Holistic Health Care for Biodiversity: from Emergency Wards to Preventive Medicine

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Abstract: This paper presents a 'big picture' overview of the global biodiversity crisis, with a particular emphasis on its Canadian dimensions and the required policy responses. The paper has three parts—an examination, a diagnosis, and a prescription—similar to the three stages a doctor goes through when a patient comes in for a health checkup. In the examination, the states of global and Canadian biodiversity are briefly assessed. The diagnosis analyzes the reasons why biodiversity is at risk in Canada by examining both the proximate causes (habitat loss, over-exploitation, pollution, invasive species, and global atmospheric change) and the root causes (over-consumption of resources, and the growing human population and the related problem of poverty). The diagnosis also includes an evaluation of why governments' responses to date—environmental laws, policies, and programs—have not been adequate to stop the ongoing decline of biodiversity. The prescription provides ten constructive recommendations for Canada in addressing both the proximate and root causes of biodiversity loss. For a more detailed treatment of these issues, readers are referred to the author's recent book, *Unnatural Law: Rethinking Canadian Environmental Law and Policy* (UBC Press 2003).

Key Words: biodiversity, law, policy, regulation, *Species at Risk Act*, SARA, over-consumption, Canada

Introduction

In this paper, I will explain how we are focusing too much attention on the symptoms of the problem of biodiversity loss and are thus failing to address the root causes of the crisis. As I do in my book, *Unnatural Law: Rethinking Canadian Environmental Law and Policy* (UBC Press 2003), I will proceed like a doctor, conducting an examination, formulating a diagnosis, and providing a prescription.

1 Examination

1.1 Global Biodiversity

About 1.75 million species have been identified to date,[1] yet the most comprehensive global assessment ever undertaken estimated that there may be 13–14 million species on Earth.[2] Other estimates of global species richness range from 5–100 million species.[3]

Fossil records suggest that in the past 500 million years there have been five major waves of extinction when large numbers of species died out. The five major extinction events of the past occurred 440 million years ago, 370 million years ago, 250 million years ago, 215 million years ago, and most recently, when the dinosaurs disappeared, 65 million years ago.[4] Preeminent scientists believe that humans are currently causing the sixth great extinction event in the history of life on Earth.[5] On the other hand, skeptics argue that extinction is a natural process.[6] They are correct, to a degree. After all, 99% of the species that have ever lived are extinct;[7] however, what is *abnormal* is the current *rate* of extinctions. Estimates of the current rate of extinction range from 100 times to 10,000 times greater than the normal rate.[8]

1.2 Canadian Biodiversity

To what extent does the biodiversity crisis exist in Canada? There are myriad signs, at the ecosystem, species, and genetic levels, that all is not well. Some ecosystems in Canada are on the verge of disappearing. Coastal Douglas-fir forest covers less than 1% of its original area.[9] Less than 1% of tallgrass prairie is still in its native state.[10] Ontario's Carolinian forest covers 3% of its previous range.[11] British Columbia’s (B.C.) Garry oak meadows occupy less than 5% of their historic area.[12] Many of Canada's wetlands have disappeared, including 65% of Atlantic coastal marshes, 70% of southern Ontario wetlands, 71% of Prairie wetlands, and 80% of the Fraser River delta.[13] The situation in B.C., Canada's most biologically diverse province, is particularly disheartening.[14]

In Canada, there are 72,000 identified species, and scientists expect there is roughly the same magnitude of unknown species.[15] Canada's official list of species at risk records 441 species and populations (including 12 extinctions and 21 extirpations), although this number is almost certainly an underestimate because very few species have actually been studied.

There is extensive evidence that the current list of species at risk underestimates the magnitude of the problem:

- a species must be gone for at least 50 years before being confirmed as extinct, meaning that current figures on extinctions in Canada underestimate the number of extinctions;
- according to the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), more than 600 species require immediate study to determine their status;[16]

- a recent government study concluded that as many as one in three Canadian species is not secure;[17]
- entire groups of species, such as arthropods, which make up a substantial proportion of Canada's 72,000 known species, have not yet been evaluated to determine if they are at risk;[18] and
- half of the species believed to live in Canada have not been scientifically identified, let alone studied or assessed, so there is no baseline for evaluating population declines.[19]

At the genetic level, a telling example of loss is the extirpation of hundreds of salmon runs on both the Pacific and Atlantic coasts. The loss of these genetically unique populations weakens the overall gene pool of salmon.[20] The populations of many species, such as the spotted owl (*Strix occidentalis*) and Vancouver Island marmot (*Marmota vancouverensis*) are below their minimum viable population size.

