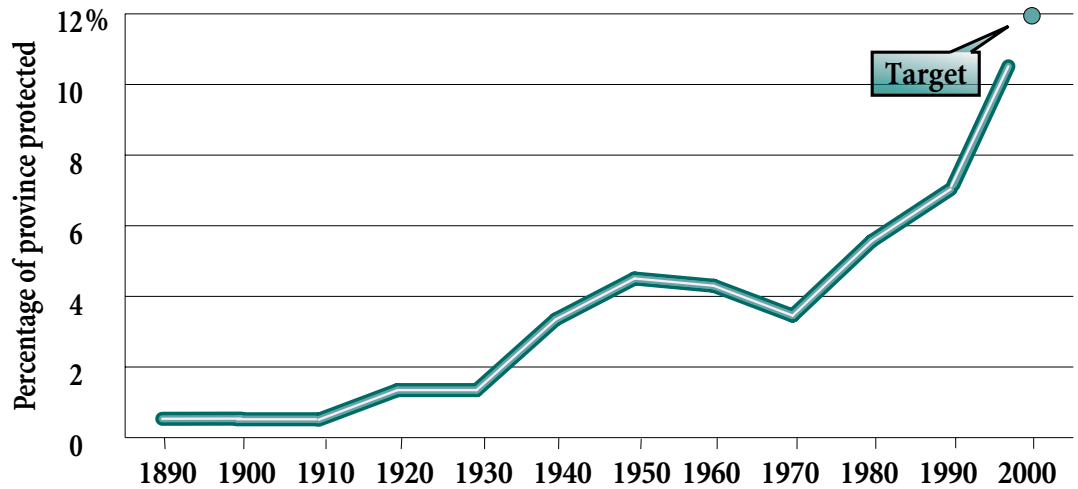
Of particular interest are the comparisons with other jurisdictions. In most areas, British Columbia fares well compared to other places. Air quality in British Columbia’s urban areas is better than most other cities in Canada or the world; toxic releases into the environment are lower than other industrialized provinces in Canada; and the number of extinct or extirpated species compares well with other western North American jurisdictions and is significantly better than jurisdictions in eastern North America. As well, the high concern British Columbians have for the environment is reflected in reduced stress on natural systems. Although solid waste disposed per person is high in industrialized jurisdictions, in British Columbia it is decreasing significantly, and by 1996 it was less than in some other Canadian and American jurisdictions. As well, per capita carbon dioxide emissions are lower than the Canadian, American, and Australian average and equal to some European jurisdictions such as Germany.

Future indicator development

The indicators in this initial set of twelve reflect, to a large extent, the availability of reliable data sets. Considerable effort is currently being put into the development of better information systems for environmental data. As environmental information becomes easily accessible on geographic information systems, it is likely that new indicators will present trends on spatial patterns of resource use, land use and ecosystem integrity. Issue areas, such as compliance with environmental legislation, will also be addressed in future reports.

Protected Areas in British Columbia

British Columbia is well on the way towards achieving its goal of establishing 12% of its land base to protected area status by 2000.



SOURCE: British Columbia Land Use Coordination Office, 1998, and BC Parks 1995. NOTES: Data for this graph were compiled by decade until 1990, and do not reflect annual trends. Protected Areas include those which have been announced but are not yet designated under the *Park Act*, *Ecological Reserve Act* or other Protected Areas legislation.

Status and trends of protected areas

- In 1990, approximately 6.3% (5.95 million hectares) of the land base of British Columbia was dedicated to protected areas; by 1998, approximately 10.6% (10.06 million hectares) was dedicated to protected areas.
- In British Columbia, protected areas include national parks, ecological reserves, class A and C parks, recreation areas and protected areas that fall under the *Environment and Land Use Act*. They do not include wildlife reserves, migratory bird sanctuaries, and regional parks.
- In the late 1930s and 1940s, park expansion was used to encourage tourism; in the 1950s and '60s, the area with protected areas status was reduced by 1 million hectares; in the 1970s and '80s park creation began to focus on protection of unique natural environments; in the 1990s representation of British Columbia's biological and cultural diversity, recreational resources and habitat protection have become primary objectives.

British Columbia is Canada's most biologically diverse province.

Why is it important?

- In British Columbia, protected areas are one key element of a strategy to protect the province's biological and cultural heritage.
- Equally important is the management of lands and resources outside the protected areas system.
- Protected areas have become an important component of land use planning, contributing to the maintenance of ecosystems, species and genetic resources.

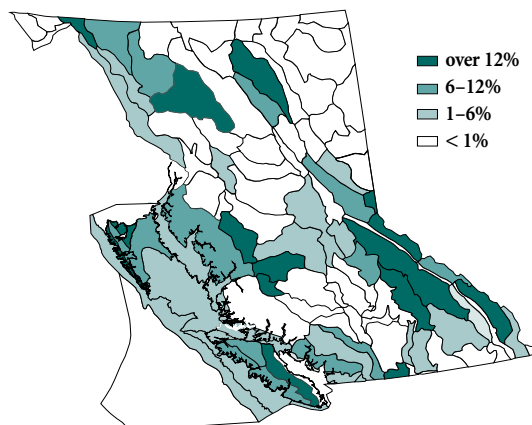
What is being done?

- Since 1992, the Protected Areas Strategy has ensured that strong regional and sectoral input from land-use planning processes is a critical part of identifying new areas to protect.
- B.C.'s Park Legacy Project is a public consultation process which has recently been created to examine the future management and planning of the protected areas system in British Columbia.

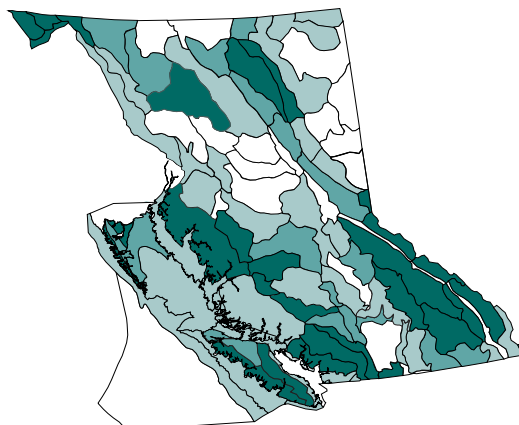
BRITISH COLUMBIA'S GOAL: *Protection, conservation and restoration of a full range of biological and physical diversity native to British Columbia and provision of social, economic and outdoor recreational opportunities consistent with maintaining a naturally diverse and healthy environment. As part of the attainment of these goals, the province has set a target to protect 12% of the land base (11.35 million hectares) by the year 2000.*

Is British Columbia's rich ecosystem diversity protected?

Percentage Protected 1991



Percentage Protected 1997



SOURCE: BC Land Use Coordination Office, 1998. NOTES: The delineations represent ecosections, as described in *Ecoregions of British Columbia*, D. Demarchi, 1993, except for the 12 marine ecosections, which are found in *The Marine Ecoregions of British Columbia*, D.E. Howes, M. A. Zacharias and J.R. Harper, 1996.

- An ecological classification system divides British Columbia into 112 ecosections, representing different ecosystem types. Twelve of these are predominantly marine.
- One objective of the Protected Areas Strategy is to increase the protection of ecosystem diversity. The amount protected will vary within each ecosection to meet the provincial target of 12%.
- Since 1991, significant progress has been made in improving ecosystem representation in the protected areas system (see table).
- Marine areas are poorly represented. However, a Marine Protected Areas Strategy is currently being developed.

Percentage of terrestrial ecosections in protected area status		
	1991	1997
less than 1%	53	23
1-6%	19	30
6-12%	12	17
greater than 12%	16	30

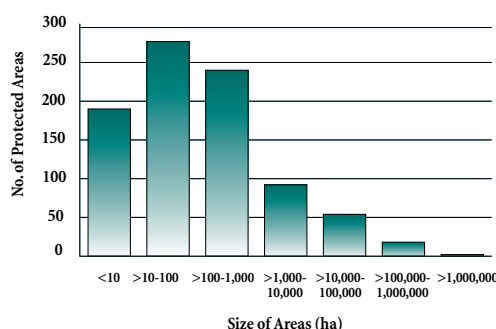
- Significant increases in the extent of ecosystem representation have occurred in the Northern Rockies (Muskwa-Kechika), Northwest (Tatshenshini-Alsek), Central Interior (Ts'yl-os), Southern Interior (Lac du Bois) and on Vancouver Island (Carmanah Walbran).

Eleven newly protected areas in the Muskwa-Kechika have resulted in a significant increase in protected areas in northern British Columbia.

7% of protected areas in British Columbia are larger than 10,000 hectares. These include recently protected areas such as Pinecone Burke, Khutzeymateen, Stein Valley, Nlaka'pamux, Itcha Ilgachuz, and significantly expanded parks such as Carmanah Walbran and Brooks Peninsula.

What size are British Columbia's protected areas?

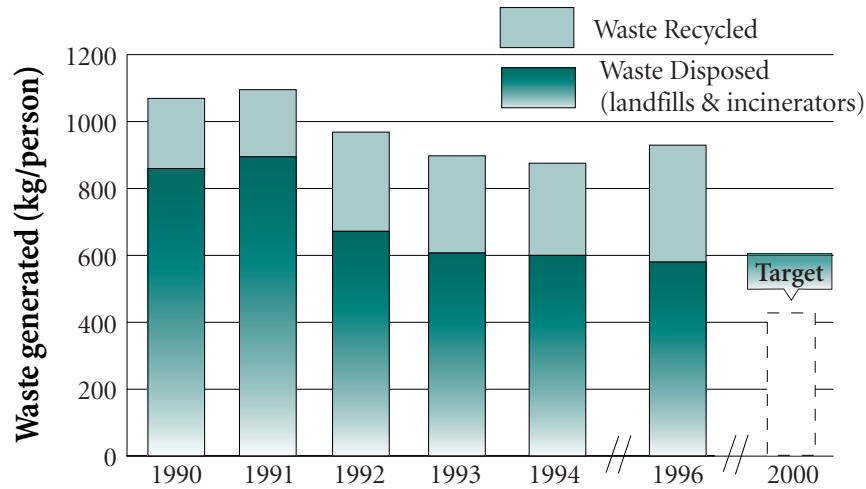
- An ongoing ecological debate focuses on the relative value of large versus small protected areas.
- Large protected areas are believed by some to have more conservation value than small areas.
- When contiguous protected areas are viewed as a single unit, 20 protected areas in British Columbia are larger than 100,000 hectares; two of those are larger than 1 million hectares.
- Small protected areas play an important role by affording protection to some rare and endangered species and their habitats, and linking larger reserves.
- 190 protected areas in British Columbia are smaller than 10 hectares.



SOURCE: BC Land Use Coordination Office and BC Parks, 1998.
NOTE: Contiguous areas are considered to be a single protected area. Does not include marine protected areas.

Solid Waste in British Columbia

In 1996, British Columbians disposed of 580 kg of solid waste per person to landfills and incinerators.



source: Ministry of Environment, Lands and Parks, 1998. *BC Municipal Solid Waste Tracking Report 1996; Municipal Solid Waste Reduction Data Summary Report 1991, 1992, 1993 and 1994.* notes: Estimates for recycled and disposed were derived from municipal surveys conducted across British Columbia. Although participation in these surveys has increased in recent years, not all municipalities are represented. Survey methodology was improved in 1996, increasing the reliability of the data.

British Columbia has set a target to reduce solid waste disposed to landfills and incinerators to 430 kg/person/year by the year 2000. The province is on track to achieving its target.

Status and trends of solid waste

- It is estimated that British Columbians generated 930 kg of solid waste/person in 1996. Of this, 580 kg was disposed to landfills and incinerators. This represents a 33% reduction in waste disposed per person, between 1990 and 1996.
- In 1996, 350 kg of solid waste per person was diverted from landfills and incinerators for recycling. Waste recycled has increased from 20% of waste generated, in 1990, to 38% in 1996.
- The total amount of waste disposed to landfills and incinerators decreased from 2.8 million tonnes in 1990 to 2.2 million tonnes in 1996. This decrease in waste disposed was achieved despite a population increase of 16% for the same time period.
- 92% of British Columbia's disposed waste is trucked to landfills; the remaining 8% is incinerated.

Why is it important?

- A large percentage of British Columbia's waste represents lost resources. In recognition of this, British Columbia is committed to reducing, reusing and recycling waste to save some of these resources.
- Landfills consume valuable land and can contribute to groundwater contamination and air pollution. These factors make landfills unappealing to most communities and the task of finding new landfill sites very difficult.
- Although modern incinerators produce much lower levels of pollutants, they still emit acid gases, carbon dioxide and toxic chemicals.

What is being done?

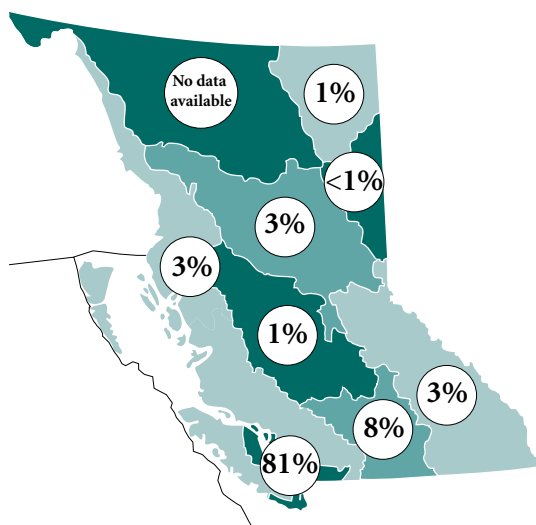
- Pollution prevention planning encourages industry to reduce hazardous waste during the production process.
- Industry stewardship programs are ensuring that the most hazardous components of solid waste are disposed of safely. Recent legislation has required recycling of: lead-acid batteries and scrap tires (1991); used lubricating oil (1992); paint residuals (1994); pharmaceuticals, solvents, flammables, pesticides and gasoline residuals (1996); and beverage containers (1998).

