



Everything Under the Sun

TOWARD A BRIGHTER FUTURE
ON A **SMALL BLUE** PLANET

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David Suzuki Foundation



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Preface

ONE HUNDRED YEARS is not a long time. But if we look at the past century, we see unimaginable change. The human population has grown exponentially, from about one and a half billion to seven billion. People have shifted from rural to urban, and now more than half of us live in cities—up to 80 per cent in developed countries. Automobiles and other amazing technological advances have allowed us to do that and so much more. But we're so involved with our technology that we've designed many of our cities for cars instead of people. Our knowledge and inventions have kept pace with population growth, but that only means they've sometimes sped ahead of our ability to plan more rationally for their use and application. And so we're consuming more, wasting more, polluting more, and using up more of the earth's resources.

Many people are understandably afraid of what we've gotten ourselves into. But we'll never get out of a jam by plugging our fingers in our ears and going "lalalala" or pretending everything's fine. The great scientist Albert Einstein once said, "We cannot solve our problems with the same thinking we used when we created them." Humans are creative and adaptable. We must imagine a brighter future and we are to create it. And we can. But we must apply new ways of thinking and seeing.

Some people view the problems we have created as insurmountable. They believe that our current systems and infrastructure are so entrenched that it would be impossible to do anything but carry on with business as usual. But that would be folly. For the most part, modern living spaces and economies have been built around fossil fuels—for transportation, for distribution of goods and services, for energy to provide us with comforts and products. Even if we didn't have to contend with the problems that our overuse of fossil fuels has created—from pollution to climate change to water contamination to ecosystem disruption to geopolitical instability and social inequity—we still have to remember that supplies of fossil fuels are limited. Even before they run out, they will be found increasingly in places that are more difficult and expensive to reach—as is already happening with deep-sea drilling and tar sands.

Our financial systems have been developed over a short time to contend with the pace of our expanding populations and needs. But they've also become instruments with which to exploit those needs and even to create "needs" that are illusory. The global market isn't just about producing and supplying goods and services to people; it's about reaping profits that create massive disparities in wealth. And that's brought us to an absurd situation where people work more hours to produce goods they don't really need and to earn money to buy more of those goods. It's led to a system based on constant growth and ever-expanding exploitation of finite resources on a finite planet.

It just doesn't make sense anymore.

We often forget how new this economic system is, and how quickly economic systems that aren't working can change. We have progressed from a time when people worked twelve or more hours a day, six days a week, with no vacations or benefits, but we're still harbouring some outmoded thinking from those days. We need to learn from history. It wasn't all that long ago that many of society's leaders in "civilized" countries like the United States believed slavery was essential to the economy. But many people recognized that human rights and dignity are more important than an artificial economic system, and they successfully fought to abolish slavery. And, surprise, it didn't destroy the economy!

Like many previous struggles, protecting our Earth is inextricably linked with issues of social justice. Inequality, poverty, and war are often at the root of environmental problems, and they

exacerbate those problems. Exploitation of people and resources around the world has allowed people in developed nations to enjoy a standard of living that is not sustainable. We simply consume too much. And people who have scarcely enough to survive are less likely to worry about large-scale environmental problems. Someone who has to feed a hungry family isn't going to worry about whether an edible plant or animal is endangered.

The global market economy that encourages inequality and exploitation is a recent invention. Note that I said "invention." It is not something real and immutable, like the laws of gravity or thermodynamics. If the economy or any other system that we've invented is not working, then we must change it or replace it. It may sound difficult, but we've done it over and over again throughout our history. That doesn't mean it's easy. Change in the past has often come in the wake of catastrophic wars or revolutions or arms races or space races. But, in the end, it has always involved people sitting down and talking about the problems and the best ways to overcome them. Our hope is to start thinking and talking before catastrophe strikes. Surely we've evolved to the point where we can do that.

With pollution and climate change, species extinction, and destruction of ocean and land ecosystems, we are nearing catastrophe. Some people will deny this, some will say there's nothing we can do about it, and still others will say it's all part of God's plan. But it's happening, and we can and must do something about it. No matter what religious or spiritual beliefs you hold, it's impossible to deny that we have been blessed with a beautiful planet that has everything we need to survive and be healthy. It is up to all of us to care for it and to keep it livable for ourselves and all the living things that share it with us.

Solutions exist. We have the science and technology. We have many intelligent and dedicated people trying to steer us on course. But we need the will and the imagination to change, and, as Einstein said, we need to think in new ways. The problem is more social than technological. We need to commit to adopting ways to live in balance with the natural systems that keep us alive, and with each other. We must recognize that our lives are possible because of a miraculous confluence of time and space, with our planet just far enough away from the sun to provide conditions for us to survive. That sun gives us all of the energy—in one form or another—that we need. Learning how to live well under the sun means finding better ways to use that energy.

This book doesn't have all the answers. But perhaps it can contribute to the conversation, to help people think about the problems we have created and how we might resolve them. This book attempts to identify some of the solutions. But we need more ideas—your ideas. We need to be creative. We need to use our imaginations. We need to talk to each other. This book is an invitation to join the most important conversation of our time.

1. All Creatures Great and Small

SOME PARENTS HAVE taken me to task for pointing out to their children that we are all animals. It's a basic scientific fact, though. Although we're blessed with large brains relative to our size, we still have a lot in common with other animals. We all need clean air, water, and food to survive. We all have an instinct for survival. But rapid exponential growth in human populations, coupled with economic systems that encourage waste and consumption, means that we often ignore the needs of the other living beings that share this world with us—and we also ignore the fact that we depend on them more than they depend on us. As this chapter shows, in failing to take into consideration our fellow creatures, we also lose sight of what we truly need as humans to survive and to be fulfilled and happy.

When mammals are threatened, we are threatened

WE HUMANS SOMETIMES forget that we are animals. We're mammals and, like all mammals, and indeed all animals, we are connected to and dependent on the web of life. When part of that web is in danger, we are all in danger. And our mammal cousins are in danger. According to the International Union for Conservation of Nature (IUCN), one quarter of the world's 5,487 known mammalian species face extinction in 30 years if we don't act now to protect them. This includes many of the planet's apes and monkeys; bears such as polar bears, sun bears, and pandas; and dozens of marine mammals, such as sei and fin whales.

The causes of this biological crisis include habitat loss and damage, introduction of invasive species, pollution, harvesting, and climate change. Because many mammals are large (elephants, hippos, rhinos), exhibit extraordinary intelligence (chimps and gorillas), or have a ferocious nature (lions, tigers, and bears), we have often assumed that they are somewhat resilient to human impacts. This couldn't be further from the truth.

Scientists now believe that the biology of many mammals contributes to their vulnerability. For example, polar bears and grizzlies are particularly susceptible to decline because they require a lot of food for energy, they are large, and they reproduce infrequently and have few offspring when they do reproduce. Human impacts such as unsustainable hunting or habitat destruction put more pressure on the ability of these species to survive.

There is some good news, though. The IUCN assessment showed that “concerted conservation efforts” can bring mammals back from the brink. For example, by reintroducing the black-footed ferret into eight western U.S. states and Mexico, the U.S. Fish and Wildlife Service managed to move the animal from the list of animals that were extinct in the wild to the endangered list.