While Canada commenced a comprehensive national geological survey in 1842, there has never been a national biological survey. In contrast, the U.S. began a national biological survey in 1993.[21] Canada's Biodiversity Convention Office admits that "Canada is still a long way from being able to produce a 'state of biodiversity' report that would provide a better understanding of the state of biodiversity in Canada."[22]

Despite our large terrestrial and marine areas, Canada is home to only about 1% of the species that live on the Earth. However, Canadian companies and Canadian consumers have significant impacts on the other 99% of global biodiversity—through our high levels of greenhouse gas emissions, through fishing and fish consumption, mining companies that wreak ecological havoc in hotspots like Guyana and the Philippines, and other individual, corporate, and government activities.

2 Diagnosis

The five proximate causes of biodiversity loss are[23] (1) loss of habitat (e.g., spotted owl), (2) over-exploitation (e.g., Atlantic cod [*Gadus morhua*]), (3) pollution (e.g., killer whale [*Orcinus orca*]), (4) invasive species (e.g., zebra mussels [*Dreissena polymorpha*]), and (5) global atmospheric change (ozone depletion and global warming) (e.g., polar bear [*Ursus maritimus*], frogs). These proximate threats are driven, in turn, by three root causes: a failure to recognize and acknowledge the Earth's limits, the increase in resource consumption, and the combination of an increasing human population and extreme poverty.

2.1 Five Proximate Causes of Biodiversity Loss

2.1.1 Habitat Loss, Degradation, and Fragmentation

Habitat loss is widely recognized as the leading reason why species are at risk of extinction.[24] In the words of Environment Minister David Anderson, a "federal law that does not adequately protect the critical habitat of an endangered species is a law of little value. Why? Simple. No habitat, no species. This is not a political argument, this is a biological fact. For 80% of all species, habitat is the critical feature of their recovery."[25] There are myriad causes of habitat destruction, degradation, and fragmentation including forestry, mining, hydroelectric development, urban sprawl, oil and gas exploration and development, and agriculture.

2.1.2 Over-exploitation

Reducing excessive levels of hunting, catching, and harvesting ought to be the most obvious means to decrease the pressure on species at risk; however there are still examples in Canada of authorities allowing direct exploitation of species at risk. For instance, the current regulation of some species of groundfish in B.C. reveals that the Department of Fisheries and Oceans (DFO) continues to sanction overfishing. Management is hampered by a lack of basic understanding about the ecology of marine species and ecosystems; a lack of information about the stock status of many species; and a refusal to use a precautionary approach in the face of scientific uncertainty. For example, an assessment prepared by DFO scientists about canary rockfish (*Sebastes pinniger*), a species caught by both commercial and sports fishermen on the west coast, states that "stock boundaries are unknown", "stock status is unknown", "future outlook is unknown", and "the stocks are probably close to maximum exploitation but actual status is unknown."[26]

2.1.3 Pollution

Despite evidence of the negative impacts on species at risk, Canadian industry and municipalities are allowed to discharge hundreds of millions of kilograms of toxic chemicals annually, including millions of kilograms of carcinogenic substances such as arsenic, formaldehyde, benzene, and mercury.[27] The amount of toxic chemicals released annually into the air and water, and onto the land is as follows:

- Air—124 million kg
- Water—51 million kg
- Land—5 million kg

Another 259 million kg are disposed of through underground injection, landfill, incineration, etc. And these figures are for only 265 substances that are covered by the National Pollutant Release Inventory and are produced by major facilities. Transportation, agriculture, small

businesses, and residential emissions add millions more kilograms of pollutants. On both a national and a per capita basis, Canadian emissions of greenhouse gases, sulphur dioxide, nitrogen oxides, volatile organic compounds, and carbon monoxide are among the highest in the Organization for Economic Cooperation and Development.[28]

2.1.4 Invasive Species

The fourth threat to biodiversity is invasive species, also called exotic or alien species. Invasive marine species can be introduced by accident (e.g., zebra mussels arriving in the ballast water of ships), on purpose (e.g., Atlantic salmon (*Salmo salar*) used in aquaculture operations in Pacific waters), or through migration (e.g., green crabs from Asia brought to the west coast of the United States are moving north into Canadian waters). Invasive species can out-compete and eradicate native species, alter predator-prey balances, and transmit new pathogens and diseases.[29] There are over 160 alien species in the Great Lakes alone.[30] The challenge posed by invasive species is expected to increase in the future as international trade and travel continue to grow.[31]