BRITISH COLUMBIA'S GOAL:

Clean, healthy and safe land, water and air for all living things. As part of the attainment of these goals, the province has set a target to reduce the weight of solid waste disposed to landfills or incinerators to 430 kg/person/year by the year 2000.

Where is the most waste generated in British Columbia?

- The majority of British Columbia's waste is generated in the Georgia Depression (81%) and Southern Interior (8%) ecoprovinces, where the population density is the highest in the province.
- In the Capital (CRD) and the Greater Vancouver (GVRD) regional districts, which together generate over 70% of the waste in the province, significant efforts are being made to reduce the amount of disposed waste. Both districts have extensive recycling programs, charge landfill tipping fees and have prohibited several materials from being disposed of in landfills.
- By the end of 1996, 19 out of 27 regional districts had completed long-term solid waste management plans that include strategies to reduce waste.

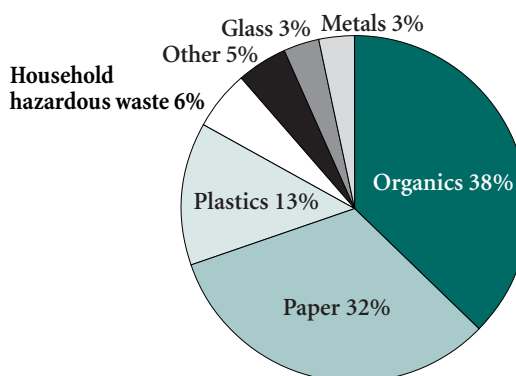


SOURCE: Ministry of Environment, Lands and Parks, August 1998. B.C. Municipal Solid Waste Report, 1996 and the State of Environment Reporting Program.

The majority of British Columbia's waste is generated in the Georgia Depression Ecoprovince, where population density is highest.

What is the composition of British Columbia's waste?

- Paper and organics make up 70% of the weight of waste disposed to landfills and incinerators in the Greater Vancouver Regional District (GVRD). Although the exact composition of waste differs from region to region, paper and organics make up the bulk of waste going to landfills and incinerators throughout the province.
- Paper and organics also make up 70% of the weight of materials recycled in the GVRD.
- Material banned from the GVRD landfills, such as lead acid batteries, tires and gypsum, comprise 16% of recycled materials.

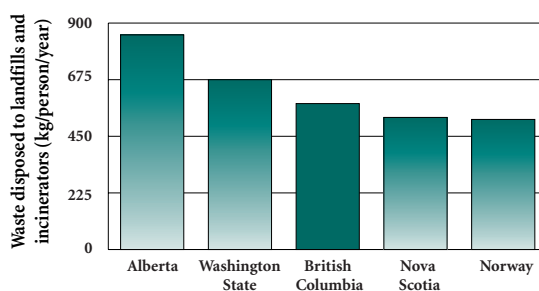


SOURCE: Greater Vancouver Regional District, 1998. Solid Waste Operations.

Significant amounts of reusable and recyclable materials are still disposed of in landfills and incinerators.

How does British Columbia compare to other places?

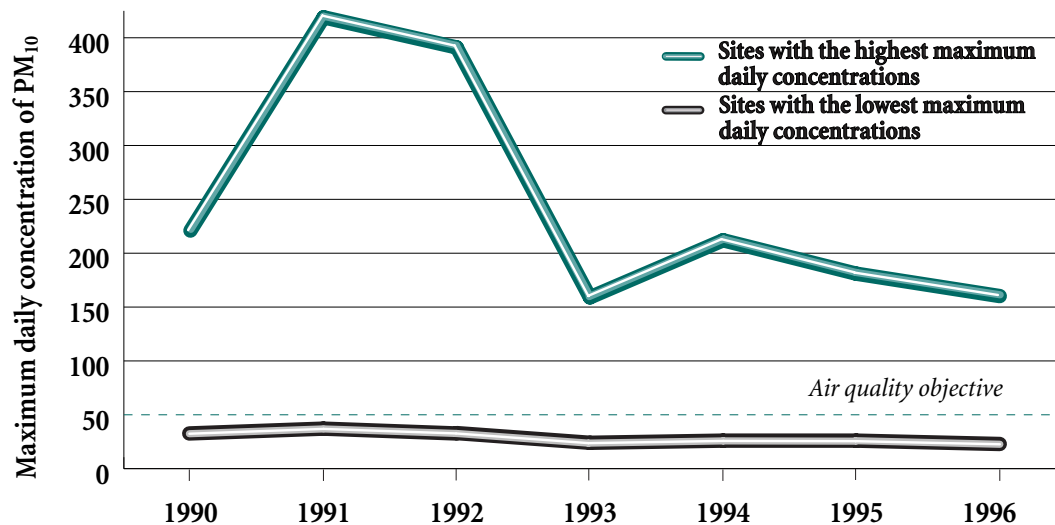
- It is very difficult to compare waste disposed between jurisdictions due to differences in definitions and data collection methodologies.
- Generally speaking British Columbians dispose of about the same amount of waste per capita as other jurisdictions with comparable standards of living.
- In recent years, better waste management practices, stewardship programs and public awareness campaigns have significantly reduced the amount of waste disposed of in British Columbia, as well as elsewhere.



SOURCE: Solid Waste Reports, posted on web sites for Washington (1996), Nova Scotia (1997), Norway (1993); 1995 Alberta State of Environment Annual Report: Waste Management; B.C. Ministry of Environment, Lands and Parks, 1998, B.C. Municipal Solid Waste Tracking Report 1996.
NOTES: Data for Washington State and Norway were recalculated using BC's definitions of solid waste. The need to ensure compatibility of definitions made it difficult to make comparisons with any other jurisdictions.

Fine Particulates in British Columbia's Air

Since 1991, the highest daily concentration of fine particulate matter in British Columbia has been decreasing.



SOURCE: Ministry of Environment, Lands and Parks, Air Resources Branch, 1998. NOTES: This indicator depicts the maximum 24-hour concentration of PM_{10} , measured in micrograms/m³. For all communities, PM_{10} concentrations fall between the extremes shown on the graph. Each year the location of the sites with the highest or lowest PM_{10} concentrations differed. The analysis was restricted to stations with 30 or more sampling days per year. The number of stations meeting these requirements were: 1990, 11; 1991, 24; 1992, 29; 1993, 42; 1994, 48; 1995, 47; 1996, 58.

Status and trends in fine particulates

- Since 1991, maximum daily concentrations of fine particulates, also known as PM_{10} , have decreased at the worst sites in the province and have remained constant at the best sites.
- In 1996, PM_{10} information was collected at more than 50 stations throughout the province. Since PM_{10} monitoring is relatively new, many stations have too few years of sampling to determine trends. Of the 34 stations with at least 4 years of data, 4 showed a significant improvement in maximum daily PM_{10} concentrations, 29 showed no change, and 1 showed a deterioration.
- In 1996, the air quality objective of 50 micrograms/m³ was exceeded more than 15% of the time at 2 stations, 1–14% of the time at 34 stations, and never exceeded at 22 stations.
- Concentrations of air pollutants, such as fine particulate matter, can vary greatly amongst communities that are fairly close together. Topography, air circulation patterns, and the location of industries all affect the concentrations of fine particulate matter in local airsheds.

Why is it important?

- Fine particulates (PM_{10}) are small solid or liquid particles measuring 10 micrometres or less. They are so small that approximately 1600 particles can fit on the dot of an 'i' on this page.
- Fine particulates pose a serious public health threat. They can contribute to the development of many respiratory diseases and are associated with a rise in the number of premature deaths due to heart and lung disease.
- PM_{10} poses as great a danger to human health as better-known pollutants such as ground-level ozone, sulphur dioxide, and carbon monoxide.
- PM_{10} also contributes to a reduction in visibility, which leads to impacts on safety, aesthetics, business development, and tourism.

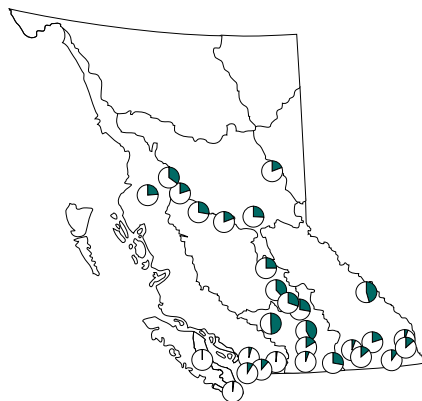
What is being done?

- British Columbia has initiated several programs and activities to improve air quality. These include a heavy vehicle testing program in the Lower Fraser Valley, modernization of monitoring programs, continued phase-out of beehive burners, Smoke Control Regulations such as the regulation of large-scale open burning, and higher standards for wood stoves.

BRITISH COLUMBIA'S GOAL: To ensure healthy and clean air for all living things. To achieve this goal, British Columbia will aim to meet air quality objectives for fine particulates at all locations in the province.

Where are the risks to health from fine particulates?

- Recent scientific evidence indicates that negative health effects from PM_{10} can occur above concentrations of 25 micrograms/ m^3 . As the concentration of PM_{10} increases, the number of people who experience health problems and the seriousness of those problems increases.
- Communities in the Central Interior are exposed to the greatest health risks from PM_{10} . For example, in 1996, PM_{10} concentrations in some Central Interior communities were above 25 micrograms/ m^3 for 6 days out of 10.
- The lowest health risk from PM_{10} is in the Georgia Depression. In several communities, PM_{10} concentrations were above 25 micrograms/ m^3 fewer than 1 day out of 10.

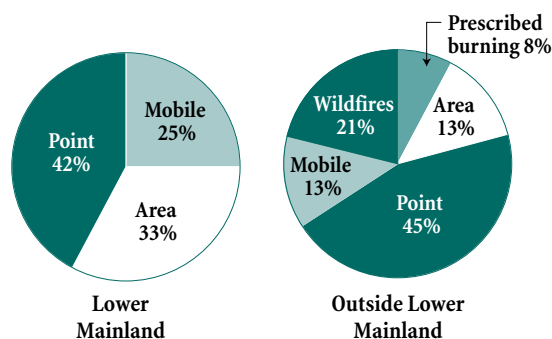


SOURCE: Ministry of Environment, Lands and Parks, 1998. *Air Data and Monitoring System Database*. NOTES: The dark portion of the pie graphs show the percentage of time in 1996, at each sampling station, that PM_{10} exceeded 25 micrograms/ m^3 , i.e. levels above which health effects can occur. The delineations on the map show the 10 ecoregions of British Columbia, based on *Ecoregions of British Columbia*, 1993.

Wildfires, wood stoves, beehive burners and road dust all contribute to high fine particulate concentrations in the interior of British Columbia.

What are the sources of fine particulates?

- In the Lower Mainland, point sources (i.e., emissions for which permits have been issued) account for 42% of PM_{10} emissions — 11% originates from the processing of forest products, including paper and allied products and wood products. Area sources account for 33% of PM_{10} — 18% originates from agriculture. Mobile sources, which include various modes of transportation, account for 25% of PM_{10} emissions.
- Outside the Lower Mainland, point sources account for 45% of PM_{10} emissions — 36% originates from the processing of forest products. Wildfires account for 21% of PM_{10} emissions.
- Secondary particulates, formed by chemical reactions in the atmosphere, are not captured by emission data, but do add significant quantities of PM_{10} to the atmosphere.

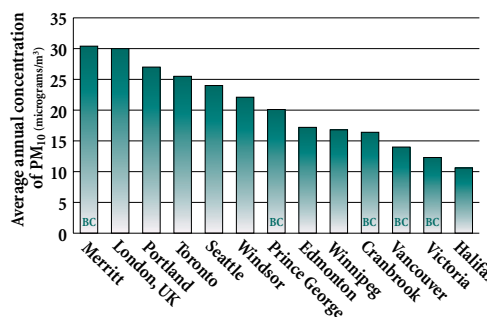


SOURCE: Ministry of Environment, Lands and Parks, 1998. Air Resources Branch. NOTES: The Lower Mainland includes the Greater Vancouver Regional District (GVRD) and the Lower Fraser Valley. The proportional breakdown of sources is calculated from 1995 data. The sources represented here do not include road dust. The contribution of road dust to PM_{10} is difficult to estimate accurately. However, it is generally believed that in some locations, road dust can add significant quantities of PM_{10} to the air.

Outside the Lower Mainland, the contribution of prescribed burning to total PM_{10} emissions has been reduced from 21,600 tonnes in 1990 to 14,700 tonnes in 1995. Smoke control regulations have played a significant role in reducing the impacts of prescribed burning.

How does British Columbia compare to other places?

- The largest urban areas in British Columbia have low average annual concentrations of PM_{10} in comparison to most Canadian, American, and European cities.
- Some smaller cities and towns located in more rural areas of British Columbia have high average annual concentrations of PM_{10} in comparison to other cities.

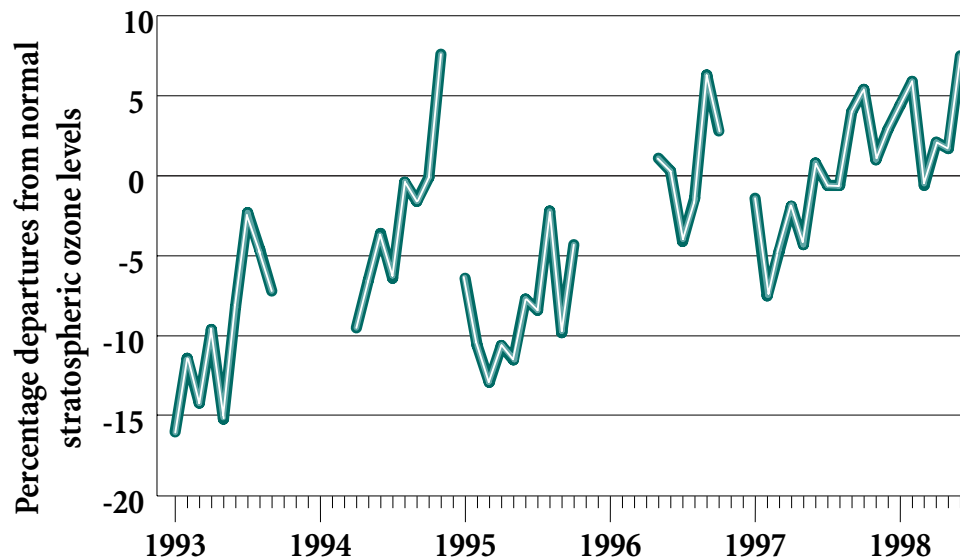


SOURCE: Environment Canada, 1998, for Canadian data; *National Air Quality and Emissions Trends Report*, 1996, for U.S. data; AEA Technology, Air Quality Information, Air Pollution Monitoring in the U.K., 1998, for London, U.K. NOTE: All data are for 1996.