But who cares about the black-footed ferret, or the wild horse, or the African elephant? We humans are not in danger of extinction, are we? Humans are the most numerous mammal species, and our influence now extends to every square centimetre of this planet, including the atmosphere. But if we think we can survive such a rending of the web of life as the extinction of one quarter of all mammal species, we're living in dreamland. The long-term consequences could be catastrophic because, as the top predator on the planet, our survival and well-being depend on the health and well-being of all life that supports us. (And remember that long-term in this case is only thirty years!)

Even if we look just at the short term, we see that it's in our best interests to protect our fellow animals. As Dr. Jane Smart, head of the IUCN's species program, points out: “The longer we wait, the more expensive it will be to prevent future extinctions. We now know what species are threatened, what the threats are, and where—we have no more excuses to watch from the sidelines.” The rapidity

and scale of the response to failing financial institutions show that we are capable of action when we perceive danger. Well, the extinction crisis on the planet imperils our very survival.

We must do much more to ensure that all species at risk survive. Besides the mammals, the IUCN added the iconic Pacific sockeye salmon to its red list of endangered species. People on the west coast of North America know that the salmon is the lifeblood of coastal ecosystems, providing food for people, bears, and birds, and fertilizer for the forests. That's a perfect example of how interconnected our web of life is.

We have to make some big changes in the way we do things on this finite planet. We can't just keep destroying habitat, polluting water and air, and killing fish and other animals faster than they can reproduce. And because we are all connected to this fragile web, we need to protect animals and their habitat not just for their sake but for our own as well.

Species loss is a silent epidemic

SCIENTISTS WARN THAT the twin threats of climate change and wildlife extinction threaten our planet's life-support systems, including clean air, clean water, and productive soil. Awareness about the causes and consequences of climate change is growing, leading some governments to look for solutions in areas such as clean energy. Species extinction, however, has gone largely unnoticed by government leaders.

In a June 2010 article in the *Guardian* newspaper titled "Give Decision Makers Access to the Value of Nature's Services," France's ecology secretary and the World Resources Institute's vice-president of science and research argue that "unlike the impacts of climate change, biodiversity—and the ecosystem services it harbours—disappears in a mostly silent, local, and anonymous fashion. This may explain in part why the devastation of nature has triggered fewer alarm bells than a hotting-up planet."

Sadly, this is true. Unlike the devastating forest fires, deadly heat waves, and violent storms that have ravaged the planet as a result of climate change, the disappearance of plants and animals seems to get the attention of politicians only when it results in serious economic and social upheaval—such as when overfishing led to the collapse of cod stocks in Atlantic Canada and orange roughy stocks in New Zealand and Australia, throwing thousands of fishermen out of work.

The unravelling of food webs that have taken millennia to evolve is happening all around us. With every patch of forest cut, wetland drained, or grassland paved over, our actions are destroying wildlife habitat at an unprecedented rate.

Scientists warn that we are in the midst of a human-caused catastrophic wildlife crisis. Of the species we know about, some seventeen thousand plant and animal species are facing extinction, including 12 per cent of birds, 23 per cent of mammals, and 32 per cent of amphibians. Some of the species most vulnerable to human impacts are iconic, well-loved creatures. For example, of the eight distinct bear species that grace our planet, six are now in serious trouble, including sun bears, pandas and polar bears.

The response of our leaders has, for the most part, been abysmal. The United Nations declared 2010 the International Year of Biodiversity. Countries reported on their progress in reducing biodiversity loss as required under an international treaty called the Convention on Biological Diversity that most nations have signed. However, the UN has admitted that governments have failed to meet the treaty's objectives "to achieve by 2010 a significant reduction of the current rate of biodiversity loss at the global, regional, and national level as a contribution to poverty alleviation and to the benefit of all life

on Earth.”

Despite our collective failure to meet the 2010 biodiversity target, countries are negotiating new global targets to slow the rate of biodiversity loss. It's easy to be skeptical about the effect these negotiations and meetings in plush hotel ballrooms will have on protecting life on our planet, given the lack of meaningful progress so far. But one outcome of the global biodiversity talks gives us hope.

In 2010, government negotiators from around the world met in Busan, South Korea, where they approved the creation of a new global science body to act as an “early warning system” to inform government leaders on major biodiversity declines and to identify what governments must do to reverse these damaging trends. This global biodiversity scientific body is modelled on the Intergovernmental Panel on Climate Change (IPCC), which, through science, has catalyzed worldwide understanding of and action on global warming.

Despite the efforts of huge multinational oil companies to discredit its work, the IPCC has compiled the best available science on the causes and impacts of global warming and charted the most effective ways for us to solve the problem. In doing so, it has ensured that climate change has remained a priority for governments, and it has proven to be an invaluable tool to help the media understand and report on the issue—independent of politics or PR spin. We hope the newly created “IPCC for nature” will play a similar role in educating, inspiring, and mobilizing policy-makers and the public to take decisive action to stem the biodiversity crisis.

The Year of the Frog

DURING HIGH SCHOOL in Ontario, I spent a lot of time at a swamp near my family's home. Smelling the sweet air in spring, listening to the frogs croak, and catching the insects that would become so important to my life and career gave me solace during those lonely years.

As much as insects became my fascination, I've always loved the frogs. These amazing amphibians occupy a crucial place in the natural order. They are both predator and prey, providing food for larger species and keeping insect populations in balance by eating them. If frogs were to disappear, the planet would soon be covered in flies and other insects. I like flies, but not that much!

In fact, frogs *are* disappearing. Many of us can remember drifting off to sleep to the sound of frogs but unless we act now, it's unlikely that our children and grandchildren will hear the same lullaby. Scientists estimate that one third to one half of the world's six thousand known amphibian species could go extinct in our lifetime. This would be the largest mass extinction since the disappearance of dinosaurs. More than one hundred species are already believed to have vanished since 1980.

The situation is so critical that conservationists and institutions, including universities, zoos, and aquariums, named 2008 the Year of the Frog. The motto, “Frogs matter. Jump in,” is one we should all take to heart. The more we understand about frogs and the reasons for their disappearance, and the more we all get involved in trying to save them, the more likely we will be to head off this impending disaster.

It's not just the frogs we have to worry about. Biologists see frogs and other amphibians as “the canary in the coal mine.” Because of their place in the natural order, frogs are often the first species affected by environmental problems and can thus serve as a warning to other species, including our own.

One of the main threats to frogs and amphibians around the world is the spread of a fungus called chytrid (kit-rid), but other factors that we can start to address immediately are also threatening amphibians. These include global warming, habitat loss, pesticide use, pollution, invasive species, and

even overuse as food or pets.

Dealing with the fungus will be a challenge. Chytrid is thought to have been spread initially by trading in the African clawed frog, which was used for pregnancy tests from 1934 to the 1950s. The fungus has now infected more than one hundred species of frog, killing them in a way that is still baffling scientists. The spores infect the outer layer of skin, but scientists have yet to figure out its mechanism. Ironically, the fungus is not fatal to the African clawed frog.

In an attempt to ensure the survival of frog species most threatened by the fungus, biologists from zoos, aquariums, and botanical gardens, working with the International Union for Conservation of Nature, set up the Amphibian Ark. Under the program, conservationists have started gathering threatened frogs to breed and protect in captivity. There's no guarantee that the scheme will work, but it's worth a try. One of the challenges will be to maintain genetic diversity under such a program. Another big challenge, though, will come when it's time to put the frogs back. Will there even be places left for them to live? And given the crucial role that frogs play as predators and prey in the natural cycle, what will become of those ecosystems while the frogs are away? Global warming is already shifting the areas where species are found, so when it's time to release the frogs, it might not even be realistic to return them to their former homes.