The use of exotic species for fish farming may also cause environmental damage. For example, farmed Atlantic salmon on the west coast pose a threat to native Pacific salmon.[32] During the 1990s, more than 345,000 Atlantic salmon escaped from B.C. salmon farms, leading to their presence in at least 79 B.C. rivers and streams and providing evidence that they can successfully reproduce in Pacific waters, contrary to industry claims. Canada's Auditor General concluded that DFO "is not fully meeting its obligations under the *Fisheries Act* to protect wild Pacific salmon stocks and habitat from the effects of salmon farming in B.C."[33]

2.1.5 Global Atmospheric Change (Global Warming and Ozone Depletion)

Climate change is emerging as a major threat to biodiversity. A recent study published in Nature predicted that 15–35% of all terrestrial species could become extinct by 2050 because of their inability to adapt to climate change.[34] Effects already observed by scientists include poleward shifts in range, habitat loss and population declines (e.g., polar bears), and localized extinctions (e.g., Costa Rica’s golden toad [*Bufo periglenes*]).

And finally, some good news: Canada has reduced the production and use of ozone-depleting substances by more than 95% since 1987. Global production and use is down 88%. Scientists anticipate that the ozone layer will repair itself by the mid- to late 21st century, unless climate change interferes with this process.

2.2 Canadian Responses to Biodiversity Decline

Canadian governments—federal, provincial, and municipal—have responded to concerns about the decline of biological diversity with a wide array of laws, policies, and programs including the establishment of parks and protected areas, endangered species legislation, pollution

regulations, environmental assessments, climate change action plans and ecosystem-based management.

And yet, it is apparent from the growing number of species at risk and the continuing decline of ecosystems that the steps taken to date are inadequate. We continue to permit the fishing of rockfish in the Georgia Strait, although DFO scientists tell us that populations are down 95% since the 1950s. We continue to allow logging in spotted owl habitat when these birds are spiraling toward extirpation. Canada continues to allow the use of dozens of agricultural pesticides that have been banned for health and environmental reasons in other industrialized nations. Canada continues to rely primarily on voluntary approaches to reduce greenhouse gas emissions, despite their proven failure. Canada continues to use a fragmented approach to the problem of invasive species, despite government reports admitting the inadequacy of existing tools.

2.2.1 Prime Example of an Inadequate Response: Canada's Species at Risk Act

The federal government is misleading Canadians about the *Species at Risk Act*. Canada's Environment Minister David Anderson claims that the Act "will protect habitat everywhere in Canada—not just on federal lands, not just on provincial Crown lands, but on private lands as well."[35] Unfortunately, Anderson's claim does not withstand scrutiny. The Act is extraordinarily narrow. It *automatically* protects designated species at risk in Canada only if the species is an aquatic species or lives on federal lands, not including federal land in the three northern territories.[36] Federal lands include national parks, military bases, Indian reserves, airports, and other federally-owned areas. The Act generally *does not apply* to endangered species on provincial lands, private lands, or territorial lands in the Yukon, Northwest Territories, and Nunavut. In total, the Act only applies to about 5% of Canada's land area. In provinces such as British Columbia, where there is little federal land, the area covered by the Act is as low as 1%. The Act covers species in Canada's marine waters, which total roughly 5 million km^2, but provides less protection for aquatic habitat than existing provisions in the Fisheries Act.[37]

In theory, species at risk on provincial, territorial, and private land will be protected by provincial and territorial endangered species legislation; however, as international experts observe, "the effect of dividing populations and habitats by artificial jurisdictional boundaries is often to make the rational conservation and management of wild species very difficult."[38]

There are complex provisions in the Act that *enable, but do not require*, the federal Cabinet to extend the Act's application to protect species and their critical habitat in both the provinces and the territories if, in the federal Minister of Environment's opinion, these jurisdictions lack effective legal protection for endangered species and their habitat.[39] These provisions, which rely on the proactive exercise of discretion by both the federal Minister of Environment and the federal Cabinet, are known as the 'national safety net' for species at risk. Based on past experience with similar discretionary provisions in other federal environmental laws, the probability of the national safety net being implemented is low. There are four other laws—the *Canada Wildlife*

Act, the *Canadian Environmental Assessment Act*, the *Canada Water Act*, and the *Canadian Environmental Protection Act*—where the federal government has the discretionary power to apply federal authority on provincial lands or waters because of international or transboundary environmental concerns.[40] These discretionary powers have *never* been used.[41]

The federal government's rationale for the limited scope of the *Species at Risk Act* is that to go any further would be an unacceptable intrusion on provincial jurisdiction. This federal timidity dates back to the rise of the Quebec independence movement in the late 1960s and early 1970s. In the mid-1970s, the federal government expressed reluctance about even generating a national list of endangered species for "fear of treading on the toes of the provinces."[42] A lawyer for the Department of Justice admitted that the Act was drafted to be as "deferential to provincial powers as possible."[43]