Many communities in British Columbia have comparatively low average annual concentrations of fine particulates.

Stratospheric Ozone Depletion

In recent years, stratospheric ozone levels over British Columbia have been below normal. This has raised concerns about health problems associated with increased exposure to UV radiation.



SOURCE: Environment Canada, Aquatic and Atmospheric Sciences Division, 1998. NOTES: All data for stratospheric ozone levels over southern British Columbia are collected at a sampling station on Saturna Island. "Normal" ozone levels refer to the pre-1980 mean, estimated from satellite data measured between 1979 and 1982, before serious stratospheric ozone depletion began to take place. The satellite data was calibrated against data from five Canadian sites to give a baseline from which to measure departures. Gaps in the data are the result of mechanical failure or too few recording days.

Status and trends in stratospheric ozone levels

*The **Montreal Protocol on Substances That Deplete the Ozone Layer** commits over 150 nations, which produce over 93% of the world's CFCs and halons, to phasing out these damaging substances.*

- Stratospheric ozone levels over southern British Columbia have been below normal (defined as pre-1980 levels) for most of the last five years. In 1997, the average thickness of the ozone layer was 0.8% below normal.
- Since 1979 there has been a steady decline in the amount of stratospheric ozone over the entire globe: a 4–6% decrease per decade at mid-latitudes, and a 10–12% decrease at higher latitudes (closer to the poles).
- Stratospheric ozone is destroyed by industrial halocarbons such as chlorofluorocarbons (CFCs), brominated fluorocarbons (halons), hydrochlorofluorocarbons (HCFCs) and methyl bromide. These substances are commonly known as ozone-depleting substances (ODS).
- The ozone layer is very slow to recover from damage. It is estimated that even if all nations meet the goals of international agreements the ozone layer will not return to normal until about 2060.

Why is it important?

- Stratospheric ozone filters out most of the sun's harmful ultraviolet (UV) radiation — specifically UV-B radiation. Lower ozone levels allow more harmful radiation to reach the earth.
- Excessive exposure to UV-B is a public health issue. It can cause skin cancer, eye disease and immunosuppression (weakening of the human immune system).
- The threat posed by ozone depletion goes beyond human health. Excessive UV-B radiation can inhibit plant growth, damage the productivity of phytoplankton — the organisms that form the first step in marine and freshwater food chains — and contribute to the decline of amphibian populations.

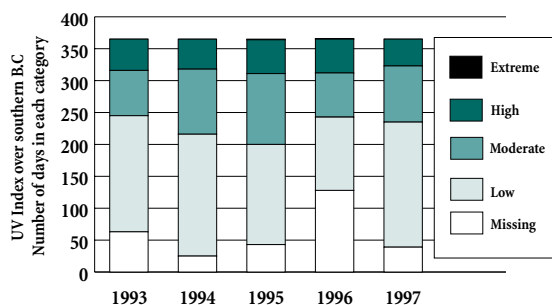
What is being done?

- In February 1993, British Columbia enacted the Ozone Depleting Substances Regulation, which prohibits the venting of ODS. This regulation requires that ODS in air-conditioners, foam materials, solvents and sterilizing equipment be recovered and recycled.
- As of October 1997, British Columbia became the first province to ban the charging and recharging of motor vehicle air conditioners with all ozone-depleting substances.

CANADA'S GOAL: *Acting under the Montreal Protocol (amended in 1995), Canada eliminated production and importation of CFCs in 1996 and halons in 1994. Canada plans to surpass measures to ban methyl bromide by 2010 and HCFCs by 2030 by eliminating them before 2001 and 2020, respectively.*

What are the risks to the health of British Columbians?

- The UV Index measures the intensity of ground-level UV on a scale of 0 to 10.
- Ground-level UV varies with the seasonal angle of the sun's rays, the thickness of the ozone layer, and the weather. Cloud cover and rain can greatly reduce UV, even in the summer.
- Under normal ozone levels, the UV Index over southern British Columbia ranged from under 1 in winter, to 4–5 in late spring and early fall, to 7 in summer.
- In 1997 the UV Index for southern British Columbia was greater than 7 on 42 days, but never greater than 9. Satellite data gathered between 1983 and 1992 indicates that UV intensity over southern Canada has increased by about 4%.

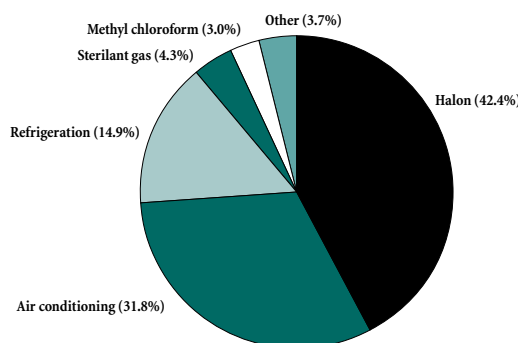


source: Environment Canada, World Ozone and UV Data Centre, Experimental Studies Division, 1998. note: The scale used for the UV Index is: Low (0-3.9), more than one hour to burn; Moderate (4-6.9), about 30 minutes to burn; High (7-8.9), about 20 minutes to burn, and Extreme (9+), 15 minutes or less to burn. Missing days were due to mechanical failure or extremely rainy or overcast weather.

UV intensity in British Columbia is at its highest in the summer. In June and July, the UV Index value for a clear day is usually between 7 and 8.

How does British Columbia contribute to stratospheric ozone depletion?

- CFCs used in refrigerators and air conditioners, and halons used in fire extinguishing systems account for about 89% of the ozone-depleting substances in British Columbia.
- In 1990, British Columbians were responsible for releasing about 1100 tonnes of ODS into the atmosphere.
- The presence of ODS can be reduced both by replacing them with less destructive chemicals, and by adopting alternative methods for cooling, such as ceiling fans, better insulation and more efficient ventilation systems.

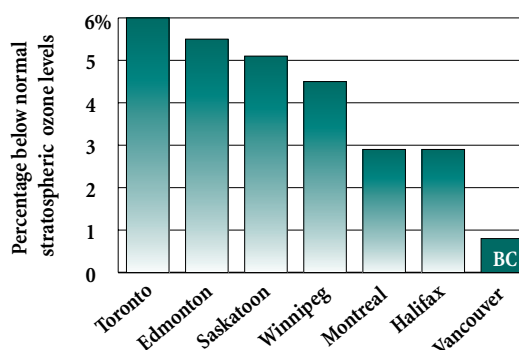


source: British Columbia Ministry of Environment, Lands and Parks, Air Resources Branch, 1996. note: Data reflect 1990 conditions, the most recent year for which information was available.

Canada has enacted regulations that prohibit the manufacture, import and sale of plastic foams containing CFCs, and pressurized containers of 10 kg of CFCs or less.

How does British Columbia compare to other places?

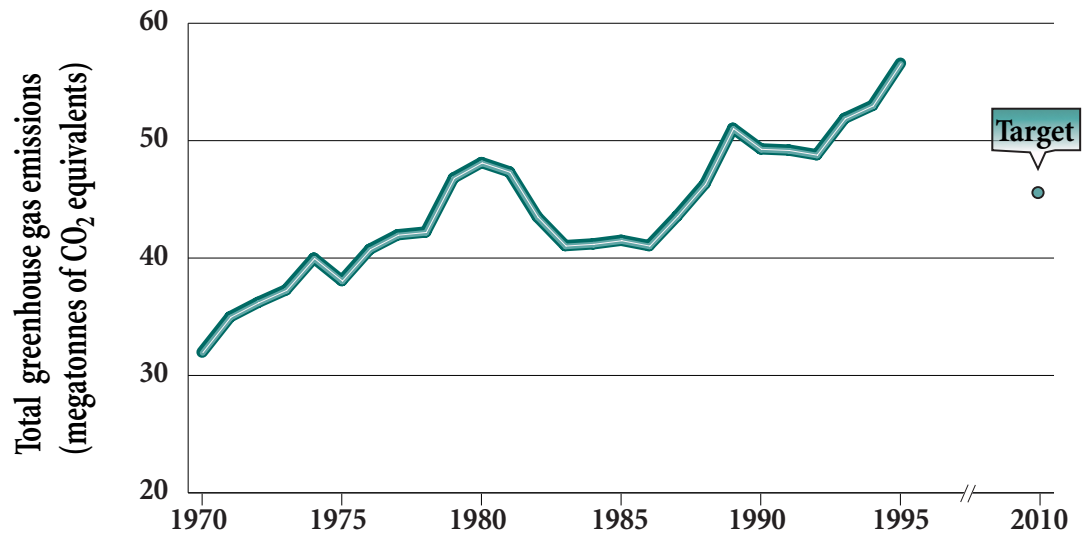
- In 1997, southern British Columbia experienced less thinning of stratospheric ozone than other Canadian locations.
- The thinning of stratospheric ozone over British Columbia is a reflection of air circulation and weather patterns, and does not reflect local releases of ODS.



source: Environment Canada, World Ozone and UV Data Centre, 1998. note: "Normal" refers to the pre-1980 mean.

Greenhouse Gases in British Columbia

Total greenhouse gas emissions in British Columbia increased by 15% between 1990 and 1995.



SOURCES: Ministry of Environment, Lands and Parks, 1997, Ministry of Employment and Investment, and Environment Canada, 1996.

Status and trends of greenhouse gases

- In 1995 total greenhouse gas emissions were 57 megatonnes of carbon dioxide equivalent, an increase of 25 megatonnes or 77% since 1970. Since 1990 there has been a 7 megatonne or 15% increase.
- Per capita greenhouse gas emissions increased by less than 1% between 1990 and 1995, indicating that population growth has had a major impact on total greenhouse gas emissions. Between 1970 and 1995, the population in British Columbia increased by 74%, from 2.2 million to 3.8 million. From 1990 to 1995 population increased by 14%.
- Carbon dioxide accounts for 83% of British Columbia's greenhouse gas emissions. Transportation is the single largest source of carbon dioxide emissions.
- Greenhouse gas emissions are strongly influenced by energy prices and economic activity. The decrease in greenhouse gas emissions in the early 1980s can largely be attributed to increasing energy costs and the economic recession.
- Other factors such as weather can also influence greenhouse gas emissions. The 1989 high in emissions may have been a result of an unusually cold winter.

Dramatic increases in population account for a significant portion of the increases to greenhouse gas emissions in the province.

In December 1997, 160 nations negotiated a legally binding protocol under which industrialized countries will collectively reduce greenhouse gas emissions by 5.2%.

Why is it important?

- Human activities, such as the burning of fossil fuels, are adding significant quantities of carbon dioxide and other greenhouse gases to the earth's atmosphere. The scientific community has concluded that elevated levels of greenhouse gases are causing changes to global climate.
- The impacts of climate change may be far ranging and include rising temperatures, changing precipitation patterns and the disruption of major weather and ocean systems.
- The effects of climate change predicted to occur in British Columbia include: increased rainfall on the coast and increased drought in the interior; altered stream flows; declining fish stocks in the southern part of the province; and increased frequency of forest fires and pest infestations.

What is being done?

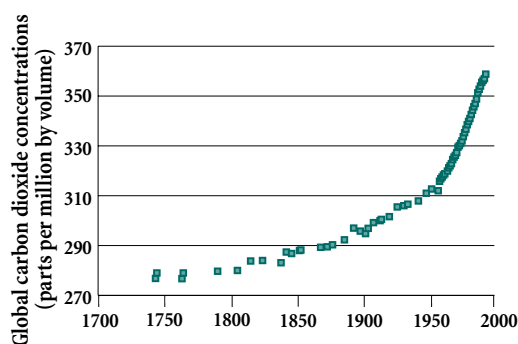
- The Greenhouse Gas Forum has been established to advise the government on ways to reduce greenhouse gas emissions.
- The Clean Vehicles and Fuels Program and development of Transportation Demand Management plans will contribute to reductions in greenhouse gas emissions.
- British Columbia is a partner in the Greenhouse Gas Emission Reduction Trading Pilot (GERT), a program designed to test the effectiveness of emission trading for greenhouse gases in the Canadian context.

CANADA'S GOAL:

In 1997 Canada participated in the development of the Kyoto Protocol to the United Nations Framework Convention on Climate Change, which when ratified will commit Canada to reduce greenhouse gas emissions to 6% below 1990 levels, by between 2008 and 2012.

Is global atmospheric carbon dioxide increasing?

- ↪ Since pre-industrial times the atmospheric concentration of carbon dioxide has increased by 30%, methane by 145% and nitrous oxide by 15%. Carbon dioxide is responsible for about 65% of the human induced greenhouse effect.
- ↪ During the last century the global average surface temperature increased by between 0.3 and 0.6°C.
- ↪ The eleven warmest years since 1860 (when measurements began) have been after 1980. The 3 warmest years have been since 1990 and the warmest year on record was 1995.