Those are things we can all work to overcome. Some governments have banned harmful pesticide use for lawns and gardens, which will prevent the deaths of many animals, including frogs. And we can all work to protect the places where animals live, through involvement with conservation groups and by lobbying governments at all levels to ensure habitat is a priority when planning and development decisions are made. Our efforts to slow global warming and to cut down on the waste we produce are also steps that will add up to make a real difference. We must listen to the frogs now, so that our children and grandchildren can listen to them tomorrow.

The macaw, the toucan, and the manduvi

NO MATTER HOW much I learn about nature, I never cease to be amazed by its mystery and complexity. That point really struck me in light of a 2008 study in the journal *Biological Conservation* about the relationship between the hyacinth macaw, the toco toucan, and the manduvi tree, titled "Conservation Puzzle: Endangered Hyacinth Macaw Depends on Its Nest Predator for Reproduction."

The hyacinth macaw is an endangered bird in central Brazil. It has a reputation for being picky when it comes to choosing a home: it lives almost exclusively in natural hollows in manduvi trees, which don't grow in great numbers in the region. In an effort to help preserve the bird and its habitat, Dr. Marco Pizo and his research team at the Universidade do Vale do Rio dos Sinos explored how the manduvi tree's seed is spread. They found that the toco toucan collects and disperses more than 83 percent of the seeds.

So far, so good. But here's the kicker: the toucan is the macaw's main predator. Besides feeding on the whole seeds of the manduvi, the toucan also has a big appetite for macaw eggs. The researchers also observed toucans taking over macaw hollows and killing the nestlings.

And so, ironically, the macaw depends on its main predator, the toucan, for its survival.

This fascinating relationship has led to what the report's authors call "a conservation biology puzzle," because "any conservation plan for hyacinth macaws must take into account the toucans, which would not normally be done because of their predator status and because toco toucans are not particularly threatened."

It's a puzzle that illustrates the importance of seeing the big picture when it comes to protecting the

environment. Attempting to manage a single species in isolation can't work because nature is just too complex. Take the caribou, an iconic species found in Norway, Finland, Siberia, Alaska, and Greenland, and throughout Canada. Caribou are in trouble across their expansive range. In the province of British Columbia, populations of mountain caribou that inhabit the Interior rainforests have plummeted to an estimated nineteen hundred individuals from historic levels of about ten thousand. The main threat is the destruction of its old-growth forest habitat by commercial logging, but scientists believe that predators, like wolves and cougars, may have also played a role in the caribou's decline. Because of this, the B.C. government initiated a plan to kill wolves and other predators, in addition to protecting significant areas of the caribou's habitat. Such "predator control" wildlife management practices are increasingly being proposed or used elsewhere in Canada and in other countries. However, because the science of predator-prey interactions is poorly understood, these methods can have severe and unintended consequences. In the case of the hyacinth macaw, killing its main predator would ensure its demise.

We must understand the broader context if we want our wildlife management plans and conservation efforts to succeed.

Governments have been talking about this "ecosystem approach" for some time, but so far they've been slow to follow the talk with action. The official (and somewhat bureaucratic) name for one area off Canada's west coast acknowledges this approach: the Pacific North Coast Integrated Management Area, or PNCIMA. This 88,000-square-kilometre marine region next to B.C.'s Great Bear Rainforest encompasses the central and north coast and Haida Gwaii and is home to a fascinating variety of life, from basking sharks and blue whales to massive kelp forests and glass-sponge reefs. Although Canada's government has committed to using an ecosystem approach for managing the PNCIMA, it has taken little action to implement the process.

Like the earth's forests, oceans are complex environments where everything is interconnected. Whether on land or at sea, large population changes (including extinction) in one species can have cascading effects throughout the ecosystem.

Good conservation planning requires efforts by local communities and governments at all levels to base decisions on an understanding not just of each species in isolation but of ecosystems as a whole. And we must keep in mind that we're a part of that whole, even though our relationship with nature is often as complex and tricky as the relationship between the hyacinth macaw and the toco toucan.

If the bees disappear, we'll all be stung

SOME PEOPLE THINK of bees as something to be feared. But without bees, humans would not be able to survive. It's not just that they provide us with honey and wax; they are also one of the world's most important pollinators. (In fact, bees native to North America do not produce honey; most North American honeybees were imported from Europe—and not all bees sting!)

Close to 90 per cent of the world's plants rely on pollinators for fertilization and reproduction—including many of the plants we use for food. Beyond providing food, plants anchor soil to prevent erosion and fuel the nutrient cycle by decomposing and absorbing nutrients. Bees aren't the only pollinators; butterflies, hummingbirds, and bats, among other animals, provide pollination. But bees are the most common pollinators. If we lose the bees, we lose the plants, and if we lose the plants, well...

The problem is we are losing bees. European honeybees, which are now used for pollination around the world, are declining in number, as are native North American bees. We know some, but not all, o

the causes. The biggest threat is habitat loss and destruction, as natural areas are increasingly developed for housing and shopping centres and sterile lawns. Pesticide use is also killing bees and other pollinators.

But we can help our buzzing buddies in a number of ways—and at least one solution is a lot of fun for you and your kids. First, we can stop using harmful pesticides to keep our lawns and gardens looking pretty. A growing number of local governments have been banning these pesticides, known as cosmetic pesticides, not just to protect pollinators but also to protect human health. As well, a number of large retail stores have voluntarily taken these chemicals off their shelves.

One of the most fun ways we can all work to keep bee populations healthy is to create homes and habitat for the insects. If you have a garden, even a small one on your balcony, you can fill it with plants and flowers that attract bees and other pollinators. And because bees are easy to please, almost any garden will attract them—but remember that native plants will attract native bees and exotic plants will attract honeybees. Choosing a variety of plants that bloom throughout the season will keep bees buzzing from spring through fall.

You can also build homes for bees. Different kinds of bees have different housing needs, and it's a great educational experience to learn how to build homes that will attract various types of bees. Canada and the U.S. are home to hundreds of bee species of all sizes. The smallest is the size of the head of a pin. Some live below ground, some above. And every species is beneficial to plants.

In my hometown of Vancouver, Canada, the Environmental Youth Alliance initiated a project to place mason-bee “condos” throughout the city. Mason bees, also known as blue orchard bees, are small, about the size of a housefly. They are called mason bees because they create rows of cells in their nests divided with walls of clay. They are great pollinators—a single female will visit as many as 17 flowers a minute. In 2008, the EYA handed out 100 bee condos, each housing 36 bees, for residents to place in their yards. The following year, the group put large condos, housing from 72 to 720 bees each, in parks and public spaces around the city. One is even designed to look like an urban condo. By the end of the year, the project had spread more than 8,000 bees across the city. Urban areas are centres for bee diversity because of the variety of flowering plants, habitats, and landscapes.

As I often point out, everything in nature is interconnected. Bees are a crucial part of this interconnection. If bees start to disappear, the effects will cascade throughout ecosystems, affecting all life, including humans. We must do everything we can to ensure that bees survive and flourish. Our own survival depends on it.