Experts in constitutional law, including retired Supreme Court of Canada Justice Gerard La Forest and Professor Dale Gibson, have stated that the federal government has ample jurisdiction to protect *all* of Canada's species at risk, wherever these species are found, because endangered species are a national concern.[44] Professor Gibson criticized the Act for taking "an unnecessarily narrow view of federal Constitutional powers."[45] The Canadian Bar Association also believes that the federal government has the constitutional authority "to enact broad endangered species legislation."[46]

In contrast to the narrow scope of Canada's Act, the U.S. *Endangered Species Act* applies on federal, state, and private land.[47] The Mexican endangered species legislation also applies to all species, wherever they may be found.[48]

Instead of automatically protecting the *habitat* of species at risk wherever they live, the *Species at Risk Act* protects only the *"residence"* of aquatic species and species living on federal lands.[49] Residence is a much narrower and more restrictive concept than habitat or even 'critical habitat'. To grasp the difference, imagine an endangered bird nesting in a tree in an old growth forest on federal land. Under the Act, a logging company could leave that single tree standing in the middle of a large clear-cut and be in full compliance with the law. The *residence* would be intact, although the *habitat* would be destroyed. If the tree was on provincial land, the Act would not even apply.

Residence is a term unfamiliar to biologists or ecologists. Dr. David Green stated "at COSEWIC we deal with habitat. We don't talk about residence. We deal with habitat—critical habitat—and that's what we identify. We don't use the term residence at all, because we don't know what it means."[50] Similarly, Dr. Geoff Scudder said that the use of the term residence "is an attempt to avoid and circumvent using the word 'habitat'. It's biologically unacceptable. It doesn't mean a darn thing to a biologist and a scientist. The term 'residence' is nonsense."[51]

2.2.2 The Inadequacy of Provincial Legislation Governing Species at Risk

One of the problems with relying on the provinces and territories to do the lion's share of the work in protecting species at risk is that five of Canada's provinces and territories lack

endangered species legislation (B.C., Alberta, and the three territories). The second major problem is that only Nova Scotia has fulfilled the majority of the commitments enumerated in the 1996 National Accord on the Protection of Species at Risk. The third and perhaps most damaging criticism is that even in provinces where endangered species legislation has been in place for decades (e.g., Ontario, since 1971), the number of endangered species has not declined. This failure is due to the inadequacy of the laws, the refusal to list species at risk, the unwillingness to protect habitat, and the lack of resources allocated to enforcement. Provincial governments claim publicly that they are protecting species at risk, even when these claims are false. For example, despite British Columbia's assertion that it is protecting endangered species, an internal report prepared by the British Columbia Ministry of Environment's Chief of Wildlife listed 18 "holes" in B.C.'s approach to protecting species at risk, concluding that B.C. deserved the 'F' grade given to it by environmental groups.[52]

2.2.3 Systemic Weaknesses in Canadian Government Responses

Missing Laws

At the federal level, Canada still lacks laws and regulations found in the European Union and the United States, including enforceable national air quality standards, enforceable national drinking water quality standards, a law requiring the cleanup of contaminated sites, and a law to address the threat of invasive species. Instead, we have National Ambient Air Quality Objectives and Canadian Drinking Water Quality Guidelines, neither of which is legally enforceable or effective. Although there are provincial laws in some of these areas, they are very inconsistent across Canada.

One example relevant to the subject of conserving biodiversity is Canada's fragmented and ineffective regulatory approach to preventing the introduction of invasive species. A number of federal departments, including Fisheries and Oceans Canada, Environment Canada, Agriculture Canada, Health Canada, and Customs Canada are involved, and use a variety of different regulations.[53] In contrast to the United States, where the *National Invasive Species Act* (1990) makes ballast water exchange mandatory for ships entering the Great Lakes, Canada relies on voluntary guidelines.[54] Both the International Joint Commission and the Great Lakes Fishery Commission warn that Canada's approach puts the biodiversity of the Great Lakes at risk.[55] Fisheries and Oceans Canada admits that Canada needs "greater protection for Canadian environment and industries from introduction of exotic species."[56]

Flawed Laws—Excessive Discretion

Environmental laws are almost always drafted in such a way as to give Canadian governments the *power* to take action or meet specified standards but *no duty* to take action or meet those standards. Seemingly insignificant differences in wording, such as using 'may' instead of 'must', transform potentially effective laws and regulations into paper tigers.