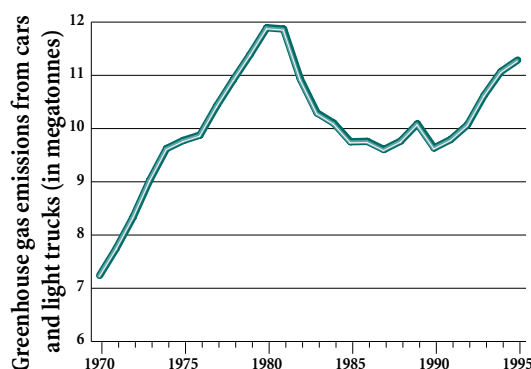


SOURCES: A. Neftel et al., 1985, *Nature*, 315, 45-47; H. Friedli et al., 1986, *Nature* 324, 237-238; C.D. Keeling, Scripps Institute of Oceanography, Mauna Loa, Hawaii.

The atmospheric concentration of carbon dioxide increased by approximately 30% between 1744 and 1994.

What is the role of personal vehicles?

- ↪ Transportation accounts for a significant portion of greenhouse gas emissions in British Columbia.
- ↪ Greenhouse gas emissions from personal vehicles increased by 56% between 1970 and 1995. In that time the per capita distance driven doubled and the total distance driven more than tripled. As well, there has been a trend towards larger, more fuel-consuming vehicles.
- ↪ The decrease in vehicle emissions in the 1980s is directly related to high fuel prices and the economic recession.
- ↪ Emissions from personal vehicles are a function of the amount of fuel burned. A reduction in distance travelled per capita, greater fuel efficiency and the use of alternative fuels would all contribute to a reduction in greenhouse gas emissions.

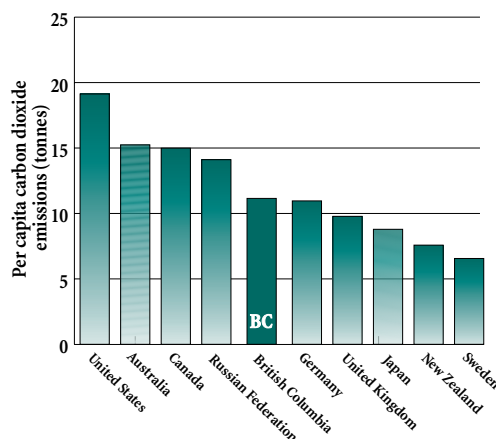


SOURCE: Ministry of Employment and Investment, 1996.

In 1994 British Columbians drove an average of 10,000 kilometres per capita. This was double the distance driven in 1970 and has contributed significantly to increases in greenhouse gas emissions from personal vehicles.

How does British Columbia compare?

- ↪ British Columbia's per capita carbon dioxide emissions are in the same range or lower than other North American jurisdictions, but higher than most European countries.
- ↪ Energy-intensive settlement and transportation patterns, industrial activity and high levels of consumption all contribute to British Columbia's relatively high per capita carbon dioxide emissions.
- ↪ Currently, per capita greenhouse gas emissions are greatest in industrialized countries. However, greenhouse gas emissions in developing countries are rapidly increasing as those countries experience industrial growth.

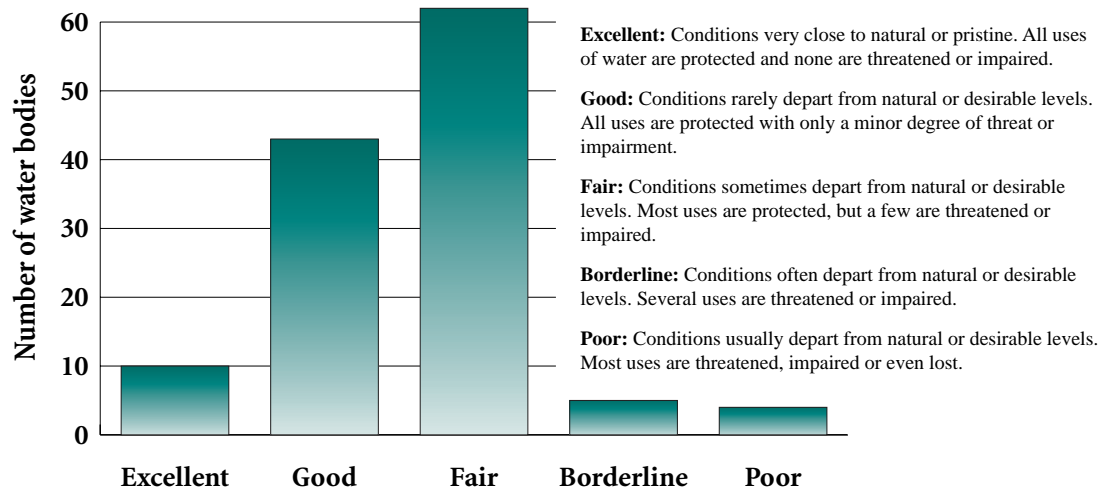


SOURCES: World Resources 1996-97, World Resources Institute; for B.C., Environment Canada, Pollution Data Branch 1996.
NOTE: These data are for 1992.

Per capita carbon dioxide emissions are significantly higher in North America and Australia than in industrialized countries in Europe and Asia.

Water Quality in British Columbia

British Columbia has recently developed a Non-Point Source Pollution Action Plan to address the difficult problems causing most of the poor or borderline water quality ratings.



SOURCE: Ministry of Environment, Lands and Parks, 1996. *Water Quality Status Report* and Ministry of Environment, Lands and Parks, Water Management Branch, 1997 for updates. NOTES: The Status Report ratings are derived from a Provincial Water Quality Index (WQI) that measures the impact of pollutants on water quality. Since the Status Report is based on areas where there are likely to be water quality concerns, the results may indicate a poorer state than if an average of all waterbodies in the province was considered. Individual indices are determined by the number of water quality objectives not met and the frequency and amount by which these objectives are exceeded. The WQI was developed based on an assessment of 124 water bodies (including fresh surface streams, rivers and lakes, aquifers and marine areas) for which at least three years of data were collected between 1987-1995. Most of the thousands of water bodies in the province are not monitored.

Status of water quality

- Regular monitoring for water quality is conducted on a small percentage of water bodies where water quality problems are most likely to occur.
- In 1995, 9 of the 124 monitored water bodies received Borderline or Poor ratings, due primarily to pollution from non-point sources.
- Half of the monitored water bodies were rated as Fair, indicating some impairment of uses and the need for actions to prevent further impairment.
- Selected examples of rated water bodies include:
 - Chilliwack River where water quality is Excellent. Continued monitoring will ensure early detection of changes in water quality.
 - Cowichan River where water quality is Fair. Coliforms, the growth of algae, and dissolved oxygen do not meet acceptable levels at times. These problems are currently being addressed.
 - Saar Creek where water quality is Poor. Dissolved oxygen and fecal coliform levels do not meet acceptable concentrations. Improvements in agricultural practices that cause this are underway.

Why is it important?

- Protection of drinking water quality and maintaining the integrity of aquatic ecosystems are important environmental issues for British Columbians.
- British Columbia has 25% of the flowing fresh water in Canada. Ongoing monitoring, protection and careful management of these water resources are of critical importance.

What is being done?

- A Non-Point Source (NPS) Pollution Action Plan will address several problems in water bodies with poor and borderline ratings.
- The impacts of industrial effluent and agricultural run-off will continue to be reduced through initiatives such as pollution prevention projects and the agricultural code of practice.
- Upgrades to sewage treatment facilities and the development of liquid waste plans will help reduce the impacts of residential sewage.
- Damaged fish-bearing streams are being restored and sensitive stream-side habitats are being protected through a combination of activities, including the Watershed Restoration Program, the Urban Salmon Habitat Program, the *Fish Protection Act*, the *Forest Practices Code* and Forest Renewal BC.

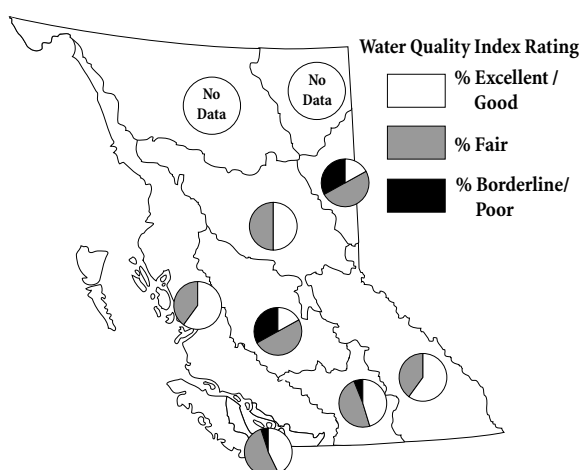
*The recently passed **Fish Protection Act**, as well as changes to the **Municipal Act**, are the first steps in a new comprehensive approach to water quality management. They provide provincial and local governments with increased powers to protect and restore water quality.*

BRITISH COLUMBIA'S GOAL:

Clean, healthy and safe land, water and air for all living things and provision of social, economic and outdoor recreational opportunities consistent with maintaining a naturally diverse and healthy environment.

What is the water quality across the province?

- While the majority of classified water bodies in all areas of the province are ranked Fair to Excellent, water quality varies significantly from ecoprovince to ecoprovince.
- Water quality ratings are generally highest in the less populated ecoprovinces, such as the Coast and Mountains, Southern Interior Mountains, and Sub-Boreal Interior.
- In the heavily populated Georgia Depression and Southern Interior ecoprovinces, 96 water bodies are monitored. Water quality is Excellent to Good in 44%; Fair in 51%; and Poor to Borderline in 5%. The high percentage of water bodies rated as Fair indicates a need for vigilant monitoring as well as actions to prevent further degradation and costly restoration.

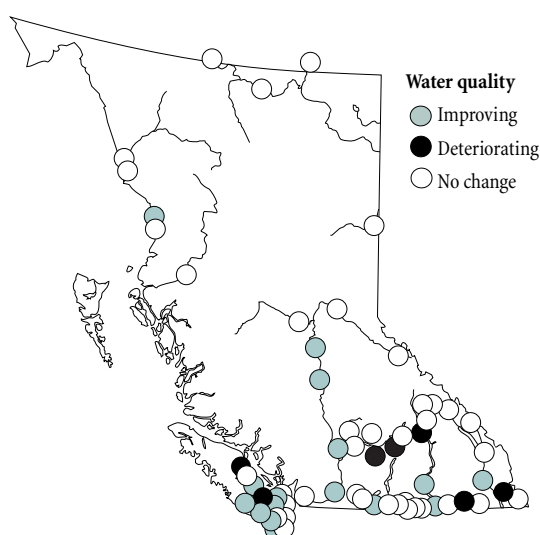


source: Ministry of Environment, Lands and Parks, 1997. Water Management Branch. notes: The water quality index was applied to a larger number of water bodies in the Georgia Depression and the Southern Interior than in the other ecoregions of the province. The delineations on the map show the 10 ecoprovinces of British Columbia, based on the *Ecoregions of British Columbia, 1993*.

Five percent of the monitored water sources in the most populated ecoprovinces, the Georgia Depression and Southern Interior, are rated as Poor or Borderline.

What are the long-term water quality trends?

- Long-term surface water quality records reveal that, with few exceptions, water quality across the province has generally remained stable or has improved over the last decade.
- Improvements have been largely due to point source water management actions.
- Results of trend assessments at 62 sites, a majority of which have at least 10 years of data, are shown on the accompanying map.
- For each of the seven sites with deteriorating water quality, characteristics of concern and implications vary.
- Discharges from mining operations have the potential to affect aquatic life in the Quinsam River at the mine site and in the Elk River. Government and the companies involved are developing plans to address concerns in these water bodies.
- Declining fisheries production in Kootenay and Arrow lakes is a result of upstream dams and reservoirs. Efforts to mitigate this problem, by fertilization, have been successful in Kootenay Lake.



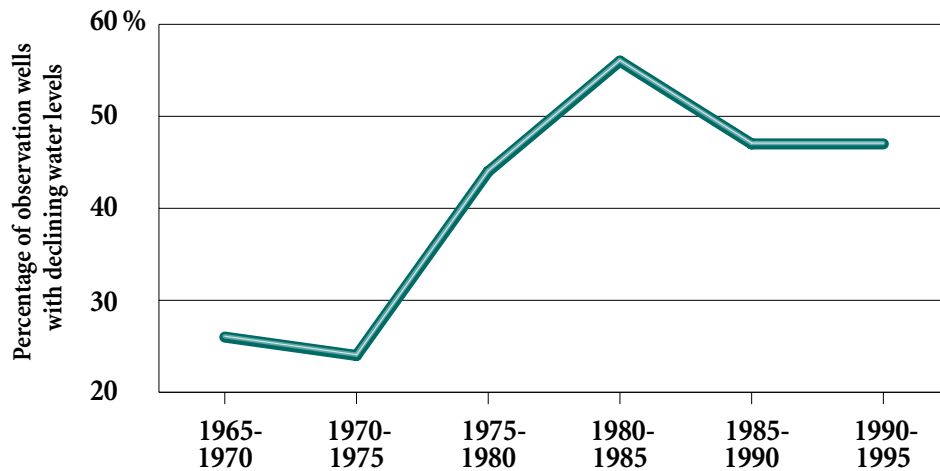
source: Ministry of Environment, Lands and Parks, and Environment Canada, 1998: *Trends in Water Quality in British Columbia*, currently under preparation.

Since 1985, water quality in British Columbia has remained stable or improved at 89% of the sampling stations and deteriorated at 11%.

- Non-point source pollution has impacted water quality for recreational, domestic or wildlife uses in the Salmon River at Salmon Arm and the South Thompson River at Kamloops. A multi-faceted approach, involving actions such as watershed restoration and pollution prevention, is being taken by industries, communities and several levels of government to address these problems. In Quamichan Lake near Duncan, naturally high waterfowl populations make the water unsuitable for swimming.

Groundwater in British Columbia

The percentage of provincial observation wells with declining water levels has nearly doubled over the past 30 years.



source: Ministry of Environment, Lands and Parks, 1996. Water Management Branch.

notes: Number of sampled wells with suitable long-term trend data increased from 31 to 150 over the thirty-year period.