Long live the monarch!

EVERY AUTUMN, TENS of millions of monarch butterflies take wing in southern Ontario, embarking on a miraculous three-thousand-kilometre, two-month journey, arriving in central Mexico in late October and early November. The indigenous people of Mexico believe the returning butterflies carry the souls of ancestors, and November 1 and 2 are celebrated there as the Day of the Dead. Catholic tradition has been syncretized with indigenous observance, so November 1 is All Saints' Day, when the spirits of children return, and November 2 is All Souls' Day, the main Day of the Dead, when the spirits of adults return.

It's a time of celebration, as many Mexicans share a belief with people around the world that a veil is lifted between the living and the dead at this time of year, allowing ancestors to visit for a brief time. We see the origins of Halloween in this belief. It's also a time to celebrate the bounty of the harvest. In fact, the Purépecha indigenous word for the monarch can be translated as “harvest

butterfly.” The monarch’s scientific name, *Danaus plexippus*, means “sleepy transformation,” because the butterflies hibernate and metamorphose, from egg to caterpillar to chrysalis to butterfly.

There’s also much to celebrate about the monarch butterfly, even though these fragile insects have flown close to the plane of death in recent times. Populations have been reduced by as much as 90 per cent in the past, but there’s still hope. That these delicate creatures can make such an arduous journey is in itself a wonderful story of survival and the mysterious workings of nature.

Adult monarchs normally live for just a few weeks. On their northern migration from Mexico, in March and April, they stop along the Gulf Coast of the United States to lay eggs on milkweed, the only source of food for the caterpillars. Over several generations, the butterflies make their way northward, landing on milkweed to lay more eggs along the way. Toward the end of summer, what is known as a “Methuselah” generation is born. These butterflies survive for seven or eight months, and it is they who make the incredible journey south.

Even though they have never been to the volcanic mountains of Mexico, the butterflies are guided by internal compasses and the movement of the sun to the oyamel fir forests where their ancestors spent the winter hibernating before renewing the cycle with their journey northward. During their southward migration, monarchs feed on nectar and help pollinate plants. They let rising columns of air carry them, helping them conserve energy from the nectar. The Methuselah monarchs do not reproduce during migration.

The monarch’s relationship with milkweed is interesting. The plant contains a poison that doesn’t harm the feeding caterpillars. The monarchs store this poison throughout their lives, which makes them toxic to many, but not all, predators. These predators have learned that the monarch’s unique bright orange wings with black veins and white spots signal danger. But this evolutionary artistry isn’t enough to protect the monarchs from threats such as logging—legal and illegal—in the forests where they winter, pesticides and herbicides, pollution, storms, parasites and disease, and development and agriculture that eradicate milkweed and nectar-rich flowers.

If we don’t protect the forests in Mexico and the milkweed habitat and nectar sources along its migration routes, the eastern monarch may not survive. Thanks to the efforts of conservation groups, including the World Wildlife Fund and the Mexican Fund for the Conservation of Nature, much of the monarch’s winter habitat has been protected as the UNESCO Monarch Butterfly Biosphere Reserve. Even in the reserve, though, illegal logging and storms threaten the monarchs.

We can all help these fascinating creatures—the eastern populations and those that migrate from other parts of Canada to the U.S. and Mexico. To start, we can support conservation efforts and encourage governments to create and protect places where the monarchs feed and breed. Creating pesticide-free monarch way stations or “butterfly gardens” with milkweed and flowers that offer nectar, water, and shelter, in parks, gardens, and schoolyards, is another great way to help the butterflies.

The monarch offers a vivid illustration of the complexity of nature and of the way all of nature is interconnected. And who knows? It may also offer a glimpse of the connection between the worlds of the living and the dead.

Caring for caribou is a matter of urgency

IF YOU’RE IN Canada, you may have a caribou in your pocket. This important icon has appeared on Canada’s twenty-five-cent coin since 1937. It would be a tragedy if the coin were the only place you could spot this magnificent animal, though. If we don’t protect Canada’s boreal forest, that could be

the result. The boreal forest extends like a green halo over 35 per cent of the country's northern land mass. Stretching from Newfoundland to the Yukon, it forms the largest uninterrupted, intact forest le on the planet.

This vast region of spruce, aspen, and fir trees, and lakes, river valleys, wetlands, and peat bogs supports three billion migratory songbirds, millions of waterfowl and shorebirds, and is a safe haven for the remaining large predatory animals left on the continent, including wolves, grizzly bears, wolverines, and lynx. Much of this biological richness is at risk from industrial activity such as logging, oil and gas development, mining, and large hydroelectric dams. Among the species most at risk of disappearing is a shy and highly secretive animal called the boreal woodland caribou. It is listed as "threatened" under Canada's Species at Risk Act (SARA).

Caribou are not only well-loved symbols of Canada's identity and a source of national pride; they are also a key indicator of the health of boreal forest ecosystems. When woodland caribou populations start to decline, it's a sure sign that the forests they inhabit are not faring well. Biologists estimate th global caribou populations are less than half of what they were fifty years ago. Canada is no exception. A 2009 federal study by a blue-ribbon panel of caribou biologists found that twenty-nine of the fifty-seven remaining herds of boreal caribou in Canada are not self-sustaining and in some places, like northeastern British Columbia, are on the verge of collapse. The scientific evidence points to two leading factors: expanding industry in the caribou's boreal forest home—including forestry, mining, and oil and gas development—and climate change, which is putting caribou populations under enormous additional strain.

The decline of the boreal caribou is both an ecological and social problem. Not only do caribou play a primary role in the ecology of Canada's boreal forest, they are also important to Aboriginal and Métis people who live in the North. Caribou meat is hearty and rich with calories, and their bones and hides are commonly used for tools and clothing. Many Aboriginal groups also have longstanding spiritual connections with caribou, so the continued persistence of caribou is critical to the ongoing health and well-being of indigenous communities in the North.

Boreal woodland caribou depend on large, intact forest landscapes for their survival. Caribou have already disappeared from half of their historical range in Canada, and scientists believe the probability of many of those herds surviving for the next one hundred years is less than 50 per cent. Herds in Alberta, British Columbia, and the southern Northwest Territories are particularly at risk of extinction because of the intensity of ongoing forestry and energy activity.

For example, one herd in the foothills west of Hinton, Alberta, is now critically endangered. Close to 82 per cent of the Little Smoky herd's habitat is now degraded by a mosaic of clear-cuts; criss-crossed with roads, seismic lines, and oil and gas pipelines; and pockmarked with wellheads. Scientists have determined that this herd, and in fact every herd in Alberta, cannot survive unless we work to protect its current habitat and to restore habitat that has been degraded.

Elsewhere in the boreal, including Ontario and Quebec, levels of industrial activity are quickly approaching similar thresholds of habitat disturbance beyond which caribou can no longer survive without decisive action on the part of federal, provincial, and territorial governments. There is a bright spot: scientists believe that in some large areas, such as the northern Northwest Territories, habitat has not yet been degraded to the point where caribou populations are at risk.

We still have time to ensure that caribou herds do not become extinct. But it will require full and immediate implementation of Canada's provincial, territorial, and federal endangered species laws and accompanying policies. In particular, governments must immediately halt further industrial activities in the ranges of critically endangered herds and must use the findings of the scientists to

develop and enact recovery and action plans that identify and protect the habitat that caribou need for food, breeding, migration, and other necessities of survival.