A prime example of the problem caused by discretionary powers in environmental law is provided by the widespread provincial failure to designate species listed by COSEWIC as being at risk for protection under provincial law. In British Columbia, only 4 of more than 1000 species at risk identified by the B.C. Conservation Data Centre are designated for the meager protection offered by the provincial *Wildlife Act*.

Failure to Reflect Current Science

The third systemic flaw running through Canadian environmental law and policy is the failure to incorporate contemporary scientific knowledge and principles. For example, laws governing endangered species, protected areas, and marine biodiversity fail to reflect principles of conservation biology. The *Species at Risk Act* will protect 'residences' rather than critical habitat. Laws governing parks and protected areas allow activities that are incompatible with the conservation of biodiversity, particularly given the role that these areas are intended to play in conserving nature. The *National Marine Conservation Areas Act* allows fishing in marine protected areas, yet fishing is the main threat to marine biodiversity. Increasing scientific awareness of the critical importance of the ecological services provided by water, forests, and other ecosystems is not yet reflected in environmental laws or policies.[57]

One of the most important scientific advances, ironically, is the recognition of how little humans understand about ecosystems, ecological processes, the relationship between chemicals and health, and other critical environmental issues. Only half of the species believed to live in Canada have been identified. The rate and severity of climate change, the rate of healing of the ozone layer, and the long-term health and environmental impacts from chemicals that disrupt endocrine systems are vital issues for which science offers no definitive answers. As a result, environmental law and policy must confront pervasive uncertainty. Two important scientific concepts—the precautionary principle and adaptive management—have emerged to respond to this uncertainty; however, neither of these concepts has been incorporated in a meaningful way into Canadian environmental laws and policies.

Inadequate Implementation and Enforcement

The fourth systemic weakness afflicting Canadian environmental law and policy is a failure to effectively implement and enforce the law, dating back to the 19th century slaughter of the buffalo. On paper, Canada has many seemingly impressive environmental laws. In practice, key elements of these laws are rarely, if ever, implemented. For example, while the proportion of Canadian *land* protected from resource exploitation may seem low at less than 8%, the proportion of Canada's *marine waters* that enjoy similar protection is less than 0.1%.[58] Although approximately 200 marine protected areas have been designated by various levels of government in Canada, fishing—the main threat to marine biodiversity—occurs in almost all of these so-called protected areas. There are only five extremely small exceptions, all located in British Columbia.[59] The bottom line, according to DFO scientists, is that "in the marine environment,

there are virtually no areas at this time where all marine species and habitats are simultaneously protected through legislation."[60]

Although the federal government candidly admits that "legislation and regulation are only as good as their enforcement", criticism of Canada's ongoing failure to enforce its environmental laws is widespread.[61] The Organization for Economic Cooperation and Development has repeatedly chided Canada for its lax environmental enforcement regime.[62] In 1998, Parliament's Standing Committee on Environment and Sustainable Development concluded "Environment Canada and indeed some provinces are not enforcing environmental laws when they could and should. This failure to act is of deep concern."[63] The environmental group Friends of the Earth released a scathing report detailing ten years of "minimalist" enforcement by Environment Canada.[64] In 1999, the Globe and Mail described Canada as the "promised land" for polluters because of a 78% drop in prosecution rates between 1992 and 1999.[65] An audit by the Commissioner of the Environment and Sustainable Development concluded that "within existing budgets, departments are struggling to meet legislated responsibilities, policy commitments, and international obligations and, in many cases, are failing to do so."[66] Environment Canada itself admits that overall enforcement efforts are "falling short of fulfilling departmental responsibility, and…not providing adequate protection to the public, the environment or wildlife."[67]

The following evidence illustrates the decline in the enforcement of environmental laws in Canada:

- government reports acknowledge that hundreds of companies and municipalities regularly break environmental laws but are not prosecuted;[68]
- Environment Canada identified over 3000 documented violations of federal laws by eastern Canadian pulp mills in recent years but conducted only seven prosecutions;[69]
- according to Ontario Ministry of Environment figures, in 2000 there were 1900 violations of water pollution laws by 200 corporations and municipalities but only four charges laid;[70] and
- the number of inspections carried out annually under the *Canadian Environmental Protection Act* fell during the 1990s from 2000 to 700.[71]

Major reasons for the dismal state of environmental law enforcement include draconian budget cutbacks, both federally and provincially, that have ranged from 30% to 65%, harmonization agreements, and excessive reliance on voluntary agreements. To its credit, the federal government has begun the process of reinvesting in environmental protection in recent budgets.