Status and trends in groundwater supply

- Long-term trends in groundwater levels are monitored at 150 observation wells throughout British Columbia.
- The percentage of wells showing declining water levels has increased from 26% in 1965 to a high of 56% in 1980. Over the past 10 years, normal or above normal precipitation has resulted in the replenishment of water levels in some wells and a slight decrease in the percentage of wells showing declining water levels.
- The general trend towards declining water levels is likely due to increasing groundwater withdrawal on Vancouver Island and in the Lower Mainland, climatic effects (i.e., dry conditions), and an increase in monitoring intensity in the areas of heaviest groundwater use.
- In some areas the volume of groundwater withdrawn may be exceeding recharge. Further groundwater monitoring and management is critical in these areas.
- Groundwater users do not need a water licence in British Columbia. As a result, there are no reporting requirements for data on the actual volume of groundwater being withdrawn.

Groundwater sources supply approximately 25% of the total municipal water demand in British Columbia, excluding Greater Victoria and Vancouver.

Why is it important?

- Approximately 600,000 people in British Columbia depend on groundwater sources.
- In some areas where available surface water supplies are already fully allocated or are too costly to develop, groundwater is the only viable and cost-effective source of water supply.
- Excluding Greater Victoria and Vancouver, groundwater sources supply approximately 25% of the total municipal water demand in British Columbia. This is expected to increase in the near future, particularly in rural areas.
- Groundwater contributes to the year-round base flow for fish-bearing streams and wetland habitat.
- Groundwater is difficult to observe and there is limited understanding of its location, quantity and quality throughout British Columbia.

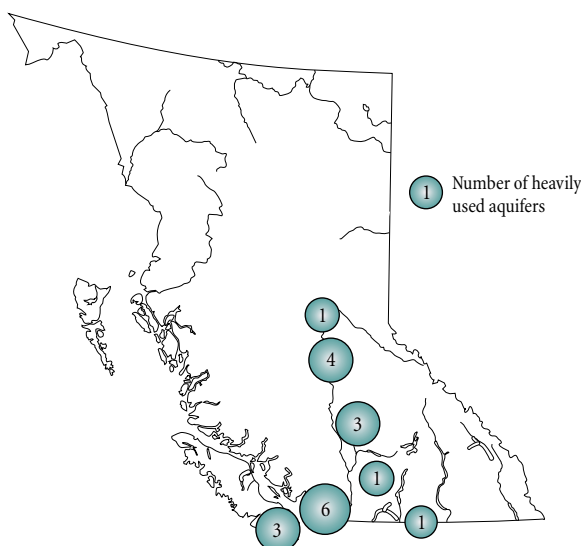
What is being done?

- The government is currently examining non-regulatory approaches to groundwater protection.
- The development of well and aquifer protection plans at the community level are being encouraged in co-operation with government agencies and water purveyors.
- Enhancements are being made to groundwater inventory activities.

BRITISH COLUMBIA'S GOAL: *Clean, healthy and safe land, water and air for all living things. The province's aim is to reduce the percentage of wells with declining water levels.*

Where is groundwater demand highest in British Columbia?

- A map-based system for classifying groundwater reservoirs (aquifers) to assess risks to their supply and quality has been developed. This inventory currently contains 192 aquifers.
- Nineteen of the aquifers have been classified as heavily used. The majority of these aquifers are in the Fraser Valley and east coast of Vancouver Island.
- While supplies of groundwater are clearly under stress in these aquifers, heavy use can also put the quality of water at risk. For example, excessive groundwater withdrawals in coastal regions are causing salt water intrusion and groundwater quality degradation in some areas of the Gulf Islands and the Saanich Peninsula.

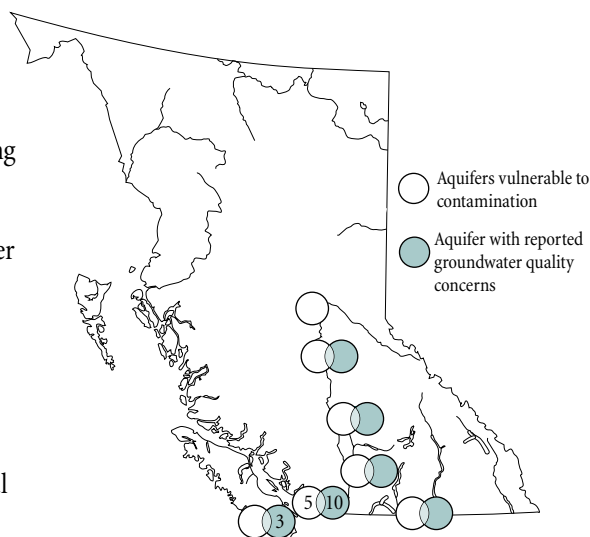


SOURCE: Ministry of Environment, Lands and Parks, 1996. Water Management Branch.

Groundwater supply in 90% of the classified aquifers is not at risk. However, in 10% of the classified aquifers, groundwater supply may be at risk due to heavy use.

Is British Columbia's groundwater contaminated?

- 36% of the classified aquifers in British Columbia are considered to be highly vulnerable to contamination. Natural characteristics are used to determine vulnerability. Eleven aquifers have been identified as having the greatest risk of declining quality. Many of these provide drinking water to large communities, for example the Township of Langley and Abbotsford.
- Based on Guidelines for Canadian Drinking Water Quality, specific sites within seventeen aquifers have been reported with health-related water quality concerns. Ten of these aquifers are in the Fraser Valley where water quality guidelines for some substances were exceeded in one or more wells. Through notifications to owners, bulletins and workshops municipal, provincial and federal governments have worked together to inform people in affected areas and to develop community-based solutions.
- Nitrate levels exceed guidelines in nine of the seventeen aquifers, probably due to agricultural fertilizer, agricultural manure and/or septic fields.
- Some contaminants (e.g., nitrate) are primarily the result of human activities and are of greatest concern in those aquifers considered vulnerable to contamination. Others are naturally occurring (e.g., fluoride, arsenic) and affect water quality even in groundwater sources that are not otherwise at risk of contamination.



SOURCE: Ministry of Environment, Lands and Parks, 1996. Water Management Branch. NOTES: 1. Each circle represents one aquifer of concern within the given area unless otherwise indicated by numbers. 2. The *BC Water Quality Status Report*, 1996, describes, in more detail, the state of water quality in some aquifers. 3. Most information is collected in areas of highest population density. Little is known about groundwater in British Columbia outside these areas.

More than 1 in 3 classified aquifers in British Columbia are potentially vulnerable to contamination.

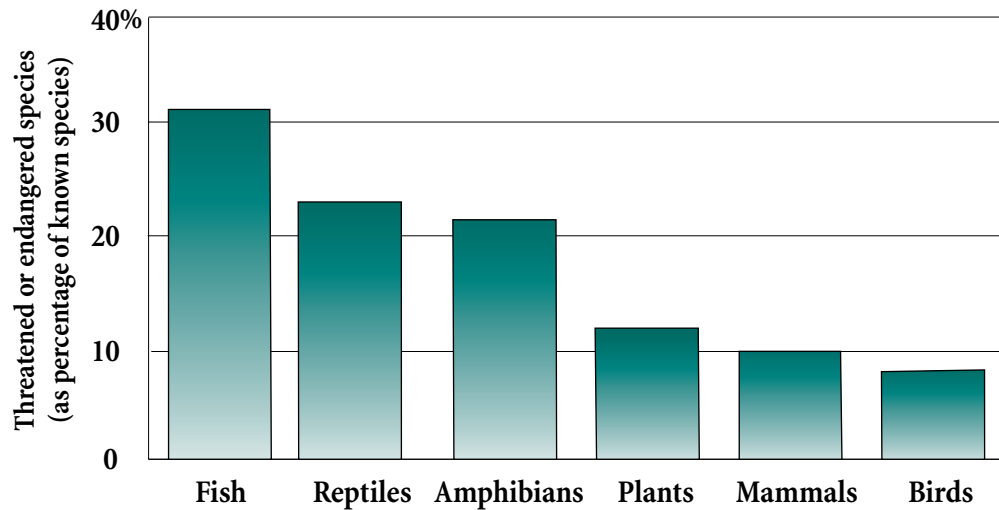
There are specific sites within 17 aquifers in British Columbia where water quality has the potential for health concerns.

Species at Risk in British Columbia

Approximately one in ten species of vertebrate animals and plants are threatened or endangered in British Columbia.

A high percentage of freshwater fish are threatened or endangered in British Columbia.

Four species have been legally designated as endangered under the **British Columbia Wildlife Act**: Burrowing Owl, White Pelican, Sea Otter and Vancouver Island Marmot. The White Pelican and the Sea Otter have shown signs of recovery in recent years.



SOURCE: Ministry of Environment, Lands and Parks, 1996, Conservation Data Centre. NOTES: Plants are restricted to vascular plants. The total threatened or endangered species /native breeding species in each group is: freshwater fish 27/84; reptiles 3/13; amphibians 4/18; vascular plants 234/2042; terrestrial mammals 10/104; breeding birds 24/308. Species are designated as: *endangered* when they are facing imminent extinction or extirpation; *threatened* when they are likely to become endangered if factors affecting their vulnerability are not reversed; or *vulnerable* when they are of special concern because of characteristics that make them particularly sensitive to human activities or natural events.

Status and trends in species at risk

- In British Columbia 68 species of vertebrate animals and 234 vascular plant species are Red-listed – either threatened, endangered or candidates for these designations.
- Threatened or endangered species include the Salish Sucker, Golden Paintbrush, Pacific Water Shrew, Sea Otter, White-headed Woodpecker and Spotted Owl.
- An additional 451 species are classified as vulnerable. Threatened or endangered species, together with vulnerable species, are considered to be at risk.
- Over 800 species of invertebrate animals such as insects are believed to be at risk.
- The *British Columbia Wildlife Act* allows for the legal designation of endangered vertebrate animals, a designation which restricts any actions resulting in the death of an endangered species. This Act is currently under review.

Why is it important?

- British Columbia is Canada's most biologically diverse province, and threatened or endangered species are an ecologically important part of this biodiversity.
- Diverse and viable populations of wild plants and animals are vital to long-term economic and social well-being.
- Threatened or endangered species, like all living things, have a right to exist beyond their value to humans.

What is being done?

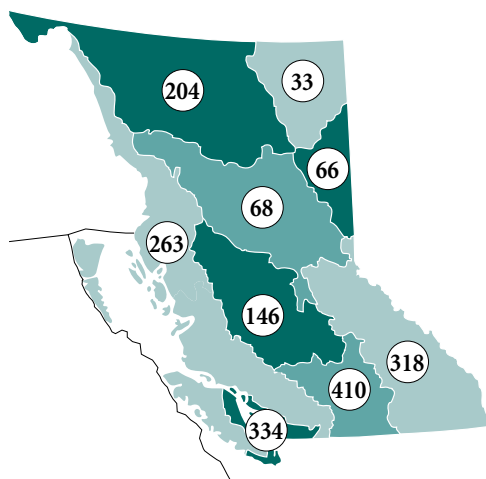
- British Columbia has signed the National Accord for the Protection of Species at Risk. It commits all provinces and territories to provide protection for threatened or endangered species by measures such as protecting the species and their habitat and developing recovery plans. The National Accord emphasizes preventative measures, stewardship initiatives, and the need for partnerships on both public and private lands.
- The province is committed to a process of consultation in 1999 to fill gaps that presently exist in meeting the National Accord.
- Identified Wildlife Management Strategy, and the Fish Protection Act will assist British Columbia in meeting the provisions of the National Accord.

BRITISH COLUMBIA'S GOAL:

Protection, conservation and restoration of a full range of biological and physical diversity native to British Columbia. By the year 2001 British Columbia will develop status assessments and recovery plans for all threatened or endangered species.

Where are the species at risk found?

- An ecological classification system divides British Columbia into 10 ecoprovinces.
- The ecoprovinces with the largest numbers of species at risk are the Southern Interior (410 species) and the Georgia Depression (334 species).
- In these ecoprovinces a high rate of human population growth coinciding with regions of high biodiversity results in habitat loss for many species.
- Species at risk in the Southern Interior include the Rattlesnake, which is vulnerable due to direct killing and loss of grassland habitat in the Okanagan and Thompson valleys.
- Species at risk in the Georgia Depression include the White Sturgeon — endangered due to overfishing early in the century and to the loss of rearing habitat caused by sloughs and dykes. Hydro-electric development has impacted sturgeon elsewhere in the province.



SOURCE: Ministry of Environment, Lands and Parks, 1995. Conservation Data Centre. NOTES: Circled numbers indicate the total number of threatened, endangered and vulnerable species and sub-species.

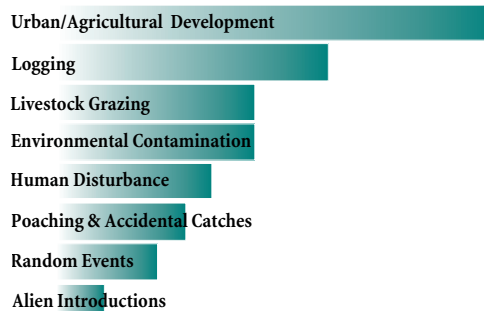
Species at risk are concentrated in ecoprovinces with the highest density of people.

Habitat loss caused by urban and agricultural development poses the greatest threat to species at risk in British Columbia.

What are the threats to species at risk?

- Urban and agricultural development pose the greatest threats to vertebrate animals and vascular plants in British Columbia.
- Effective legislation that will reduce the impacts of urban and agricultural development on species at risk has not yet been developed.
- Logging poses the second greatest threat to vertebrate animals, while its impact on vascular plants is unknown.
- Biodiversity and wildlife guidelines in the *Forest Practices Code* provide a legislated requirement to reduce the impact of logging and livestock grazing on species at risk.