As well as using scientific knowledge, governments must also reach out to Aboriginal people in the boreal who have interacted with the species for millennia. Aboriginal people in Canada have important knowledge about woodland caribou, and governments need to respectfully gather that knowledge and incorporate it into recovery measures for the species. Aboriginal people need to be fully involved in recovery efforts, as the survival of caribou is critical to not only the ecological health of the forest but also the health, culture, and well-being of Aboriginal people who share its boreal habitat.

At a summit meeting in Winnipeg in 2009, Dene Nation president and former Northwest Territories premier Stephen Kakfwi argued that Aboriginal people have a critical role in shaping and leading caribou conservation. “First Nations people have a wealth of intricate land-management knowledge and it applies to caribou,” he told delegates from Russia, Greenland, Norway, and other countries. “Losing caribou is not an intellectual exercise for us and it is not an option. If the caribou are destroyed, our people are destroyed.”

Kakfwi also issued a challenge to stakeholders, including non-governmental organizations, industry and governments, to sit down and work together. “We can’t keep fighting each other,” he said.

There was a time not long ago when billions of passenger pigeons darkened the skies for days, when huge herds of bison ranged along the centre of the continent, supporting wolves and grizzly bears. Today, caribou are the remnants of the once breathtaking abundance of animals in North America. Are we willing to protect them from becoming mere memories stamped on our coins?

We must fight the alien invasion

IN 2008, CUSTOMS officers at the Vancouver airport got a surprise when they checked the luggage of a woman returning from China. They found seventy live Shanghai hairy crabs! Meanwhile, people in England seem reluctant to flush unwanted goldfish down the toilet, so they give them a new home in the River Thames. Back in my hometown of Vancouver, if you walk through Stanley Park in the summer, you’ll come across a pretty spot called Beaver Lake. It’s covered in water lilies and is home to red-eared slider turtles and bullfrogs.

What’s the common thread? It’s all about invasive alien species. These are plants and animals that end up in an environment where they weren’t previously found—usually with help from humans—typically causing harm to the native species and ecosystems they interact with. Most invasive species share ecological characteristics that give them an edge over native flora and fauna in competing for resources such as nutrients, light, physical space, water, and food. These characteristics include the ability to reproduce quickly and disperse throughout the environment, as well as tolerance to a range of habitat conditions.

Thus, although the hairy crabs may have been destined for the cooking pot, as the woman claimed, customs officers couldn’t take that chance. Environment Canada notes that the crab is one of the one hundred most invasive species in the world. They compete with native species for food; they tunnel into riverbanks and dikes, causing erosion; and they carry parasites that can make people sick.

The Thames goldfish also compete with native species for food and transmit diseases to competing species. In Beaver Lake, the lilies are speeding up the demise of the lake itself, rotting and decaying in the fall and turning the lake into a bog. The UN Convention on Biological Diversity notes that these alien plants and animals constitute “one of the greatest threats to biodiversity, and to the ecological

and economic well-being of society and the planet.”

Introduction of a species from one environment to another is nothing new. Early European explorers and settlers brought with them to North America livestock and grains that weren't previously found here, as well as stowaway Norway rats and numerous diseases. But globalization and human movement have increased the spread of invasive species worldwide. As with plants and animals introduced by European settlers and explorers, today's invasive plants and animals are sometimes deliberately introduced—often for food or decorative purposes—and are sometimes accidentally introduced, as with zebra mussels and invasive plants spread when ships empty their ballast in Canadian or U.S. waters.

As well as competing for resources, many alien species kill and feed on native plants and animals. They can also alter habitats, making them uninhabitable to plants and animals that previously lived there. And they can breed with native species and weaken the gene pool. The economic impacts can also be severe, as when, for example, valuable food crops or species are wiped out. Because they enter in so many ways, these invaders can't be stopped through laws alone—though laws can help when it comes to things such as regulations governing where and when ships' ballast water can be dumped. Education is one of the best ways to slow the spread. Often, people are unaware of the consequences of introducing new species to an ecosystem.

Cooperation at local and international levels is also essential. Once an introduced species has established itself, it is extremely difficult to eradicate. Targeted control is commonly used where species have already been introduced. This can range from removing the alien species to using pesticides or herbicides to introducing native predator species.

We should all become aware of alien invasive species and the ways they are spread. Many communities have volunteer programs to get rid of these species. In Vancouver's Stanley Park, people volunteer to pull out the invasive English ivy that has grown throughout the park, choking many of the park's native plants. In Maryland, a volunteer program uses a range of methods to eradicate a variety of invasive plants from Swann Park. We can't entirely stop the spread of these alien invaders, but we can all pitch in to make sure we keep our ecosystems as healthy and natural as possible.

B.C.'s trophy hunt is unbearable

FOR MILLENNIA, ABORIGINAL people have hunted wildlife for food, traditional purposes, and trade. But coastal First Nations in British Columbia argue that killing a threatened animal simply for the thrill of it is foreign to their culture. We call it sport, as if the animals had entered into a life-and-death game. According to Haida leader Guujaaw, “It's not right that anyone should make a sport of killing.”

I agree. Grizzlies are officially designated as a threatened species, and black bear subspecies on the B.C. coast are among the most diverse in North America, ranging from the spirit or kermode bear to the Haida black bear. Yet, the B.C. government has ignored pleas from First Nations and conservation groups and has continued to allow these majestic animals to be killed for sport, even in many parks and protected areas and in the Great Bear Rainforest. The results are devastating. As of 2009, in the thirty years that the government has kept records, close to eleven thousand grizzly bears have been killed in B.C., 88 per cent of them by sport hunters. Many are big-game hunters from the U.S. and Europe who pay thousands of dollars to kill a bear in B.C., since these marvellous bruins no longer exist in their own home countries.

First Nations have shared the land with bears for thousands of years. According to Guujaaw, “Bears

are as much a part of the environment as we are.” Indeed, the bears that feed, breed, and roam among the archipelago of islands and lush mainland valleys of British Columbia play important roles in the ecosystems they inhabit. For example, bears, like other large predatory animals, help regulate prey populations such as deer and thereby prevent overgrazing in forests. Bears feeding on salmon in streams also distribute the nutrients from the fish carcasses across the forest floor. It is a direct transfer of nutrients from the ocean to the forest, and one of the reasons why coastal forests are so rich in biodiversity and why the trees grow to such monstrous sizes.

The ethical and scientific reasons to end the sport hunt are compelling, but so too are the economic arguments. This is particularly true for Aboriginal communities that see the non-consumptive use of bears, such as bear viewing, as potential sources of employment and income for their struggling communities. In 2003, a study by the Centre for Integral Economics showed that grizzly bear viewing brings in twice the income for coastal communities as the trophy hunt. One bear-watching operation at Knight Inlet grossed more than \$3 million in direct revenue in 2007—more than all trophy-hunting revenue combined.

“Each bear killed is one less bear that tourists will pay top dollar to photograph,” said Dean Wyatt of the Commercial Bear Viewing Association. “Only a total ban on trophy hunting will ensure that bear populations can support the high-end viewing operations that add valuable income to coastal communities.”