Lack of Public Involvement

Unlike in the U.S., citizens in Canada are largely unable to enforce environmental laws where government refuses to do so.

Reliance on a Narrow Range of Tools

Both federal and provincial governments fail to use economic tools, market-based regulations, and other innovative problem-solving approaches that have track records of success elsewhere.

For further details on these systemic weaknesses, please see Chapter 8 of *Unnatural Law: Rethinking Canadian Environmental Law and Policy* (UBC Press 2003).

2.2.4 Structural Obstacles

The foregoing systemic weaknesses continue to plague Canada's legal system. Why do these weaknesses persist? The answer is that there are structural obstacles to further environmental progress, including, most importantly, the continued predominance of economic interests over environmental protection; international trade liberalization (the North American Free Trade Agreement, World Trade Organization, Free Trade Agreement of the Americas, General Agreement on Trade in Services); unresolved constitutional problems; the lack of separation of powers between the legislative and executive branches of government; the extraordinary concentration of power in the Prime Minister's and Premiers' offices; and barriers to an effective role for the courts. These obstacles impede efforts to strengthen Canadian environmental law and policy, and ultimately to improve Canada's environmental record.

For further details on these structural obstacles, please see Chapter 9 of *Unnatural Law: Rethinking Canadian Environmental Law and Policy* (UBC Press 2003).

2.3 The Root Causes of Biodiversity Loss, from a Global Perspective, are Over-consumption and Population Growth

2.3.1 Over-consumption

Canadians are among the wealthy 20% of the world's population that consumes 80% of the resources and creates 80% of the pollution. That leaves 80% of the world's population with only 20% of the resources. Another way of looking at the same thing is to measure our ecological footprint, the area of land required to produce enough resources and absorb enough waste to support the average Canadian. Our ecological footprint is 8.8 ha, but there is only 1.7 ha of productive land per person on the Earth. In other words if everybody lived lifestyles like us, we would need four more planets to make it possible!

2.3.2 Population Growth

The United Nation's medium fertility projection anticipates a global population of 9.2 billion in 2050, an increase of roughly 50%. At least 90% of future population growth will occur in

developing countries; the poorest 48 nations on Earth will see their populations triple from 658 million to 1.8 billion people.

Areas of high biological diversity are located in countries with large populations and high rates of population growth—particularly in Africa, Asia, and Latin America.[72] These biodiversity hotspots contain a disproportionate amount of the world's plant and animal species, as up to half of the world's land species can be found on only 2% of the world's land area.

3 Prescription: Ten Constructive Suggestions

The first six recommendations outlined below focus primarily on addressing the symptoms of biodiversity decline. As I mentioned earlier, it is vital that we also tackle the root causes. Think of crime. Of course we need a strong Criminal Code, but we must also address the social and economic problems that produce crime. The final four recommendations are intended to begin moving us in the direction of ecological sustainability.

1. Strengthen the *Species at Risk Act* and provincial legislation
    - This is required to fulfill the commitments in the National Accord for the Protection of Species at Risk

2. Learn lessons from the U.S. experience with endangered species legislation
    (a) It is unlikely to get legislation right the first time. For example, the evolution of the *Endangered Species Act* was as follows:
        - 1966 *Endangered Species Preservation Act*
        - 1969 *Endangered Species Conservation Act*
        - 1973 *Endangered Species Act*

    (b) Incentives work. These can include such things as
        - habitat conservation plans
        - safe harbors
        - conservation leasing
        - covenants coupled with tax relief

    (c) Emergency Room care is expensive
        - The Department of Interior budget for *Endangered Species Act* implementation is U.S.$138 million
        - The U.S. Fish and Wildlife Service estimates that listing decisions cost $200,000 and critical habitat $400,000 per species

- Certain targeted species (e.g., California condor [*Gymnogyps californianus*], grizzly bear [*Ursus arctos*], northern spotted owl [*Strix occidentalis caurina*]) take up the lion's share of resources

(d) Economic impacts are minimal
- The U.S. is the wealthiest nation in the history of the world
- 99.9% of projects evaluated for potential impacts proceed

(e) Citizen pressure and involvement is essential
- Lawsuits have led to the listing of dozens of species and the protection of millions of acres of critical habitat
- Lawsuits can only succeed where government or industry has broken the law

(f) Political will is the Achilles heel of implementation
- As of July 2003, only 428 of 1263 listed species had critical habitat listed
- The Bush administration has consistently violated the law by failing to list species, designate habitat, and otherwise implement the *Endangered Species Act*

(g) Cooperation with states/provinces is vital
- Forty-five states have their own legislation, which vary widely in effectiveness
- Federal funding is an incentive to cooperate