Relative importance of threats to vertebrates

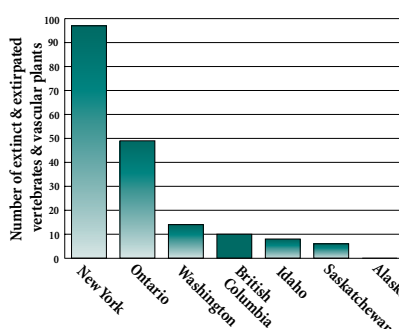


SOURCE: Ministry of Environment, Lands and Parks, 1995. Wildlife Branch. NOTES: Does not include fish. Urban and agricultural development are combined because of overlaps in their impact on habitat.

Species extirpated from British Columbia are: White-tailed Jackrabbit, Sage Grouse, Yellow-billed Cuckoo, Short-horned Lizard, Pink Sand-verbena, and Common Downingia. British Columbia species now extinct are: Passenger Pigeon, Dragon Lake Whitefish, Hadley Lake Limnetic and Benthic Sticklebacks.

How does British Columbia compare to other places?

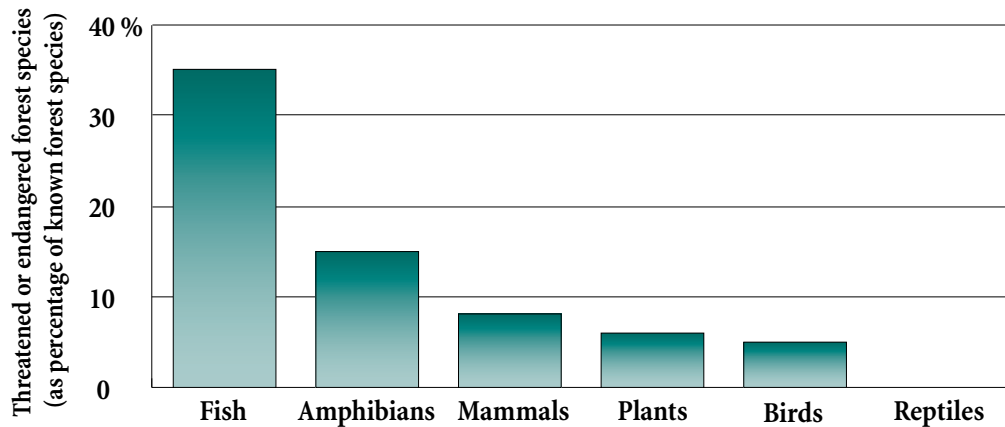
- Extirpated species (i.e., those no longer in a particular location but found elsewhere) and extinct species provide an indication of the degree to which a jurisdiction's biological diversity has deteriorated.
- British Columbia has 10 extinct and extirpated species, compared to 97 in New York State, 49 in Ontario, 14 (excluding fish) in Washington State and none in Alaska.
- Species extirpated from British Columbia include 1 mammal, 2 birds, 1 reptile and 2 vascular plants. British Columbia species now extinct include 1 bird and 3 fishes.



SOURCES: Conservation Data Centres or Heritage Programs for each jurisdiction, 1996. NOTES: Conservation Data Centres and Heritage Projects in British Columbia, and elsewhere, use a system of ranking species, developed by The Nature Conservancy (U.S.), which is internationally recognized and allows for comparisons between jurisdictions. Data for Washington do not include fish.

Forest Species in British Columbia

Thirteen percent of forest-dwelling vertebrates and 6% of forest-dwelling vascular plants are threatened or endangered in British Columbia.



SOURCE: Ministry of Environment, Lands and Parks, Wildlife and Fisheries Branches, 1997. NOTES: The total number of threatened or endangered forest-dwelling species/total number of forest dwelling species in each group are: freshwater fish 24/69; amphibians 2/13; mammals 5/61; vascular plants 49/792; birds 7/135; reptiles 0/4. Except for fish, a forest species was defined as a species that requires forest habitat for at least one of its life requirements. A forest was defined as an area having at least 10% tree cover. A forest-dependent fish was defined as a fish with high to medium dependence on forests.

Status and trends in forest species

- In British Columbia, 8% of 1074 known species of forest-dwelling vertebrate animals and vascular plants are Red-listed — either threatened, endangered or candidates for these designations.
- Threatened or endangered forest species include Nooksack Dace, Pacific Giant Salamander, Keen's Long-eared Myotis, Silvery Lupine, Marbled Murrelet, and Spotted Owl.
- Small organisms, such as non-vascular plants, invertebrates and fungi, comprise the majority of forest-dwelling species and fill an important role in the ecology of forests. However, very little is known about their status.
- Changes in the nature and extent of forest habitat affects the diversity of forest-dwelling species. Species that require large ranges (e.g., Grizzly Bear, Wolverine) and those that are associated with older forests (e.g., owls, bats) are most affected.
- Urban development is a threat to some threatened or endangered forest plants, such as the Deltoid Balsamroot of the Garry Oak Meadow ecosystem.

Many of the threatened or endangered forest species are found where habitat loss, due to pressures for development, are greatest — in British Columbia's Lower Mainland and Southern Interior.

Why is it important?

- Forests cover nearly two-thirds of British Columbia and provide a wide range of habitats for plants and animals.
- A significant portion of the species in British Columbia are forest-dependent. This includes 82% of freshwater fish, 72% of the amphibians, 60% of the mammals, 50% of the breeding birds and 31% of the reptiles.
- Forest ecosystems and the species that live in them are closely linked to many other ecosystems. For example, through the exchange of water, material, gases and species, aquatic ecosystems and forest ecosystems are highly interdependent. Even seabirds can be influenced by the nature and extent of forest practices in watersheds far from the ocean.
- *Threatened or endangered forest species* is an indicator of ecosystem diversity and integrity, which is, in turn, linked to forest productivity and the health of the forest industry.

What is being done?

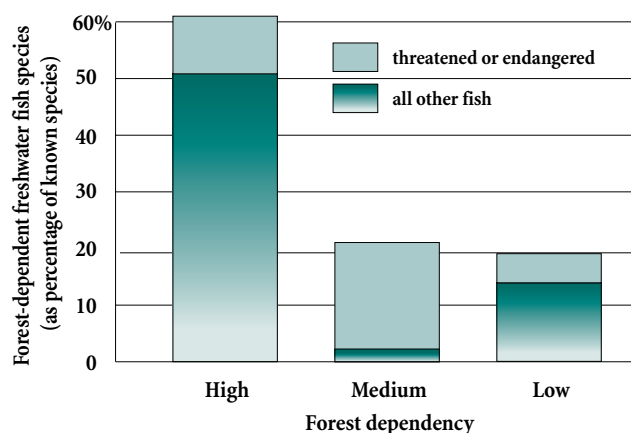
- The *Forest Practices Code*, through the Biodiversity and Riparian Guidelines, provides an ecosystem approach for the management of forest-dependent species.
- The Identified Wildlife Management Strategy will provide guidelines specific to species known to be at risk.

BRITISH COLUMBIA'S GOAL:

Protection, conservation and restoration of a full range of biological and physical diversity native to British Columbia and provision of social, economic and outdoor recreational opportunities consistent with maintaining a naturally diverse and healthy environment.

Are forest-dependent freshwater fish threatened?

- All of British Columbia's 84 native freshwater fish are considered dependent on forests to some extent because forests are the dominant factor determining water quality, quantity and temperature, and sediment delivery in rivers, streams and lakes.
- Fish with a high forest dependency require stream habitat to complete at least one stage of their life history. Streams are directly influenced by riparian forests that provide shade, organic litter and nutrients, and large woody debris for channel structure, stability, and habitat diversity.
- Species with a medium forest dependency rely on lake habitats for one or more life stages. Lake habitats are assumed to be less influenced by adjacent forests than are streams. Lakes are indirectly influenced by forests through their effect on incoming streams.
- Fish with a low forest dependency can complete all life stages in habitats that have naturally low or unforested riparian areas (i.e., alpine), or in large rivers where riparian forests have minimal influence.
- Of the 51 fish species with a high forest dependency, 8 are threatened or endangered (16%), including Broad Whitefish, Nooksack Dace, and Umatilla Dace.
- Forest practices designed to protect stream habitats are outlined in the Riparian Management Area Guidebook, Watershed Assessment Procedures, and Terrain Stability and Gully Stability Assessment Procedures of the *British Columbia Forest Practices Code*.



SOURCES: Ministry of Environment, Lands and Parks, 1997 with assistance from Ministry of Forests, Royal British Columbia Museum, Canadian Department of Fisheries and Oceans, University of Victoria, University of Alberta. NOTE: The numbers of threatened or endangered/total fish species are 8/51 for high forest dependency; 16/18 for medium dependency; 3/15 for low forest dependency.

Approximately one in three species of forest-dependent native freshwater fish are threatened or endangered in British Columbia. Many of these threatened or endangered fish are especially vulnerable to disturbances because they are naturally rare or have restricted distributions.

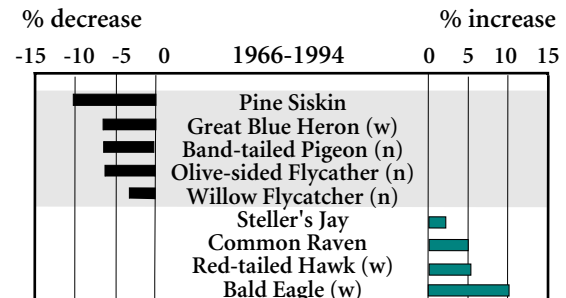
Forest Species in British Columbia/continued

Most forest dwelling birds captured by the Breeding Bird Survey show no clear trends over the past 30 years. A few, such as the Great Blue Heron on the coast and the Ruffed Grouse, in the interior, have been declining. Others, such as the Bald Eagle on the coast and the Pileated Woodpecker, in the interior, have been increasing.

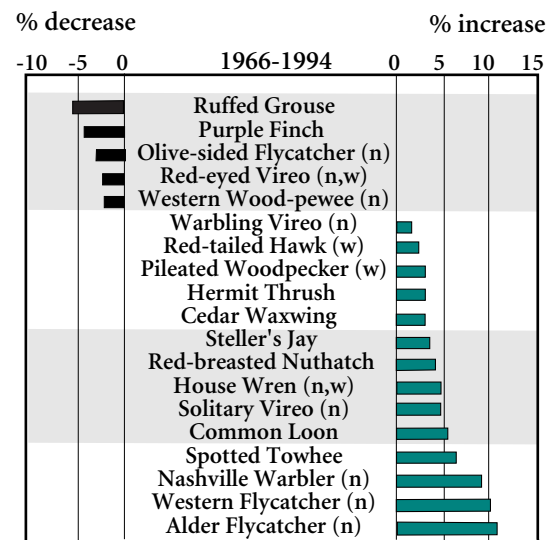
Are forest-dwelling birds declining in British Columbia?

- Fifty percent (135) of the native breeding birds in British Columbia live in forests, making their population trends important early-warning signals for the state of biodiversity in the province's forests.
- The Breeding Bird Survey provides reliable long-term information on trends in bird populations from 1966 to 1994. It captures 58% of the native breeding forest birds in British Columbia. Rare, nocturnal, silent and interior forest birds are not captured.
- Thirty-six percent (28) of the forest bird species followed by the Breeding Bird Survey are neotropical migrants or birds that breed in British Columbia but spend most of their lives south of the United States. In British Columbia, most neotropical migrant birds captured by the Breeding Bird Survey — 17 on the coast and 28 in the interior — show no clear trends. Three species on the coast and 3 in the interior are declining, 6 species in the interior are increasing.
- Fifty-four forest-dwelling birds are known as “wildlife tree users” because they require the specialized habitat created by dead or decaying trees. The 30 species captured by the Breeding Bird Survey — 14 on the coast and 26 in the interior — show no clear trends in population size. On the coast, 1 is declining and 2 are increasing; in the interior, 1 is declining and 3 are increasing.

Coast



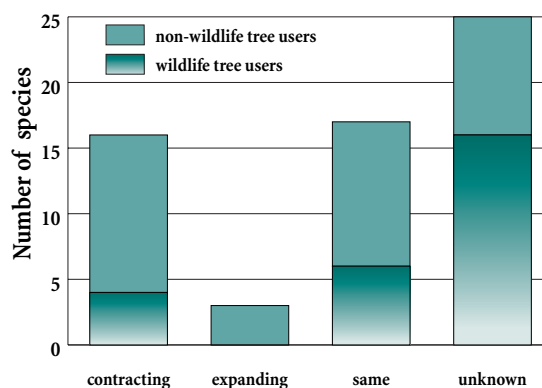
Interior



SOURCE: Canadian Wildlife Service, Breeding Bird Survey, 1996.
 NOTE: 58% (78) of the native breeding forest birds in British Columbia are captured by the Breeding Bird Survey. Only forest birds showing clear trends for the 29-year period between 1966 and 1994 are shown. n = neotropical migrant; w = wildlife tree user. The Coast includes the Coast and Mountains and Georgia Depression Ecoprovinces; the Interior includes the Sub-Boreal Interior, Central Interior, Southern Interior and Southern Interior Mountains ecoprovinces. No Breeding Bird Survey data were available for the Northern Boreal Mountains, Taiga Plains and Boreal Plains ecoprovinces in northern and north-eastern British Columbia.

Is the range of forest mammals shrinking?

- Sixteen (44%) of the 36 forest-dwelling mammals with known range trends have contracting ranges. This trend may be an early warning signal that species are moving towards endangerment.
- The three species that have expanded their ranges are associated with early seral forests (Moose and White-tailed Deer) and/or are well adapted to rural development (White-tailed Deer and Coyote).
- The range trends of 40% of forest-dwelling mammal species are unknown, including 16 of 26 wildlife tree users.
- Mechanisms for protecting forest-dwelling mammals through the *B.C. Forest Practices Code* include the Biodiversity Guidebook, the Riparian Management Area Guidebook, and the Identified Wildlife Management Strategy.