Protecting opportunities for Aboriginal businesses to participate in the multi-million-dollar ecotourism industry in B.C. must be a priority for government. Art Sterritt, executive director of the Coastal First Nations Turning Point Initiative, argued that government must manage bears to promote sustainable tourism. “This is not a sustainable industry,” Sterritt has said of trophy hunting. “It is jeopardizing the sustainable industries we are trying to create.”

Killing bears for sport makes no sense scientifically, but it is also unethical and immoral to hunt these animals so that they become a head on a wall or a rug in front of a fireplace when tourists are willing to pay for the chance to photograph them alive and in the wild. Most British Columbians agree. A 2008 McAllister Opinion Research poll found that 79 per cent of B.C. residents believe that to kill a bear simply for the thrill of it is reprehensible and that the practice should end.

Today, the only place you’ll find a grizzly bear south of Wyoming is on California’s state flag. It would be more than a shame if all we had left to remember these magnificent animals in B.C. were a few films and First Nations carvings.

Hunting in parks is at odds with conservation

IN NATURE, PREDATORS usually go after the weakest of the prey—the oldest or youngest, the injured or ill. It makes sense; these animals are easier to catch, even if they’re not always the meatiest. We humans are different. We’re often out to prove something, so with our fancy hunting or fishing gear, we go after the biggest and strongest animals—the trophy bucks with bigger horns, the bears with the best coats, or the biggest salmon or halibut.

In the natural order, the predator-prey relationship can ensure that wildlife populations stay strong, as the weakest animals get culled while the strongest and healthiest survive to pass on their genes. Some hunting and harvesting done by humans has the opposite effect. Research published in the *Proceedings of the National Academy of Sciences* shows that many of our current hunting and fishing practices not only reduce population numbers but also cause dramatic and often negative changes in the behaviour, size, and characteristics of targeted species.

Researchers from Canadian and American universities looked at twenty-nine earlier studies, mostly of fish but also of larger animals such as bighorn sheep and even some plants, and found that rates of evolutionary change were as much as three times higher in species that are hunted and harvested by humans.

We've long known that unsustainable rates of hunting and fishing can devastate wildlife populations and fish stocks. Just think of the Atlantic cod fishery and the looming crisis in the Pacific salmon fishery. Now, as the new study shows, we're not just affecting the numbers, we're also having an impact on the characteristics of the animals themselves, such as body size and the age at which they reproduce. We have become a part of the evolutionary process, and that has huge implications when you consider how ignorant we are about the web of living things. It's an important issue to consider when we look at hunting and fishing practices and regulations. When rules are overhauled to allow hunters to take even more species of animals, we have to think hard about what effect that may have on biodiversity and on evolution.

Although I don't hunt (but I love fishing), I'm not opposed to sustainable hunting and fishing for subsistence and even commercial purposes. But we should be clear: many hunting regulations, especially those that allow hunting in parks, are not about putting venison on the table. They are often at odds with a key principle of sustainable wildlife management: that we should keep *common species common* to ensure they aren't placed at risk in the first place.

Wildlife species around the world are already under enormous pressure, due mainly to habitat loss and fragmentation. We need to act in a precautionary way now to minimize our actions that affect the ability of species to survive and evolve.

Doing the right thing for whales

THE FEW NORTH Atlantic right whales left in the world visit the waters off the east coast of Canada and the U.S. every summer and fall, after migrating from the coasts off Georgia and Florida, where they breed in winter. They're big animals, weighing up to eighty tonnes and measuring up to eighteen metres. But even though the whales enjoy prolonged multi-partner mating and the males have the biggest *cojones* in the animal kingdom, they're slow breeders and haven't been able to increase their number much above four hundred for some time.

Their name was bestowed on them by early whalers, who considered them the "right" whale to hunt because they are large, swim slowly and often close to shore, and usually float when they are killed. Although people haven't hunted them since 1935, we're still putting them in danger from collisions with ships or entanglement in fishing gear in the busy waters off the U.S. and Canada. These factors have made this giant mammal one of the most endangered whales in North America.

But there has been some good news for the North Atlantic right whale. The whale has been listed as endangered in the U.S. since 1973, and its critical habitat has been identified under a recovery plan that was finalized in 1991. Canada's government has been slower to act. The Canadian government released its final recovery strategy for the whales in June 2009, and it includes identification of the whale's critical habitat. Critical habitat refers to areas necessary for a plant or animal species to survive or recover. Under Canada's Species at Risk Act, once an endangered species' critical habitat has been identified in a recovery strategy, the government must legally protect it if it falls within federal jurisdiction, as oceans do.

In the case of the right whale, the government must ensure the whales have a functioning ecosystem that supports their primary needs and that they are protected from collisions with ships and

entanglements in fishing gear.

Fisheries and Oceans Canada's original proposed recovery strategy in January 2009 did not identify the Roseway Basin, an area 48 kilometres south of Nova Scotia, as critical habitat. But the David Suzuki Foundation, with advice from Ecojustice, argued that the Roseway Basin and Grand Manan Basin must be included. The revised recovery strategy reflected this advice by adding the Roseway Basin to the critical habitat identification. It's great that the government has moved to protect the habitat of these magnificent mammals, but more needs to be done if our Species at Risk Act is to be effective. A report card issued in April 2009 by conservation groups, including the David Suzuki Foundation, showed that few of the 449 species listed under the act are receiving adequate protection especially where there might be competing interests.

The Banff Springs snail, which lives in the already protected Banff National Park, is the only animal species to get an action plan since the act became law in late 2002. Three plant species have recently had action plans finalized. Meanwhile, numerous species like the boreal woodland caribou, northern spotted owl, and polar bear continue to disappear with no protection of their critical habitat under Canada's act. Habitat loss and degradation are the primary causes of decline for 85 per cent of species at risk in the world. Some, such as the polar bear, are protected in the U.S. We can't expect a plant or animal to survive or recover if it doesn't have a healthy and safe place to live.

Of course, governments often find it difficult to put the needs of plants and animals above competing human interests. Protecting critical habitat often means that industrial activities such as logging and mining must be halted or practices significantly improved in areas critical to species' survival. But we often fail to realize that the consequences—both ecological and economic—of losing species and the functioning ecosystems upon which they depend are more severe than the consequences of altering or halting industrial activity within that habitat.

When a species disappears, it affects entire ecosystems. The species may be important as a food source for other animals, or for maintaining the pH of the forest floor, or it may be a predator that keeps other species populations from expanding too rapidly. Functioning ecosystems are far more complex than we realize. Damaging ecosystems that bring us services such as carbon sequestration and storage, pollination, nutrient cycling, and water and air purification tampers with the composition of the natural systems that support wildlife and humans alike.

Some at-risk species in Canada and the rest of the world don't have a lot of time left. We must view the protection strategy for these whales as an example to follow for protecting other endangered species—for their sake and ours.

Leaders rally to keep the tiger's future burning bright

THE YEAR OF the Tiger ended in February 2011. Chinese zodiac aside, it wasn't a good year for the tiger. Even golfer Tiger Woods had a better year than his namesake animal. And, as you may know, his year sucked.

The situation for the tiger worldwide has become so precarious that politicians, scientists, conservationists, and bankers from thirteen countries where tigers live met in Russia in November 2010 to discuss ways to save it from extinction. Government leaders from Bangladesh, Bhutan, Cambodia, China, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Thailand, Vietnam, and Russia signed the St. Petersburg Declaration, with the aim of doubling the world tiger population by 2022—the next Year of the Tiger. The agreement calls for improved habitat protection and enhancement, and a crackdown on illegal poaching and trade in tiger parts.