(h) Endangered species legislation has a mixed record
- Extinctions have been rare, but so have recoveries

The *Endangered Species Act* has been forcefully interpreted by American courts, with the U.S. Supreme Court ruling that "the plain language of the Act, buttressed by its legislative history, shows clearly that Congress viewed the value of endangered species as incalculable."[73] The law provides for mandatory listing based solely on scientific evidence; prohibition of harm regardless of where a species is located; mandatory habitat protection on federal, state, and private land; recovery plans within specified time limits; and enforcement by citizens if the government fails to apply the law.[74] Nearly every state has enacted endangered species legislation and implemented programs which supplement the federal effort.[75]

Despite the strength of the *Endangered Species Act*, opinion is split over its effectiveness.[76] Although strong on paper, its implementation has been hampered by inadequate resources.[77] The most authoritative assessment of whether or not the law is working was carried out by the National Research Council in 1995. The study concluded that "the *Endangered Species Act* has successfully prevented some species from becoming extinct and slowed the decline of others" but

the extent of the Act in achieving the recovery of species was more limited.[78] Approximately half of the species covered by the Act either had stabilized or were improving.[79]

3. Increase resources allocated to research, implementation, and enforcement
   - Conduct a National Biological Survey
   - Implement legislation (e.g., *National Marine Conservation Areas Act*, *Species at Risk Act*, *Oceans Act*)
   - Enforce legislation (e.g., *Fisheries Act*, *Canadian Environmental Protection Act*)

4. Reduce Canadian greenhouse gas emissions by 50% by 2030
   - Mandate efficiency improvements for buildings, vehicles, industry, appliances, space heating systems, etc.
   - Set regulatory targets for renewable energy
   - Set targets for carbon sequestration
   - Eliminate coal burning power plants
   - Establish national industrial cap and emissions permit trading

5. Enact legislation to address the problem posed by invasive species
   - See the U.S. *National Invasive Species Act*

6. Create more parks and protected areas which focus on rare species, diversity hotspots, ecological representation, and large predator-prey ecosystems
   - Selection and protection is a precondition to resource development (recommended by the National Round Table on the Environment and the Economy)
   - Use the 'reverse-matrix' model for conservation areas where 100% of the land base is considered 'protected' *a priori*, and resource development must prove 'no harm' before proceeding

7. Create a national sustainability strategy which has a concrete goal of achieving sustainability within a generation, as Sweden and the Netherlands have done
   - Concrete long-term and interim goals are vital

8. Change the way that Canada measures progress
   - Supplement the Gross Domestic Product (GDP) with the implementation of a Genuine Wealth system

9. Redesign the economy to dematerialize (consume less resources) and detoxify (substitute safe, clean, natural substances for chemicals that are toxic, persistent, bioaccumulative, carcinogenic, mutagenic, or endocrine-disrupting)
   - Eliminate perverse subsidies

- Experiment with ecological fiscal reform
  - Implement tax shifting so that the tax burden is transferred to activities that society wants to discourage such as the dumping of wastes and toxic chemicals
- Aggressively pursue and encourage efficiency gains of 75–90%

10. Fulfill Canada's commitment to global leadership in sustainable development
    - Increase development assistance (foreign aid) to 0.7% of the GDP
    - Meet commitments made at the United Nations' Cairo conference to fund population issues in developing nations
    - Forgive the debts of poor countries that meet corruption and human rights criteria
    - Transfer useful Canadian knowledge, technology, and institutions

For further details about these recommendations, please consult David R. Boyd's *Sustainability Within a Generation: A New Vision for Canada* (David Suzuki Foundation 2004) and *Unnatural Law: Rethinking Canadian Environmental Law and Policy* (UBC Press 2003). See the web site www.unnaturallaw.com