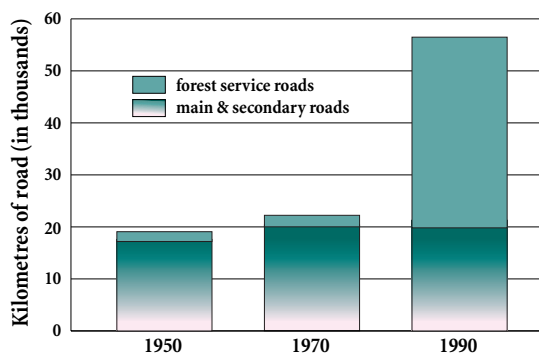


SOURCES: Royal British Columbia Museum and Ministry of Environment, Lands and Parks, 1997. NOTE: A wildlife tree is defined as any standing dead or live tree with special characteristics that provide valuable habitat for the conservation or enhancement of wildlife. Wildlife tree users are identified by the Wildlife Tree Committee of British Columbia. Trends were evaluated using range expansions or contractions since 1900.

Four of the 16 forest-dwelling mammals with shrinking ranges use wildlife trees.

Are roads intruding on forest habitat?

- Main and secondary highways are the basic transportation system for the province. By the early 1990s there were about 22,000 km in this system. It has expanded by 18% since the 1950s. Most of the increase occurred before 1970.
- Forest service roads are used to access forests for timber and recreation. In 1990 there were 35,000 km of forest service roads, up from 850 km in 1950. Most of the increase occurred since 1970.
- Roads provide access to resources and recreational opportunities. They can also lead to increased development, habitat fragmentation and stream sedimentation, and provide access for predators and introduced species.
- Some of the negative impacts of roads can be mitigated by regular road maintenance and access management, including road closures.

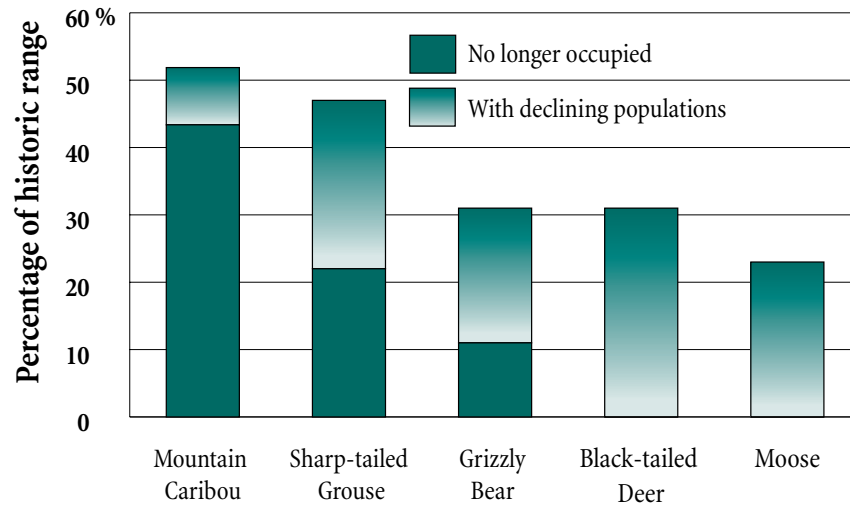


SOURCES: Ministry of Environment, Lands and Parks 1997 and Ministry of Forests: MOF Annual Reports 1950-1990.

Most of the roads in British Columbia are built for logging.

Wildlife in British Columbia

Several wildlife species, including Mountain Caribou and "Columbian" Sharp-tailed Grouse, have experienced significant declines in their historic range since the 1950s.



SOURCE: Ministry of Environment, Lands and Parks, Wildlife Branch, 1997. NOTE: The calculations for this graph were made from an assessment of historical (1950) and current habitat suitability for each species. The range of each species was calculated by ecoregion, except for Mountain Caribou, which was calculated using the distribution of sub-populations. Mountain Caribou refers to the southern mountain populations of Woodland Caribou. "Columbian" Sharp-tailed Grouse is a subspecies of Sharp-tailed Grouse.

Status of wildlife populations

- As a group, Mountain Caribou, Columbian Sharp-tailed Grouse, Grizzly Bear, Black-tailed Deer and Moose represent species of wildlife managed for recreational use. Together they have historically ranged over most of the province and live in a variety of habitats. Many other species are also managed for recreational use (e.g., Wolf, Wolverine, Bighorned Sheep, Elk).
- A number of managed wildlife species no longer occupy significant portions of their historic ranges.
- Other species occupy most of their historic range, although some have experienced population declines in a large part of that range.
- Mountain Caribou, Grizzly Bear and Columbian Sharp-tailed Grouse have all been classified as vulnerable in British Columbia because of characteristics that make them particularly sensitive to human activities or natural events.

Some wildlife species, such as Black-tailed Deer and Moose still occupy most of their full range, although population declines in some of their range are of concern.

Why is it important?

- British Columbia's managed wildlife produce many benefits to the economy, social structure and natural diversity of the province.
- Many of British Columbia's managed wildlife populations are of national and international significance. They are often used in transplant and recovery programs in the United States.
- Maintaining all species across their range is fundamental to preserving biodiversity.

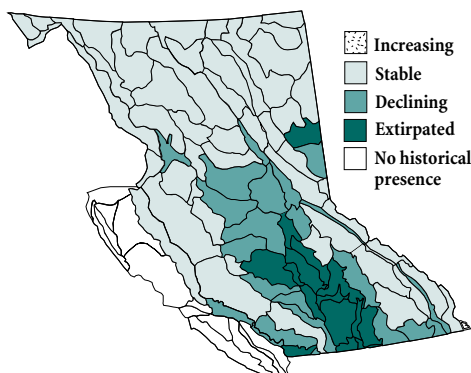
What is being done?

- The Protected Areas Strategy will help protect, conserve and restore wildlife habitat. This includes Columbian Sharp-tailed Grouse grassland habitat in the newly created Junction Range and Lac du Bois protected areas.
- Conservation strategies have been developed or are under development for several managed wildlife species and some ecosystems, such as Grizzly Bear and Mountain Caribou and the Southern Interior ecosystem (home to some Columbian Sharp-tailed Grouse populations).
- Over 40 species and ecosystems have been designated as Identified Wildlife under the *Forest Practices Code*. These will be subject to special management considerations.

BRITISH COLUMBIA'S GOAL: Protection, conservation and restoration of a full range of biological and physical diversity native to British Columbia and provision of social, economic and outdoor recreational opportunities consistent with maintaining a naturally diverse and healthy environment.

Has the range of grizzly bear changed?

- British Columbia is home to an estimated 10,000–13,000 grizzlies — half of Canada's and one-quarter of North America's current Grizzly Bear population.
- Historically, Grizzly Bears have ranged most of the province. Today, their populations are increasing in less than 1%, stable in 69%, declining in 20%, and extirpated in 11% of their historical range.
- Grizzly Bears are territorial and range over hundreds of kilometres. Their requirement for unfragmented habitat makes them particularly vulnerable to human settlement and resource development.

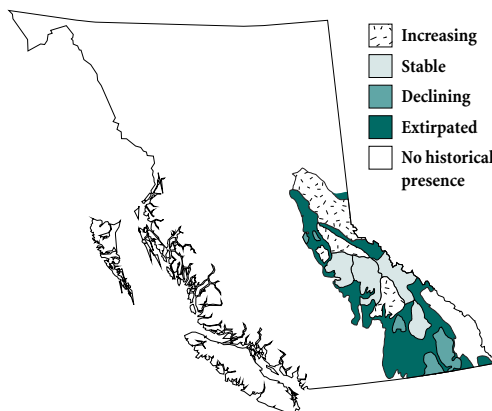


SOURCE: Ministry of Environment, Lands and Parks, Wildlife Branch, 1998. The divisions on the map represent the 110 ecosections which divide British Columbia into similar ecosystems, as depicted in *Ecoregions of British Columbia*, 1993.

Grizzly Bears once ranged throughout much of North America, from Mexico to northern Canada and Alaska. Today, their range is less than half that area.

Has the range of mountain caribou changed?

- British Columbia is home to about 2,500 Mountain Caribou. This represents about 90% of the world population.
- Mountain Caribou are extirpated in 43% of their historic range, declining in 9% and stable or increasing in the remaining 48%.
- The most serious threat facing Mountain Caribou is the loss of lichen-bearing old-growth forests. Many other animals also depend on this type of forest.

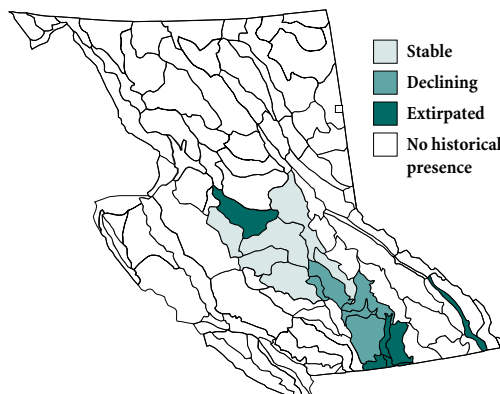


SOURCE: Ministry of Environment, Lands and Parks, Wildlife Branch, 1997. NOTE: The range for mountain caribou was calculated using the estimated historic and current range. Because of the unique distribution pattern of this species the ecoregional classification system does not provide a good description of range.

Over 90% of the current range of Mountain Caribou is found in British Columbia.

Has the range of Columbian sharp-tailed grouse changed?

- British Columbia has the largest remaining distribution of Columbian Sharp-tailed Grouse of any state or province. Six states average less than 10% of their original distribution and in a further three states they are extirpated.
- Columbian Sharp-tailed Grouse are stable in 53%, declining in 25% and extirpated in 22% of their historical range.
- Loss of the entire breeding population in the Kootenays is primarily due to forest encroachment on grassland caused by successful fire suppression. Overgrazing, loss of riparian habitat, urban development and hunting also affect populations.

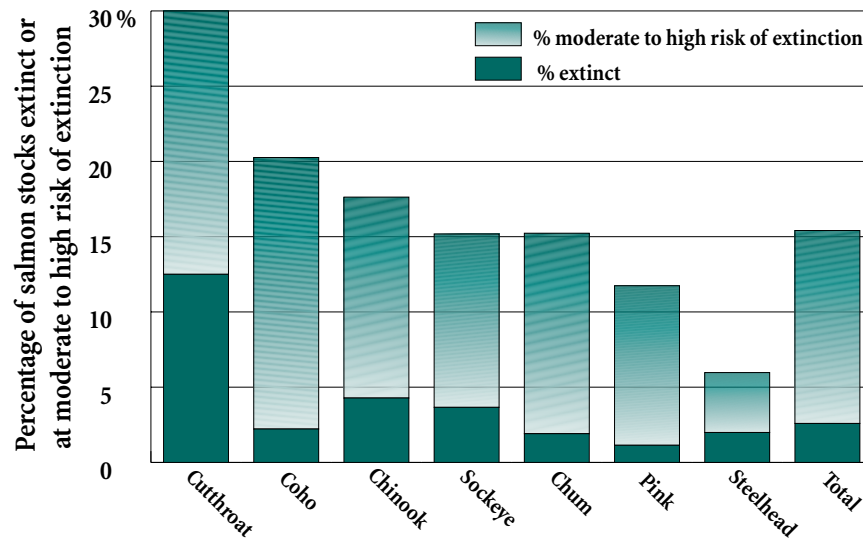


SOURCE: Ministry of Environment, Lands and Parks, Wildlife Branch, 1997.

British Columbia is the largest remaining population centre of Columbian Sharp-tailed Grouse.

Fish in British Columbia

844 salmon stocks in British Columbia have been classified as extinct or at moderate to high risk of extinction.



SOURCE: T.L. Slaney et al., 1996. *Status of Anadromous Salmon and Trout in British Columbia and Yukon*, Fisheries, V. 21, No. 10, pp 20-35.

NOTES: The graph displays the proportion of those stocks for which there was sufficient data to determine status. Of the approximately 10,000 stocks assessed in this study the status of 80% of Cutthroat Trout, 50% of Coho, 51% of Chinook, 40% of Sockeye, 29% of Chum, 31% of Pink, 48% of Steelhead and 43% of all salmon stocks was unknown. At moderate to high risk means that the stock experienced serious declines in the last decade so that less than 20% or 1000 fish (whichever is smaller) of the long-term population remains. Yukon stocks and introduced stocks are not included in this data.

Status and trends in salmon

- The status of 43% of the salmon stocks in British Columbia is unknown. Of the 5,476 stocks which could be classified, 3% (142 stocks) are extinct and 13% are at moderate to high risk of extinction.
- Cutthroat Trout has the greatest percentage of extinct stocks (12.5%) as well as the highest proportion (80%) of stocks whose status is unknown.
- 16% of Coho and 12% of Chinook stocks are at moderate to high risk of extinction. Chinook stocks are most at risk on Southwest Vancouver Island, while Coho stocks are most at risk on the Central Coast.
- 4% of all stocks are classified "of special concern." Although Steelhead have the lowest proportion of stocks at moderate to high risk, 32% are classified "of special concern."
- An additional 22% of the unknown stocks may be at high risk or extinct, but the existing information is inconclusive.
- Important factors contributing to extinct and declining salmon stocks are: loss of spawning habitat due to logging; hydropower and urban development; overfishing; pollution and changes in the marine environment.

The status of more than 5,400 salmon stocks is known. Of these, over 80% are healthy.

Why is it important?

- Salmon are an integral part of British Columbia's culture, heritage and economy. Salmon have sustained aboriginal peoples for centuries and have supported commercial and recreational fisheries since the 1830s.
- Salmon are essential to British Columbia's natural ecosystems and serve as important indicators of the health of freshwater and marine environments.
- Although the province-wide abundance of some salmon species, such as Chum and Pink, is stable or increasing, declining stocks represent a loss of genetic diversity which is essential to the long-term sustainability of salmon.