Three of the nine subspecies of tiger are already extinct and the remaining six are endangered, two of them critically. A century ago, more than 100,000 tigers roamed the eastern hemisphere from the tropical forests of Malaysia to the subarctic woodlands of Siberia. Now, scientists believe only about 3,200 remain in the wild. Like other large iconic predators, including grizzly bears, tigers are threatened especially by habitat loss and fragmentation. But tigers are encountering additional pressures. Tiger skins and body parts are valued by poachers, in part because of their use in traditional Chinese medicine. Increasing conflict with people as human populations expand is also putting the tiger in danger.

As Vancouver writer John Vaillant notes in his excellent book *The Tiger: A True Story of Vengeance and Survival*, it's not just for the tiger's sake that we should be concerned. Vaillant writes that "the tiger represents an enormous canary in the biological coal mine." When a large predator like the tiger or the grizzly in Canada, is healthy, it's a sign that the habitat and prey that support it are also healthy.

In a November 2010 article for The Tyee news website, "We Can Save the Tiger," Vaillant wrote that the tiger is "a bellwether for what scientists are calling the Sixth Great Extinction: the massive, human-driven loss of species currently underway across the globe." He adds, "If the tiger is allowed to go extinct in the wild (and 'allow' is the operative word here), it will represent the first time in ten thousand years that such a large predator has disappeared from our collective landscape."

Scientists believe the earth has experienced five mass extinctions in its history, all caused by physical forces. This time humans are the cause. Biologists estimate that we are losing about thirty thousand species a year, or about three every hour, through alteration of the landscape and atmosphere, pollution, overexploitation of plants and animals, and introduction of alien species into ecosystems.

With the tiger, we have seen some small successes that should give us hope for the possibility of turning things around. In 1947, Russia became the first country in the world to protect the tiger, and the country's population of Amur, or Siberian, tigers grew from a low of about 30 to 250 in the mid 1980s. As the Soviet Union started crumbling in the late 1980s, the tiger again became threatened because of the ensuing corruption and illegal deforestation and poaching. In 1992, Russia's government implemented new conservation measures, which led to recovery and stabilization of the tiger population at about 450 today.

World leaders now appear to be taking the tiger's fate seriously. With efforts and funding from a number of governments and conservation groups such as the Wildlife Conservation Society, Global Environment Facility, and the World Wildlife Fund, along with donations from individuals including movie star Leonardo DiCaprio, the tiger may be facing a brighter future.

If it is true, as Vaillant points out, that tigers are the bellwether for the Sixth Great Extinction, then we really have little time to lose. Our planet and its natural systems are resilient, but they have recovered from past extinction events only when the cause of those events dissipated. We absolutely must change the way we treat the natural systems of which we are very much a part, or we, as the cause of this impending extinction and as the top predator on the planet, will suffer the consequences.

Aflockalypse now, extinction forever

ON NEW YEAR'S EVE 2011, five thousand red-winged blackbirds dropped out of the sky in Beebe, Arkansas. Necropsies revealed no evidence of poisoning but did indicate the birds had suffered massive internal trauma. Days later, fishermen observed schools of fish floating belly up on Chesapeake Bay. In England, tens of thousands of dead crabs washed up on local beaches, and reports

come in almost daily of penguins, turtles, and even dolphins dying unexpectedly in the wild. Are these events signs of the “aflockalypse,” as the media dubbed the spate of die-offs? The answer is yes. And no.

Our inherent love and respect for the natural world compels us to take notice when animals die in large numbers, but observations going back more than a century suggest that these mass-mortality events aren't as unusual as we might think, and they are often the result of natural causes, such as adverse weather, disease outbreaks, or stress associated with long-distance migration.

In analyzing bird counts, journal records, and other observations dating back to the late nineteenth century, European researchers found frequent reports of deaths of birds in the hundreds and thousands. One massive kill occurred in spring 1964, when an estimated 100,000 king eiders, representing nearly a tenth of the species' western Canadian population, perished in the Beaufort Sea. These large, beautiful ducks starved when pools of open water in the sea ice re-froze suddenly, preventing them from getting to the food in the water below. More recently, an estimated 40,000 individual birds from 45 different species were killed on April 8, 1993, when a tornado crossed their migration routes off the coast of Louisiana.

Although the sudden death of wildlife in great numbers is alarming, the unravelling of entire food webs is happening all around us and every day—but in a far less obvious manner. With every patch of forest cut, wetland drained, or grassland paved, our ongoing destruction of wildlife habitat is leading to population declines, and even driving some species to extinction.

Climate change is predicted to sharply increase the risk of species extinction within our children's lifetime. According to the Intergovernmental Panel on Climate Change, 20 to 30 per cent of plant and animal species assessed will likely be at increased risk of extinction if global average temperatures continue to rise with escalating emissions of carbon pollution.

This wildlife crisis has been described as a silent epidemic by scientists, like famed Harvard entomologist E.O. Wilson, because it receives so little attention from governments.

The unsettling mass die-offs reveal the inherent vulnerability of wildlife to sudden and dramatic population declines, often as a result of natural causes. This is all the more reason to ensure we don't exacerbate the challenges faced by wildlife in an increasingly busy world. We need to reduce the environmental stressors that we impose on wildlife, so that animals can better cope with and survive the challenges they face every day. We need to eliminate dangerous pesticides and other toxic materials, protect the habitats of endangered plants and animals like caribou, and get serious about tackling climate change.

It's good that people are concerned about sudden animal die-offs, but if we really care about the future of wildlife, we need to start paying more attention to our own role in the extinction crisis—and urge our elected officials to take concrete steps to protect the biological richness with which our planet is blessed.

2. People on the Move

WE'VE BECOME CITY dwellers. More than half of us now live in urban areas—up to 80 per cent in industrialized nations—and close to 75 per cent of the greenhouse gas emissions that cause climate change are produced in cities. As human populations have grown and moved from rural communities to cities, so too has the need to find ways to transport ourselves and the goods on which we rely. In the developed world, where corporate profits and new products are often valued above fulfilling our needs, that has meant the spawning of a car culture. The demand for private automobiles is now spreading to the developing world, especially in places like China and India, where growing economies are compelling people to give up bicycles and other forms of transportation for cars. As auto-makers grew in the twentieth century, along with the oil and gas industry that kept the cars going, streetcar infrastructure was torn up and replaced by roads, parking lots, and shopping malls. Now we are seeing the consequences of our actions: climate change, pollution, gridlock, car-centric rather than human-centric urban areas, and more. Our car-centric cities and consumer culture are also spawning other problems, including the tremendous amounts of waste we produce. This chapter explores our urban societies and the potential to make cities more livable.

There's no such thing as garbage

IN MEXICO CITY, politicians banned the ubiquitous plastic bags that citizens use for everything from groceries to soft drinks. But that will go only part way to reducing the twelve thousand tonnes of garbage the city produces every day. As of 2009, only 6 per cent of Mexico City's garbage was recycled, but the government has an ambitious plan to recycle, compost, or burn for energy 85 per cent of it by 2013.