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Endnotes

[1]Heywood and Watson 1995
[2]Ibid
[3]For a low estimate, see Dolphin and Quicke 2001. For a higher estimate, see Wilson 1992, p. 161
[4]Benton 1995
[5]Supra, n. 1
[6]Easterbrook 1995, pages 556–562; Jones and Fredricksen 1999
[7]May et al. 1995. Tudge 2000
[8]Supra, n. 1
[9]Morrison and Turner 1994
[10]Environment Canada 1996, p. 17-9
[11]Mosquin 2000, p. 65
[12]Environment Canada 1996, p. 3-11
[13]Linton 1997, p. 47
[14]British Columbia is Canada's most biologically diverse province, with a fantastic array of ecosystems, species, and genetic diversity. Sadly, in recent years the political commitment to safeguarding this extraordinary legacy has taken a dramatic turn for the worse. Things began to go downhill under Premier Glen Clark, and the decline has accelerated under Premier Gordon Campbell. A handful of positive steps including the protection of Burns Bog and interim protection of some areas in the Great Bear Rainforest are more than offset by dozens of major setbacks in other areas. The provincial government is behaving like the Pacific dampwood termite, a local species that feasts on wooden structures. At first it is difficult to notice that there is a problem, until a catastrophic event reveals that these busy insects have sabotaged the integrity of the infrastructure or framework of your home. The Liberals are rapidly eroding the infrastructure, framework and capital (human, manufactured, and financial) that was built up over many years to protect our natural heritage. For details see www.bcfacts.org
[15]Mosquin 2000
[16]Freedman et al. 2001
[17]Environment Canada 2000
[18]Mosquin 2000
[19]Freedman et al. 2001
[20]Slaney et al. 1996. Environment Canada 1996, p. 11-42
[21]National Research Council 1993
[22]Commissioner of the Environment and Sustainable Development 1998, p. 4-11, 12
[23]National Research Council Committee on Biological Diversity in Marine Ecosystems 1995; Norse 1993

[24]Heywood and Watson 1995
[25]Environment Minister David Anderson 1999, quoted by Canadian Nature Federation, "Endangered Species Report Card, 2000." See www.cnf.ca
[26]Department of Fisheries and Oceans Canada 1999a, 1999b
[27]Environment Canada 2001, p. 14
[28]OECD 1999
[29]Enserink 1999
[30]International Joint Commission 2002
[31]Kolar and Lodge 2001
[32]Auditor General of Canada 2000
[33]Auditor General of Canada 2000
[34]Thomas et al. 2004
[35]Mittelstaedt 2002
[36]*Species at Risk Act*, S.C. 2002, c. 29, ss. 32-34, 58-61
[37]Boyd and Wallace 2001
[38]de Klemm and Shine 1993, p. 73
[39]*Species at Risk Act*, S.C. 2002, c. 29, ss. 34, 35, 58, 61
[40]*Canada Wildlife Act*, R.S.C. 1985, c. W-9, s. 12(b); *Canadian Environmental Assessment Act*, S.C. 1992, c. 37, ss. 46-47; *Canada Water Act*, R.S.C. 1985, c. C-11 ss. 6, 13; *Canadian Environmental Protection Act, 1999*, S.C. 1999, c. 33, s. 165
[41]Elgie 2001
[42]Bocking 2001, p. 127
[43]Dawson 2001
[44]La Forest and Gibson 2000a, 2000b
[45]Gibson 2001
[46]Muir 2001
[47]*Endangered Species Act*, 16 U.S.C. 1531
[48]*General Law of Ecological Balance and Environmental Protection* (*Ley General del Equilibrio Ecológico y Protección al Ambiente*) and Official Mexican Standard NOM-059-ECOL-1994
[49]*Species at Risk Act*, S.C. 2002, c. 29, s. 33
[50]Green 2001
[51]Scudder 2001
[52]Jones 1997
[53]See for example, the *Health of Animals Act*, S.C. 1990, c. 21, *Plant Protection Act*, S.C. 1990, c. 22, *Fish Health Protection Regulations*, C.R.C. 1978, c. 812
[54]International Joint Commission and Great Lakes Fishery Commission 1990
[55]Ibid
[56]Department of Fisheries and Oceans Canada 2001
[57]Daily and Ellison 2002
[58]Jamieson and Lessard 2000
[59]Ibid
[60]Jamieson and Levings 2001
[61]Environment Canada 1990, p. 156
[62]OECD 1995, 2000
[63]Standing Committee on the Environment and Sustainable Development 1998
[64]Friends of the Earth Canada 2001
[65]Mittelstaedt 1999a, 1999b
[66]Commissioner of the Environment and Sustainable Development 1999, p. 3-18
[67]Environment Canada 1999
[68]For repeat offenders in British Columbia, see the annual "Non-compliance list" published by the Ministry of Water, Land and Air Protection. wlapwww.gov.bc.ca/epd/epdnon. For repeat offenders in Ontario, see Sierra Legal Defence Fund 2002
[69]Christie 2000
[70]Sierra Legal Defence Fund 2001
[71]Benidickson 1997, p. 123
[72]Cincotta and Engelman 2000
[73]*T.V.A.* v. *Hill* (1978)
[74]U.S. *Endangered Species Act*, 16 U.S.C. 1531
[75]Kohm 1991, p. 38
[76]Lambert and Smith 1994; Helmy 2000
[77]Kohm 1991

[78]National Research Council 1995
[79]Ibid