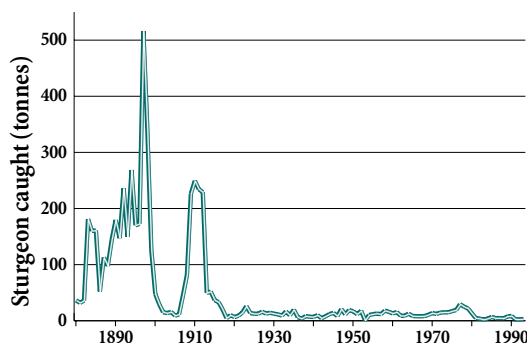
What is being done?

- The protection of fish is a provincial priority. The *Fish Protection Act* passed in 1997 includes measures to protect and enhance fish habitat, to enable local governments to include fish protection as part of their planning process and to provide incentives for fish habitat protection.
- Other provincial initiatives include the Urban Salmon Habitat Program, Watershed Restoration Program and measures in the *Forest Practices Code* to protect wetlands, rivers, streams and lakes.

BRITISH COLUMBIA'S GOAL: Protection, conservation, and restoration of a full range of biological and physical diversity native to British Columbia and provision of social, economic and outdoor recreational opportunities consistent with maintaining a naturally diverse and healthy environment.

What is the status of White Sturgeon in the Fraser River?

- At the peak of the fishery in 1897, 517 metric tonnes (over 1 million pounds) of Sturgeon were caught. The smaller peak in 1910 likely consisted of younger fish that escaped overfishing a decade earlier. In 1994 only 3 tonnes were caught.
- White Sturgeon have been designated as “endangered” in British Columbia and “vulnerable” in Canada. Since 1994 any Sturgeon caught in the Fraser River must be released.
- Historically, Sturgeon were an important food source of aboriginal peoples and were valued internationally for their flesh, roe and isinglass (swim bladders).
- Intensive harvesting has decimated White Sturgeon stocks. The Fraser River stocks may never recover.

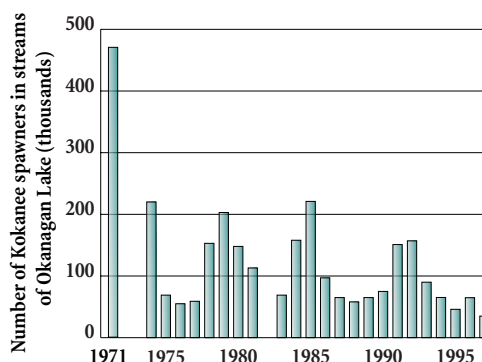


SOURCE: Department of Fisheries and Oceans, 1996. *BC Commercial Catch Statistics*. Note: The catch prior to 1930 resulted from a directed Sturgeon fishery and since then from bycatches of salmon fisheries. Recent year-to-year variations may be due to variations in market prices.

One of the largest White Sturgeons ever caught in the Fraser River weighed 630 kg (1390 pounds).

What is the status of Kokanee?

- The population of stream-spawning Kokanee in Okanagan Lake has declined by 92% since 1971, and the lake has been closed to angling since March 1995.
- Kokanee are an important sport fishery in British Columbia's interior. They are the major food source for the region's legendary Rainbow Trout populations, which, though relatively stable, are under stress due to declining Kokanee numbers.
- Reasons for declining populations include loss of stream habitat through urbanization and development and competition for food from introduced Opposum Shrimp.
- A fertilization project in Kootenay Lake has boosted plankton production and resulted in an increase in spawners from 237,000 in 1991 to 2.1 million in 1998. Fertilization is not appropriate for all lakes; in Okanagan Lake, for example, nutrient levels are already elevated.

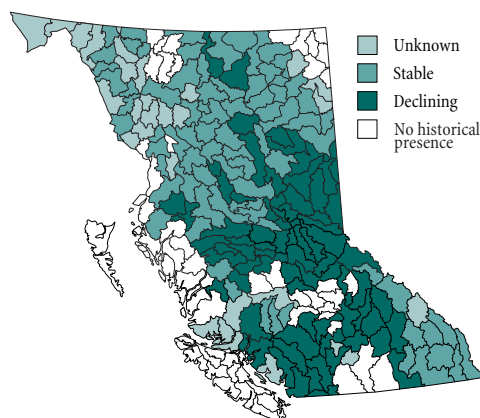


SOURCE: Ministry of Environment, Lands and Parks, 1998.

Kokanee stocks in the Okanagan region are highly susceptible to human impacts.

What is the status of Bull Trout?

- Bull Trout populations are declining in 41%, stable in 43% and have unknown status in 15% of the 182 watershed groups that historically contained Bull Trout.
- In British Columbia, Bull Trout are classified as “vulnerable,” and stringent fishing regulations are in place. In Alberta, Bull Trout are a species of “special concern,” and in the United States, where many populations have been extirpated, Klamath River and Columbia River Bull Trout population segments are listed under the *Endangered Species Act* as “threatened.”
- The main threat to Bull Trout is habitat loss. This is caused by logging, grazing, mining, road building, and dam construction. These activities also increase access to Bull Trout, which increases threats from poaching and over-fishing.

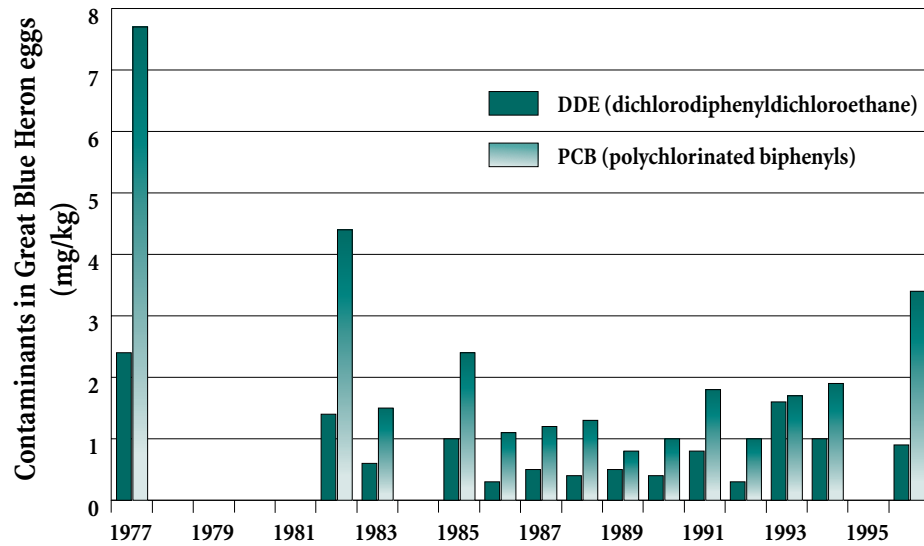


SOURCE: Ministry of Environment, Lands and Parks, 1998.
NOTES: This map delineates 250 watershed groupings, as described in the *British Columbia Watershed Atlas*. 187 of these watershed groupings have historically contained Bull Trout.

*Bull Trout has been identified as a species requiring special management practices under the **British Columbia Forest Practices Code**.*

Toxic Contaminants in British Columbia

Since 1977 there has been a decrease in the levels of PCBs and DDE detected in the eggs of Great Blue Herons from a colony located near the University of British Columbia.



SOURCE: Environment Canada, Canadian Wildlife Service, 1998. NOTES: Data are presented as geometric means. Data for 1983, 1989, 1991, 1993, and 1994 are based on pooled samples. Data are from the Great Blue Heron colony at the University of British Columbia.

Status and trends in contaminants

- The level of contaminants found in some wildlife species has been decreasing over the past 20 years. Since 1977, PCB levels detected in Great Blue Heron eggs at the University of British Columbia (UBC) colony have decreased by between 43 and 90%.
- PCB manufacturing was banned in Canada in 1977, but PCBs are still present in electrical equipment manufactured before that date. Current levels of PCBs may be due to spills or leaks from old equipment or long-range atmospheric transportation and deposition.
- Since 1977, levels of DDE, a breakdown product of the persistent pesticide DDT, decreased by between 40 and 88% in Great Blue Heron eggs. Canada banned the use of DDT in the 1970s, but it persists in the environment and is still legally manufactured and used in some countries.
- Organochlorines, such as PCBs and DDE, are found in the eggs of other birds, such as Leach's Storm-Petrel, a predatory seabird. The presence of contaminants in remote bird populations found on the west coast of Vancouver Island illustrates how DDE and PCBs can be dispersed long distances through the atmosphere, fresh water, and the ocean.

Despite being banned since the 1970s, DDT still persists in the environment.

Why is it important?

- Human activities, including industry, transportation, waste disposal, agriculture, forestry, and recreation have contaminated the environment with substances that are toxic to humans and other living organisms.
- One group of toxic substances, *persistent organochlorines*, includes pesticides such as DDT and industrial compounds such as PCBs, dioxins (by-products of industrial processes) and furans. They are termed persistent because they linger in the environment for decades or even centuries before breaking down.
- These substances tend to accumulate within exposed organisms (bioaccumulation) and increase in concentration as they rise through the food chain (biomagnification).
- Top predators, such as the Great Blue Heron, are particularly affected.

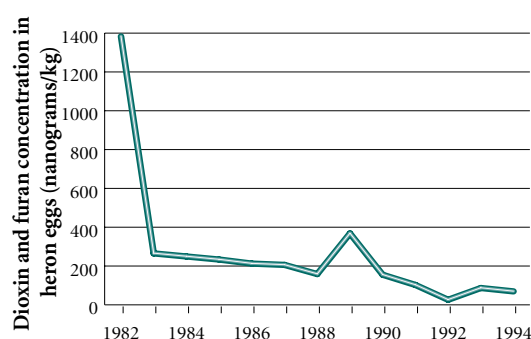
What is being done?

- Measures designed to minimize or eliminate exposure to contaminants include: stringent regulations for the management of toxic wastes; the use of pollution prevention planning; industry initiatives; and a program for responsible management of household hazardous waste.

BRITISH COLUMBIA'S GOAL: Clean, healthy and safe land, water and air for all living things and provision of social, economic and outdoor recreational opportunities consistent with maintaining a naturally diverse and healthy environment.

What are the trends in dioxins and furans?

- Between 1982 and 1983, the levels of dioxins and furans in Great Blue Heron eggs at the UBC colony decreased by approximately 80% and a further 15% between 1983 and 1994.
- Dioxins and furans are chemical by-products produced in a number of industrial processes such as pulp and paper production, wood preservation and municipal incineration.
- Recent changes to processes in the pulp and paper industry, encouraged by federal and provincial regulations, have dramatically reduced the levels of dioxins and furans in effluent entering rivers in British Columbia.

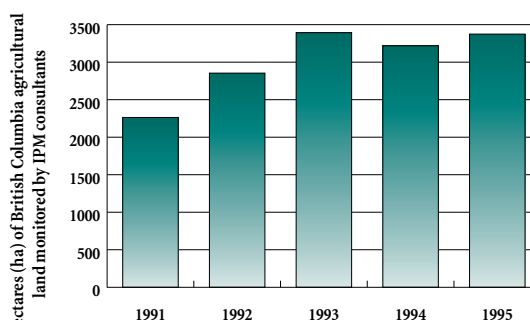


SOURCE: Canadian Wildlife Service, Environment Canada, 1998.
NOTE: Data are from the Great Blue Heron colony at the University of British Columbia.

The level of dioxin and furans found in Great Blue Heron eggs decreased by over 90% between 1982 and 1994.

Are efforts to reduce pesticide use increasing?

- Integrated Pest Management (IPM) combines a variety of chemical, biological, cultural and genetic methods to control pests in an environmentally sound way, and to reduce the use of pesticides in agriculture and other industries.
- Between 1991 and 1995, the total area of agricultural land in British Columbia monitored by IPM consultants increased by 50%. During this same period, total purchases of highly toxic, restricted pesticides controlled under the federal *Pesticide Control Act* decreased 14% from 65,794 kg in 1991, to 56,455 kg in 1995.
- Recent changes to the British Columbia *Pesticide Control Act* encourage pesticide users to adopt pest management plans that use IPM.

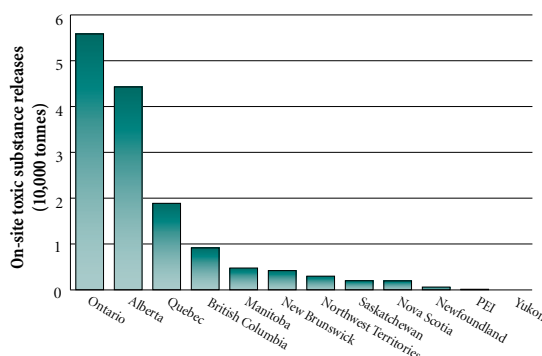


SOURCE: Ministry of Environment, Lands and Parks, 1997.
Pollution Prevention and Pesticides Management Branch.

3,374 hectares of British Columbia's agricultural land was monitored by Integrated Pesticide Management consultants in 1995.

How does British Columbia compare to other places?

- According to the National Pollutant Release Inventory (NPRI), Canada released 142,613 tonnes of on-site pollution in 1996.
- The majority (77%) of British Columbia's releases were into air, with 18% into water, 5% onto land, and less than 1% underground.
- In 1996, the two substances with the largest releases in British Columbia were methanol (3,501 tonnes), and ammonia (1,802 tonnes).
- Releases in British Columbia have decreased from 32,079 tonnes in 1993 to 9,134 tonnes in 1996.
- Of the 176 substances tracked by NPRI, 10 have been classed as toxic; 6 identified as carcinogenic, and 9 as probably carcinogenic.
- Pollutant loading data gives an indication of environmental stress, but cannot characterize the impact on environmental health.



SOURCE: Environment Canada, 1998, *Summary Report 1996*, the National Pollutant Release Inventory. Data is for 1996, the latest year for which information is available.

In Canada, British Columbia has the fourth highest weight of pollutant loading, after Ontario, Alberta and Quebec.

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