Mexico City's waste-management situation illustrates the importance of the three Rs: reduce, reuse, and recycle. And we should add another R: rethink. Many people are getting better at this, but we can do more. Canadians and Americans recycle just over 20 per cent of their garbage. And each Canadian and American produces more than eight hundred kilograms of non-hazardous solid waste a year. That's a lot of garbage going to the landfill, and it's a lot of resources and energy being wasted. Some European countries, such as Austria and Switzerland, are now recycling more than half their waste, so there's a lot of room for improvement. After all, whatever we throw away represents a waste of resources and money—not to mention time.

Beyond the waste problem itself, landfills produce about 25 per cent of methane emissions in Canada and about 17 per cent in the U.S.—and methane is a greenhouse gas more powerful than carbon dioxide. Some cities are now capturing that methane to burn for energy rather than allowing it to escape into the atmosphere. Reducing the amount of trash we create in the first place is the best way to start tackling our waste-management problems. Not only does it mean we send less waste to the landfill, it also means we use fewer resources and less energy—as it takes energy to produce and transport packaging and disposable items.

Every day, more people, stores, and cities are finding ways to cut down on use of disposable plastic bags, but we still create a lot of unnecessary packaging and products. Planned obsolescence—the absurd practice of producing goods that won't last so that the consumer cycle can continue—is still very much with us. We can all avoid buying products that are overpackaged or that are “disposable”—and encourage producers to be more responsible. When we consumers take the time to let stores, businesses, and governments know that we want less packaging and that we want goods that last, we

will make a difference. Our changing attitude about plastic bags is a perfect example.

Reusing offers opportunities to get creative. People have always re-tailored clothes to give them new life. Think of the other ways you can use products that no longer function in their intended role. But reusing is an area where some difficulties arise, especially on a larger scale. Reusing waste by converting it to energy is a growing trend. The most common method is burning garbage and using the heat to produce energy. Although the technology is improving, it still has its problems; burning waste creates emissions, for one. And it can turn waste into a lucrative energy commodity, which diminishes the incentive to reduce or recycle. When you really think about it, there is no such thing as garbage. It's all resources of one kind or another, and burning them destroys them forever. Other methods of waste disposal are also being explored, including breaking down the waste with micro-organisms to produce methane and carbon dioxide for biogas.

Recycling is one of the first things that come to mind when we think of waste reduction. Most urbanites in North America dutifully put their paper, plastic, and bottles and cans in the blue box recycling bins. Again, if we use fewer products that must be thrown away, we'll have less stuff to recycle and send to landfills. But we should all be aware that our efforts to recycle are not in vain. If we work to ensure that our communities, schools, and workplaces have good recycling and composting programs and that producers and retailers take responsibility for their products, and if we all improve our own efforts to recycle, we will reduce our need for landfills.

Individual action is important, but legislated solutions are also effective. In Switzerland, people buy stickers that they have to attach to garbage before it is picked up. The more garbage you put out, the more you have to pay. Switzerland now has the highest rate of recycling in the world. We can all do our part as citizens, but, as can be seen in Mexico City and Switzerland, a push by governments can go a long way to creating the kind of large-scale change needed to get our waste-management problem under control.

Making cities more livable may save the world

MORE THAN HALF of the world's seven billion people live in cities. City dwellers consume about three-quarters of the world's energy and generate most of the greenhouse gases that cause climate change. If we are to resolve some of the serious issues around pollution, climate change, human health, and energy consumption, we must look to cities for solutions. As the world's population continues to grow, a shift back to rural living is unlikely. So, what can we do?

Progress in my home city of Vancouver gives me hope, but even here we have a long way to go. The most important move urbanites can make is to get out of their cars. But governments must encourage this with better community design and investments in public transit and pedestrian and cycling infrastructure.

Cycling is the fastest-growing method of travel in Vancouver, thanks in part to a municipal decision to expand bike routes, especially into downtown. Walking is also becoming more popular, with the number of walking trips up 44 per cent since 1994. And increases in the number of people taking public transit are outpacing those in all other urban Canadian centres, with a 20 per cent rise in ridership over the past decade—though government investment in the system has not kept up with the demand, hampering its potential. Transit use is increasing in many U.S. and European cities as well, partly in response to rising gas prices.

Making cities more sustainable isn't just about shifting from car-centric to human-centric planning. Providing incentives to retrofit older buildings or design newer ones to be more energy efficient,

encouraging economic activity that doesn't cause a lot of pollution, and creating more parks and green spaces are essential to making cities more livable and less polluting. But steering society away from cars is essential. In his book *Seven Rules for Sustainable Communities: Design Strategies for the Post-Carbon World*, University of British Columbia professor Patrick Condon points out that "thirty per cent of the world's carbon dioxide production comes from the United States and Canada, where only about six per cent of the world's people live. Of this amount, about a quarter comes directly from transportation—and the bulk of that from single-passenger automobiles."

On top of the environmental problems, cars kill. Even though accident rates are going down, thanks in part to technical innovations and regulations around speeding and seatbelt use, cars are a leading cause of death for Canadians and Americans.

The biggest challenges to transforming cities include the entrenched belief among many North Americans that cars are an absolute necessity and the failure of many people to see the benefits of a balanced transportation system. The backlash against a few bike lanes in Vancouver has been strong, even though the lanes have done little to hinder traffic or business.

Vancouver was able to avoid many of the problems other cities face, especially in the U.S., thanks in part to a decision in the late 1960s (spurred by activists) not to expand freeways into the city and to instead focus on a balanced transportation system where walking, biking, and transit are viable options. Statistics Canada reports that Vancouver is the only major Canadian city where commuting times decreased between 1992 and 2005. Cities that focused on expanding roads have seen more traffic and gridlock. As well, Vancouver's transportation emissions, which were once on the rise, have been arrested. Unfortunately, Metro Vancouver still risks repeating the mistakes of other cities, as provincial pressure to expand freeways is ever present. We really need to be more forward thinking.

Condon sums up the opportunities well: "If we change the way cities are built and retrofitted, we can prevent the blackest of the nightmare scenarios from becoming real and can create the conditions for livable life for our children and grandchildren. It is not apocalyptic to say we can save their lives."

Ride a bike and save the world

Every time I see an adult on a bicycle, I no longer despair for the future of the human race.—H.G. Wells

SCIENCE HAS HAD a tremendous impact on the planet in an incredibly short time. In just the past few hundred of our 150,000 years on Earth, we have invented everything from steam engines, cars, and airplanes to sophisticated weapons and supercomputers. And the pace at which we keep inventing more complex and fascinating machines is increasing. Some of our inventions have been a great boon, some have been harmful, and some, such as cars, have turned out to be a mixed blessing.

But one invention, the bicycle, is so efficient, beneficial, and simple that it may be the best thing we've ever made. A U.K. man even built a bicycle entirely out of wood, with no plastic or metal parts. Everything, including the wheels, gears, and seat, is wood. Inventor Michael Thompson, who made the SplinterBike on a bet with a friend, says it can travel up to fifty kilometres an hour. What's amazing is that, almost two hundred years after the first two-wheeler was made, people are still able to come up with innovative ideas for this practical transportation device.

The modern version of the bicycle with pedals and cranks was invented by French carriage-maker Ernest Michaux in 1861. It's come a long way since then, but whether it's a high-tech racing bike or one-gear street cruiser, the bike is still a marvel of ingenuity. In fact, it may well be the most efficient form of transportation yet invented.

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